

## **APPENDIX 1—WILD AND SCENIC RIVER SUITABILITY CONSIDERATIONS**

---

This Approved Resource Management Plan (RMP) makes Wild and Scenic River (WSR) suitability recommendations pursuant to Section 5(d)(1) of the WSR Act. WSR designations are made by Congress or by the Secretary of the Interior upon application of a state governor.

Suitability was the process of determining which if any of the 12 river segments found to be free-flowing and having outstandingly remarkable values in the Wild and Scenic River Eligibility and Tentative Classification Report, Richfield Field Office, March 2005, should be recommended to Congress as additions to the National Wild and Scenic Rivers System (NWSRS). Suitability took into account factors not considered in the eligibility evaluation, such as threats to a river or the need to develop the water for municipal, agricultural, or industrial uses. In addressing these considerations, the benefits and impacts of WSR designation have been evaluated and alternative protection methods considered. Eligibility was based on criteria; suitability was based on judgment.

### **INTERIM MANAGEMENT**

Until a Record of Decision (ROD) is signed for the approved plan, protection of segments found eligible (regardless of suitability finding) would be addressed on a case-by-case basis. This means that whenever any proposed action would affect these outstandingly remarkable values, impacts would be analyzed through the National Environmental Protection Act (NEPA) process, and mitigation and alternatives would be considered to avoid such impacts.

Once a ROD is signed, segments recommended as non-suitable would be dropped from special management and would be managed under the provisions of the RMP. Segments recommended as suitable would be managed for the preservation of outstandingly remarkable values, tentative classifications, and their free-flowing status.

### **SUITABILITY RECOMMENDATIONS FOR THE APPROVED RMP**

The five miles of the Fremont Gorge segment (the Fremont River above Capitol Reef National Park) identified in the Preferred Alternative of the DRMP/Environment Impact Statement (EIS) would be considered suitable for inclusion into the NWSRS. The following segments are recommended as non-suitable and would be released from further WSR consideration: Dirty Devil, Beaver Wash Canyon, Larry Canyon, No Mans Canyon, Robbers Roost Canyon, Sams Mesa Box Canyon, Twin Corral Box Canyon, Fish Creek, Fremont River below Capitol Reef National Park to Caineville Ditch Diversion, Maidenwater Creek, and Quitcupah Creek.

### **SUITABILITY FACTORS ADDRESSED FOR EACH ELIGIBLE RIVER**

In addition to resource uses, conflicts, and tradeoffs identified in the analysis of the alternatives, several suitability factors were addressed for each eligible river in this appendix, including:

- The characteristics that do or do not make the area a worthy addition to the NWSRS
- Current status of land ownership and human use of the area

- Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system
- Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners
- The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress
- Bureau of Land Management's (BLM) ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act
- Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns.

### **Fremont Gorge (Fremont River Above Capitol Reef National Park)**

The Fremont Gorge is considered a worthy addition to the NWSRS based on an outstandingly remarkable value of outstanding scenery and is being recommended as suitable with the tentative classification of wild. It is the deepest gorge cutting across the Waterpocket Fold. The scenery is highly diverse and not common to other rivers in the region. There are no human developments, and land use impacts on public lands do not detract from the natural qualities found in the rugged and primitive stretches of the gorge.

This is a free-flowing, perennial segment, although water flows in Fremont Gorge can vary considerably from year to year based on upstream precipitation and upstream water diversions.

#### ***Current status of land ownership and human use of the area***

The river segment is 5.0 miles in length, all public lands administered by BLM. Public lands within the river corridor support livestock grazing and dispersed activity including hiking, hunting, sightseeing, photography, and other types of primitive recreation. Use levels are low. The only access to the area is along a single, non-maintained vehicle way.

#### ***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

WSR designation would be compatible with BLM proposals to maintain riparian values and protect the watershed and high quality of water. It would help to maintain the important scenic values of the area.

Inclusion into the NWSRS could preclude dams or other water developments within the designated stretch, but no such developments are currently planned. Wayne County interests have proposed water diversion and storage projects for the Fremont River in a variety of locations, including sites upstream and downstream from this location. To date, none of the proposals have moved beyond the idea stage.

Designation would complement management of the eligible river segment within Capitol Reef National Park.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation as a means of preserving the free-flowing character and other values of this nationally significant river. No state, tribal, or local government has expressed support for inclusion of the river in the NWSRS. Local and state agencies, water users, and municipalities oppose designation due to perceptions that existing water rights could be affected and opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream. In actuality, there is no likely development identified within the eligible segment, and any upstream or downstream development would be affected only if federal money was involved, and even then only if the development would invade or unreasonably diminish fish, wildlife, recreation, or scenic values identified within the designated segment at the time of designation.

Congressional designation of this eligible segment would not preclude consideration of this water diversion and storage project in the future, as long as it would not exceed the “invade or unreasonably diminish” standard discussed above. Although the WSR Act infers a federal reserved water right upon designation, rather than establishing an amount it actually imposes a limit, expressing that any such right is to be the minimum necessary for the purposes of the Act. Such right would have to be adjudicated through the state and would be junior to any existing rights.

Although none of the above entities would share costs, because Capitol Reef National Park has determined the contiguous portion of the river that it manages to be eligible, costs and administration of the river area could be shared with it if Congress were to also designate the portion of the river within its boundaries.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter could involve additional studies and monitoring.

***The BLM’s ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs. Also, BLM could partner with the National Park Service (NPS) in administering the river.

Alternatives to congressional WSR designation are contained in the Richfield PRMP/FEIS and include land use prescriptions to manage riparian systems, watershed, water quality, and habitats for sensitive and listed fish and wildlife species, including potential Special Recreation Management Area (SRMA) or area of critical environmental concern (ACEC) designations and limiting off-road motorized travel, mining and mineral leasing, and rights-of-way (ROW) development. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

The lands within the river corridor are public lands administered by BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

The WSR Act infers a federal reserved water right upon designation. Any such right would be the minimum necessary for the purposes of the Act, would have to be adjudicated through the state, and would be junior to any existing rights.

Local and state agencies, water users, and municipalities have expressed concern that opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

**Dirty Devil River Excluding Its Tributaries****Dirty Devil River**

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. The entire Dirty Devil segment is within the Dirty Devil and Fiddler Butte Wilderness Study Areas (WSA) or the Dirty Devil SRMA. Approximately 35 miles of this segment are in the Dirty Devil and Fiddler Butte WSAs and 48 miles are in the Dirty Devil SRMA. WSA management through the Interim Management Plan (IMP) and management prescriptions associated with the Dirty Devil SRMA would provide protection to the segment's outstandingly remarkable values. In addition, the BLM land within this segment is Visual Resource Management (VRM) Class I (35 miles) or II (19 miles), which would protect the scenic and other outstandingly remarkable values.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Scenery is rated Class A with extremely rugged topography and contrasting variety and color of exposed sandstone layers and vegetation. The Dirty Devil River and its surrounding landscape has been the subject of professional photographers.

Recreational opportunities, including hiking, backpacking, and, on those rare occasions when conditions are right, boating, attract visitors from outside the region. Several guidebooks describe opportunities for backpacking and hiking. The river and surrounding lands provide for commercial use, with trips conducted annually. People are willing to travel long distances to recreate here as indicated by repeat users, commercial operations, and increasing visitation levels despite the area's remoteness and the difficult access.

The Dirty Devil River has exposed eight geologic formations, some of which contain rare paleontological resources within the river corridor.



Habitat for several special status species, including the Mexican spotted owl (MSO), Southwestern willow flycatcher, and yellow-billed cuckoo, is found within the canyon created by the river. There are active Peregrine falcon aeries in cliff habitat above the river. The river corridor provides crucial habitat for big game, neo-tropical migratory birds, non-game mammals, bats, and small rodents.

The river corridor contains multiple sites with evidence of occupation and use by both Desert Archaic and Fremont peoples. Sites span a very long time period, from 5000 BC to 1300 A.D.

This river segment is free-flowing in character and free of impoundments and other intrusions.

***Current status of land ownership and human use of the area***

The eligible segment totals 57 miles: 54 miles of BLM-administered land and 3 miles of state and private land. There are no plans for acquisition of the private land. The river corridor is undeveloped and primitive and mostly within the Dirty Devil and Fiddler Butte WSAs.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values, protect the watershed, protect potential habitat for the MSO, and manage the lands for primitive recreation opportunities. However, congressional designation into the national system is not necessary for these goals to be achieved.

Inclusion in the NWSRS could preclude dams or other development including roads, pipelines, or other structures on federal lands within this stretch of river if classified as “wild,” but no such developments are proposed.

The Dirty Devil drainage is almost exclusively within the Dirty Devil and Fiddler Butte WSAs. BLM has recommended these lands to Congress for wilderness designation. Adjacent NPS lands are also administratively recommended for wilderness.

Failure to include the Dirty Devil River in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area’s WSA status would continue, and many of the other land use prescriptions being considered within the Richfield PRMP/FEIS would also preserve and enhance such values if implemented.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted WSR designation as a means of preserving the free-flowing character of this nationally significant river, and NPS has determined to be eligible the contiguous portion of the river that it manages. No state, tribal, or local governments have expressed support for inclusion of the river in the NWSRS. Local and state agencies, water users, and municipalities oppose designation due to perceptions that upstream water rights and water projects could be adversely affected. No water developments are proposed or likely to be proposed within the eligible segment given that it is immediately upstream from Lake Powell with its huge, and currently underutilized, water storage capacity.

NPS has determined the portion of the river that it manages within the Glen Canyon National Recreation Area (NRA) to be an eligible WSR, so costs and administration of the river area could be shared between BLM and NPS if Congress added the entire Dirty Devil to the NWSRS.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition is needed because no private land acquisitions are anticipated. State lands could be acquired through exchange. The initial costs of administration would include preparing and implementing a management plan and ongoing recreation permitting. Yearly administration costs thereafter could involve additional studies, monitoring, and ongoing recreation permitting.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

Failure to include Dirty Devil in the NWSRS would not necessarily diminish the values for which the river was determined eligible. BLM currently has little administrative presence on this river. To date, remoteness and difficult access have kept visitation light throughout a significant portion of the year. In addition, the entire Dirty Devil segment is within the Dirty Devil and Fiddler Butte WSAs or the Dirty Devil SRMA. Further, 35 miles of this segment are in the Dirty Devil and Fiddler Butte WSAs and 48 miles are in Dirty Devil SRMA. WSA management through the IMP and the Dirty Devil SRMA management prescriptions would provide protection to the segment's outstandingly remarkable values. BLM land within this segment is also VRM Class I (35 miles) or II (19 miles), which would protect the scenic and other outstandingly remarkable values.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

There are no valid mining claims, mineral leases, or private lands within the public lands portion of the eligible segment. Wayne County and Emery County interests have expressed concern that designation of the Dirty Devil into the NWSRS could affect upstream water rights and water uses on the Fremont River and Muddy Creek, tributaries of the Dirty Devil.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Dirty Devil Tributaries**

### **Beaver Wash Canyon**

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. The segment is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Beaver Wash Canyon is a side canyon and tributary to the Dirty Devil River. The canyon was designated as an ACEC for its high biological and ecological values. Grazing and mineral extraction is not allowed in the river corridor below the canyon rim for resource concerns. The lands are also entirely within the Dirty Devil WSA.

The amount of water present can vary considerably seasonally and from year to year.

***Current status of land ownership and human use of the area***

The river segment is 6.9 miles in length, including 6.8 miles of public lands administered by BLM and 0.1 mile state land. Grazing is not allowed in the river corridor below the canyon rim. The area has an established hiking trail crossing it from Angel Point Trail head, which provides access into the main Dirty Devil drainage and side canyons. Recreational use includes primitive hiking, canyoneering, camping, and sightseeing for day and extended use trips. Use levels are moderate and increasing.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values and protect the watershed and high quality of water. However, congressional designation into the national system is not necessary for these goals to be achieved.

Non-designation would leave open the possibility of future water developments that could alter the free-flowing nature of the stream, thus diminishing natural values within public lands and limiting options for habitat enhancements. No such developments or uses are currently proposed, however.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS. Local and state agencies, water users, and municipalities oppose designation due to perceptions that existing water rights could be affected and opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream. In actuality, there is no likely development identified within the eligible segment, and any upstream or downstream development would only be affected if federal money was involved and if the development would invade or unreasonably diminish fish, wildlife, recreation, or scenic values identified within the designated segment at the time of designation. Although the WSR Act infers a federal reserved water right upon designation, rather than establishing an amount it actually imposes a limit, expressing that any such right is to be the minimum necessary for the purposes of the Act. Such right would have to be adjudicated through the state and would be junior to any existing rights.

There is no opportunity to share costs of administration with the above entities. Also, there is no contiguous federal agency with which to share cost of administration. If the entire watershed of the Dirty Devil River including all of its side canyons is designated, then there is an opportunity for shared administration of the river area with NPS if Congress were to also designate the portion of the river within its boundaries.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The Utah state-owned lands could be acquired through exchange of lands with other public lands. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter would involve monitoring.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

Failure to include Beaver Wash Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible. The outstandingly remarkable values within this segment could be effectively managed through land use prescriptions contained in the Richfield PRMP/FEIS should congressional designation not occur. The canyon's relevant and important values are currently protected by ACEC designation. Further, the segment is located entirely within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values.

***Existing rights that may be adversely affected because of designation into the NWSRS or other issues or concerns***

The lands within the river corridor are public lands administered by BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Larry Canyon**

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. The segment is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Larry Canyon is a tributary side canyon to the Dirty Devil River. The canyon is rated Class A scenery. Long technical slots in the upper canyon and natural pour-offs in the lower end hinder access and have kept the middle portion in pristine condition. Cottonwood trees complement the form, line, color, and texture of the canyon walls and shade much of the canyon floor.

Larry Canyon provides one of the main hiking entries into the Dirty Devil River canyon system from the west. These public lands provide a significant part of the regional recreation opportunity, serving as a gateway to the Dirty Devil River. People are willing to travel long distances to use the recreational opportunities within Larry Canyon and other canyons of the Dirty Devil River drainage, as indicated by increasing visitation levels despite lengthy and difficult access. Several guidebooks describe outstanding opportunities for hiking, backpacking, and canyoneering, and there are opportunities for commercial use. There are challenging canyoneering opportunities in the upper stretch of Larry Canyon.

Long stretches of perennial springs within this canyon provide diverse habitats for native plants and support a great variety of bird and animal species. These include the MSO (federally listed) and the goshawk and Peregrine falcon, both sensitive species. This canyon is designated critical MSO habitat. The riparian corridor provides crucial habitat for big game, neo-tropical migratory birds, non-game mammals, bats, and small rodents. It is identified by the Utah Division of Wildlife Resources (UDWR) as critical year-long habitat for the Desert bighorn sheep.

This segment provides an exemplary illustration of the hydrologic transition from headwaters to a deeply incised canyon, all within the course of a few miles. The dramatic changes associated with the transition are visible from several vantage points along the canyon rim as well as while hiking through the canyon.

The drainage is intermittent.

***Current status of land ownership and human use of the area***

The river segment is 4 miles in length and is administered in its entirety by BLM. The lower end of the canyon could still be grazed. It has not been closed or relinquished for grazing. The primary activity occurring on public lands in the canyon is dispersed primitive recreation including hiking, hunting, and sightseeing. There are no private lands. This canyon is undeveloped and primitive and is within the Dirty Devil WSA.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation as a WSR would be compatible with BLM proposals to maintain riparian values, protect the watershed and high quality of water, protect potential habitat for the MSO, protect Desert bighorn sheep habitat, and manage the lands for their primitive recreation opportunities.

There are no proposals or potential for dam-building on this segment. No other developments including roads, pipelines, or other structures are proposed or likely.

The entire canyon is within the Dirty Devil WSA. Designation of Larry Canyon into the NWSRS would be compatible with and enhance wilderness use and management of the area. Designation would also be compatible with management of the area as part of a Dirty Devil SRMA or ACEC, both contained in the Richfield PRMP/FEIS.

Failure to include Larry Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area's WSA status would continue, and many of the other land use prescriptions contained within the Richfield PRMP/FEIS would, if implemented, also preserve and enhance such values.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted WSR designation. No state, tribal, or local governments have expressed support for inclusion of this river segment in the NWSRS.

None of the above entities would share costs or administration of the area should Congress designate it. There is also no contiguous federal agency to share the costs or administration. If the river was designated as a portion of the larger Dirty Devil watershed, then there would be opportunity for joint management with the adjacent NPS river segment.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. Initial costs of administration would include preparing and implementing a corridor management plan and administering recreation permits. Yearly administration costs thereafter could involve additional studies, monitoring, and administering recreation permits.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

Larry Canyon is within the Dirty Devil WSA, which has been recommended for wilderness designation. Other alternatives to congressional WSR designation include land use prescriptions contained in the Richfield PRMP/FEIS to designate the river and surrounding lands as an SRMA and implement land use prescriptions to protect riparian systems, including limiting off-road motorized travel, mining and mineral leasing, and ROWs. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS or other issues or concerns***

The lands within the river corridor are public lands administered by the BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

Development within the river corridor is unlikely due to its WSA status. There are no issues regarding upstream or downstream effects.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## No Mans Canyon

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. The entire 7.1 miles of this segment are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and off-highway vehicle (OHV) use would provide additional protection to outstandingly remarkable values.

### ***Characteristics that do or do not make the area a worthy addition to the NWSRS***

No Mans Canyon is a tributary to the Dirty Devil River. The river corridor and surrounding canyon system were inventoried as Class A scenery.

This canyon is one of the few that visitors can generally depend on for a reliable source of fresh water. Almost all visitors are from outside the general area. Almost all use occurs near the confluence with the Dirty Devil River and is associated with more extensive trips along the main drainage.

The river segment is free-flowing but intermittent. Water flows in No Mans Canyon can vary considerably from year to year based on upstream precipitation and water depletions. Large portions of the canyon in the upper reaches dry up during periods of the year.

### ***Current status of land ownership and human use of the area***

The eligible segment of No Mans Canyon is 7.1 miles in length. The entire river corridor is public land administered by BLM.

The area is remote and access is limited and difficult, recreational use is relatively light except during the canyoneering season. Mineral exploration has occurred in the past but no unpatented mining claims remain active in the area. The river corridor is within the Dirty Devil WSA. None of the Dirty Devil or its side canyons have been closed or relinquished to grazing.

### ***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values, protect the watershed and high quality of water, protect potential habitat for the MSO, and manage the lands for their primitive recreation opportunities.

There are no proposals or potential for dam-building on this segment. No other development including roads, pipelines, or other structures are proposed or likely.

This entire canyon is within the Dirty Devil WSA. The BLM has recommended these lands to Congress for wilderness designation. Designation of No Mans Canyon into the NWSRS would be compatible with and enhance wilderness use and management of the area. Designation would also be compatible with management of the area as part of a Dirty Devil SRMA or ACEC, which are contained in the Richfield PRMP/FEIS.

Failure to include No Mans Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area's WSA status would continue, and many of the other land use prescriptions contained within the Richfield PRMP/FEIS would also preserve and enhance such values if implemented.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS.

None of the above entities would share costs or administration of the area should Congress designate it. There is also no contiguous federal agency to share the costs or administration. However, if the river is designated as a portion of the larger Dirty Devil watershed, then there is opportunity for joint management with the adjacent NPS river segment.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The initial costs of administration for the first 3 years would involve management plan preparation and implementation and ongoing recreation permitting. Yearly administration costs thereafter may involve additional studies, monitoring, and ongoing recreation permitting.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

The entire 7.1 miles of this segment are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS or other issues or concerns***

The lands within the river corridor are public lands administered by the BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

Development within the river corridor is unlikely due to its WSA status. There are no issues regarding upstream or downstream effects.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.



## Robbers Roost Canyon

This section is recommended non-suitable because the values identified would be protected by alternative protection methods.

White Roost—4.6 miles of this fork are within the Dirty Devil WSA, and the additional 0.6 mile is proposed for management of wilderness characteristics. WSA management through the IMP and proposed management prescriptions for the wilderness characteristic lands would provide protection to this fork's outstandingly remarkable values.

Robbers Roost Middle Fork—This fork is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values.

Robbers Roost North Fork—This fork is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values.

Robbers Roost South Fork—This fork includes 10 miles within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. Management of the 1.6 miles outside the WSA would conflict with water rights and spring developments that occur within that area. This fork would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values outside of the WSA.

### ***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Robbers Roost Canyon is a side canyon and tributary to the Dirty Devil River. The river corridor and the entire canyon are rated as Class A, with superlative examples of red rock scenery. The name, outlaw lore, and scenery draw recreationists from outside the region. Robbers Roost is the most accessible of all the Dirty Devil side canyons, and is publicized as a destination hike in a number of guidebooks. Canyoneers have come to recognize that the upper ends of each of the Robbers Roost tributaries contain superb opportunities for technical slot canyoneering. The canyon contains prehistoric values associated with Fremont Native American and archaic inhabitants. The river segment is free-flowing in character and free of impoundments and other intrusions. Water flows vary considerably from year to year based on precipitation, and the upper reaches of the canyons dry seasonally.

### ***Current status of land ownership and human use of the area***

The river segment is 33 miles in length—31 miles cross public lands administered by BLM and 2 miles cross lands owned by the State of Utah. Although there is livestock grazing on the benchlands above the canyons, most use in the canyons is recreational including hiking, canyoneering, hunting, sightseeing, photography, and primitive recreation. The river corridor is mostly within the Dirty Devil WSA.

### ***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values, protect the watershed and high quality of water, protect potential habitat for the MSO, and manage the lands for their primitive recreation opportunities.

There is no proposal or potential for dam-building on this segment. No other development including roads, pipelines, or other structures could be developed within this stretch of river if classified as "wild," but no such development is proposed or likely considering the area's WSA status.

This canyon is mostly within the Dirty Devil WSA. The BLM has recommended these lands to Congress for wilderness designation. Designation of Robbers Roost Canyon into the NWSRS would be compatible with and enhance wilderness use and management of the area. Designation would also be compatible with management of the area as part of a Dirty Devil SRMA or ACEC, which are contained in the Richfield PRMP/FEIS.

Failure to include Robbers Roost Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area's WSA status would continue, and many of the other land use prescriptions contained within the Richfield PRMP/FEIS would also preserve and enhance such values if implemented.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local governments have expressed support for inclusion of this river segment in the NWSRS.

None of the above entities would share costs or administration of the area should Congress designate it. There is also no contiguous federal agency to share the costs or administration. However, if the river was designated as a portion of the larger Dirty Devil Watershed, there would be opportunity for joint management with the adjacent NPS river segment of the Dirty Devil River.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The lands owned by the State of Utah could be acquired by exchange with public lands elsewhere. The initial costs of administration for the first 3 years would involve management plan preparation and implementation and ongoing recreation permitting. Yearly administration costs thereafter may involve additional studies, monitoring, and ongoing recreation permitting.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

White Roost—4.6 miles of this fork are within the Dirty Devil WSA, and the additional 0.6 mile is proposed for management of wilderness characteristics. WSA management through the IMP and proposed management prescriptions for the wilderness characteristic lands would provide protection to this fork's outstandingly remarkable values.

Robbers Roost Middle Fork—This fork is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values.

Robbers Roost North Fork—This fork is located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values.

Robbers Roost South Fork—This fork includes 10 miles within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. Management of the 1.6 miles outside the WSA would conflict with water rights and spring developments

that occur within that area. This fork would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values outside of the WSA.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

The lands within the river corridor are public lands administered by BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

Development within the river corridor is unlikely due to its WSA status. There are no issues regarding upstream or downstream effects.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Sams Mesa Box Canyon**

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. The entire 9.5 miles of this segment are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values. BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Sams Mesa Box Canyon was inventoried as Class A scenery. It is a very deep, rugged canyon that descends through a series of steep falls that are visually attractive. At 400 to 600 feet deep, it is the deepest of all the Dirty Devil River tributary canyons.

There is no dependable hiking route into this canyon. Most visitors into the canyon use a semi-technical trail that starts on the west side of the Dirty Devil on Burr Point and drops in near Twin Corral Box Canyon. Access to the upper end of Sams Mesa Box Canyon is limited to technical canyoneering. People are willing to travel long distances to use the recreational opportunities along this river segment as indicated by visitation levels despite lengthy and difficult access.

This canyon provides habitat for the MSO and includes two known owl protected activity centers (PACs). This canyon has been designated by the UDWR as year-long crucial habitat for Desert bighorn sheep.

The river segment is free of impoundments and other intrusions.

***Current status of land ownership and human use of the area***

The river segment is 9.5 miles in length, entirely within public lands administered by BLM. Human use includes dispersed recreational activity including hiking, canyoneering, sightseeing, photography, and

primitive recreation. The river corridor is almost completely within the Dirty Devil WSA, with the exception of a small portion of the south bank near its junction with the Dirty Devil River.

Although not used in recent years, this area is part of the Robbers Roost grazing allotment.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values, protect the watershed and high quality of water, protect potential habitat for the MSO and Desert bighorn sheep, and manage the lands for their primitive recreation opportunities

There are no proposals or potential for dam-building on this segment. No other development including roads, pipelines, or other structures are proposed or likely.

Most of this canyon is within the Dirty Devil WSA. The BLM has recommended these lands to Congress for wilderness designation. Designation of Sams Mesa Box Canyon into the NWSRS would be compatible with and enhance wilderness use and management of the area. Designation would also be compatible with management of the area as part of a Dirty Devil SRMA or ACEC, which are contained in the Richfield PRMP/FEIS.

Failure to include Sams Mesa Box Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area's WSA status would continue, and many of the other land use prescriptions contained within the Richfield PRMP/FEIS would also preserve and enhance such values if implemented.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS.

None of the above entities would share costs or administration of the area should Congress designate it. There is also no contiguous federal agency to share the costs or administration. However, if the river was designated as a portion of the larger Dirty Devil watershed there would be opportunity for joint management with the adjacent NPS river segment for the Dirty Devil River.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The initial costs of administration for the first 3 years would involve management plan preparation and implementation and ongoing recreation permitting. Yearly administration costs thereafter may involve additional studies, monitoring, and ongoing recreation permitting.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

The entire 9.5 miles of this segment are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

The lands within the river corridor are public lands administered by the BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

Development within the river corridor is unlikely due to its WSA status. There are no issues regarding upstream or downstream effects.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Twin Corral Box Canyon**

This section is recommended non-suitable because the values identified would be protected by alternative protection methods. Of the 9 miles of this segment 8 miles are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values located within the WSA. The remainder of the segment is isolated by two state sections, which would result in management conflicts. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable value outside of the WSA. BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

Twin Corral Box Canyon possesses Class A scenery, enhanced by the transition from the Wingate to the Chinle formation. The canyon provides designated MSO habitat. In addition, the canyon has been designated by the UDWR as year-long crucial habitat for Desert bighorn sheep.

The river segment is free-flowing and free of impoundments and other intrusions. Water flows in Twin Corral Box Canyon can vary considerably year to year, and the upper reaches of the canyon dry up seasonally.

***Current status of land ownership and human use of the area***

The river segment is 10.1 miles in length. Of that, 9 miles cross public lands administered by BLM, with 1.1 river miles crossing lands owned by the State of Utah. There are no private lands. Public lands support dispersed activity including hiking, canyoneering, sightseeing, photography, and primitive recreation.

All but the upper 2 miles of the canyon are within the Dirty Devil WSA. Twin Corral Box Canyon is within the Robbers Roost grazing allotment. Although no grazing has occurred in recent years, it is not closed or relinquished.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation as a WSR would be compatible with BLM proposals to maintain riparian values, protect the watershed and water quality, protect designated critical habitat for the MSO, and manage the lands for primitive recreation opportunities.

There are no proposals or potential for dam-building on this segment. No other development including roads, pipelines, or other structures are proposed or likely.

Most of the canyon is within the Dirty Devil WSA. The BLM has recommended these lands to Congress for wilderness designation. Designation of Twin Corral Box Canyon into the NWSRS would be compatible with and enhance wilderness use and management of the area. Designation would also be compatible with management of the area as part of a Dirty Devil SRMA or ACEC, which are contained in the Richfield PRMP/FEIS.

Failure to include Twin Corral Box Canyon in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as the area's WSA status would continue, and many of the other land use prescriptions contained within the Richfield PRMP/FEIS would also preserve and enhance such values if implemented.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS.

None of the above entities would share costs or administration of the area should Congress designate it. There is also no contiguous federal agency to share the costs or administration. However, if the river is designated as a portion of the larger Dirty Devil watershed, then there could be opportunities for joint management with the NPS river segment for the Dirty Devil River.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. The initial costs of administration for the first 3 years would involve management plan preparation and implementation and ongoing recreation permitting. Yearly administration costs thereafter could involve additional studies, monitoring, and ongoing recreation permitting. State lands could be acquired through exchange.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

Of the 9 miles of this segment 8 miles are located within the Dirty Devil WSA. WSA management through the IMP would provide protection to the segment's outstandingly remarkable values located within the WSA. The remainder of the segment is isolated by two state sections, which would result in management conflicts. The segment would be located within the Dirty Devil SRMA. The proposed management prescriptions for this SRMA in relation to VRM, oil and gas leasing, and OHV use would provide additional protection to the outstandingly remarkable values outside of the WSA. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

There are no valid mining claims, mineral leases, or private lands within the public land portion of the eligible segment. The State of Utah manages 1 mile of the eligible segment. Development within the river corridor is unlikely due to its WSA status. There are no issues regarding upstream or downstream effects.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Other Rivers**

### **Fish Creek**

This section is recommended non-suitable because the cultural values identified would be protected by laws and regulations related to cultural resources and lack of management feasibility due to its small size. This segment consists of 0.25 miles of Fish Creek between U.S. Forest Service (USFS) and private lands. The USFS has not found its portion of the creek to be eligible or suitable as a WSR. On the national forest sections a potential outstandingly remarkable value of Recreational Fishing was identified. However, the segment was found to be not eligible because the values were rated as only moderately responsive to the definition and attributes. The scale of importance for recreation was less than regional. The BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

This stream segment includes a significant Fremont Native American site containing rock art (Fish Creek Cove pictographs) and other evidence of habitation. The rock art is nationally significant and has been nominated to the National Register of Historic Places (NRHP). It is an important site to several Native American tribes.

The river segment is free-flowing in character and free of impoundments and other intrusions. Water flows in Fish Creek can vary considerably from year to year. The segment involving public lands is very short, totaling just 0.25 miles in length.

***Current status of land ownership and human use of the area***

The river segment is approximately 0.25 miles in length, entirely on public lands administered by the BLM. Public lands within the river corridor support livestock grazing and dispersed activity including sightseeing and photography. Recreation use levels are very low.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values, protect the watershed and high quality of water, and protect cultural features.

Non-designation would leave open the possibility of future water developments that could alter the free-flowing nature of the stream. No such developments or uses are currently proposed, however.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

USFS found its upstream section to be neither eligible nor suitable for inclusion into the NWSRS. On the national forest sections a potential outstandingly remarkable value of Recreational Fishing was identified. However, the segment was found not eligible because the values were rated as only moderately responsive to the definition and attributes. The scale of importance for recreation was less than regional.

Some private citizens and regional and national conservation groups have promoted designation as a means of preserving the free-flowing character of the segment. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS. There is no opportunity to share costs with the above entities.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No private lands are proposed for acquisition. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter would involve monitoring.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The public lands portion of Fish Creek is relatively short and would be difficult to manage separately from adjoining state, private, and national forest lands. USFS did not find its segment of Fish Creek as an eligible WSR. The outstandingly remarkable cultural value within this segment is protected by laws and regulations related to cultural resources.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

No valid existing rights were identified in the eligible segment. The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

This segment consists of 0.25 miles of Fish Creek between USFS and private lands. USFS has not found its portion of this creek to be eligible as a WSR. This segment would not be feasible for management as a WSR due to its size. The cultural outstandingly remarkable value of this segment would be protected through laws and regulations related to Cultural Resources.



## **Fremont River (Below Capitol Reef NP to Caineville Ditch Diversion)**

This section was found non-suitable due to ROWs and ownership conflicts. This segment is adjacent to Utah State Highway 24 (south side of the river), and the ROW for this highway is within the 0.25-mile corridor of the segment. The powerline ROW for the communities of Caineville and Hanksville is located on the north side of the river and is within the 0.25-mile corridor of the segment. There are also state and private lands within the segment. This segment of the Fremont River is not recommended for suitability as a WSR due to conflicts with the ROWs and ownership. The BLM believed that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

### ***Characteristics that do or do not make the area a worthy addition to the NWSRS***

The canyon of the Fremont River between Capitol Reef National Park and Caineville is geologically interesting in that it illustrates the relatively recent age of the local landscape and the huge volumes of material that were removed in a very short time.

A significant length of this river segment parallels Utah State Highway 24, the main east-west route through the county and the access route to Capitol Reef National Park. Much of the canyon is cut into the highly photogenic Brushy Basin member of the Morrison formation, and examples of large balanced rocks are perched along the canyon walls. That the river cuts through the geological formations and is free-flowing and perennial in character makes it rare in the high desert of Southern Utah. Approximately 700,000 visitors travel to Capitol Reef National Park each year, many of whom enter or leave the park along this stretch of the river.

### ***Current status of land ownership and human use of the area***

There are 6 river miles between the Capitol Reef National Park boundary and the Caineville ditch diversion. Of this, 4 miles are public lands administered by the BLM and 2 miles are owned by the State of Utah or privately owned. Other than Utah State Highway 24 that parallels the river, there is no development. Lands within the river corridor are open for grazing, although topography restricts actual use. Several small vehicle pull-offs also exist for day use and overnight camping. Highway 24 is a state-designated scenic highway. The ROW for this highway is within the 0.25-mile corridor of the segment. The powerline ROW for the communities of Caineville and Hanksville is located on the north side of the river and is within the 0.25-mile corridor of the segment. This segment of the Fremont River is not recommended for suitability as a WSR due to conflicts with the ROWs and ownership.

### ***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river was designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

WSR designation would be compatible with BLM proposals to maintain riparian values and protect the watershed and high quality of water. It would help to maintain the important scenic values of the area.

Inclusion into the NWSRS would preclude dams or other water developments within the designated stretch, but no such developments are currently planned. Wayne County interests have proposed water diversion and storage projects for the Fremont River in a variety of locations, including sites upstream and downstream from this location. To date, none of the proposals have moved beyond the idea stage.

Designation would complement management of the eligible river segment within Capitol Reef National Park.

Failure to include this segment of the Fremont River in the NWSRS would not necessarily diminish the values for which the river was determined eligible inasmuch as other land use prescriptions contained within the Richfield PRMP/FEIS could also preserve and enhance such values.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation as a means of preserving the free-flowing character and other values of this nationally significant river. No state, tribal, or local government has expressed support for inclusion of the river in the NWSRS. Local and state agencies, water users, and municipalities oppose designation due to perceptions that existing water rights could be affected and opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream. In actuality, there is no likely development identified within the eligible segment, and any upstream or downstream development would only be affected if federal money was involved, and even then only if the development would invade or unreasonably diminish fish, wildlife, recreation, or scenic values identified within the designated segment at the time of designation. Wayne County has proposed a water diversion and storage project for the Fremont River in a variety of locations far upstream of the eligible segment in the past and for a number of different purposes, but has no actual proposal under consideration.

Congressional designation of this eligible segment would not preclude consideration of this water diversion and storage project in the future, as long as it would not exceed the “invade or unreasonably diminish” standard discussed above. Although the WSR Act infers a federal reserved water right upon designation, rather than establishing an amount it actually imposes a limit, expressing that any such right is to be the minimum necessary for the purposes of the Act. Such right would have to be adjudicated through the state and would be junior to any existing rights.

Although none of the above entities would share costs, because NPS has determined the contiguous portion of the river that it manages to be eligible, costs and administration of the river area could be shared with it if Congress were to also designate the portion of the river within its boundaries.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

Funding for acquisition would be needed if it was determined that the private land within the river corridor were desirable for acquisition. The cost of acquiring the lands is not known at this time. State lands could be acquired through exchange. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter could involve additional studies and monitoring.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs. Also, BLM could partner with NPS in administering the river.

Alternatives to congressional WSR designation are proposed in the Richfield PRMP/FEIS and include prescriptions to manage riparian systems, watershed, water quality, and habitats for sensitive and listed

fish and wildlife species, including placing limits on off-road motorized travel, mining and mineral leasing, and ROWs. New costs could be incurred to implement any of these management schemes.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

The lands within the river corridor are public lands administered by the BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

Local and state agencies, water users, and municipalities have expressed concern that opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Maidenwater Creek**

Maidenwater Creek was not found to be suitable due to the highway corridor ROW and conflicts with ownership. Utah Highway 276 bisects this 4.3-mile segment. The highway ROW consists of 100 feet on each side of centerline, and a box culvert has been constructed in the creek at this location. There are also state lands located within the segment. Further, other management prescriptions would provide protection to the outstandingly remarkable values. The portion of the segment below Highway 276 has been identified for management of the wilderness characteristics of that area. The portion of the segment above Highway 276 is proposed as VRM Class II, which would provide protection for the scenic values. Proposed decisions pertaining to riparian protection zones and fish and wildlife would provide protection for those values. The BLM determined that the quality of river characteristics in this segment would not significantly enhance nor contribute to the NWSRS.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

The entire canyon is rated Class A scenery due to the closeness of canyon walls, topographical screening, and the diversity of vegetation, including on the canyon walls. Visitors to the canyon are attracted by the scenic contrast displayed in the formations. This area is unique in that hanging gardens are prevalent and have not been heavily impacted by domestic ungulates.

This narrow slot canyon provides canyoneering opportunities with a variety of visual and other natural attractions. Guidebooks and websites publicize this area and attract visitors from outside the region. Almost all users to the area come from outside the region.

There is a diversity of animal life. Speckled dace, several species of aquatic invertebrates, observed ring-tail cat, deer and bighorn sheep tracks, and scat and old beaver cuttings and blown-out dams were noted in a field visit.

This is an intermittent, free-flowing segment. The amount of water present can vary considerably seasonably and from year to year.

***Current status of land ownership and human use of the area***

The river segment is 4 miles in length, including 3 miles of public lands administered by BLM and 1 mile of state land. Public lands within the river corridor support livestock grazing and dispersed recreational activity including sightseeing, canyoneering, hiking, and photography. Actual cattle use in the river corridor is restricted by topography to the benchlands above the canyon, because there are limited access points. Utah Highway 276 bisects this 4-mile segment. The highway ROW consists of 100 feet on each side of centerline, and a box culvert has been constructed in the creek at this location. Due to the highway corridor ROW and conflicts with ownership, Maidenwater Creek is not recommended for suitability as a WSR.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

Designation would be compatible with BLM proposals to maintain riparian values and protect the watershed and high quality of water.

Non-designation would leave open the possibility of future water developments that could alter the free-flowing nature of the stream, thus diminishing natural values within public lands and limiting options for habitat enhancements. No such developments or uses are currently proposed, however.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Some private citizens and regional and national conservation groups have promoted designation. No state, tribal, or local government has expressed support for inclusion of this river segment in the NWSRS. Local and state agencies, water users, and municipalities oppose designation due to perceptions that existing water rights could be affected and opportunities for water development could be foreclosed, not only within the eligible river segment, but also upstream and downstream. In actuality, there is no likely development identified within the eligible segment, and any upstream or downstream development would only be affected if federal money was involved and if the development would invade or unreasonably diminish fish, wildlife, recreation, or scenic values identified within the designated segment at the time of designation. Although the WSR Act infers a federal reserved water right upon designation, rather than establishing an amount it actually imposes a limit, expressing that any such right is to be the minimum necessary for the purposes of the Act. Such right would have to be adjudicated through the state and would be junior to any existing rights.

There is no opportunity to share costs of administration with the above entities. Also, there is no contiguous federal agency with which to share cost of administration.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No funding for acquisition would be needed because there is no private land within the river corridor. Utah state lands could be acquired through exchange with other public lands elsewhere. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter would involve monitoring.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The BLM is capable of managing this segment as wild and scenic. Designation of this segment would not significantly elevate management costs above current levels nor require substantial increases in appropriations or diversion of resources from critical ongoing programs.

Other management prescriptions would provide protection to the outstandingly remarkable values. The portion of the segment below Highway 276 has been identified for management of the wilderness characteristics of that area. The portion of the segment above Highway 276 is proposed as VRM Class II, which would provide protection for the scenic values. Proposed decisions pertaining to riparian protection zones and fish and wildlife would provide protection for those values.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

The lands within the river corridor are public lands administered by the BLM. There are no valid mining claims, mineral leases, private lands, or other existing rights within the eligible segment that would be affected by congressional designation.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## **Quitcupah Creek**

Quitcupah Creek was not found to be suitable. The small portion of public land along the river would make management difficult. River corridor uses include livestock grazing and dispersed recreational activities such as hunting. Recreation use levels are very low. The canyon has been proposed and is currently under review for possible development of a coal haul road.

***Characteristics that do or do not make the area a worthy addition to the NWSRS***

There are many documented Fremont and archaic habitation sites and use areas as well as the remnants of more recent historic activity within the river corridor and canyon. Many of these sites have been determined by the Utah State Historic Preservation Officer to be eligible for listing in the NRHP. Also, the Paiute Tribe of Utah and the Hopi Tribe have both stated that the canyon is sacred to them. Tribes contend that the traditional use of the canyon plays an important role in the spiritual welfare and existence of both tribes. An ethnographic study conducted to document the importance and use of the canyon to and by the interested tribes supports this view.

***Current status of land ownership and human use of the area***

The river segment is 1.4 miles in length, entirely public lands administered by BLM. River corridor uses include livestock grazing and dispersed recreational activities such as hunting. Recreation use levels are very low. The canyon has been proposed and is currently under review for possible development of a coal haul road.

***Uses, including the reasonably foreseeable potential uses of land and water, that would be enhanced, foreclosed, or curtailed if the river were designated into the NWSRS by Congress, and the values that could be lost or diminished if the area is not protected as part of the national system***

There are no proposals or potential for dam-building on this segment. However, the canyon has been proposed and is currently under review for possible development of a coal haul road. Failure to include Quitcupah Creek in the NWSRS would not necessarily diminish the values for which the river was determined.

***Interest by local, state, or federal agencies; Native American tribes; and other public entities in congressional designation or non-designation of the river, and the extent to which river administration, including costs thereof, may be shared by state and local agencies or other potential partners***

Tribal governments support WSR designation to protect cultural resource values found along the river corridor. Local and state agencies have expressed opposition due to the effect such designation could have on the proposed coal haul road.

None of the above entities would share costs or administration of the area should Congress designate it. USFS did not find its portion of Quitcupah Creek eligible for inclusion in the NWSRS.

***The estimated cost to the government of acquiring lands and interests in lands and administering the area if the river is designated into the NWSRS by Congress***

No acquisition of private or state land is proposed. The initial costs of administration for the first 3 years would involve management plan preparation and implementation. Yearly administration costs thereafter could involve additional studies and monitoring.

***The BLM's ability to manage and protect the values of the river segment as part of the NWSRS if designated by Congress, and other mechanisms to protect identified values or alternative ways to protect rivers other than through Congressional designation under the WSR Act***

The small portion of public land along the river would make management difficult.

***Existing rights that may be adversely affected because of designation into the NWSRS, or other issues or concerns***

No existing rights were identified that would be affected by adding the river segment to the NWSRS.

The WSR Act infers a federal reserved water right upon designation. However, it does not quantify the right other than to place limitations on it. The Act states that it shall not be construed as a reservation for purposes other than those specified in the Act, or in quantities greater than necessary to accomplish these purposes. The amount of the federal right will therefore depend upon the river's flow, the values for which the river is being protected, and the unappropriated quantities in the river. It would be adjudicated through the state and would be junior to any rights existing prior to the date of designation.

## APPENDIX 2—303(D) LIST OF IMPAIRED WATERS

Pursuant to Section 303(d) of the Clean Water Act (as amended), each state is required to identify those water bodies for which existing pollution controls are not stringent enough to maintain state water quality standards. Water or water bodies (e.g., lakes, reservoirs, rivers, and streams) that are not currently achieving or are not expected to achieve those standards are identified as water quality limited. The quality of a water body can be limited because of point sources of pollution, non-point sources of pollution, or both. In addition, pollutants can result from habitat alterations (e.g., riparian habitat loss) or hydrological modifications. Surface water quality problems are detailed in Utah's 303(d) list of impaired waters, as required by the Clean Water Act.

A full list of the streams and water bodies located within the Richfield Field Office (RFO) and listed on Utah's 2006 303(d) list of impaired waters is included in Table A2-1 and Table A2-2. Water bodies that received permit renewals between April 1, 2004, and March 31, 2006, are listed for pollutants that are not controlled through technology-based requirements or end-of-pipe requirements. With few exceptions, stream water bodies assessed as "partially supporting" or "not supporting" their beneficial uses are listed.

Total Maximum Daily Load (TMDL) reports and Water Quality Management Plans are discussed in the table footnotes. Of the six stream assessment units in Category 5A on the 2006 Utah 303(d) List of Impaired Waters, only Sevier River-6 is not included in a current TMDL plan. Lower Ivie, Peterson, and Lost Creeks were assessed for total dissolved solids (TDS) in TMDL plans that the Environmental Protection Agency (EPA) approved 1 to 2 years ago. TDS standards have been determined stream by stream for each of the three streams. They remain in Category 5A while water quality monitoring recalibrated in August 2004 is continued and analyzed to determine whether the new TDS standards are being met for each stream. East Fork Sevier-4 continues to be listed in Category 5A for total phosphorus, even though total phosphorus was included in a TMDL plan that the EPA approved more than a year ago. A Water Quality Management Plan has been approved for the San Pitch River. Of the four lakes and reservoirs in Category 5A on the 2006 Utah 303(d) list, only Piute Reservoir is not included in a current TMDL plan.

Table A2-1. Utah's 2006 303(d) List of Category 5A: Impaired River and Stream Assessment Units Requiring TMDL Analysis

Water Body Name	Water Body Description	Causes
East Fork Sevier River-4	East Fork Sevier River and tributaries from confluence with Sevier River upstream to Antimony Creek confluence, excluding Otter Creek and its tributaries	Temperature Total phosphorus
Lost Creek	Lost Creek and tributaries from confluence with Sevier River upstream about 6 miles	Total Dissolved Solids (TDS)
Sevier River-6	Sevier River from Clear Creek confluence to Hydrologic Unit Code (HUC) boundary	Temperature
Peterson Creek	Peterson Creek and tributaries from confluence with Sevier River to the United States Forest Service (USFS) boundary	TDS
Lower Ivie Creek	Ivie Creek and tributaries from confluence with Muddy Creek to U-10 highway	TDS

Water Body Name	Water Body Description	Causes
San Pitch River-5	San Pitch River and tributaries from beneficial U132 to Pleasant Creek confluence, excluding Cedar Creek, Oak Creek, Pleasant Creek, and Cottonwood Creek	Temperature
Lower Muddy Creek	Muddy Creek from confluence with Fremont River to Ivie Creek confluence	Selenium
<p>Notes: All but one river and stream assessment unit listed in Table A4-1 are discussed in Water Quality Management Plans and/or TMDL reports that have been prepared for the Utah Division of Water Quality, the Utah Department of Environmental Quality, and the U.S. Environmental Protection Agency (EPA). Coverage is as follows:</p> <ol style="list-style-type: none"> <li>1. Ivie Creek is discussed in the Price River, San Rafael River, and Muddy Creek TMDLs for Total Dissolved Solids, West Colorado Watershed Management Unit, Utah, January 2004, prepared by MFG, Inc., Fort Collins, Colorado.</li> <li>2. Lost Creek and Peterson Creek are discussed in the Draft TMDL Water Quality Study of the Middle and Lower Sevier River Watershed, February 9, 2004, submitted by Tetra Tech, Inc., Water Resources and TMDL Center.</li> <li>3. East Fork Sevier River 4 and its tributaries are rated a high priority for coverage in a TMDL report or Water Quality Management Plan prepared between 2004 and 2006. This is the only river or stream assessment unit listed in Table A4-1 that is not already covered in a draft or final TMDL report or Water Quality Management Plan.</li> <li>4. San Pitch River is discussed in the San Pitch River Watershed Water Quality Management Plan, prepared by Millennium Science and Engineering and approved by the EPA November 18, 2004.</li> </ol>		

Source: UDWQ 2006 303(d) List of Waters.


Table A2-2. Utah's Draft 2004 List of Category 5A—Lakes and Reservoirs Identified as Needing TMDL Analysis

Water Body Name	Water Body ID	Pollutant
Piute Reservoir	UT-L-16030001-011	Total phosphorus
Nine Mile Reservoir	UT-L-16030004-001	Total phosphorus Dissolved oxygen
Otter Creek Reservoir	UT-L-16030002-004	Total phosphorus
Koosharem Reservoir	UT-L-16030002-011	Total phosphorus

Source: UDWQ 2006 303(d) List of Water



## APPENDIX 3—STATE HISTORIC PRESERVATION OFFICER LETTER CONCURRENCE LETTER

 <b>State of Utah</b> JON M. HUNTSMAN, JR. <i>Governor</i> GARY R. HERBERT <i>Lieutenant Governor</i>	<b>Department of Community and Culture</b> PALMER DePAULIS <i>Executive Director</i>  <b>State History</b> PHILIP F. NOTARJANNI <i>Division Director</i>	<b>RECEIVED</b> AUG 22 2008 Richfield BLM Field Office
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------

July 17, 2008

Cornell Christensen  
Field Office Manager  
Bureau of Land Management  
Richfield Field Office  
150 East 900 North  
Richfield UT 84701

RE: Richfield RMP

In reply, please refer to Case No. 07-2036

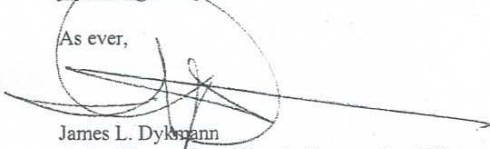
Dear Mr. Christensen:

The Utah State Historic Preservation Office received your request for our comment on the above referenced project.

We concur with your determinations made by BLM in the Richfield RMP. [Reference your letter June 25 2008: 1610].

This letter serves as our comment on the determinations you have made, within the consultation process specified in §36CFR800.4. If you have questions, please contact me at (801) 533-3555 or [jdymann@utah.gov](mailto:jdymann@utah.gov).

As ever,

  
James L. Dykman  
Acting Deputy State Historic Preservation Officer - Archaeology

**UTAH STATE HISTORY**  
UTAH STATE HISTORICAL SOCIETY  
ANTIQUITIES  
HISTORIC PRESERVATION  
RESEARCH CENTER & COLLECTIONS

300 S. RIO GRANDE STREET, SALT LAKE CITY, UT 84101-1162 • TELEPHONE 801 533-3500 • FACSIMILE 801 533-3505 • HISTORY.UTAH.GOV

## **APPENDIX 4—US FISH & WILDLIFE SERVICE SECTION 7 LETTER**

---



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE  
2369 WEST ORTON CIRCLE, SUITE 50  
WEST VALLEY CITY, UTAH 84119

October 23, 2008

In Reply Refer To

### Memorandum

To: Field Office Manager, Bureau of Land Management, Richfield Field Office, 150 East 900 North, Richfield, Utah 84701

From: Utah Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services, West Valley City, Utah

Subject: Biological Opinion for BLM Resource Management Plan (RMP), Richfield Field Office (RFO)

This document transmits the Fish and Wildlife Service's (USFWS) Biological Opinion based on our review of potential activities described under the Resource Management Plan of the Utah Bureau of Land Management (BLM) Richfield Field Office's (RFO) and their potential effects on the federally threatened Mexican spotted owl (*Strix occidentalis lucida*), Utah prairie dog (*Cynomys parvidens*), Last Chance townsendia (*Townsendia aprica*), Winkler pincushion cactus (*Pediocactus winkleri*) and the federally endangered southwestern willow flycatcher (*Empidonax traillii eximius*), California condor (*Gymnogyps californianus*), Wright fishhook cactus (*Sclerocactus wrightiae*), and San Rafael cactus (*Pediocactus despaninii*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). In addition, this document includes the Conference Opinion for the candidate species yellow-billed cuckoo (*Coccyzus americanus occidentalis*) and the experimental, non-essential population of the endangered California condor (*Gymnogyps californianus*). Critical habitat was designated for the Mexican spotted owl on February 01, 2001 and was re-designated August 31, 2004 (66 FR 8530, 69 FR 53181). Critical habitat was designated for the southwestern willow flycatcher on October 12, 2004 (69 FR 60705). Your July 21, 2008 request for formal consultation for all aforementioned species was received on July 22, 2008.

We concur with your determination that five species, the federally endangered Barneby reed-mustard (*Schoenocrambe barnebyi*), bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*) are unlikely to be adversely affected by the proposed action. Listed Colorado River fish species have not been located within the boundaries of the planning area, and potential suitable Colorado River fish habitat is restricted to portions of the Dirty Devil River. However, the Dirty Devil River is considered to be poor habitat in part due to low flow and sometimes dry river conditions. In addition, no critical habitat for these species occurs within the planning area. Barneby reed-mustard is not currently known to occur within the Richfield planning area, however, potentially suitable habitat for the species may exist. Surveys and analysis for this species will be required before future site-specific activities are undertaken. For these reasons, we concur that the types of activities described in the document below are not likely to adversely affect the endangered Colorado river fish or Barneby reed-mustard.

Richfield FO BLM Resource Management Plan proposed activities are categorized into the following 22 programs:

- Air Quality
- Soil Resources
- Water Resources
- Vegetation Management
- Cultural Resources
- Paleontological Resources
- Visual Resource Management
- Special Status Species Management
- Fish and Wildlife Management
- Wild Horse and Burro Management
- Fire and Fuels Management
- Non-WSA Lands with Wilderness Characteristics
- Forestry and Woodland Resources
- Livestock Grazing Management
- Recreation Management
- Travel Management
- Lands and Realty Management
- Minerals and Energy Management
- Special Management Areas Programs (4)
- Transportation Management
- Health and Safety Management

This Biological Opinion and Conference Opinion is based on information provided in the July 29<sup>th</sup> 2008 Biological Assessment, personal communications between the USFWS's biologists and the BLM's biologists, telephone conversations, email correspondence, conference calls, planning meetings, and other sources of information. A complete administrative record of this consultation is on file at this office.

### **Consultation History**

This section summarizes significant steps in the consultation process. Additional correspondence, and email transmissions, that occurred between February 12, 2008, and September 25, 2008 are documented in the administrative record for this consultation.

- February 12, 2008: BLM electronically sent a draft Biological Assessment for the Richfield BLM Field Office Resource Management Plan to the USFWS for review;
- February 2008 through July 23, 2008: The USFWS reviewed and provided comments on the draft Biological Assessments;
- July 29, 2008: We received the final version of the RFO Biological Assessment and began formal consultation;

## APPENDIX 5—LANDS AND REALTY

### LAND TENURE ADJUSTMENT CRITERIA

Public lands must meet one or more of the criteria listed below before they can be considered for any form of land tenure adjustment (LTA), including Exchanges, State Indemnity Selection (in lieu of selections), State Grants, Desert Land Entry (DLE), Recreation and Public Purposes Act (R&PP) patents (except Section 203, 206, and 209 of the Federal Land Policy and Management Act [FLPMA] sales), within the Richfield Field Office (RFO) planning area:

1. The LTA is in the public interest and accommodates the needs of state, local, or private entities, including needs for the economy, community growth, and expansion, and are in accordance with other land use goals and objectives and Resource Management Plan (RMP) planning decisions.
2. The LTA results in a net gain of important and manageable resource values on public lands such as crucial wildlife habitat, significant cultural sites, high-value recreation areas, high-quality riparian areas, live water, threatened and endangered species habitat, or areas key to the maintenance of productive ecosystems.
3. The LTA ensures the accessibility of public lands in areas where access is needed and cannot otherwise be obtained.
4. The LTA is essential to allow effective management of public lands in areas where consolidation of ownership is necessary to meet resource management objectives.
5. The LTA results in the acquisition of lands that serve a national priority as identified in national policy directives.
6. In addition to the above criteria, all future land disposal actions will require a site-specific environmental analysis in accordance with the National Environmental Policy Act (NEPA) when an actual LTA action is proposed. A subsequent analysis may reveal resource conditions that could not be mitigated to the satisfaction of the authorized officer and may therefore preclude disposal.
7. All future LTAs must be in conformance with other goals and objectives in the field office RMP, which could preclude LTA. All LTAs will be subject to valid existing rights as determined by the authorized officer.

Table 5-1. Lands Identified for Proposed Sale Under FLPMA Section 203, Sanpete County

Tract	Legal Description	Acres
1	T. 12 S., R. 3 E., Sec. 1, Lots 2-4; S½N½, NW¼SW¼, N½SE¼.	400.56
2a	T. 13 S., R. 2 E., Sec. 12, NE¼NE¼.	40.00
2b	T. 13 S., R. 2 E., Sec. 12, SW¼NE¼.	40.00
2c	T. 13 S., R. 2 E., Sec. 12, N½SW¼.	80.00
3	T. 13 S., R. 2 E., Sec. 13, SE¼NW¼, NE¼SW¼.	80.00
4	T. 13 S., R. 3 E., Sec. 7, SW¼NE¼, SE¼NW¼.	80.00
5a	T. 13 S., R. 3 E., Sec. 19, Lot 4.	39.62
5b	T. 13 S., R. 3 E., Sec. 19, S½NE¼, NW¼NE¼, SE¼NW¼, NE¼SW¼, N½SE¼.	280.00
6	T. 13 S., R. 3 E., Sec. 29, SE¼SE¼.	40.00
7	T. 13 S., R. 4 E., Sec. 15, NW¼NE¼.	40.00

Tract	Legal Description	Acres
8	T. 13 S., R. 5 E., Sec. 31, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$ .	120.00
9*	T. 14 S., R. 3 E., Sec. 12, SW $\frac{1}{4}$ NW $\frac{1}{4}$ .	40.00
10*	T. 14 S., R. 3 E., Sec. 14, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ .	120.00
11	T. 14 S., R. 3 E., Sec. 22, SE $\frac{1}{4}$ SE $\frac{1}{4}$ ; Sec. 23, S $\frac{1}{2}$ SW $\frac{1}{4}$ .	120.00
12	T. 14 S., R. 3 E., Sec. 26, N $\frac{1}{2}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ .	120.00
13	T. 14 S., R. 3 E., Sec. 27, NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ .	400.00
14	T. 14 S., R. 3 E., Sec. 34, NE $\frac{1}{4}$ NW $\frac{1}{4}$ .	40.00
15	T. 14 S., R. 5 E., Sec. 7, SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
16	T. 15 S., R. 2 E., Sec. 2, Lots 4-9. (Lots 4,5,9 FERC Wdl U-73401)	50.53
17	T. 16 S., R. 1 E., Sec. 34, NW $\frac{1}{4}$ NW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
18a	T. 16 S., R. 2 E., Sec. 1, Lot 3.	40.00
18b	T. 16 S., R. 2 E., Sec. 1, SE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
19	T. 16 S., R. 2 E., Sec. 12, E $\frac{1}{2}$ W $\frac{1}{2}$ .	160.00
20	T. 16 S., R. 2 E., Sec. 13, W $\frac{1}{2}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ .	160.00
21a	T. 17 S., R. 1 W., Sec. 22, NW $\frac{1}{4}$ SW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
21b	T. 17 S., R. 1 W., Sec. 35, W $\frac{1}{2}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ . (West side of Hwy 28-Supplemental Plat/Cadastral to be requested)	+/-60.00
21c	T. 17 S., R. 1 W., Sec. 35, E $\frac{1}{2}$ SE $\frac{1}{4}$ . (West side of Hwy 28-Supplemental Plat/Cadastral to be requested)	+/-65.00
21d	T. 18 S., R. 1 W., Sec. 1, Lot 4, SW $\frac{1}{4}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ . (West side of Hwy 28-Supplemental Plat/Cadastral to be requested)	+/-65.24
21e	T. 18 S., R. 1 W., Sec. 1, E $\frac{1}{2}$ SW $\frac{1}{4}$ . (West side of Hwy 28-Supplemental Plat/Cadastral to be requested)	+/-60.00
22	T. 19 S., R. 1 W., Sec. 13, W $\frac{1}{2}$ NE $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	80.00
23	T. 19 S., R. 1 E., Sec. 1, Lot 4. (NW $\frac{1}{4}$ NW $\frac{1}{4}$ )	40.17
24a	T. 19 S., R. 1 E., Sec. 5, SE $\frac{1}{4}$ SW $\frac{1}{4}$ . (U-39313 R&PP SR & Wdl)	40.00
24b	T. 19 S., R. 1 E., Sec. 8, E $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ . (U-18351 old landfill)	10.00
25	T. 19 S., R. 2 E., Sec. 15, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	80.00
26a	T. 19 S., R. 2 E., Sec. 17, NW $\frac{1}{4}$ NW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
26b	T. 19 S., R. 2 E., Sec. 18, E $\frac{1}{2}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ .	120.00
27**	T. 19 S., R. 2 E., Sec. 30, SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ . (Mayfield Com Site U-68179)	10.00
28	T. 20 S., R. 1 W., Sec. 1, SW $\frac{1}{4}$ NW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
29*	T. 20 S., R. 2 E., Sec. 3, SE $\frac{1}{4}$ NE $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
<b>Total Acres Within Sanpete County</b>		<b>+/-3,401.12</b>

\* Central Region Utah Division of Wildlife Resources (UDWR) selected for anticipated expansion of existing wildlife management areas.

\*\* Mayfield Town, Utah selected for anticipated community expansion.

Table 5-2. Lands Identified for Proposed Sale Under FLPMA Section 203, Sevier County

Tract	Legal Description	Acres
1	T. 21 S., R. 1 W., Sec. 35, N $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$ .	120.00
2	T. 21 S., R. 1 E., Sec 17, NW $\frac{1}{4}$ . (That portion located North of Salina Creek Quarry Ditch/North of existing county-maintained road) (Randy Crane)	+/-10.00
3	T. 21 S., R. 1 E., Sec. 17, SW $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
4	T. 21 S., R. 1 E., Sec. 19, E $\frac{1}{2}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ .	200.00
5	T. 21 S., R. 1 E., Sec. 20, NW $\frac{1}{4}$ NW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	40.00
6	T. 21 S., R. 2 E., Sec. 6, SE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	80.00
7a***	T. 22 S., R. 1 W., Sec. 10, SW $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
7b***	T. 22 S., R. 1 W., Sec. 10, SE $\frac{1}{4}$ .	160.00
8a	T. 22 S., R. 1 W., Sec. 11, Lots 1-6.	209.71
8b	T. 22 S., R. 1 W., Sec. 11, Lots 7-10.	158.88
9	T. 22 S., R. 2 W., Sec. 3, Lots 1, 2 and 8.	124.60
10	T. 22 S., R. 2 W., Sec. 27, SW $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
11	T. 22 S., R. 2 W., Sec. 28, S $\frac{1}{2}$ .	320.00
12	T. 22 S., R. 2 W., Sec. 33, N $\frac{1}{2}$ , N $\frac{1}{2}$ S $\frac{1}{2}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$ .	600.00
13	T. 22 S., R. 2 W., Sec. 34, N $\frac{1}{2}$ NW $\frac{1}{4}$ .	80.00
14	T. 22 S., R. 3 E., Sec. 5, Lots 3 and 4.	81.92
15	T. 22 S., R. 3 E., Sec. 6, SW $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
16	T. 22 S., R. 3 E., Sec. 7, SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
17	T. 22 S., R. 4 E., Sec. 6, NE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
18	T. 23 S., R. 2 W., Sec. 5, All. (Lots 1-4, S $\frac{1}{2}$ N $\frac{1}{2}$ , S $\frac{1}{2}$ )	640.96
19	T. 23 S., R. 2 W., Sec. 7, Lots 3 and 4.	79.80
20	T. 23 S., R. 2 W., Sec. 7, NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ . (Winkle Gun Range) (80 acres—OS Wdl PLO 4522, EO5327)	200.00
21*	T. 23 S., R. 2 W., Sec. 23, N $\frac{1}{2}$ N $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ .	25.00
22	T. 23 S., R. 2 W., Sec. 26, NE $\frac{1}{4}$ NE $\frac{1}{4}$ . (That portion located Southwest of U.S. Highway 119.)	4.50
23a	T. 23 S., R. 3 W., Sec. 13, E $\frac{1}{2}$ . (OS Wdl PLO 4522, EO5327)	320.00
23b	T. 23 S., R. 3 W., Sec. 13, N $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$ . (OS Wdl PLO 4522, EO5327)	120.00
24	T. 23 S., R. 3 W., Sec. 23, N $\frac{1}{2}$ NE $\frac{1}{4}$ .	80.00
25	T. 23 S., R. 5 E., Sec. 20, E $\frac{1}{2}$ E $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ . (B Johnson TP)	15.00
26	T. 23 S., R. 5 E., Sec. 21, NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ , N $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ . (B Johnson TP) (Only portion North of Oak Spring Creek as determined by cadastral and depicted on cadastral supplemental plat.)	15.00
27a	T. 23 S., R. 5 E., Sec. 29, S $\frac{1}{2}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ . (B Johnson TP)	15.00
27b	T. 23 S., R. 5 E., Sec. 29, Lots 2, 4, 5. (B Johnson TP)	3.72
28	T. 23 S., R. 5 E., Sec. 31, Lot 4, S $\frac{1}{2}$ SE $\frac{1}{4}$ . (B Johnson Sale)	105.58
29**	T. 24 S., R. 2 W., Sec. 19, Lot 3, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ .	200.00

Tract	Legal Description	Acres
30**	T. 24 S., R. 2 W., Sec. 20, NW $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ NW $\frac{1}{4}$ .	160.00
31	T. 27 S., R. 4 W., Sec. 27, SW $\frac{1}{4}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ , N $\frac{1}{2}$ S $\frac{1}{2}$ SW $\frac{1}{4}$ . (That portion located North and West of county-maintained road) (James K. Kent)	+/- 39.30
32	T. 25 S., R. 4 W., Sec. 33, NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ . (That portion located Northwest of Sevier River) (Richard G. Jones)	+/-2.00
33	T. 25 S., R. 1 E., Sec. 15, SW $\frac{1}{4}$ NW $\frac{1}{4}$ .	40.00
34	T. 26 S., R. 1 W., Sec. 1, Lots 5-7, SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ W $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ W $\frac{1}{2}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	63.78
<b>Total Acres Within Sevier County</b>		<b>+/-4,554.75</b>

\* Town of Glenwood, Utah selected for anticipated community expansion.

\*\* Town of Annabella, Utah selected for anticipated community expansion.

\*\*\* Sevier County selected for anticipated community expansion.

Table 5-3. Lands Identified for Proposed Sale Under FL PMA Section 203, Piute County

Tract	Legal Description	Acres
1	T. 27 S., R. 1 W., Sec. 33, W $\frac{1}{2}$ SW $\frac{1}{4}$ .	80.00
2	T. 27 S., R. 3 W., Sec. 21, Lots 4-6.	74.34
3*	T. 27 S., R. 3 W., Sec. 30, SW $\frac{1}{4}$ SE $\frac{1}{4}$ .	40.00
4*	T. 27 S., R. 3 W., Sec. 31, NW $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
5	T. 27 S., R. 4 W., Sec. 26, Lot 53B. (Roth Life Estate Lease)	4.82
6	T. 28 S., R. 3 W., Sec. 5, Lot 2.	40.27
7	T. 28 S., R. 3 W., Sec. 5, SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
8	T.29S., R.3W., Sec. 17, SWSE. (That portion located East of county-maintained road [old Hwy 89 location]) (David E. Sorensen)	+/- 10.00
9	T.29S., R.3W., Sec. 20, E $\frac{1}{2}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ . (That portion located East of county-maintained road [old Hwy 89 location] or East of Hwy 89) (David E. Sorensen)	+/- 130.00
10	T.29S., R.3W., Sec. 20, N $\frac{1}{2}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ . (That portion located East of Hwy 89) (David E. Sorensen)	+/- 80.00
11	T.29S., R.3W., Sec. 29, E $\frac{1}{2}$ W $\frac{1}{2}$ NE $\frac{1}{4}$ . (That portion located East of Hwy 89) (David E. Sorensen)	+/- 20.00
<b>Total Acres Within Piute County</b>		<b>+/-559.43</b>

\* Town of Marysville, Utah selected for anticipated community expansion.

Table 5-4. Lands Identified for Proposed Sale Under FL PMA Section 203, Wayne County

Tract	Legal Description	Acres
1	T. 27 S., R. 3 E., Sec. 26, E $\frac{1}{2}$ E $\frac{1}{2}$ .	160.00
2	T. 27 S., R. 14 E., Sec. 5, W $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ . Subject to U-41592 Intrp 196 Wdl PW Res 107 and site-specific survey (Dan Vacher dba Moore Land & Livestock [existing improvements—Texas Hill])	+/-20.00



Tract	Legal Description	Acres
3	T. 28 S., R. 3 E., Sec. 22, SE $\frac{1}{4}$ SW $\frac{1}{4}$ . (That portion located West of Hwy 24)	+/-10.00
4*	T. 28 S., R. 3 E., Sec. 25, W $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ .	440.00
5*	T. 28 S., R. 3 E., Sec. 26, N $\frac{1}{2}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$ .	360.00
6*	T. 28 S., R. 3 E., Sec. 27, NE $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{2}$ , NW $\frac{1}{4}$ NW $\frac{1}{4}$ (Russell Edwards), W $\frac{1}{2}$ SE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ .	480.00
7***	T. 28 S., R. 11 E., Sec. 15, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ .	200.00
8	T. 28 S., R. 11 E., Sec. 17, SW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ . (South side of Hwy 24-Supplemental Plat/Cadastral to be requested)	+/-55.00
9***	T. 28 S., R. 11 E., Sec. 21, E $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	30.00
10***	T. 28 S., R. 11 E., Sec. 22, E $\frac{1}{2}$ .	320.00
11***	T. 28 S., R. 11 E., Sec. 23, All.	640.00
12***	T. 28 S., R. 11 E., Sec. 26, All.	640.00
13***	T. 28 S., R. 11 E., Sec. 27, All.	640.00
14***	T. 28 S., R. 11 E., Sec. 28, SE $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ .	480.00
15	T. 29 S., R. 4 E., Sec. 5, S $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ .	120.00
16	T. 29 S., R. 4 E., Sec. 6, Lots 3-6, SW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$ . (Wayne Co. R&PP Lease U-47337-Shooting Range)	438.76
17a	T. 29 S., R. 4 E., Sec. 9, S $\frac{1}{2}$ N $\frac{1}{2}$ .	160.00
17b	T. 29 S., R. 4 E., Sec. 9, S $\frac{1}{2}$ .	320.00
18a	T. 29 S., R. 4 E., Sec. 10, SW $\frac{1}{4}$ NW $\frac{1}{4}$ .	40.00
18b	T. 29 S., R. 4 E., Sec. 10, SW $\frac{1}{4}$ .	160.00
18c	T. 29 S., R. 4 E., Sec. 10, SW $\frac{1}{4}$ SE $\frac{1}{4}$ .	40.00
19	T. 29 S., R. 4 E., Sec. 13, W $\frac{1}{2}$ SW $\frac{1}{4}$ .	80.00
20a	T. 29 S., R. 4 E., Sec. 14, SW $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
20b	T. 29 S., R. 4 E., Sec. 14, Lots 1-3.	111.07
20c	T. 29 S., R. 4 E., Sec. 14, SE $\frac{1}{4}$ .	160.00
21a	T. 29 S., R. 4 E., Sec. 15, SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
21b	T. 29 S., R. 4 E., Sec. 15, N $\frac{1}{2}$ NW $\frac{1}{4}$ . (Except pat #43-76-0006)	+/-195.00
21c	T. 29 S., R. 4 E., Sec. 15, N $\frac{1}{2}$ SE $\frac{1}{4}$ .	80.00
22a	T. 29 S., R. 4 E., Sec. 23, N $\frac{1}{2}$ NE $\frac{1}{4}$ .	80.00
22b	T. 29 S., R. 4 E., Sec. 23, SE $\frac{1}{4}$ NE $\frac{1}{4}$ .	40.00
23a	T. 29 S., R. 4 E., Sec. 24, N $\frac{1}{2}$ NW $\frac{1}{4}$ . (Allan and Thalia Smart NE $\frac{1}{4}$ NW $\frac{1}{4}$ )	80.00
23b	T. 29 S., R. 4 E., Sec. 24, SE $\frac{1}{4}$ NW $\frac{1}{4}$ .	40.00
23c	T. 29 S., R. 4 E., Sec. 24, NE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
23d	T. 29 S., R. 4 E., Sec. 24, N $\frac{1}{2}$ SE $\frac{1}{4}$ .	80.00
23e	T. 29 S., R. 4 E., Sec. 24, S $\frac{1}{2}$ SE $\frac{1}{4}$ .	80.00
24	T. 29 S., R. 5 E., Sec. 19, Lot 4. (SW $\frac{1}{4}$ SW $\frac{1}{4}$ )	38.94
25**	T. 29 S., R. 7 E., Sec. 35, W $\frac{1}{2}$ W $\frac{1}{2}$ .	160.00

Tract	Legal Description	Acres
26	T. 30 S., R. 5 E., Sec. 3, Lot 3.	40.55
27	T. 30 S., R. 5 E., Sec. 3, E $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ .	20.00
28a	T. 30 S., R. 5 E., Sec. 10, NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ . (That portion located East of U.S. Hwy 12)	5.70
28b	T. 30 S., R. 5 E., Sec. 10, W $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ . (That portion located East of U.S. Hwy 12) (Carcass Creek Properties, LLC)	+/-2.60
29	T. 30 S., R. 5 E., Sec. 11, W $\frac{1}{2}$ W $\frac{1}{2}$ . (Less mineral patent 43-77-0006)	+/-160.00
30	T. 30 S., R. 11 E., Sec. 5, SE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.00
31	T. 30 S., R. 11 E., Sec. 8, Lot 1, NE $\frac{1}{4}$ NW $\frac{1}{4}$ .	80.00
32	T. 30 S., R. 11 E., Sec. 8, Lot 4.	40.00
<b>Total Acres Within Wayne County</b>		<b>+/-7,487.62</b>

\* Bicknell Town, Utah selected for anticipated community expansion.

\*\* National Park Service (NPS)-Capitol Reef National Park selected for anticipated park boundary expansion.

\*\*\* Town of Hanksville selected for anticipated community expansion.

Table 5-5. Lands Identified for Proposed Sale Under FLPMA Section 203, Garfield County

Tract	Legal Description	Acres
1*	T. 31 S., R. 7 E., Sec. 34, N $\frac{1}{2}$ NE $\frac{1}{4}$ .	80.00
2*	T. 31 S., R. 7 E., Sec. 34, S $\frac{1}{2}$ SE $\frac{1}{4}$ .	80.00
3	T. 31 S., R. 7 W., Sec. 35, SW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$ .	280.00
<b>Total Acres Within Garfield County</b>		<b>440.00</b>

\* NPS-CRNP selected for anticipated park boundary expansion.

Table 5-6. Summary, Section 203 Sales, by County

County	Acres +/-
Sanpete County	3,401.12
Sevier County	4,554.75
Piute County	559.43
Wayne County	7,487.62
Garfield County	440.00
<b>Total</b>	<b>+/- 16,442.92</b>

Table 5-7. Existing Withdrawals

Withdrawal Type	Legal Description	Acreage
Henry Mountain Administrative Site	T. 28 S., R. 11 E., Sec. 21, NW $\frac{1}{4}$ NE $\frac{1}{4}$ .	41.21
<b>Administrative Site Withdrawal Total Acres: 41.21</b>		

Withdrawal Type	Legal Description	Acreage
Oil Shale	Sanpete County North Sevier County	106,612.36* 34,532.29*
<b>Oil Shale Withdrawal Total Acres: 141,144.65</b>		
Temporary Power Site Withdrawal #42	T. 26 S., R. 17 E., Sec. 32, E½, E½W½; Sec 33, All; Sec. 34, All; Sec. 35, All.	72.80
<b>Temporary Power Site Withdrawal Total Acres: 72.80</b>		
Federal Energy Regulatory Commission (FERC)–UTU- 73084	T. 27 S., R. 3 E., Sec. 3, Lots 2, 3, SW¼NE¼, SE¼NW¼, E½SW¼, SW¼SW¼; Sec. 9, SW¼NE¼.	12.08
FERC–UTU-73401	T. 15 S., R. 2 E., Sec. 2, Lots 5, 9; Sec. 25, Lots 1, 2, 5; T. 16 S., R. 2 E., Secs. 1, 9, 10, 12, 13, 15, 21, 22.	1,195.00
<b>FERC Withdrawal Total Acres: 1,207.08</b>		
Public Water Reserve	T. 28 S., R. 8 E., Sec. 29, SE¼SW¼.	40.0
Public Water Reserve	T. 28 S., R. 11 E., Sec. 6, SE¼NE¼. T. 31 S., R. 9 E., Sec. 15, NE¼NW¼.	40.0 40.0
Public Water Reserve	T. 20 S., R. 1 E., Sec., 35 SE¼SE¼; T. 30 S., R. 2½ W., Sec. 5 Lot 4; T. 30 S., R. 11 E., Sec. 22 NE¼SW¼.	120.0**
Public Water Reserve	Various.	1,040.0**
Public Water Reserve	Various.	378.7**
Public Water Reserve	Various.	191.05**
Public Water Reserve	T. 23 S., R. 1 W., Sec. 13, Lot 2. T. 25 S., R. 1 W., Sec. 35 NE¼SW¼, SE¼NW¼. T. 27 S., R. 3 W., Sec. 12 SW¼SE¼. T. 34 S., R. 10 E., Sec. 24, SW¼NW¼.	32.90 80.0 40.0 40.0
Public Water Reserve	Various.	360.0**
Public Water Reserve	T. 28 S., R. 15 E., Sec. 25 Prot SE¼NW¼ and T. 28 S., R. 16 E., Sec. 7 Prot SE¼NE¼ and Sec. 8, Prot SE¼SE¼.	120.0
Public Water Reserve	Various.	780.0**
Public Water Reserve	T. 32 S., R. 10 E., Sec. 34, NW¼SE¼.	40.0
Public Water Reserve	T. 33 S., R. 11 E., Secs. 11, 14, 15, 21, 22, 23.	520.0
Public Water Reserve	T. 31 S., R. 10 E., Sec. 29, SW¼NW¼.	40.0
Public Water Reserve	T. 27 S., R. 2 E., Sec. 6, Lot 5; T. 27 S., R. 14 E., Sec. 5, Lots 3, 4; S½NW¼.	158.12
Public Water Reserve	T. 27 S., R. 3 W., Sec. 1, NE¼SE¼; Sec. 12, SW¼SE¼; Sec 13, NE¼NW¼.	120.0
Public Water Reserve	T. 26 S., R. 1 E., Sec. 29, NW¼NW¼.	40.0
Public Water Reserve	T. 31 S., R. 13 E., Sec. 9, PROT S½NW¼, N½SW¼; Sec. 16, W½NE¼, SE¼NW¼.	280.0

Withdrawal Type	Legal Description	Acreage
Public Water Reserve	T. 31 S., R. 15 E., Sec. 9, PROT N $\frac{1}{2}$ NW $\frac{1}{4}$ ; T. 32 S., R. 15 E., Sec. 27, PROT SE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ ; T. 32 S., R. 16 E., Sec. 35, NW $\frac{1}{4}$ NW $\frac{1}{4}$ .	200.0
Public Water Reserve	T. 27 S., R. 16 E., Sec. 1, NE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.0
Public Water Reserve	T. 27 S., R. 1 E., Sec. 1; T. 27 S., R. 2 E., Secs. 6, 33, 34; T. 28 S., R. 2 E., Sec. 10; T. 24 S., R. 5 E., Secs. 5, 13; T. 25 S., R. 5 E., Sec. 1, Lot 3; T. 26 S., R. 5 E., Secs. 10, 11; T. 27 S., R. 7 E., Sec. 17; T. 28 S., R. 7 E., Secs. 4, 11, 25; T. 31 S., R. 7 E., Sec. 1; T. 27 S., R. 8 E., Secs. 11, 12; T. 28 S., R. 8 E., Sec. 5; T. 29 S., R. 8 E., Sec. 7; T. 30 S., R. 8 E., Sec. 31; T. 31 S., R. 8 E., Secs. 7, 13, 24, 27; T. 32 S., R. 8 E., Sec. 21; T. 33 S., R. 8 E., Secs. 25, 26, 28, 34 T. 34 S., R. 8 E., Sec. 12; T. 31 S., R. 9 E., Secs. 3, 7, 17, 22, 35; T. 32 S., R. 9 E., Secs. 30, 31; T. 33 S., R. 9 E., Secs. 12, 15, 17, 19, 20, 31; T. 34 S., R. 9 E., Sec. 22; T. 35 S., R. 9 E., Secs. 13, 26; T. 36 S., R. 9 E., Sec. 10; T. 29 S., R. 10 E., Secs. 1, 17, 20, 22, 30; T. 30 S., R. 10 E., Secs. 12, 13, 20, 23, 24, 25, 29, 31, 33, 35; T. 31 S., R. 10 E., Secs. 3–5, 7, 9, 14, 18–20, 24, 26, 27, 29–31, 33, 35; T. 32 S., R. 10 E., Secs. 4, 6, 8, 9, 13, 18, 21, 29, 30, 33–35; T. 33 S., R. 10 E., Secs. 5, 8, 13, 23–26; T. 34 S., R. 10 E., Sec. 26; T. 35 S., R. 10 E., Secs. 7, 18, 20, 21, 33, 35; T. 28 S., R. 11 E., Secs. 6, 9; T. 29 S., R. 11 E., Secs. 1, 18, 20; T. 30 S., R. 11 E., Secs. 19, 27, 28; T. 31 S., R. 11 E., Secs. 1, 21, 28; T. 32 S., R. 11 E., Sec. 24; T. 33 S., R. 11 E., Secs. 4, 19, 21, 25, 30, 31; T. 34 S., R. 11 E., Secs. 7, 8, 10, 11, 14, 18, 27; T. 35 S., R. 11 E., Secs. 33, 34; T. 36 S., R. 11 E., Secs. 6, 10, 21, 29;	7,330.0

Withdrawal Type	Legal Description	Acreage
	T. 37 S., R. 11 E., Sec. 9; T. 28 S., R. 12 E., Secs. 9, 27; T. 29 S., R. 12 E., Secs. 30, 33; T. 30 S., R. 12 E., Sec. 4; T. 31 S., R. 12 E., Sec. 3; T. 32 S., R. 12 E., Secs. 1, 3; T. 33 S., R. 12 E., Secs. 27, 33; T. 34 S., R. 12 E., Secs. 8, 33; T. 35 S., R. 12 E., Secs. 9, 18, 19; T. 36 S., R. 12 E., Secs. 3, 9, 16; T. 29 S., R. 13 E., Sec. 7; T. 30 S., R. 13 E., Secs. 9, 30; T. 31 S., R. 13 E., Sec. 33; T. 32 S., R. 13 E., Sec. 31; T. 33 S., R. 13 E., Secs. 4, 5, 15; T. 28 S., R. 14 E., Secs. 23, 34; T. 32 S., R. 14 E., Sec. 35; T. 31 S., R. 15 E., Sec. 4.	
Public Water Reserve	T. 28 S., R. 15 E., Sec. 25 PROT; T. 28 S., R. 16 E., Secs. 7, 8.	120.0
Public Water Reserve	T. 30 S., R. 10 E., Sec. 20, SE¼SE¼.	40.0
Public Water Reserve Total Acres: 12,230.77		

\* Approximate acres based on 1981–82 Mountain Valley Planning Area Unit Resource Analysis (URA)

\*\* Approximate acres based on Geographic Information Systems (GIS) extraction of Legacy Rehost 2000 data.

## Segregative Effects:

Hanksville Administrative Site: Subject to valid existing rights; temporarily withdrew lands from settlement, sale, location, or entry under the general land laws, including the mining laws, but not leasing under the mineral leasing law.

Oil Shale E.O. 5327, 04/15/1930: Subject to valid existing rights; temporarily withdrew lands containing deposits of oil shale “from lease or other disposal.” On 02/06/1933, Executive Order (EO) 6016 modified EO 5327 of 04/15/1930 “to the extent of authorizing issuance of oil and gas permits and leases under the general leasing act of 02/25/1920 (41 Stat. 437-451), for any of the lands withdrawn by said order.”

Oil Shale E.O. 4522, 09/13/1968: Subject to valid existing rights; temporarily withdrew in part certain lands containing deposits of oil shale “from appropriation under the U.S. mining laws, relating to metalliferous minerals.” Supplements but does not otherwise affect the withdrawal for oil shale made by E.O. 5327 of 04/15/1930.

Temporary Power Site Withdrawal No. 42 - 08/26/1909: Temporarily withdrawn from all forms of entry, selection, disposal, settlement, or location.

Federal Energy Regulatory Commission (FERC)–UTU-73084: Fremont Irrigation Company Application filed 03/04/1994. Order Issuing Preliminary Permit Issued 05/20/1994: Mill Meadow Hydropower Project No. P 11461; Federal Power Act, 16 U.S.C. 791(a)-825 (r). The filing of an application for a power

project with the FERC withdraws the lands covered by the application from the operation of the public land laws; however, the lands remain open to the location, lease, or disposal of the mineral estate. The issuance of a permit or license for a project by the FERC withdraws the lands from the operation of the mining laws (See part 3730).

FERC-UTU-73401: Magma Power Company Application filed 06/17/1994; amended on 07/05/1994; Amended Application accepted by FERC on 07/20/1994. Order Issuing Preliminary Permit Issued 10/20/1994: Big Mountain Modular Pumped Storage Project No. P 11489; Federal Power Act, 16 U.S.C. 791(a)-825 (r). The filing of an application for a power project with the FERC withdraws the lands covered by the application from the operation of the public land laws; however, the lands remain open to the location, lease, or disposal of the mineral estate. The issuance of a permit or license for a project by the FERC withdraws the lands from the operation of the mining laws (See part 3730).

E.O. of 03/29/1912, Public Water Reserve (PWR) No. 1: Public lands are withdrawn from settlement, location, selection, sale, or entry and reserved for public use, and all land within one quarter of a mile of every spring or water hole located on un-surveyed public land, and the same was withdrawn from settlement, location, sale, or entry and reserved for public use.

E.O. of 04/17/1926, PWR No. 107: In accordance with the provisions of Sec. 10 of the Act of 12/29/1916 (39 Stat. 862), and in aid of pending legislation, it was ordered that every smallest legal subdivision of the public land surveys that is vacant, unappropriated, unreserved public land and contains a spring or water hole, and all land within one quarter of a mile of every spring or water hole located on unsurveyed public land, and the same was thereby, withdrawn from settlement, location, sale, or entry and reserved for public use.

Table 5-8. Proposed Mineral Withdrawals and Areas Closed to Disposal, by Alternative

Alternative	Proposed Withdrawals		Closed to Disposal	
<b>Alternative N (No Action)</b>	N. Caineville Mesa Area of Critical Environmental Concern (ACEC)	2,200 ac	Wilderness Study Areas (WSAs)	446,900 ac
	S. Caineville Mesa ACEC	4,100 ac	N. Caineville Mesa ACEC	2,200 ac
	Beaver Wash ACEC	4,800 ac		
	Gilbert Badlands ACEC	3,680 ac		
	Developed Recreation Sites	15 ac		
	<b>Alternative N Total</b>	<b>14,795 ac</b>	<b>Alternative N Total</b>	<b>450,700 ac</b>
<b>Alternative A</b>	(No proposed withdrawals)	0 ac	WSAs	446,900 ac
	<b>Alternative A Total</b>	<b>0 ac</b>	<b>Alternative A Total</b>	<b>446,900 ac</b>
<b>Proposed RMP</b>	N. Caineville Mesa ACEC	2,200 ac	WSAs	446,900 ac
	Old Woman Front ACEC	300 ac	N. Caineville Mesa ACEC	2,200 ac
	Suitable Wild River Corridor	17,400 ac	Old Woman Front ACEC	300 ac
	Developed Campgrounds	15 ac	W&S River Corridor (outside WSAs)	4,400 ac
	<b>Proposed RMP Total</b>	<b>19,915 ac</b>	<b>Proposed RMP Total</b>	<b>455,400 ac</b>
<b>Alternative C</b>	Badlands ACEC*	27,800 ac	WSAs	446,900 ac
	Dirty Devil/North Wash ACEC*	47,400 ac	Badlands ACEC (outside WSA)	48,500 ac

Alternative	Proposed Withdrawals		Closed to Disposal	
	Fremont Gorge/Cockscomb ACEC*	4,500 ac	Bull Creek ACEC	4,800 ac
	Henry Mountains ACEC*	53,400 ac	Dirty Devil/ N. Wash ACEC (outside WSA)	74,600 ac
	Little Rockies ACEC*	11,200 ac	Fremont Gorge/Cockscomb ACEC (outside WSA)	31,500 ac
	Old Woman Front ACEC	300 ac	Henry Mountains ACEC (outside WSA)	158,200 ac
	Rainbow Hills ACEC	3,900 ac	Horseshoe Canyon ACEC (outside WSA)	3,100 ac
	Wild and Scenic River Corridors (outside ACEC withdrawals)	28,000 ac	Kingston Canyon ACEC	22,100 ac
			Little Rockies ACEC (outside WSA)	11,800 ac
			Lower Muddy Creek ACEC	16,200 ac
			Old Woman Front ACEC	300 ac
			Parker Mountain ACEC	107,900 ac
			Quitcupah ACEC	180 ac
			Rainbow Hills ACEC	4,000 ac
			Sevier Canyon ACEC	8,900 ac
			Thousand Lake Bench	500 ac
			W&S River corridors (outside WSAs and ACECs)	360 ac
	<b>Alternative C Total</b>	<b>176,500 ac</b>	<b>Alternative C Total</b>	<b>939,840 ac</b>

\*Only portions of these ACECs are proposed for withdrawal from mineral entry.

Table 5-9. Designated Right-of-Way Corridors and Management Specifications – Proposed RMP and Alternatives A, C and D

Serial Number	Name and Type	Corridor Width (ft)
UTU-35442	PacifiCorp (Camp Williams-Sigurd #1) 345-kV Transmission Line	¼ mile each side of centerline
UTU-36797	PacifiCorp (Camp Williams-Sigurd #2) 345-kV Transmission Line	¼ mile each side of centerline
UTU-47994	Garkane Power (Sigurd-Koosharem/ Parker Mountain Substation) 138-kV Transmission Line	¼ mile each side of centerline
UTU-57063	PacifiCorp (Sigurd-Antimony/Arizona) 230-kV Transmission Line	¼ mile each side of centerline
UTU-36469	PacifiCorp (Emery County-Sigurd) 345-kV Transmission Line	¼ mile each side of centerline

Serial Number	Name and Type	Corridor Width (ft)
UTU-22141	PacifiCorp (Huntington-Sigurd) 345-kV Transmission Line	¼ mile each side of centerline
UTU-25670	PacifiCorp (Sigurd to Cedar City/Poverty Flat Area) 230-kV Transmission Line	¼ mile each side of centerline
UTU-081591	PacifiCorp (Sigurd-Sevier) 138-kV Transmission Line	¼ mile each side of centerline
UTU-54534	PacifiCorp (Utah to Nevada) 345-kV Transmission Line	¼ mile each side of centerline
UTU-42692	PacifiCorp (Nebo-Moroni) 138-kV Transmission Line	¼ mile each side of centerline
UTU-14023	PacifiCorp (Sigurd-Nevada State Line) 230-kV Transmission Line	¼ mile each side of centerline
UTU-10657	PacifiCorp (Salt Lake-San Juan County) 345-kV Transmission Line	¼ mile each side of centerline
UTU-60034	Questar (Indianola-Cedar City, Utah) 4",6",8",10" Diameter Buried Natural Gas Line	¼ mile each side of centerline
UTU-0110883 UTU-8966 UTU-059061	Interstate 70	400' each side of centerline
UTU-65090 SL-071443	U.S. Highway 50	400' each side of centerline
UTU-0133352 UTU-0053116 UTU-12035	U.S. Highway 89	400' each side of centerline
SL-0062873 SL-0062677	State Highway 10	400' each side of centerline
UTU-013504 SL-063829 SL-062996 SL-052444 SL-052391 SL-052445 SL-0062023	State Highway 24 (Proposed RMP, Alternatives A and C only)	400' each side of centerline
SL-052391	State Highway 25	400' each side of centerline
SL-051932	State Highway 28	400' each side of centerline
UTU-059936 UTU-036663 SL-067357	State Highway 62 (Proposed RMP Alternatives A and C only)	400' each side of centerline
SL-0062804 UTU-004057	State Highway 119	400' each side of centerline
SL-0062891 UTU-019925 SL-067882	State Highway 132	400' each side of centerline



Serial Number	Name and Type	Corridor Width (ft)
UTU-44286	State Highway 153	400' each side of centerline
UTU-0147162	State Highway 95 (To Hite Crossing) (Proposed RMP, Alternatives A and C only)	400' each side of centerline
UTU-1088	State Highway 276 (To Bullfrog) (Proposed RMP, Alternatives A and C only)	400' each side of centerline

All right-of-way (ROW) corridors listed above (Table 5-9) would be managed with the following conditions of use:

1. The road or highway within the ROW corridor would be used to the maximum extent possible for construction and maintenance of new ROWs.
2. Whenever feasible, compatible facilities (e.g., roads, pipeline, and telephone lines) would be located within or adjacent to existing ROW areas.
3. To the maximum extent possible, roads needed for construction of a new ROW would be temporary and fully rehabilitated once construction is completed. When possible, existing transmission line access roads would be used. If a road is needed for long-term operation and maintenance, it must be specifically authorized by a ROW.
4. All land disturbed by new ROWs, except authorized new access roads, would be rehabilitated to as close to natural conditions as possible.
5. Transmission line ROWs would be located adjacent to each other or as close as possible as allowed under utility standards for safety and reliability.
6. Where feasible, buried telephone and fiber optic cable lines would be close to existing roads and highways and generally within the road ROW area.
7. All ROWs must comply with the applicable visual resource management (VRM) classification objectives.
8. Existing major ROWs noted in Table 5-9, shall be recognized as designated corridors. New ROWs would be restricted to within or adjacent to these corridors whenever feasible. New ROWs proposed within or adjacent to segments of corridors that are located within special designations (e.g., ACECs, WSAs, and wild and scenic rivers [WSRs]), would comply with requirements of the relevant designation.

NOTE: Section 368 of the Energy Policy Act of 2005 (designation of West-wide energy corridors) is being implemented through the current development of an interagency programmatic environmental impact statement (PEIS). The PEIS will address numerous energy corridor related issues, including the utilization of existing corridors (enhancements and upgrades), identification of new corridors, supply and demand considerations, and compatibility with other corridor and project planning efforts. It is likely that the identification of corridors in the PEIS will affect the RFO, and the decisions in the approved PEIS will be carried forward into the Richfield Approved RMP. Thus, additional corridors not identified in Table 5-9 could be designated.

Table 5-10. Existing Communication Sites

Site Name	Location	Holder	Types of Use	Type of Authorization
Steens Meadow	T 30 S, R 2 W Secs. 20, 21	UTU-0147177 Town of Antimony	Microwave	1911 Act Right-of-way Grant

Site Name	Location	Holder	Types of Use	Type of Authorization
South Creek Ridge	T 32 S, R 10 E Sec. 5	UTU-68169 Aspen Achievement Academy	Private Mobile Radio Service	FLPMA Title V Right-of-way Grant
		UTU-58602 BLM	Microwave, PMRS, Passive Reflector	Federal Reservation
		UTU-72931 Dixie National Forest	Microwave, PMRS, Passive Reflector	Federal Reservation
		UTU-72917 Capitol Reef National Park	Microwave, PMRS, Passive Reflector	Federal Reservation
Bulldog Ridge	T 33 S, R 10 E Sec. 10	UTU-68989 Beehive Telephone Company	Microwave	FLPMA Title V Right-of-way Grant
Copper Ridge	T 32 S, R 10 E Sec. 1	UTU-58601 BLM	Microwave, PMRS, Passive Reflector	Federal Reservation
Miners Mountain	T 30 S, R 6 E Sec. 26	UTU-80704 Capitol Reef National Park	Private Mobile Radio Service	Federal Reservation
Bullfrog Basin	T 37 S, R 11 E Sec. 33 T 38 S, R 11 E Secs. 4, 5, 7, 8	UTU-9987 Citizens Telecommunications Company of Utah	Microwave, Cellular, Local Exchange and buried cable	1911 Act Right-of-way Grant
Parker Ridge	T 27 S, R 1 E Sec. 9	UTU-0101227 Dixie National Forest	Private Mobile Radio Service	44 LD 513
Black Ridge	T 29 S R 4 E Sec. 18	UTU-55037 Wayne County	Private Mobile Radio Service	FLPMA Title V Right-of-way Grant
		UTU-47315 Hanksville Telecommunications Inc	Microwave	FLPMA Title V Right-of-way Grant
		UTU-47342 State of Utah	Microwave, Private Mobile Radio Service (DAS/ITS)	FLPMA Title V Right-of-way Grant
		UTU-51870 Fishlake National Forest	Microwave, Cellular	Federal Reservation
		UTU-72908 WWC Holding Co (Western Wireless)	Cellular	FLPMA Title V Right-of-way Grant
		Beehive Telephone	Cellular	FLPMA Title V Right-of-way Grant
Hanksville	T 28 S, R 11 E Sec. 5	UTU-47316 Hanksville Telcom Inc.	Microwave	FLPMA Title V Right-of-way Grant

Site Name	Location	Holder	Types of Use	Type of Authorization
	Sec. 15	Hanksville Town	Radio Repeater	FLPMA Title V Right-of-way Grant
		UTU-47314 Wayne County	TV Translator, Emergency Medical Services Cross-Band Repeater, FM Translator, Private Mobile Radio Service	FLPMA Title V Right-of-way Grant
Mayfield	T 19 S, R 2 E Secs. 30, 31	UTU-68179 Mayfield Town	TV Broadcast, microwave	FLPMA Title V Right-of-way Grant
Mt. Ellsworth	T 35 S, R 12 E Sec. 2	UTU-6847 Glen Canyon Nat'l Park Service	Private Mobile Radio Service	44 LD 513
Antimony	T 31 S, R 2 W Sec. 21	UTU-124747 PacifiCorp	Microwave	1911 Act Right-of-way Grant
Marysvale	T 26 S, R 4 W Sec. 26	UTU-096474 PacifiCorp	Microwave, Private Mobile Radio Service	1911 Act Right-of-way Grant
		UTU-72948 Department of Energy	Seismograph Station	FLPMA Title V Right-of-way Grant
Junction	T 30 S, R 3 W Secs. 7, 8, 17	UTU-28224 Piute County	TV Relay Station	1911 Act Right-of-way Grant
Marysvale Peak	T 26 S, R 4 W Sec. 26	UTU-142160 Piute County	TV Relay Station	1911 Act Right-of-way Grant
Mt. Pennell	T 35 S, R 11 E Secs. 26, 27, 34	UTU-51872 Plateau Resources Limited	Private Mobile Radio Service	FLPMA Title V Right-of-way Grant
Glenanna	T24 S, R 2 W Secs. 4, 9	UTU-144755 Qwest Corporation	Passive Reflector	1911 Act Right-of-way Grant
	Secs. 4, 9	UTU-46781 Sanpete County Broadcast	FM Radio, Cellular, Commercial Mobile Radio Service	FLPMA Title V Right-of-way Grant
Gunnison	T 18 S, R 2 E Secs. 29, 31	UTU-144801 Qwest Corporation	Microwave, Private Mobile Radio Service	1911 Act Right-of-way Grant
Bull Claim Hill	T 24 S, R 2 W Sec. 4	UTU-57755 Richfield Irrigation and Canal Company	Telemetry Radio Repeater	FLPMA Title V Right-of-way Grant
San Pitch Mountain	T 18 S, R 2 E Sec. 31	UTU-47324 Sanpete County	FM Radio,	FLPMA Title V Right-of-way Grant
Koosharem	T 27 S, R 1 E Secs. 8, 9	UTU-57015 Sevier County	TV Translator	FLPMA Title V Right-of-way Grant
Grover-Miners Mountain Mine Shaft	T 30 S, R 6 E Sec. 17	UTU-45952 University of Utah	Seismograph Station	FLPMA Title V Right-of-way Grant

Site Name	Location	Holder	Types of Use	Type of Authorization
Caineville	T 28 S, R 9 E, Sec. 24	UTU-3722 Wayne County	TV Broadcast	1911 Act Right-of-way Grant
West Loa	T 28 S, R 2 E Sec. 4	UTU-51880 Wayne County	TV Broadcast	FLPMA Title V Right-of-way Grant
Mt Ellen/South Summit Ridge	T 31 S, R 10 E, Sec. 34	UTU-72956 WWW Holding Company Inc. (Western Wireless)	Cellular, Private Mobile Radio Service, Amateur Radio	FLPMA Title V Right-of-way Grant
Browns Knoll	T 33 S, R 11 E, Sec. 18	UTU-80716 University of Utah	Seismograph Station	FLPMA Title V Right-of-way Grant
Runts Knob	T 29 S, R 15 E, Sec. 8	UTU-80721 University of Utah	Seismograph Station	FLPMA Title V Right-of-way Grant

Table 5-11. Shooting Ranges Authorized on Public L and

Lessee	Legal Description	Acreage
Town of Hanksville	T. 28 S., R. 11 E., Sec. 9, S $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ .	17.5
Wayne County	T. 29 S., R. 4 E., Sec. 6, within portions of NW $\frac{1}{4}$ , NE $\frac{1}{4}$ , SW $\frac{1}{4}$ .	25.0
Gunnison City	T. 19 S., R. 1 E., Sec. 5, SE $\frac{1}{4}$ SW $\frac{1}{4}$ .	40.0
Utah Rifle & Pistol Association	T. 25 S., R. 3 W., Sec. 19, Lot 4 T. 25 S., R. 3 W., Sec. 24, SE $\frac{1}{4}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ .	120.0

Table 5-12. Culinary Water Sources Authorized on Public L and

ROW Serial Number	ROW Holder	Legal Description	Acreage
UTU-456	William Murray	T. 27 S., R. 3 W., Sec. 7.	1.72
UTU-21327	Town of Kingston	T. 30 S., R. 3 W., Sec. 24.	85.00
UTU-23664	Utah Division of Water Resources (Greenwich)	T. 27 S., R. 1 W., Sec. 35.	400
UTU-26547	Town of Annabella	T. 24 S., R. 2 W., Sec. 19.	3.3
UTU-30906	Utah Division of Water Resources (Town of Lyman)	T. 27 S., R. 3 E., Sec. 35; T. 28 S., R. 3 E., Sec. 3, 4.	4.28
UTU-32112	Town of Bicknell	T. 28 S., R. 3 E., Sec. 25.	2.5
UTU-32473	Town of Loa	T. 28 S., R. 2 E., Sec. 3.	5.11
UTU-38454	Aurora City	T. 22 S., R. 1 W., Sec. 6.	3.45
UTU-46494	Town of Sigurd	T. 23 S., R. 1 W., Sec. 6, 21, 28.	16.58

ROW Serial Number	ROW Holder	Legal Description	Acreage
UTU-47312	Kings Meadow Ranches	T. 23 S., R. 1 W., Sec. 28.	1.00
UTU-47346	City of Aurora	T. 22 S., R. 2 W., Sec. 1.	1.0
UTU-57066	Caineville Special Service District	T. 28 S., R. 8 E., Sec. 33.	8.3
UTU-63477	Town of Koosharem	T. 26 S., R. 1 E., Sec. 30.	1.00
UTU-68964	Town of Bicknell	T. 29 S., R. 3 E., Sec. 3.	70.00
UTU-77186	Town of Hanksville	T. 29 S., R. 11 E., Sec. 1.	0.23
UTU-79482	Town of Antimony	T. 31 S., R. 2 W., Sec. 19.	1.00
SL-052445	Federal Highway Administration	T. 26 S., R. 1 E., Sec. 29.	Part of a larger ROW for a rest stop

## **APPENDIX 6—WILDLAND FIRE MANAGEMENT**

---

### **GENERAL RISK CATEGORIES**

#### **General Risk Category A**

Category A includes areas where fire is not desired at any time and where mitigation and suppression are required to prevent direct threats to life or property. In addition, Category A includes areas where fire has never played a major role historically in the development and maintenance of the ecosystem (e.g., vegetative communities such as blackbrush ecosystems and shadscale ecosystems), and some areas where fire return intervals were very long (such as spruce communities). Other examples are very mesic sites and very xeric sites.

Emphasis will be placed on those actions that will reduce unwanted ignitions and reduce losses from unwanted wildland fires.

Emphasis will be placed on prevention, detection, and rapid suppression response and techniques. Non-fire fuel treatments will be used.

#### **General Risk Category B**

Category B includes areas where wildland fire is not desired because of current conditions. It includes areas where fire may naturally have performed an important role in the ecosystem function, but because of current resource concerns and potentially high economic impacts from unplanned ignitions (including in some wildland/urban interface areas), considerable constraints and mitigation measures are required. Sagebrush ecosystems, for example, can fall into this category because of encroachment of cheatgrass or a prolonged lack of fire that leads to large monotypic stands of sagebrush that will not burn as they would have historically.

The appropriate management response is usually aggressive suppression response and techniques.

Response will emphasize prevention and mitigation programs that reduce unwanted fire ignitions and resource threats.

Fuels reduction is a major means of mitigating the potential risks and losses. Fire and non-fire fuels treatments are used to reduce the hazardous effects of wildfire. Prescribed fire projects are often complex and costly because of stringent contingency planning. Hazardous fuel treatments may consist of multiple non-fire treatments before fire will be used.

#### **General Risk Category C**

Category C includes areas where wildland fire use is desired, but significant constraints must be considered for its use. Ecological, social, or political constraints must be considered prior to wildland fire use. These constraints could include air quality, threatened and endangered species considerations (e.g., effect of fire on survival of species), or wildlife habitat considerations. Resource considerations will be described for each Fire Management Unit in the annual update of the Fire Management Plan.

In multiple wildland fire situations, Category C areas would generally receive lower suppression priority than category A or B areas.

Fire and non-fire fuels treatments will be used to reduce the hazardous effects of wildland fire. Prescribed fire treatments for hazard reduction are a lower priority than in the category A or B areas.

## **General Risk Category D**

Category D includes areas where wildland fire use is desired, and there are few or no constraints. In these areas, fire is an integral component in maintaining or achieving the desired vegetative condition for affected lands, and there are fewer mitigation requirements or resource constraints. Wildland fires may be managed to meet resource management objectives under an approved Fire Management Plan.

Areas in this category would have the lowest suppression priority in a multiple fire situation.

There is generally less need for hazardous fuel treatments in Category D areas. If treatment is necessary, however, all fire management activities may be used.

## **FIRE ECOLOGY OF MAJOR COVER TYPES**

The way in which fire affects vegetation is an important component of this appendix; it is that direct relationship that influences many of the effects on other resources. The existing vegetation communities reflect evolutionary processes, natural disturbance, recent climatic trends and patterns, historic fire management, (e.g., suppression), and other land use practices (e.g., livestock grazing) that directly affect fuel loading, community composition (e.g., invasive concerns such as cheatgrass, knapweeds, tall peppergrass), and fire return intervals.

Historically, fire played an essential role in the landscape that helped define species composition, structure, and productivity (Bradley et al. 1992, Paysen et al. 2000). Therefore, many plants that make up these communities are adapted to withstand wildfire through a variety of anatomical or physiological mechanisms. However, over the past century, aggressive fire suppression efforts, introduction of exotics (e.g., cheatgrass), juniper encroachment, and some land management practices have altered the fire ecology and dynamics of successional processes across the Richfield Field Office (RFO). Therefore, current-day fire return intervals for many vegetation communities have changed in comparison with historic patterns because of a drastic decrease in fire occurrence and size (Brown 2000). Understanding the fire ecology of the major vegetation cover types is important to reintroducing wildland fire into the environment and restoring natural fire regimes, as well as to understanding the impacts from the proposed decisions. The remainder of this appendix addresses the fire ecology of the dominant vegetation cover types in the RFO.

### **Desert Shrub**

Desert shrub composes nearly half of the vegetation acreage of the RFO, including most of the lower elevation public lands east of Capitol Reef National Park. Located primarily on the valley floors, this vegetation community is most common on well-drained, sandy to rocky soils; however, it can tolerate saline and alkaline soils. Desert shrub is characterized by salt-tolerant succulent shrubs including greasewood, seepweed, ephedra, shadscale, four-wing saltbush blackbrush, and threadleaf rubber rabbitbrush. A single or a few species dominate large areas, creating homogeneous landscapes. There is very sparse vegetation in the interspaces in intact native communities. Biological crusts are usually present and cover most of the interspaces between shrubs in intact, native species-dominated salt desert shrub communities. Cheatgrass expansion into this vegetation type poses a serious threat because it provides a continuous understory of fine fuel and reduces fire return intervals in otherwise non-fire-adapted communities.

### *Fire Ecology*

The desert shrub community is not a fire-adapted community because most shrub species are fire sensitive. Even low-intensity fires can kill most species because most do not resprout or resprout weakly. A lack of continuous cover (e.g., fuels) has made historic fire rare to non-existent. Historically, these communities did not burn often enough or in large enough patches to support dominance of fire-adapted plants. Saltbush communities, however, are considered fire tolerant primarily because saltbush and many of its grass associates resprout vigorously and recover quickly (Evers 1998). In areas with a high percentage of cover of desert grasses, low-intensity fires may have been more common than in more shrub-dominated areas.

Fires in blackbrush were historically infrequent, and this vegetation community is characterized by Fire Regime V and Condition Class 2. This ecosystem is at moderate risk of losing key ecosystem components because of fire.

Recent experience on Utah Bureau of Land Management (BLM) land has shown that blackbrush does not respond favorably to fire. In addition, most of the blackbrush in Utah has suffered substantial dieback because of recent ongoing drought conditions. Burning has promoted succession to grassland by destroying the biological crust that stabilizes the soil. The biological crust provides important soil microflora apparently required for blackbrush survival or reestablishment (Paysen et al. 2000). Frequent large fires can be problematic from a management standpoint because recovery can take more than four decades or, in some cases, not occur at all (Wright and Bailey 1982, Paysen et al. 2000). Fire frequently destroys blackbrush seed banks and mature shrubs.

Fire frequency in the desert shrub communities has been estimated at 35 to more than 300 years for the desert shrub vegetation type (USDA Forest Service 2004). Because of the risk of losing key ecosystem components and greatly increased fire regimes as invasive annual grasses (e.g., cheatgrass) dominate, desert shrub is typically classified as Fire Regime Condition Class 3.

## **Pinyon-Juniper**

Pinyon-juniper woodlands make up more than 25 percent of the vegetation cover in the RFO. It is estimated that pinyon and juniper woodlands have increased 10-fold over the past 130 years throughout the Intermountain West (Miller and Tausch 2001). Forest Inventory and Analysis data collected in the RFO revealed that more than 67 percent of identified plots had a stand age of less than 150 years. Throughout the RFO, this age discrepancy is indicative of juniper woodland expansion to more than 60 percent of its historic range. This expansion is largely a result of historic fire suppression in range communities, primarily grasslands and sagebrush, as well as a reduction of fine fuels that allowed fire to regularly remove young trees from grass/sagebrush ecosystems.

Juniper is considered a climax species for a number of pinyon-juniper, sagebrush steppe, and shrub steppe habitats. Old-growth pinyon-juniper is often restricted to fire-safe habitats, e.g., steep, dissected, and rocky terrain. Old-growth pinyon-juniper can be characterized by large trees, the presence of extensive dead woody material, increased number of canopy layers, rounded canopies, large lower limbs, and large, irregularly shaped and deeply furrowed trunks (Miller et. al. 1999, Miller & Rose 1999).

Pinyon-juniper stands that are most likely to burn are characterized by small, scattered trees with abundant herbaceous fuel between the trees, or dense, mature trees capable of carrying crown fire during dry, windy conditions. Stands of moderate tree density, where overstory competition reduces the herbaceous fuel, and the trees are more widely spaced, are unlikely to burn. Closed pinyon-juniper stands do not have understory shrubs to carry a surface fire, and do not burn until conditions are met to carry a



crown fire. Trees taller than four feet in open pinyon-juniper stands are difficult to kill unless there are heavy accumulations of fine fuel beneath the trees. Because of the lack of undergrowth to act as fuel on dry sites, fire may never have been as important an influence as climatic fluctuations in governing the rate of tree replacement of shrubland or grassland. Moist, more productive sites probably have had more extensive and frequent fires when drought periods occurred. The steady increase in crown fuels has allowed burning through areas with deep soils (formerly sagebrush communities) at higher than normal intensities. These sites have never experienced such intensities and therefore are not adapted to this new fire regime.

### *Fire Ecology*

Most of the area where pinyon-juniper currently dominates was historically characterized by fires burning every 15 to 50 years (Miller and Tausch 2001). Pinyon-juniper in Utah is typically described by Condition Class 2 (elevations greater than 7,000 feet) or 3 (elevations less than 7,000 feet). Areas of Condition Class 3 are characterized by dense stands of pinyon-juniper, scarce understory, and high potential for cheatgrass invasion following fire. Condition Class 2 areas have encroaching pinyon-juniper but are less dense than Condition Class 3 and are at less risk of cheatgrass invasion following fire. Areas of old-growth pinyon-juniper have experienced fire frequencies of 200 to more than 300 years (Goodrich and Barber 1999) and would be classified as Fire Regime V. However, this old-growth component is estimated to be less than 10 percent of the current area classified as pinyon-juniper (Miller and Tausch 2001).

Surface fires readily kill thin-barked young pinyon and juniper trees and have been relatively frequent historically in areas on which juniper has now encroached. It is generally agreed that fire was the most important natural disturbance that impacted the distribution of juniper and/or pinyon-juniper woodlands before the introduction of livestock in the 19th century (Miller and Rose 1999). Burkhardt and Tisdale (1976) concluded that fire frequencies of 30 to 40 years would control juniper expansion into mountain big sagebrush communities.

## **Sagebrush**

Sagebrush cover types compose about 16 percent of the RFO. Historically (e.g., presettlement) sagebrush steppe is estimated to have dominated as much as 30 percent of the RFO. Sagebrush has been lost because of juniper encroachment, historical seedings for forage production (e.g., crested wheatgrass), and cheatgrass conversion.

Because seral diversity applies to sagebrush, a considerable portion of the acreage listed under perennial grasslands (native) and areas with recent sagebrush seedings may be considered as representing the early seral component of sagebrush communities. Healthy sagebrush is a patchwork mosaic of seral communities that range from recovering perennial grass-shrublands following natural fire, to old growth, decadent sagebrush steppe with high canopy cover and reduced herbaceous understory. In the past 100 years, the extent of sagebrush has been greatly reduced because of conversion to irrigated agriculture, livestock grazing, juniper encroachment, cheatgrass conversion, and the deliberate eradication of sagebrush for range improvement.

Low-elevation sagebrush, generally found below 6,500 feet, is dominated by basin big sagebrush and Wyoming big sagebrush. Mid-elevation sagebrush occurs at mid to high elevations (greater than 7,000 feet), is characterized by dominance of mountain big sagebrush, and appears less vulnerable to conversion to annual grasslands than low-elevation shrub steppe. On the other hand, mid-elevation sagebrush steppe is more vulnerable to encroachment of juniper as a result of fire suppression compared with lower-elevation sagebrush. Grass and forb species associated with these low- and mid-elevation sagebrush

communities assist with the spread of fire. When domestic livestock are heavily grazed in sagebrush communities, the understory becomes sparse and can prevent the spread of fire. Ignition probabilities have also declined substantially because of the lack of fine grass fuels.

### *Fire Ecology*

Fire frequency in sagebrush varies for the different sagebrush species but is considered to be between 10 and 110 years depending on precipitation, elevation, and sagebrush species. Presettlement stand-replacing fire frequencies for low-elevation sagebrush are estimated to vary from 60 to 110 years (Whisenant 1990, Peters and Bunting 1994). For mountain big sagebrush, presettlement stand-replacing fire frequencies have been estimated to vary between 10 and 25 years (Houston 1973, Harniss and Murray 1973). Wyoming sagebrush communities burned about every 40 years. Sagebrush is considered to be in Condition Class 2 if it is above 6,500 feet and Condition Class 3 if it is below 6,500 feet because of the high risk of losing key ecosystem components resulting from cheatgrass invasion following fire.

The cold-desert climate, with cold, wet-to-dry winters and springs, and dry, hot summers predispose sagebrush communities to an evolutionary history with recurring fire. Wright et al. (1979) surmised that the interval between fires must have been sufficiently long for big sagebrush, which does not resprout and recolonizes from seeds, to regain dominance.

Most sagebrush species do not sprout after fire, and most plants are killed by low- to high-intensity fires. This is true of all three subspecies of big sagebrush common throughout the RFO. Generally, the herbaceous understory composition does not determine the intensity and severity of wildland fires; sagebrush itself is the primary fire carrier. The high canopy cover associated with late mature sagebrush stands likely facilitated stand-replacing fires historically. However, the prefire understory is an important determinant of post-fire response. Because sagebrush seeds generally are not transported far from the parent, unburned areas within large burn areas are often the most important source of seed material for natural recruitment and reestablishment of sagebrush.

## **Grassland**

Grasslands in the RFO include native perennial grasslands and seedings of native species and exotic perennial grasses, primarily crested wheatgrass; and some cheatgrass is classified as grassland. Cheatgrass is discussed more extensively below.

Crested wheatgrass-dominated grasslands are the deliberate result of historic range improvement projects and post-fire seedings. Other perennial grasslands have expanded in portions of the RFO as a result of the eradication of shrubs, especially sagebrush species or by wildland fires on relatively good condition rangelands where cheatgrass did not invade or does not dominate. Native perennial grasslands are an intermediate successional stage that would eventually return to a diverse sagebrush steppe habitat if allowed to recover for extended periods (e.g., 20 to 70 years) without impacts from wildland fires. Native perennial grass species include Idaho fescue, bluebunch wheatgrass, needlegrass, grama grass, and Indian ricegrass.

Perennial grasslands dominated by crested wheatgrass and/or other non-native species are stable communities that do not trend toward recovery to sagebrush steppe habitat as quickly as native perennial grasslands. Historically, native perennial grasslands would have formed part of the seral mosaic of the sagebrush steppe habitat, although it is unclear how widespread they once may have been across the landscape.

### *Fire Ecology*

Because native grasslands are often seral to sagebrush, fire regimes are similar. Perennial grasses respond vigorously to fires of various intensities by resprouting from basal growing points. The primary determinant of fire response in native perennial grasslands is fire residence time. Fast, high-intensity fires have a short residence time and seldom cause substantial mortality to native perennial bunchgrasses. Slow backing fires have a longer residence time and greater severity; mortality to native perennial bunchgrasses may be high under these conditions. With most natural ignitions, the predominant fire spread would be as a fast moving head fire.

## **Mountain Shrub**

Mountain shrub occupies about 2 percent of the RFO and occurs as a transition vegetation type between mid-elevation sagebrush and conifer vegetation types. This cover type is found at moderately high elevations (7,000–8,500 ft.). Mountain shrub is usually found on north and east slopes that tend to be cooler and moister than south and west aspects. Mountain shrub is a highly diverse community: Gambel oak, chokecherry, serviceberry, currant, mountain snowberry, elderberry, and mountain sagebrush. With its characteristically high productivity and diverse herbaceous understory, it provides important biodiversity, wildlife habitat, and protective ground cover to the ecosystem.

The range of most mountain shrub species has been shrinking as a result of fire exclusion and overgrazing by ungulates. Pinyon-juniper and sagebrush have encroached into sites where fires would have historically prevented their spread into the mountain shrub community. The range of Gambel oak, however, is estimated to be greater today than it was historically (Brown 1958, Christensen 1949, Christensen 1957).

### *Fire Ecology*

Stand-replacing fire frequency ranges from 25 to 100 years in mountain shrub (Loope and Gruell 1973), although return intervals may vary widely with changes in elevation, aspect, site moisture, and the associated forest or woodland type. Fire regimes in mountain shrub cover types vary depending on the dominant species. Condition classes also vary depending on the dominant species, although most mountain shrub communities are in Condition Class 2 because of some missed fire return intervals, moderate risk of losing key ecosystem components, and moderately altered vegetation attributes. However, some mountain shrub communities at lower elevations (below 6,500 feet) are classified as Condition Class 3 because of their high risk of cheatgrass invasion following fire.

All species of mountain shrubs resprout after fire except mountain sagebrush. Mountain shrub communities generally recover rapidly following wildland fire and are considered to be fire tolerant.

## **Ponderosa Pine**

Ponderosa pine occupies less than 2 percent of the RFO, mainly located in the Henry Mountains. Ponderosa pine communities are naturally characterized by an open, savannah-like appearance in which widely spaced large trees are present with open understories that are periodically cleared by low-intensity ground-fires.

Historically, frequent low-severity fire probably restricted the accumulation of large downed woody fuels. Fine fuels (e.g., grasses and needles) were the medium through which historical fires spread because most large fuels (e.g., limbs and trunks) would have been consumed by the frequent fires. Historic land management practices, along with fire exclusion, have created stand conditions that were rare or non-existent prior to European settlement. The absence of disturbance has encouraged a conversion to a higher

proportion of shade-tolerant species such as Douglas fir and white fir. These stands are in the mid- to mature-age classes, overly dense, and more susceptible to insect and disease epidemics (Fule et al. 1997). The steady accumulation of tree biomass has contributed to progressively declining herbaceous productivity. Ladder fuels are well developed and contribute to unwanted wildland fires outside the historical range of intensity and severity.

#### *Fire Ecology*

Mature ponderosa pines have thick bark, which protects them from serious damage from surface fires. It is considered to be the most fire-adapted conifer in the west (Bradley et al. 1992). Fire frequency for ponderosa pine communities ranges from 10 to 40 years, with low- to mixed-severity (USDA Forest Service 2004) fires. Ponderosa pine forests in the RFO are classified as Fire Regime I and Condition Class 3. These forests have typically missed up to 5 to 10 fire cycles in the years of fire suppression and are at risk of stand-replacing canopy fires.

### **Mixed Conifer**

Major forest community types of mixed conifer include Douglas fir, Engelmann spruce, and sub-alpine fir. These communities occupy more than 1 percent of the RFO and generally occur at elevations above 7,000 feet. These forest types do, however, have a high value for recreation, aesthetics, and special and status species habitat. Forest composition varies with elevation, exposure, and latitude. Fire frequency varies with summer dryness and lightning occurrence and also depends on slope, aspect, elevation, and natural fire barriers.

Because of selective logging practices over the last 100 years, favoring the removal of ponderosa pine and Douglas fir, and fire exclusion, these stands are now dense and even-aged. Once adapted to a more frequent fire regime, they are now predisposed to endure high-intensity fires from the development of ground and ladder fuels. Stand-replacing fires outside the historical range of intensity and severity are likely. Closed stands with dense Douglas fir understories present the highest fire hazard. Stands may have large amounts of downed twigs and small branchwood. Dense overstory trees and the presence of dead branches near the ground create a crown fire potential under severe burning conditions.

#### *Fire Ecology*

Fire frequencies range from 100 to 300 years, and these forests are often characterized by a combination of understory and complete stand-replacement fire regimes (Arno 2000). Because of the longer historic fire return intervals and well-functioning vegetation attributes, mixed conifer is classified as Condition Class 1 when associated with Fire Regime IV and Condition Class 2 when associated with Fire Regime III.

This mixed severity fire regime often results in a mosaic pattern of stand structure and fuels. Past stand burn mosaics tend to increase the probability that subsequent fires will also burn in a mixed pattern (Arno 2000). Dead woody fuels accumulate on the ground, often in a haphazard manner, and the greatest fuel loadings tend to occur on the most productive sites, which are predominantly stand-replacement fire regimes.

### **Aspen**

Aspen-dominated communities occupy less than 1 percent of the RFO. Aspen communities can be climax or seral to conifer communities (e.g., Douglas fir) and are found between elevations of 6,500 feet and 10,500 feet. Aspen occurs as pure stands or in association with various conifers. Although conifer invasion is a natural pattern in many aspen stands, because of long-term fire suppression throughout the

RFO, it has resulted in increased representation and dominance by conifer in aspen stands, thus reducing the extent of aspen-dominated stands (Mueggler 1989). The absence of fire, coupled with excessive browsing of young aspen trees by livestock and wildlife, has led to rapid replacement of aspen communities by conifer forests (Bartos 1998). However, the presence of conifers does increase aspen stand flammability and therefore may be essential to carrying the fire to regenerate aspen on the site. Brown and Simmerman (1986) found that livestock grazing reduces fine fuels so that fire intensity and rates of spread may be as low as one-tenth that of ungrazed stands.

Areas with small amounts of aspen in a stand may indicate that the area was once dominated by aspen (Bartos and Campbell 1998). Throughout national forests in Utah, including the adjacent Fishlake National Forest, aspen-dominated landscapes have declined by about 60 percent (Bartos and Campbell 1998). Aspen in the RFO, either adjacent to Forest Service land or in the Henry Mountains, is intermingled with and adjacent to stands of mixed conifer stands. Conditions noted throughout Utah are not expected to be different than those in the RFO.

#### *Fire Ecology*

Fire frequencies range between 25 and 100 years with mixed severity (Loope and Gruell 1973). Aspen is characterized by Fire Regime IV and Condition Class 2. Fire regimes have been moderately altered, and vegetation structure has been moderately altered from the historical.

Pure stands of aspen are particularly susceptible to mortality of above-ground stems from fire of low intensity, even though aspen is well adapted to regeneration by sprouting after fire (Jones and DeByle 1985). Aspen stands do not easily burn and often act as natural fuel breaks during wildland fires. Fires in young aspen stands tend to be low-intensity surface fires unless there is a great deal of understory fuel. In older stands, during the warmest and/or driest months of the year, abundant fuel can lead to higher intensity fires.

## **Riparian/Wetland**

Riparian areas occupy only a small portion of the overall landscape (less than 1 percent of the RFO), typically in narrow stringer communities along both sides of the rivers and streams and adjacent to springs. Native tree communities may be dominated by Fremont or narrowleaf cottonwoods with understories of shrubs (such as sandbar, whiplash, and Booth's willows) and herbaceous species.

Invasive species, such as tamarisk, tall whitetop, and Russian olive, along with greasewood, have become well established in the riparian communities and are slowly replacing the native vegetation across much of Utah.

#### *Fire Ecology*

Fremont cottonwood communities are characterized by a late seral stage (e.g., all mature to late-mature trees) with little or no representation of younger age-classes and are not typically fire adapted. Narrowleaf cottonwood is a somewhat fire-adapted species that may resprout from roots, provided the stands are not decadent and occur in areas where the water table remains reasonably high throughout the growing season. Willow species typically sprout vigorously following a fast-moving fire. Slow-moving fires are generally more damaging, presumably because of greater heat transfer to root crowns.

Although many riparian species may resprout following a fire, this community is not considered a fire-dependent ecosystem. Historically, fire in these riparian communities would have been infrequent, and vary from small size, with highly mosaic burn patterns as a result of the higher moisture content generally present in riparian areas/species, to stand-replacing burns likely to have occurred only in extreme drought

periods. These riparian communities are classified as Fire Regime IV, with most areas presently in Condition Classes 2 and 3. Lower elevation riparian areas would be in Condition Class 3 because of the higher incidence and potential of invasive species.

## Cheatgrass

The effects of cheatgrass on fire ecology raise the importance of addressing it in this appendix. Introduced from Eurasia in the late 1800s (USDA Forest Service 2004), cheatgrass is an opportunistic winter annual that germinates anytime between autumn and spring when temperatures and soil moisture are suitable. It outcompetes native grasses that grow dormant through winter and are slower to develop in the spring. This exotic species may be present in relatively undisturbed plant communities but easily becomes dominant if a site is disturbed. Cheatgrass has been less successful in dominating sites that are above elevations of 7,000 feet, but there are known populations of cheatgrass at higher elevations.

### *Fire Ecology*

The establishment of cheatgrass fosters much more frequent fire return intervals. Shortened natural/historical fire rotations impact perennial vegetation by killing the tops of the plants and allowing little time (e.g., few growing seasons) between recurrent fires. However, the fire regime of cheatgrass-dominated sites is the historical fire regime of that site before it was invaded by cheatgrass. For example, where cheatgrass has invaded a salt desert scrub community, the fire regime would be Fire Regime V. Wherever cheatgrass threatens to dominate the landscape, the vegetation type is managed as Condition Class 3 because of the potential for loss of key ecosystem components (e.g., native species).

The presence of cheatgrass in a wildland community extends the time during which the community is susceptible to wildland fire ignitions. In the summer, cheatgrass dries out 4 to 6 weeks earlier than perennial grasses and forms a fine-textured, highly flammable fuel. Cheatgrass may also be susceptible to fire one to two months longer in the fall because perennial grasses may green up following periods of moisture in the autumn (Paysen et. al. 2000).

## REFERENCES

- Arno, S.F. 2000. "Fire in western forest ecosystems." In: Brown, J.K.; Smith, Kapler, J., eds. *Wildland fire in ecosystems: effects of fire on flora*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT. Gen. Tech. Rep. RMRS-GTR-42-vol. 2: 97–120.
- Bartos, D.L. and Campbell, R. B. 1998. *Decline of quaking aspen in the interior west—examples from Utah. Rangelands*. 20(1): 17–24.
- Bartos, D.L. 1998. "Aspen, fire, and wildlife." In: *Fire and wildlife in the Pacific Northwest—research, policy, and management*. April 6–8, 1998, Spokane, WA.
- Bradley, A.F.; Noste, N.V.; and Fischer, W.C. 1992. *Fire ecology of forests and woodlands in Utah*. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Ogden, UT. Gen. Tech. Rep. INT-GTR-287.
- Brown, H.E. 1958. "Gambel oak in west-central Colorado." *Ecology* 39(2): 317–327.
- Brown, J.K. and Simmerman, D.G. 1986. *Appraising fuels and flammability in western aspen: a prescribed fire guide*. USDA Forest Service, Intermountain Region Research Station. Ogden, UT. Gen. Tech. Rep. GTR-INT-205.
- Brown, James K., ed. 2000. *Wildland fire in ecosystems: effects of fire on flora*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT. Gen. Tech. Rep. RMRS-GTR-42-vol. 2.
- Burkhardt, J.W. and Tisdale, E.W. 1976. "Causes of juniper invasion in southwestern Idaho." *Ecology* 57(3): 472–484.
- Christensen, E.M. 1957. *Photographic history of the mountain brush on "Y" Mountain, central Utah*. Utah Acad. Proc. 34:154–155.
- Christensen, E.M. 1949. *Distributional observations of oakbrush (Quercus gambelii) Nutt. in Utah*. Proc. Utah Acad. Sci. Arts. & Lett. 27:22–25.
- Evers, L. 1998. *Fire ecology considerations for the Arizona strip*. U.S. Department of the Interior, Bureau of Land Management, white paper, 34p.
- Fule, P.Z.; Covington, W.W.; and Moore, M.M. 1997. "Determining reference conditions for ecosystem management of southwestern ponderosa pine forests." *Ecological Applications* 7(3):895–908.
- Goodrich, S. and Barber, B. 1999. "Return interval for pinyon-juniper following fire in the Green River corridor, near Dutch John, Utah." In: Monsen, S.B. and Stevens, R. (compilers). *Proceedings: Ecology and management of pinyon-juniper communities within the interior west, 1997 September 15–18, Provo UT*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT: Proc. RMRS-P-9: 391–393.
- Harniss, R.O. and Murray, R.B. 1973. "30 years of vegetal change following burning of sagebrush-grass range." *Journal of Range Management*. 26(5): 322–325.
- Houston, D.B. 1973. "Wildfires in northern Yellowstone National Park." *Ecology*. 54(5): 1111–1117.

- Jones, J.R.; DeByle, N.V. 1985. "Fire." In: DeByle, N.V. and Winokur, R.P., eds. *Aspen: ecology and management in the western United States*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. Gen. Tech. Rep. RM-119: 77–81.
- Loope, L.L. and Gruell, G.E. 1973. "The ecological role of fire in the Jackson Hole Area, Northwestern Wyoming." *Quaternary Research*, 3, 425–443.
- Miller, R.; Tausch, R.; and Waichler, W. 1999. "Old growth juniper and pinyon woodlands." In: Monsen, S.B. and Stevens, R. (compilers). *Proceedings: Ecology and management of pinyon-juniper communities within the interior west*, 1997 September 15–18, Provo UT. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT. Proc RMRS-P-9: 375–384.
- Miller, R.F., and Tausch, R.J. 2001. "The role of fire in pinyon and juniper woodlands: a descriptive analysis." In: Galley, K.E.M. and Wilson, T.P., eds. *Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species*. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL: 15–30.
- Miller, R.F. and Rose, J.A. 1999. "Fire history and western juniper encroachment in sagebrush steppe." *Journal of Range Management*. 52(6): 550–559.
- Mueggler, W.F. 1989. "Age distribution and reproduction of intermountain aspen stands." *Western Journal of Applied Forestry* 4(2):41–45.
- Paysen, T.E.; Ansley, R.J.; Brown, J.K.; [and others]. 2000. "Fire in western shrubland, woodland, and grassland ecosystems." In: Brown, J. K. and Smith, J. K. eds. *Wildland fire in ecosystems: effects of fire on flora*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT. Gen. Tech. Rep. RMRS-GTR-42-volume 2: 121–159.
- Peters, E.F. and Bunting, S.C. 1994. "Fire conditions and pre- and post-occurrence of annual grasses on the Snake River Plain." In: Monsen, S.B. and Kitchen, S.G., (compilers). *Proceedings: Ecology and management of annual rangelands*, 1992 May 18–22, Boise, ID. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Ogden, UT: Gen. Tech. Rep. INT-GTR-313: 31–36.
- USDA Forest Service. 2004. *Fire effects information system*. Internet: <http://www.fs.fed.us/database/feis/>. Accessed October–December, 2004.
- Whisenant, S.G. 1990. "Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications." In: McArthur, E. D., (compiler). *Proceedings on cheatgrass invasion, shrub die-off, and other aspects of shrub biology*. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. Ogden, UT. Gen. Tech. Rep. INT-276: 4–10.
- Wright et. al. September 1979. *The role and use of fire in sagebrush-grass and pinyon-juniper plant communities: a state-of-the-art review*. Ogden, UT. USDA FS General Technical Report INT-58.
- Wright, H.A. and Bailey, A.W. 1982. *Fire ecology: United States and Southern Canada*. New York: John Wiley & Sons.



## APPENDIX 7—LIVESTOCK GRAZING ALLOTMENTS

Table A7-3. Approved RMP

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Angle Bench	00802	6,678	C	356	0	222	0	0	222				D,E	578
Antelope Valley	01733	15,479	M	2,349	379	537	0	0	537				D	2,886
Antimony Creek	06045	4,329	I	373	0	132	0	0	132				D,E,A	505
Antimony Ranch	06046	436	C	18	0	36	0	0	36				D,E,A	54
Apple Spring	01702	1,640	M	26	165	117	0	0	117				D,E	143
Aurora	00200	11,385	M	741	324	345	0	0	345				D,E	1,086
Axhandle	01703	2,878	M	91	274	234	0	0	234				D,E	325
Axtell	01704	1,222	C	39	49	30	0	0	30				D,E	69
Bear Valley	00201	2,416	M	150	0	217	0	0	217				D,E	367
Bicknell	00700	1,772	C	90	150	29	0	0	29				D,E	119
Bicknell Spring	00701	26,559	M	2,267	0	233	0	0	233				D,E,A	2,500
Bicknell Winter	00702	25,447	M	2,203	0	369	0	0	369				D,E,A	2,572
Blue Bench	00100	96,943	I	4,601	1,300	179	4	0	183			X	D,B,A	4,784
Box Creek	00803	1,411	M	109	10	108	0	0	108				D,E	217
Bullfrog	00101	83,265	I	2,861	976	697	45	0	742			X	D,E(e), B,S(p)	3,603
Burr Point	00102	63,646	I	2,768	1,091	193	15	0	208			X	D,B(i),A, S	2,976
Burrville	00202	3,300	M	48	0	108	0	0	108				D,E	156
Busenbark	—	247	—	0	0	0	0	0	0	30	0		D	30
Canal	00219	4,051	C	357	8	34	0	0	34				D	391

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Cannon/Whittaker	–	780	–	0	0	172	0	0	172				D,E	172
Cathedral	00600	105,989	I	2,616	413	222	0	0	222			X	D,E,A(i)	2,838
Cedar Grove	00705	7,300	C	533	118	61	0	0	61				D,E,A	594
Cedar Point	00103	53,102	M	1,962	802	335	6	0	341			X	D,B(i),A, S	2,303
Center Creek	06047	2,470	I	179	0	75	0	0	75				D,E,A	254
Chicken Coop	00203	7,088	M	213	0	280	0	0	280				D,E,A	493
Crescent Creek	00104	8,564	I	387	73	282	55	0	337			X	D,B	724
Cyclone Co-Op	00740	5235	M	276	4	56	0	0	56				D,E,A	332
Deer Peak	00602	8,410	I	391	0	0	0	0	0			X	D,E	391
Denmark	00224	16,322	M	976	0	172	0	0	172				D	1,148
Dez Hickman	–	230	–	0	0	6	0	0	6				D	6
Donkey Hill	–	1,285	–	0	0	0	0	0	0	25			D	25
Dry Lake	00813	7,520	I	240	0	310	0	0	310				D,E	550
Dry Lakes	–	9,077	–	0	0	143	88	0	231			X	D,B	231
Dry Wash	06048	3,437	I	216	0	62	0	0	62				D,E,A	278
Durkee	00815	3,895	I	134	357	455	0	0	455				D,E	589
East Bench	00816	15,558	I	762	0	362	0	0	362				D,E,A	1,124
East Fork	00817	3,242	C	120	84	86	0	0	86				D,E	206
East Piute	00818	5,906	M	212	85	241	0	0	241				D,E	453
Elbow	00819	7,383	C	214	274	310	0	0	310				D,E	524
Fayette Cattle	01705	9,580	M	1,476	516	537	0	0	537				D,E	2,013
Fishlake	00220	22,263	M	737	0	326	0	0	326				D,E,A	1,063
Flat Canyon	01706	2,983	C	49	301	26	0	0	26				D	75
Flint Trail	–	32,550	–	0	0	974	0	0	974			X	D,S	974

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Government Creek	00713	1,832	C	91	0	31	0	0	31				D	122
Greenwich Creek	00821	580	M	33	31	52	0	0	52				D,E	85
Grover	00714	1,488	C	80	0	58	0	0	58				D,E	138
Gunnison Valley	01734	15,949	I	1,263	1,031	768	0	0	768				D,E	2,031
Gypsum	00205	19,729	M	1,029	60	657	0	0	657				D,E,A	1,686
Hanksville	00107	82,658	I	5,334	1,680	369	18	0	387			X	D,B(i),A	5,721
Hartnet	00603	22,990	I	1,802	512	128	0	0	128			X	D,E,S(p)	1,930
Hatch Canyon	00822	1,140	C	46	0	83	0	0	83				D,E	129
Hayes Canyon	01708	7,013	M	300	251	190	0	0	190				D,E	490
Hector Hollow	00716	1,955	M	138	0	61	0	0	61				D,E	199
Hodge Ranch	00823	13,584	C	484	0	276	0	0	276				D,E	760
Hop Creek	01709	521	C	94	146	51	0	0	51				D,E	145
Horse Pasture	00717	467	C	14	26	8	0	0	8				D,E	22
Horse Ridge	01710	2,220	C	57	59	84	0	0	84				D,E	141
Horseshoe Canyon South	–	35,247	–	0	0	2,025	0	0	2,025			X	D,A,S	2,025
Hunt	00206	910	C	52	0	21	0	0	21				D,E	73
Hunter Spring	00824	2,873	M	129	0	216	0	0	216				D,E	345
Indian Hollow	01711	1,040	C	154	0	92	0	0	92				D,E	246
Jefferey Well	35033	81,535	I	2,802	0	0	0	0	0				D,A	2,802
Joe Hickman	00718	269	C	4	0	8	0	0	8				D,E	12
Johns Valley	06050	5,392	C	255	0	106	0	0	106				D,E,A	361
Jones	–	330	–	0	0	14	0	0	14	12			D,E	26

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Junction	00826	9,129	M	331	0	414	0	0	414				D,E	745
Kingston Canyon	00827	2,323	C	84	0	104	0	0	104				D,E	188
Koosharem Creek	00221	1,918	C	46	0	222	0	0	222				D,E	268
Last Chance	00605	18,800	I	1,036	0	0	0	0	0			X	D,E,A	1,036
Lime Kiln	00720	2,927	M	354	0	58	0	0	58				D,E	412
Little Valley	01712	7,094	M	798	1,589	184	0	0	184				D,E	982
Loa Winter	00721	19,266	M	780	309	451	0	0	451				D,E,A	1,231
Lone Cedar	01713	13,282	I	1,050	260	363	0	0	363				D,E	1,413
Lost Creek	00209	2,164	M	46	0	146	0	0	146				D,E,A	192
Lyman	00723	2,020	C	125	48	32	0	0	32				D,E	157
M&O	00607	15,570	I	1,217	0	0	0	0	0			X	D,E	1,217
Manning Creek	–	7,241	–	0	0	384	0	0	384	128			D,E	512
Maple Canyon	01715	2,246	M	135	0	74	0	0	74				D,E	209
Marysvale	00846	2,704	M	97	123	325	0	0	325				D,E	422
Middle Hollow	01717	764	M	82	0	43	0	0	43				D,E	125
Miners Mountain	00724	14,896	M	212	307	159	0	0	159			X	D,E	371
Monroe Co-Op	00222	24,202	I	1,038	0	460	0	0	460				D,E	1,498
Mussentuchit	00608	52,360	I	1,998	0	0	0	0	0			X	D,E,A	1,998
Nasty Flat	00108	14,253	I	482	0	210	576	0	786			X	D,E(e),B	1,268
Neff Ranch	00725	1,602	C	82	122	91	0	0	91				D,E	173
North Cove Mountain	00211	8,469	M	268	0	488	0	0	488				D,E	756
North Freemont	00726	4,036	C	230	71	101	0	0	101				D,E	331

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
North Hollow	01718	1,318	M	92	0	101	0	0	101				D,E	193
North Narrows	00832	13,713	I	702	196	255	0	0	255				D,E,A	957
Oak Springs	00833	6,375	C	296	0	244	0	0	244				D,E	540
Ogden	00834	6,538	I	286	39	113	0	0	113				D,E	399
P-Hill	–	2,200	–	0	0	296	0	0	296				D,E	296
Parson Mills	–	881	–	0	0	14	0	0	14	21			D,E	35
Pasture Canyon	15063	41,600	I	208	0	0	0	0	0				A	208
Pearson-Lewis	00835	1,973	C	114	0	138	0	0	138				D,E	252
Pennell	00109	56,272	I	1,769	0	824	1,660	0	2,484			X	D,E(e),B	4,253
Pine Creek	06051	11,260	I	791	0	399	0	0	399				D,E,A	1,190
Piute Dam	00838	2,364	C	56	18	34	0	0	34				D,E	90
Plateau	00213	4,321	M	340	0	163	0	0	163				D,E	503
Poison Creek	06052	4,126	M	281	0	212	0	0	212				D,E,A	493
Pole Canyon	06053	6,497	M	380	0	115	0	0	115				D,E	495
Post Hollow	00727	9,561	M	325	5	86	0	0	86				D,E,A	411
Red Canyon	01719	8,110	I	711	893	222	0	0	222				D,E	933
Ricks Pasture	–	721	–	0	0	9	0	0	9	11			D	20
River	00729	2,029	C	75	51	14	0	0	14				D	89
River	01720	488	C	34	22	18	0	0	18			X	D	52
Robbers Roost	00901	159,786	I	3,847	0	1,9261	0	600 <sup>1</sup>	3,126	600		X	D,A,S	6,973
Rock Canyon	01721	8,794	I	5,009	420	212	0	0	212				D,E	5,221
Rock Springs	00611	86,766	I	4,229	0	0	0	0	0			X	D,E,A	4,229
Rockies	00110	116,030	M	5,600	1,434	1,355	0	0	1,355			X	D,A,S	6,955
Rocky Ford	00842	11,447	M	386	0	388	0	0	388				D,E	774
Rough Canyon	01722	5,123	C	328	263	199	0	0	199				D	527

Allotment Name	Alltmnt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Salls Meadow	00215	6,100	M	101	68	321	0	0	321				D,E	422
Sand Ledge	00216	1,716	M	31	0	291	0	0	291				D,E	322
Sand Wash	00730	676	C	33	21	18	0	0	18				D	51
Sandy #1	00111	24,670	I	1,088	28	92	0	0	92			X	D,A(i)	1,180
Sandy #2	00112	45,304	I	2,228	0	62	155	0	217			X	D,B,A(i)	2,445
Sandy #3	00113	4,491	C	282	185	21	0	0	21			X	D,B(i), A(i)	303
Sanpitch	–	360	–	0	0	21	0	0	21	48	37		D,E	69
Sawmill Basin	–	9,328	–	0	0	181	210	0	391			X	D,B	391
Seven Mile	00731	17,333	I	723	112	165	0	0	165				D,E,A	888
Sevier River	06049	50	C	80	0	10	0	0	10				D,E	90
Sewing Machine	00902	55,549	I	1,599	0	1,064	0	0	1,064			X	D,S	2,663
Slickrock/Little Rockies	–	33,685	–	0	0	660	0	0	660			X	D,S	660
South Hollow	01724	2,096	I	200	92	201	0	0	201				D,E	401
South Narrows	00843	12,755	I	670	389	281	0	0	281				D,E,A	951
South Valley	01725	17,637	M	849	0	227	0	0	227				D,E	1,076
Spring Branch	00733	452	C	11	0	35	0	0	35				D,E	46
Steele Butte	00115	73,931	I	4,554	0	488	682	0	1,170			X	D,B,A(i)	5,724
Swedes Canyon	01726	2,823	M	428	0	77	0	0	77				D	505
Sweetwater	25086	70,120	I	3,922	1,289	0	0	0	0				D,A	3,922
Teasdale Bench	00736	1,118	C	98	55	9	0	0	9				D	107
Teasdale Ranch	00737	921	C	58	0	10	0	0	10				D	68
Ten Mile	00845	3,919	M	149	181	207	0	0	207				D,E	356

Allotment Name	Alltmt Number	Public Acres	Mgt Cat	Livestock AUMs		Wildlife AUMs				Mgmt AUMs		No Dom. Sheep	Kinds of Wildlife Present	Total Active AUMs Allotted
				Active	Suspnd	Wildlife	Bison	Burro	Total	Active	Suspnd			
Timber Canyon	01727	13,317	M	654	0	750	0	0	750				D,E	1,404
Torrey Town	00739	9,199	C	388	108	10	0	0	10			X	D	398
Trachyte	00116	51,488	M	3,014	818	391	14	0	405			X	D,E(e),B(i),A(p),S	3,419
Twelvemile	–	160	–	0	0	7	0	0	7	11	88		D,E	18
Twist	00223	5,307	M	209	158	52	0	0	52				D,E	261
Uinta	01729	566	C	130	0	20	0	0	20				D,E	150
Under the Rim	01730	1,059	C	72	214	29	0	0	29				D	101
Washburn	–	595	–	0	0	21	0	0	21				D,E	21
Waterpocket	00117	37,902	M	3,007	407	206	0	0	206			X	D,S(p)	3,213
West Freemont	00742	1,429	C	83	82	43	0	0	43				D,E	126
West Side	01731	3,506	M	405	434	84	0	0	84				D	489
Wild Horse	00613	80,136	C	1,522	573	128	0	0	128			X	D,S(p)	1,650
Wildlife	–	320	–	0	0	4	0	0	4				D,E	4
Willow Spring	00612	7,350	I	304	0	0	0	0	0			X	D,E	304
Wood Hollow	–	3,715	–	0	0	102	0	0	102	100	113		D,E	202
<b>TOTAL</b>				<b>108,543</b>	<b>22,93325</b>	<b>32,545<sup>1</sup></b>	<b>3,528</b>	<b>0<sup>1</sup></b>	<b>36,673</b>	<b>986</b>	<b>238</b>			<b>146,202</b>

Wildlife Key: D= Deer; E= Elk; B= Bison; A= Antelope; S= Bighorn Sheep; (i)= Infrequent or occur on only a small part within the allotment; (e)= Species occurs within the allotment but is targeted for elimination by UDWR; (p)= Potential for species within the allotment

Note:

1) Changes in the Wild Horse and Burro management alternatives cause this figure to vary by alternative. The numbers shown represent the Proposed RMP. For the Robbers Roost Allotment in Alternative C and D, 1,200 AUMs would be allocated to wild burros, 1,826 AUMs would be allocated to wildlife, and 100 AUMs would be allocated to management. That would change the total Active AUM allocations in Alternative C as follows: Wildlife: 32,445; Burros: 1,200; Management: 475. There would be no change in livestock or bison allocations from these changes.

## APPENDIX 8—COAL RESOURCES WITHIN THE RICHFIELD PLANNING AREA

This appendix includes four documents that address coal resources within the Richfield planning area:

1. Coal Resource Evaluation of the Henry Mountains Coal Field, July 2004
2. Coal Resources of the BLM Richfield Planning Area, July 2003
3. Coal Unsuitability Report, Henry Mountains Coal Field (draft), March 2005
4. Coal Unsuitability Report, Wasatch Plateau and Emery Coal Fields (draft), March 2005

Federal regulations provide detailed guidance for addressing coal resources in Bureau of Land Management (BLM) land use planning under 43 Code of Federal Regulation (CFR) 3400, 30 CFR 700, and elsewhere. These regulations are addressed in the Richfield Approved Resource Management Plan (RMP)/Final Environmental Impact Statement (FEIS), summarized in Table A8-1, and detailed in the attached reports.

**Table A8-1. Federal Regulations Related to Coal**

Topic	Federal Regulations (30 and 43 CFR)	Richfield PRMP/FEIS
General Direction for Coal in Land Use Planning	43 CFR 3420.1-4 (a) The Secretary may not hold a lease sale under this part unless the lands containing the coal deposits are included in a comprehensive land use plan. 43 CFR 3420.1-4 (d) A comprehensive land use plan...shall contain an estimate of the amount of coal recoverable by either surface or underground means or both.	The two coal resource evaluations included in this appendix identify lands containing coal deposits, including estimates of the amount of coal recoverable by surface and underground means.
Call for Coal Resource Information	43 CFR 3420.1-2 (a) Prior to or as part of the initiation of a land use plan...a Call for Coal Resource Information shall be made to formally solicit indications of interest and information on coal resource development potential and on other resources which may be affected by coal development...	A "Call for Coal Resource and Other Resource Information for Public Lands in Garfield, Piute, Sanpete, Sevier, and Wayne Counties, Utah" was published in the Federal Register on May 2, 2003. During the 30-day comment period, two responses were received, one from the State of Utah School and Institutional Lands Administration and the other from the State of Utah Division of Oil, Gas and Mining.
Coal Screening Process	43 CFR 3420.1-4 (e) The major land use planning decision concerning the coal resource shall be the identification of areas acceptable for further leasing which shall be identified by the [four step] screening process below:	



Topic	Federal Regulations (30 and 43 CFR)	Richfield PRMP/FEIS
Coal Screening Process Step 1: Coal Report	43 CFR 3420.1-4 (e) (1) Only those areas that have development potential may be identified as acceptable for further consideration. The [BLM] shall estimate coal development potential... Where such information is determined to indicate development potential for an area, the area may be included in the land use planning evaluation for coal leasing.	A coal resource evaluation for the Richfield Field Office (RFO) was completed in June 2003. A coal resource evaluation for the Henry Mountain coal field was completed and signed in September 2004. Estimates of amounts of coal recoverable by surface and underground mining are included in the evaluations.
Coal Screening Process Step 2: Coal Unsuitability	43 CFR 3420.1-4 (e) (2) The [BLM] or the surface managing agency conducting the land use planning shall, using the unsuitability criteria and procedures set out in subpart 3461 of this title, review Federal lands to assess where there are areas unsuitable for all or stipulated methods of mining... (The unsuitability criteria are listed under 43 CFR 3461.5.)	Draft unsuitability reports for the Wasatch Plateau and Emery and Henry Mountains coal fields, developed in consultation with the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service (USFS), and the State of Utah, are included in this appendix. Final unsuitability reports will be included in the final Environmental Impact Statement (EIS).
Disclosure of Application of Unsuitability Criteria in the RMP.	43 CFR 3461.2-1 (b) (1) The authorized officer shall describe in the comprehensive land use plan...the results of the application of each unsuitability criteria, exception and exemption [and]...shall state...those areas which could be leased only subject to conditions or stipulations to conform to the application of the criteria or exceptions. Such areas may be ultimately leased provided that these conditions or stipulations are contained in the lease.	The application of the unsuitability criteria is described in the unsuitability reports.
Public Comment on Unsuitability	43 CFR 3461.2-1 (a) (2) Public comments on the application of the unsuitability criteria shall be solicited by a notice published in the Federal Register. This call for comments may be part of the call for public comments on the draft land-use or land-use analysis.	The Notice of Availability for the Draft Resource Management Plan and Draft Environmental Impact Statement includes this statement on the unsuitability analysis: "The application of the Federal coal unsuitability criteria to the Henry Mountain and Emery coal fields is included in Appendix D of the draft environmental impact statement. As required by 43 CFR 3461.2-1(a) (2), the public is invited to comment on the results of the application of the criteria and the application process used. The criteria are listed under 43 CFR 3461.5."
Adequacy of Data Used in Unsuitability Determinations	43 CFR 3461.2-2 (b) (2) ...The comprehensive land use plan...shall include an indication of the adequacy and reliability of the data involved...	Draft unsuitability determinations were made in consultation with the USFWS, USFS, and the State of Utah. They are now open for public comment.

Topic	Federal Regulations (30 and 43 CFR)	Richfield PRMP/FEIS
Revising the Unsuitability Determinations After the RMP Is Approved	43 CFR 3461.2-2 (c) Any unsuitability assessments which result from either a designation or a termination of a designation of Federal lands as unsuitable by the Office of Surface Mining Reclamation and Enforcement, or from changes warranted by additional data acquired in the activity planning process, may be made without formally revising the comprehensive land use plan...	This topic is outside the scope of the RMP.
Petition Process for Unsuitability	30 CFR 769.11 Any person having an interest which is or may be adversely affected by surface coal mining operations to be conducted on Federal lands may petition the Secretary to have an area designated as unsuitable for all or certain types of surface coal mining operations, or to have an existing designation terminated... For the purpose of this section, a person having an interest which is or may be adversely affected must demonstrate how he or she meets an "injury in fact" test by describing the injury to his or her specific interests and demonstrate how he or she is among the injured.	This topic is outside the scope of the RMP.
Coal Screening Process Step 3: Multiple Use Analysis	43 CFR 3420.1 (3) Multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing to protect other resource values and land uses that are locally, regionally, or nationally important or unique and that are not included in the unsuitability criteria... Such values and uses include, but are not limited to, those identified in section 522(a)(3) of the Surface Mining Reclamation and Control Act of 1977 and as defined in 30 CFR 762.51. In making these multiple use decisions, the [BLM] or the surface managing agency conducting the land use planning shall place particular emphasis on protecting the following: Air and water quality; wetlands, riparian areas and sole-source aquifers; the Federal lands which, if leased, would adversely affect units of the National Park System, the National Wildlife Refuge System, the National System of Trails, and the National Wild and Scenic Rivers System.	This step will be completed if and when there is interest in coal leasing.  The USFS will complete this analysis for the national forest lands in its land use planning process.

Topic	Federal Regulations (30 and 43 CFR)	Richfield PRMP/FEIS
Coal Screening Process Step 4: Consultation With Other Surface Owners	43 CFR 3420.1-5 (4) (i) While preparing a comprehensive land use plan or land use analysis, the [BLM] shall consult with all surface owners who meet the criteria in paragraphs (gg) (1) and (2) of 3400.0-5 of this title, and whose lands overlie coal deposits, to determine preference for or against mining by other than underground methods.	This step will be completed if and when there is interest in coal leasing.
Hearing Requirements	3420.1-5 After public notice, the [BLM] or other surface management agency shall conduct a public hearing on the proposed comprehensive land use management plan analysis if it involves the potential for coal leasing before it is adopted if such a hearing is requested by any person who is or may be adversely affected by the adoption of the plan. A hearing conducted under part 1600 of this title of this chapter shall fulfill this requirement.	The Notice of Availability for the Draft Resource Management Plan and Draft Environmental Impact Statements includes this statement: "...Additionally, the BLM shall conduct a public hearing on the proposed comprehensive land use plan if it involves the potential for coal leasing before it is adopted if such a hearing is requested by any person who is or may be adversely affected by adoption of this plan."

30 CFR 762.5 Definitions. For the purposes of this part:

Fragile lands means areas containing natural, ecologic, scientific, or esthetic resources that could be significantly damaged by surface coal mining operations. Examples of fragile lands include valuable habitats for fish or wildlife, critical habitats for endangered or threatened species of animals or plants, uncommon geologic formations, paleontological sites, National Natural Landmarks, areas where mining may result in flooding, environmental corridors containing a concentration of ecologic and esthetic features, and areas of high recreational value due to high environmental quality.

Historic lands mean areas containing historic, cultural, or scientific resources. Examples of historic lands include archaeological sites, properties listed or eligible for listing on a state or national register of historic places, national historic landmarks, properties having religious or cultural significance to Native Americans or religious groups, and properties for which historic designation is pending.

Natural hazard lands means geographic areas in which natural conditions exist which pose, or as a result of surface coal mining operations, may pose a threat to the health, safety or welfare of people, property or the environment, including areas subject to landslides, cave-ins, large or encroaching sand dunes, severe wind or soil erosion, frequent flooding, avalanches and areas of unstable geology.

Renewable resource lands mean geographic areas which contribute significantly to the long-range productivity of water supply or food or fiber products, such lands to include aquifers and aquifer recharge areas.

Form 3060-1  
(July 1984)

Serial Number  
Not  
Applicable

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND  
MANAGEMENT

MINERAL REPORT

COAL RESOURCE EVALUATION OF THE  
HENRY MOUNTAINS COAL FIELD,  
GARFIELD AND WAYNE COUNTIES,  
UTAH

(Title)

LANDS INVOLVED

Tps. 27-34 S., Rs. 7-11 E.  
Salt Lake Meridian

Prepared By:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

Technical Approval:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

Management Acknowledgement:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

☆ U.S. Government Printing Office: 1994-573-004/01002

# COAL RESOURCE EVALUATION OF THE HENRY MOUNTAINS COAL FIELD

---

## INTRODUCTION

The Bureau of Land Management (BLM) is preparing a land use plan, referred to as a Resource Management Plan (RMP), which will address the management of public land that is administered by the Richfield Field Office. Coal is one of the resources that will be addressed in this plan. To plan for coal exploration and development, the areas with a coal resource, the quantity of recoverable coal, and the development potential must be identified to the extent feasible.

In this report, the coal resources in the Henry Mountains coal field are evaluated to determine the public land that should be considered for the Federal leasing of coal resources. The conclusions in this report are limited to the action prompting this review and are not intended for any other purpose.

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Coal resources have been identified in the Ferron Sandstone and Muley Canyon Sandstone Members of the Mancos Shale in the Henry Mountains coal field. The Dakota Sandstone also contains coal beds, but the coal is not considered a resource. Total, in-place, coal resources considered to have development potential by surface and underground methods are 278.6 million tons in the Ferron Sandstone and 1,472.1 million tons in the Muley Canyon.

Coal resources in central Utah, namely the Wasatch Plateau and Book Cliff coal fields, are expected to meet the demand for Utah coal in the next 15 years or longer, assuming market conditions do not change significantly. The above described Henry Mountains coal field is an additional coal resource that has development potential.

It is recommended that those areas in the Henry Mountains coal field with a coal resource that have development potential be considered for coal leasing in the planning for the RFO. Those areas are identified on maps contained in this report.

## ACKNOWLEDGEMENT

This resource evaluation is based primarily on recent published reports by Tabet (1999, 2000) and an unpublished report by Tabet (2002). Tabet's reports provide an adequate evaluation of the coal resources that allows for an assessment of the coal potential as part of land use planning and the preparation of a RMP. I would like to gratefully acknowledge David E. Tabet, Utah Geological Survey, for granting permission to use his reports as the basis for this evaluation.

## LANDS INVOLVED

The lands involved are public lands managed by the RFO within the Henry Mountains coal field (Figure 1). The coal field is defined by the outcrop boundary of the Ferron Sandstone Member of the Mancos Shale.

The coal field is approximately 48 miles long in a north–south direction and up to 18 miles wide in an east–west direction. Generally, the land is located within Tps. 27-34 S., Rs. 8-11 E., SLM, Garfield and Wayne counties, Utah.

State Highway 24, which is a main highway to Hanksville and the Henry Mountains area, crosses the northern part of the coal field. The Notom Road, from Highway 24 southward, provides general access to the west side of the field. The Notom Road is paved at its north end.

No rail lines are developed in the area. The nearest railroad is at Green River, which is 60 miles away.

Surface and mineral ownership is shown in Figure 2. No Federal coal leases are currently held on the subject public lands. Federal leases for other mineral resources and mining claims were not checked for this report because the resulting information would not have a bearing on determining coal resources. Portions of the coal field are included within designated wilderness study areas (WSAs). As WSAs are not relevant to determining where coal resources may be situated on the ground, WSAs are not addressed in this report. However, WSAs will need to be addressed in the land use planning process through the application of unsuitability criteria.

A portion of the subject lands has been classified as a Known Recoverable Coal Resource Area (KRCRA) (Figure 3). At one time, KRCRA was a classification used to identify lands that met the minimum standards for recoverable coal in accordance with standard mining methods and to designate lands that would be leased through a competitive process. Under current Federal regulations, coal is leased by a competitive process.

## PHYSIOGRAPHIC SETTING

The Henry Mountains coal field is in the Colorado Plateau physiographic province (Stokes 1986) as displayed in Figure 4. The Colorado Plateau is characterized by relatively undeformed Paleozoic and Mesozoic sedimentary strata, but in places, the strata are folded into monoclines and anticlines and are displaced by faults. The coal field is mostly in the Henry Mountains subdivision, with the northern part extending into the Green River Desert.

The Henry Mountains coal field lies between the Henry Mountains on the east and the Waterpocket Fold on the west. The Henry Mountains contain several prominent peaks that are greater than 11,000 feet in elevation which were formed by igneous intrusions, referred to as laccoliths, which have domed the surrounding sedimentary strata. The Waterpocket Fold is a monocline on the east flank of the Circle Cliffs and is a prominent, regional ridge (reef) that is the main physiographic feature of Capitol Reef National Park. Other landforms include buttes and mesas, such as Factory Butte and Swap, Tarantula, Cave Flat, and Wildcat Mesas. Factory Butte is the prominent landform at the northern end of the field; Swap Mesa is near the southern end. The low point in elevation is 4,600 feet at the northern end of the coal field.

The terrain in the coal field is generally rugged and dissected by stream channels. Most channels are ephemeral, with the exception of the Fremont River, which cuts the North and South Caineville mesas, which are on the north end of coal field.

## **GEOLOGIC SETTING**

### **Stratigraphy**

The exposed bedrock near the Henry Mountains coal field is predominantly sedimentary strata of Jurassic and Cretaceous age (see Figures 5 and 6). The Jurassic strata crop out around the perimeter of the coal field while the Cretaceous strata are exposed in the center. These formations contain conglomerate, sandstone, and shale or mudstone of variable thickness and distribution, and were deposited in various marine, marine shoreline, deltaic, fluvial, and continental environments. The peaks of the Henry Mountains are dioritic igneous intrusive rocks. The regional stratigraphy is well described in other reports, namely Hunt et al.(1953) and Doelling (1972), and is not the focus of this report.

The coal-bearing units in the coal field are part of the Dakota Sandstone and Mancos Shale, which are Upper Cretaceous in age. Nomenclature of the Upper Cretaceous stratigraphy, in particular the Mancos Shale, has been developed through numerous investigations and has been revised through the years. Gilbert (1877) and Spieker and Reeside (1926) completed early studies in the basin, and in recent years, Peterson et al. (1975, 1980), Smith (1983), and Eaton (1990) proposed changes to the nomenclature. Peterson et al. determined that the sandstone unit between the Blue Gate and Masuk Members of the Mancos Shale in the Henry Mountains basin did not correlate with the type section of the Emery Sandstone at the Wasatch Plateau. Smith recommended that the Emery Sandstone Member in the Henry Mountains basin be named the Muley Canyon Sandstone, replacing the name Emery Sandstone. Eaton proposed formation status for the Masuk and Muley Canyon Sandstone Members, and that the coal-bearing strata of the Muley Canyon should be included in the Masuk Formation. In addition, the Mesaverde Formation is now named the Tarantula Sandstone.

Tabet (1999, 2000) adopted the stratigraphy proposed by Smith (1983), although the changes proposed by Eaton (1990) may better reflect stratigraphic relationships (Figure 7). As Tabet was compiling geologic information from existing maps, using Eaton's proposal would have made correlation more difficult and Smith's nomenclature could be easily adopted. Because this report is based primarily on Tabet (2000), the Upper Cretaceous stratigraphic nomenclature that will be utilized for this report, in ascending order, is the Dakota Sandstone; the Tununk, Ferron Sandstone, Blue Gate, Muley Canyon Sandstone, and Masuk Members of the Mancos Shale; and the Tarantula Sandstone.

### **Structure**

The coal field lies in a structural basin, the Henry Mountains syncline, which is asymmetric and has a north-trending axis. The syncline lies between the Waterpocket Fold on the west and the Monument Uplift to the east. Strata exposed on the west limb of the syncline, the Waterpocket Fold, dip easterly at 20 to 30 degrees, whereas in the central part of the basin, strata are nearly horizontal in aspect. The east side of the coal field is defined by the Henry Mountains, where strata have a generally westerly dip of 10 degrees.

## **HISTORY OF COAL EXPLORATION AND DEVELOPMENT**

Coal has historically been mined from the Henry Mountain coal field for primarily local use. Coal in the Ferron Sandstone was mined from the Stanton mine at the south end of the field from 1888 to 1900 to supply power for gold dredges on the Colorado River. A mine near Factory Butte, also in the Ferron Sandstone, operated from 1908 to the 1950s and was re-opened in 1978 for a short period of time, when coal was hauled to Green River. There was active mining in Muley Canyon at Sweetwater Creek and

Dugout Creek from about 1914 until the 1940s. Coal from these two mines was used to supply power for drill rigs in the Green River Desert.

In the 1970s Amax leased Federal land in the Henry Mountain coal field and exploration for surface minable coal was conducted by several companies. Since the mid-1980s, exploration and development for Federal coal on Federal land has not been authorized in this area.

Total production for the coal field is reported at about 59,000 tons of coal (Doelling and Smith 1982). Most of this production was from the Factory Butte area at the north end of the field.

## METHODOLOGY

Tabet (2000) evaluated coal data that had been collected by subsurface investigations completed by coal companies and the U.S. Geological Survey (USGS) during the 1970s and early 1980s and through outcrop studies by the Utah Geological Survey during the late 1980s. Outcrop data were used only if representative of the full thickness of the coal section. The data for the Ferron Sandstone and the Muley Canyon Sandstone Members of the Mancos Shale were used to determine the thickness of the coal zone (isopach) and the depth to the coal zone (overburden). Then, coal resources were identified in accordance with USGS guidelines. A mineral resource is a concentration of naturally occurring material in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible (USGS Circular 831). Tabet (2000, p. R7) defined demonstrated, inferred, and hypothetical resources as—

“Demonstrated resources lie within 0.75 mi from a thickness-measurement point, inferred resources are between 0.75 and 3 mi from a thickness-measurement point, and hypothetical resources lie more than 3 mi from a thickness-measurement point.”

Tabet further classified resources using the following depth categories: less than 100 feet, 100 to 1,000 feet, and 1,000 to 2,000 feet. Coal resources in the Ferron Sandstone and Muley Canyon Sandstone generally lie at depths of less than 2,000 feet.

Drill hole and outcrop samples and data were not examined for this assessment. Isopach and overburden maps from Tabet (2000) were used to delineate public lands with a coal resource. Individual coal beds were not identified by Tabet, rather the aggregate thickness of coal beds that are greater than 1 foot were used to determine a resource.

The mining method selected for extracting coal depends on the thickness of the coal bed(s) and the depth to the coal. Assessments of the coal potential in the Henry Mountains coal field and at other coal fields have used variable parameters. The parameters selected depend on the coal resource, the reliability of the data, and the current mining practices. In the Henry Mountains coal field, Doelling (1972) used a 4-foot mining thickness, whereas, a coal development potential report completed by Dames and Moore for the USGS in 1980 used a 5-foot mining thickness and a depth of 100 feet as break between surface and underground mining methods. Tabet (2002) used an approximate 7-foot thickness and 200-foot depth to assess coal resources in the Wasatch Plateau and Book Cliffs coal field in Carbon and Emery counties. Tabet (2003, in preparation and personal communication) is using a 4-foot thickness and a depth of less than 200 feet for surface mining and a 6-foot thickness and a depth of greater than 200 feet for underground mining in the Emery coal field in Sevier County.

For this report, coal resources that are greater than 2 feet in thickness and that have less than 100 feet of overburden are considered to have potential for development by surface mining methods. Underground,



conventional mining methods were considered applicable to coal resources that are 6 feet or greater in thickness and that have a depth of 100 feet or more. These parameters are adaptable to the data at hand from Tabet (1999, 2000) without a need to re-grid and re-tabulate the coal data points. By using a 6-foot thickness for underground mining, the deeper resource may be somewhat under-reported in terms of quantity and acreage. For purposes of delineating public land that should be furthered considered for coal leasing, this methodology is considered adequate for land use planning. For purposes of leasing, minable coal beds would need to be determined.

In this report, although all tonnage quantities are short tons, they are referred to simply as tons. Resource estimates are made without regard to surface or mineral estate; however, most of the land is public land managed by the BLM (Figure 2).

## **MINERAL DEPOSITS**

Coal-bearing strata in the Henry Mountains basin are contained in three Upper Cretaceous stratigraphic units: the Dakota Sandstone and the Ferron Sandstone and Muley Canyon Sandstone Members of the Mancos Shale.

### **Dakota Sandstone**

The Dakota Sandstone has a maximum thickness of 92 feet and has an average thickness of 35 feet; the Dakota Sandstone thickens from the north end of the coal field to the southwest (Hunt, et al. 1953; Peterson, et al. 1983, Tabet 2000). Coal beds within the Dakota Sandstone are thin, usually 2 feet or less in thickness, and their lateral extent is limited and discontinuous (Tabet 2000). Therefore the Dakota Sandstone does not have a coal resource that warrants consideration for development potential.

### **Ferron Sandstone Member**

The Ferron Sandstone contains a lower marine unit and an upper non-marine unit. The upper unit averages 110 feet in thickness and contains a coal resource in a 50-foot interval that overlies the lower marine unit. The coal interval in the Ferron Sandstone consists of one to five beds that have a cumulative thickness of 16.5 feet; the average thickness of the individual coal beds is 1 to 3 feet and is rarely more than 4-feet (Tabet 2000).

The Ferron coal is not uniformly distributed across the coal field and is found in discontinuous pods that are 1 to 5 miles wide and 3 to 10 miles long (see Figure 8). The coal pods are primarily oriented lengthwise in an east-west direction, which may reflect deposition in swamps and fluvial channels or may reflect erosion prior to the deposition of the Blue Gate Member. Three areas, one each in the northern, central, and southern parts of the coal field, contain the thickest coal deposits. The assessment of the coal deposits of the Ferron Sandstone in the central area of the coal field has primarily been extrapolated from data collected from one oil and gas well.

The Ferron Sandstone is exposed in outcrop around the margins of the Henry Mountains coal field (see Figure 8). Coal in the Ferron Sandstone is not present in much of the coal field because of the discontinuity of the coal beds. Thus, the depth to the top of the Ferron Sandstone is mapped, rather than the depth to the Ferron coal. The top of the Ferron Sandstone is a close approximation to the top of the coal because the coal is in the upper part of the sandstone. The Ferron Sandstone is deeper toward the axis of the basin because of the synclinal nature of the Henry Mountains basin. The deepest part is east of Tarantula Mesa, where the depth slightly exceeds 2,000 feet. Most of the Ferron Sandstone is less than 1,000 feet in depth.

## Coal Quality

Limited sampling and analysis have been completed on the Ferron coal. Four coal samples have been analyzed, including three from the northern and one from the southern parts of the coal field. Based on these four samples, Tabet (2000, p. R10) states that the apparent rank of the coal is high-volatile C bituminous and that the average for proximate analysis is 14.5% ash, 2.5% sulfur, 11,038 British thermal units (Btu) per pound, 5.8% moisture, 34.8% volatile matter, and 44.9% fixed carbon.

## Muley Canyon Sandstone Member

Tabet (2000, p. R14) describes the Muley Canyon coal as follows:

“The upper part of the Muley Canyon Member is a nonmarine coal-bearing interval with thicknesses ranging from 92 to 209 ft thick and averaging 150 ft. This stratigraphic interval, referred to as the Muley Canyon coal zone \* \* \* commonly contains three to four coal beds, but locally has as many as 10 beds. Individual beds range from 0 to 13.4 ft thick and are commonly 2-5 ft thick; aggregate thickness of coal is as much as 27.5 ft. \* \* \* Most of the area underlain by this zone has at least 5 ft of total coal, and about half of the area has 10 ft or more of total coal.”

The Muley Canyon coal is distributed more widely in the coal field than the Ferron Sandstone coal (see Figure 9). Similar to the Ferron Sandstone coal, the Muley Canyon coal is thickest near the central part of the Henry Mountains basin in pods that are oriented lengthwise in an east–west direction. The pods tend to be thicker on the west side of field.

The shallower coal beds (depths less than 100 feet) are generally exposed around the perimeter of the coal field. Most of the shallow coal is at the north and south ends of the extent of the Muley Canyon in the general area of Wildcat Mesa, Cave Flat, and Swap Mesa. The deepest coal, at slightly more than 1,000 feet, is under Tarantula Mesa where the coal zone is thicker than 24 feet.

## Coal Quality

The Muley Canyon coal has been sampled in more detail than the Ferron Sandstone coal, although the samples are again mostly from the shallower coal beds at the northern and southern ends of the coal field. Based on 7 outcrop samples and 30 drill hole samples, the Muley Canyon coal's rank is sub-bituminous A to high-volatile bituminous C (Tabet 2000, p. R14). The average for proximate analyses of the Muley Canyon coal samples are 11.74% ash, 0.9% sulfur, 10,086 Btu per pound, 12.1% moisture, 35.34% volatile matter, and 40.82% fixed carbon, and the range in heat content is 7,710 to 12,491 Btu. Compared with the Ferron Sandstone coal, the Muley Canyon coal is a lower rank, has lower contents of heat, ash, and sulfur and has higher moisture content. In comparison with coal from the Wasatch Plateau and Book Cliff fields that averages 10% ash, 0.5-0.7% sulfur, and 11,500-12,900 Btu, the Muley Canyon coal has higher ash and sulfur contents and lower heat (Tabet 2000, 2002).

Thirteen samples from ash of the Muley Canyon coal were analyzed for major oxides. Major oxides are used to evaluate the potential for boiler slagging and fouling. Slagging and fouling refer to the accumulation of molten ash and sintered material in different parts of the boiler, and these build-ups could decrease boiler efficiency and life and increase operating costs. The ratio of the sum of the CaO and MgO to Fe<sub>2</sub>O<sub>3</sub> determines whether the ash is lignitic or bituminous. In addition, NaO is indicative of fouling properties of the ash. Most of the Muley Canyon coal ash samples were lignitic and fell in the low fouling range.

Although more sampling has been completed in the Muley Canyon coal than the Ferron Sandstone coal, the sample population of the Muley Canyon is very small in comparison with typical sampling for resource evaluation in a field under exploration and development or for quality control in producing fields, such as those in central Utah. Tabet (2000) infers that quality control, blending of coals, selective mining, and selective washing of Muley Canyon coal could produce a low ash, low sulfur coal with low slagging and fouling characteristics that would be similar to other coal currently mined and produced in central Utah.

## **ECONOMIC EVALUATION**

### **Worldwide and National Markets**

The markets for coal have not been steady in recent years; however, consumption has remained constant on a worldwide scale (Guzzino 2003). The market for exported coal is now a prominent feature of global trade, and coal companies increasingly compete in a global market.

The prediction for markets varies from country to country. In the United States, coal consumption has been about 1.05 billion tons of coal for approximately the last 5 years (Guzzino 2003). This demand is predicted to remain fairly level for the next several years; however, improvement in the U.S. economy and technological changes could increase the demand.

In 2002, 1.1 billion tons were produced in the United States (Guzzino 2003). Warehouse stocks in the United States have remained at about 150 to 190 million tons. Electric power production is the largest market for coal in the United States, which commands about 88% of the total production. That demand has been fairly constant for several years. Because of the stability in demand, coal prices have also remained constant, at about \$17 per ton.

Although other energy sources, such as natural gas or renewable resources, seem to have fewer environmental impact issues associated with them, the coal industry appears to be dedicated to finding ways to make coal a clean energy source in order to remain competitive with other fossil fuels and non-fossil fuels as part of the Climate Change initiative and the Clear Skies initiative (Guzzino 2003). Guzzino forecasts that “(t)he U.S. expects to gain greater utilization of its coal-fired power-generating capacity from the addition of new coal-burning units. While details surrounding new coal-fired generators still remain cloudy and idealistic, the subject of new nuclear capacity remains taboo, and renewable resources are still in their infancy...while demand for coal isn’t expected to skyrocket, it doesn’t seem to be diminishing either.”

### **Utah Coal Markets, Production, and Coal Resources**

Tabet (2002) reported that 27 million tons were produced in 2001 from mines in Utah, and the price for coal increased slightly. The active mines are large, efficient producers that use longwall mining technology. Five companies operate 11 mines in the state, and production from individual mines ranged from fewer than 1 million tons per year to 7 million tons per year in 2001. Since 1993, production from Utah has increased about 22%, an increase attributed to Utah’s low-sulfur, high-quality, bituminous coal, which is favorable for compliance with Federal emission standards. The markets for Utah coal are electrical power, industrial, export to Pacific Rim nations, and residential and commercial customers, in descending order of significance.

In Utah, production has historically been mostly from underground mines in central Utah, namely in three coal fields—the Wasatch Plateau, Book Cliffs, and Emery fields (Tabet 2002). Production from the

Wasatch Plateau and Book Cliffs has exceeded that of Emery. Historically, other smaller fields in Utah have also produced but have not been as important as these three fields.

The Wasatch Plateau field in Carbon, Emery and Sevier counties has been the largest producer, with a total production of 523.7 million tons through 2001 from more than 80 mines (Tabet 2002). In 1986, production was about 14 million tons, and in 2001, production increased to 22 million tons. Approximately 81% of the total production in Utah in 2001 came from eight mines in the Wasatch Plateau field.

In the portion of the Wasatch Plateau field in Carbon and Emery counties, the remaining in-place resources that are available for mining are estimated at 1,054.8 million tons (Tabet 2002). That resource estimate is based on coal beds that are mostly greater than 7 feet in thickness and that are greater than 200 feet and less than 2,500 feet in depth. Using a 14-foot maximum, mining thickness, which is based on the cutting height of longwall equipment, and applying recoverability factors for individual tracts, the resources are reduced to 686.0 million tons. At a yearly production rate of 14 million tons, this recoverable resource would last for 49 years; at 22 million tons, the life would be 31 years. The minable coal resource estimate for that portion of the Wasatch Plateau field in Sevier County is in progress (Tabet 2003, personal communication).

The Book Cliffs field in Carbon and Emery counties is the second largest producer, with a total production of 293.3 million tons through 2001 (Tabet 2002). From 1986 through 1995, production was in the range of 2 to 3 million tons per year, and since 1996, has been 3 to 5 million tons annually. Coal mined from the Book Cliffs accounted for approximately 19% of the Utah production in 2001.

In the Book Cliffs field, the remaining, in-place coal resources that are available for mining are estimated at 409.1 million tons (Tabet 2002). Using the similar parameters as those used for the Wasatch Plateau field, the recoverable resource estimate is 275.2 million tons. If the production rate held steady at 5 million tons per year, these resources would last for 55 years, and if production were to increase to 7 million tons annually, then the life would be 39 years.

The Emery field in Emery and Sevier counties is currently inactive, having ceased production when the last mine was closed in 1990. In 2002, plans were being developed for reopening that mine. For the field, total production through 1990 was 9.5 million tons, and peak production was fewer than 0.6 million tons in 1989.

In the Emery field, the original in-place resources are estimated at 675.8 million tons (Tabet 2002). Tabet, using a 66% recovery factor, estimated the recoverable reserves at 446.0 million tons. If past mining rates in this field were applied, the expected life would be very long.

## **MINERAL POTENTIAL OF THE HENRY MOUNTAINS COAL FIELD**

Within the Henry Mountains coal field, coal resources are assigned a high potential, based on abundant direct and indirect evidence (H/D). Drill hole and outcrop data support that assignment and support that coal resources in the Ferron Sandstone and Muley Canyon Sandstone Members of the Mancos Shale are favorable for development. Coal is also found in the Dakota Sandstone, but based on available data, is not considered a resource.

## Coal Resources—Ferron Sandstone Member

Tabet (2000) estimates 683.5 million tons of in-place, coal resources in Ferron Sandstone Member of the Mancos Shale. The reliability of the resource estimate is categorized as 27% as demonstrated, 67% as inferred, and 6% as hypothetical. Greater than two-thirds of the total resources are in the lower confidence categories, inferred and hypothetical, which reflects that the coal has not been drilled adequately to reduce the distance between data points. Approximately 75% of the Ferron Sandstone coal resource is in Garfield County.

In Table A8-2, the coal resource is tabulated by thickness intervals (isopachs) of 2 to 6 feet, 6 to 10 feet, and greater than 10 feet, and by depth (overburden) intervals of zero to 100 feet, 100 to 1,000 feet, and 1,000 to 2,000 feet. The estimates include all coal beds that are thicker than 1 foot. The coal resource is generally thin, which is indicated by the fact that 68% of the total resource is in the thickness interval of 2 to 6 feet.

Table A8-2. Total Ferron Coal Zone Resources by Thickness and Depth of Cover

Depth (ft)	Thickness (ft)								
	DEM	2-6 INF	HYP	DEM	6-10 INF	HYP	DEM	10+ INF	HYP
0–100	54.2	5.1	0.0	6.7	2.2	0.0	6.9	0.0	0.0
100–1,000	81.3	187.4	12.8	20.0	84.4	0.0	5.5	0.0	0.0
1,000–2,000	4.3	103.3	16.0	4.5	75.3	9.8	4.0	0.0	0.0
<b>TOTAL</b>	<b>139.9</b>	<b>295.8</b>	<b>28.8</b>	<b>31.1</b>	<b>161.8</b>	<b>9.8</b>	<b>16.3</b>	<b>0.0</b>	<b>0.0</b>

All coal beds are greater than or equal to 1 foot thick; figures in millions of tons. DEM, demonstrated; INF, inferred; HYP, hypothetical. From Tabet (2000). Individual categories may not sum due to rounding in the original spreadsheet.

Based on a 2-foot minimum thickness and a 100-foot depth as the cut-off requirements for surface mining, 75.1 million tons are considered favorable for mining by surface methods. Deeper resources, which are 100 to 2,000 feet deep and which are 6 feet or greater in thickness, total 203.5 million tons and are considered favorable for underground mining methods. The total resource, considered to have development potential by surface or underground methods, is 278.6 million tons, which is 43% of the in-place resource.

## Coal Resources—Muley Canyon Sandstone Member

Tabet (2000) estimates 1,526.1 million tons of in-place coal resources in the Muley Canyon Sandstone Member of the Mancos Shale. All of this resource is categorized as either demonstrated or inferred. The demonstrated resource is 62% of the total in-place resource, and the inferred accounts for 38%. The resource, which is almost exclusively in Garfield County, is only 7.5 million tons, which is approximately 0.5% of the total in-place resource in Wayne County.

In Table A8-3, the coal resource is tabulated by thickness intervals (isopachs) of 2 to 6 feet, 6 to 10 feet, and greater than 10 feet and by depth (overburden) intervals of zero to 100 feet, 100 to 1,000 feet, and 1,000 to 2,000 feet. In the Muley Canyon Sandstone, 91% of the coal resource is 6 feet or thicker and 70% is thicker than 10 feet, which is generally thicker than the Ferron coal. At Tarantula Mesa, one bed is

6 to 12 feet thick. In addition, approximately 26% of the resource has less than 100 feet of cover and 71% is at depth of 1,000 feet or less. The estimates include all coal beds that are 1 foot thick or greater.

Table A8-3. Total Muley Canyon Coal Zone Resources by Thickness and Depth of Cover

Depth (ft)	Thickness (ft)						TOTAL
	2–6		6–10		10+		
	DEM	INF	DEM	INF	DEM	INF	
0–100	78.3	4.4	107.4	7.6	172.4	20.9	391.0
100–1,000	42.1	11.3	118.5	75.7	383.7	449.4	1,087.7
1,000–2,000	1.6	0.0	4.9	1.2	36.8	9.9	54.4
TOTAL	121.9	15.8	230.9	84.5	592.8	480.2	1,526.1
All coal beds are greater than or equal to 1 foot thick; figures in millions of tons. DEM, demonstrated; INF, inferred; HYP, hypothetical. From Tabet (2000). Individual categories may not sum due to rounding in the original spreadsheet.							

Based on a 2-foot minimum thickness and a 100-foot depth as the cut-off requirements for surface mining, 391.0 million tons are considered favorable for mining by surface methods. Deeper resources, which are 100 to 1,000 feet deep and 1,000 to 2,000 feet deep and which are 6 feet or greater in thickness, total 1,080.1 million tons and are considered favorable for mining by underground methods. The total resource, considered to have development potential by surface or underground methods, is 1,472.1 million tons, which is 96% of the estimated, in-place, coal resource.

## Development Potential

Past and current mining in Utah has been mainly from two coal fields in central Utah —the Wasatch Plateau and the Book Cliffs. The Emery field, also in central Utah has been the third largest producer. Based on a study by Tabet (2002), these three fields could meet the demand for Utah coal at current production rates for the next 15 years. These fields, especially the Wasatch Plateau and the Book Cliffs fields, have an infrastructure for transportation and accessibility in place. As marketing conditions change nationally and worldwide, the demand for Utah coal could also change, with an increase in demand, or with a decrease driven by the availability of coal from other nations in the global market. In the next 15 years, at current mining rates, the more easily mined central Utah coal may be depleted, and industry may be interested in evaluating other fields, such as the Henry Mountains field. However, at present, development of coal resources in the Henry Mountains field does not seem likely within the time frame of 15 to 20 years, which is the planning horizon of a BLM land use plan.

## REFERENCES

- Doelling, H.H., 1972, Henry Mountains coal field, in Doelling, H. H., and Graham, R. L., eds., Eastern and Northern Utah coal fields: Utah Geological and Mineralogical Survey Monograph Series, no. 2, p. 97–190.
- , and Smith, M.R., 1982, Overview of Utah coal fields, 1982, in Gurgel, K.D., ed., Proceedings, Fifth Symposium on the Geology of Rocky Mountain Coal: Utah Geological and Mineralogical Survey Bulletin 118, p. 1–26.
- Eaton, J.G., 1990, Stratigraphic revision of Campanian (Upper Cretaceous) rocks in the Henry Basin, Utah: *The Mountain Geologist*, v. 27, no. 1, p. 27–38.
- Gilbert, G.K., 1877, Report on the geology of the Henry Mountains: U.S. Geographical and Geological Survey, Rocky Mountain Region, 160 p.
- Guzzino, T., 2003, Coal: Global stability reached through growing markets: *Engineering and Mining Journal*, v. 204, no. 3, p. 21–23.
- Hunt, C.B., Averitt, P., and Miller, R.L., 1953, Geology and geography of the Henry Mountains region: U.S. Geological Survey Professional Paper 228, 234 p.
- Peterson, F., Ryder, R.T., and Law, B.E., 1980, Stratigraphy, sedimentology, and regional relationships of the Cretaceous System in the Henry Mountains region, Utah: in Picard, M.D., ed., Henry Mountains Symposium: Utah Geological Association Guidebook, p. 151–170.
- Smith, C.T., 1983, Geology, depositional environments, and coal resources of the Mt. Pennell 2 NW quadrangle, Garfield County, Utah: *Brigham Young University Studies*, v. 30, pt. 1, p. 145–169.
- Spieker, E.M., and Reeside, J.B., Jr., 1926, Upper Cretaceous shoreline in Utah: *Geological Society of America Bulletin*, v. 37, p. 429–438.
- Tabet, D.E., 1999, Coal resources of the Henry Mountains coalfield: Utah Geological Survey Open-File Report 362, 32 p. 6 plates, scale 1:100,000.
- , 2000, Coal resources of the Henry Mountains coal field, Utah, in Kirschbaum, M.A., Roberts, L.N.R., and Biewick, L.R.H., *Geologic assessment of coal in the Colorado Plateau: Arizona, Colorado, New Mexico, and Utah*, Chapter R, p. R1–R25.
- , 2002, Coal Resources [of the Wasatch Plateau, Book Cliffs, and Emery coal fields in Carbon and Emery counties, Utah]: Utah Geological Survey report for the U.S. Bureau of Land Management, unpublished, 47 p.
- , 2003, Coal Resources [of the Wasatch Plateau and Emery coal fields in Sevier County, Utah]: Utah Geological Survey report for the U.S. Bureau of Land Management, in preparation by personal communication.
- , 1976, Principles of a resource/reserve classification for minerals: U.S. Bureau of Mines and the U.S. Geological Survey, Geological Survey Circular 831, 5p

## **FIGURES FOR COAL RESOURCE EVALUATION OF HENRY MOUNTAINS COAL FIELD**

Figure 1 – Henry Mountains Coal Field

Figure 2 – Henry Mountains Surface Estate

Figure 3 – Henry Mountains Known Recoverable Coal Resources

Figure 4 – Physiographic Provinces of Utah

Figure 5 – Regional Geographic Provinces

Figure 6 – Regional Stratigraphic Section

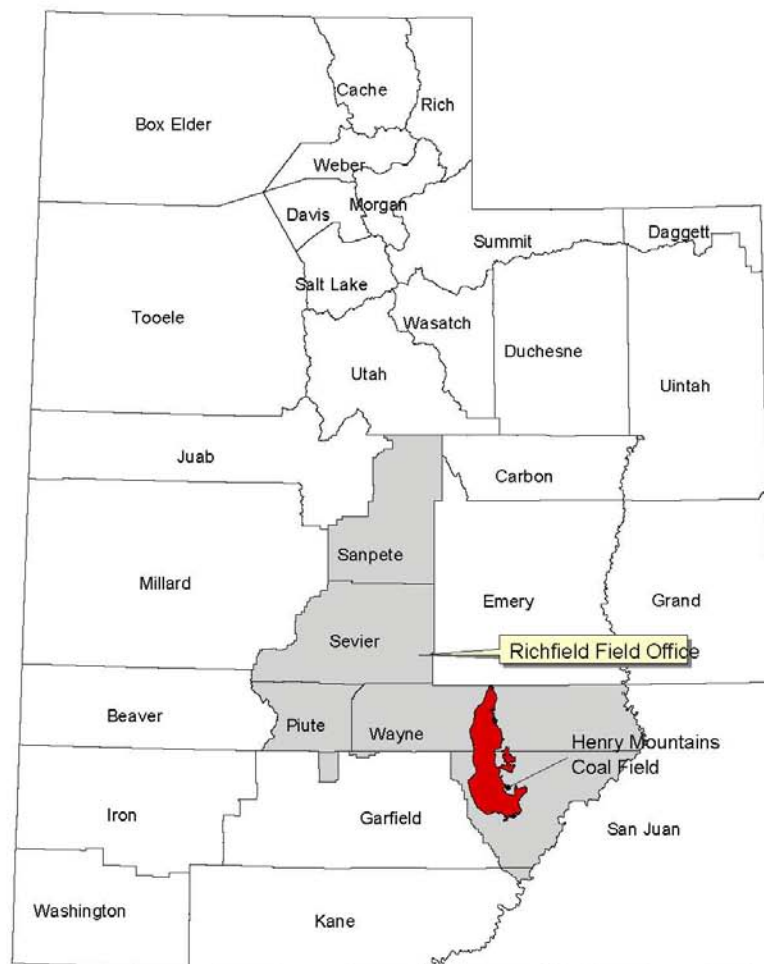
Figure 7 – Upper Cretaceous Stratigraphic Nomenclature

Figure 8 – Ferron Coal Zone

Figure 9 – Muley Coal Zone



**Figure 1: Location Map of the  
Richfield Field Office and the Henry Mountains Coal Field**



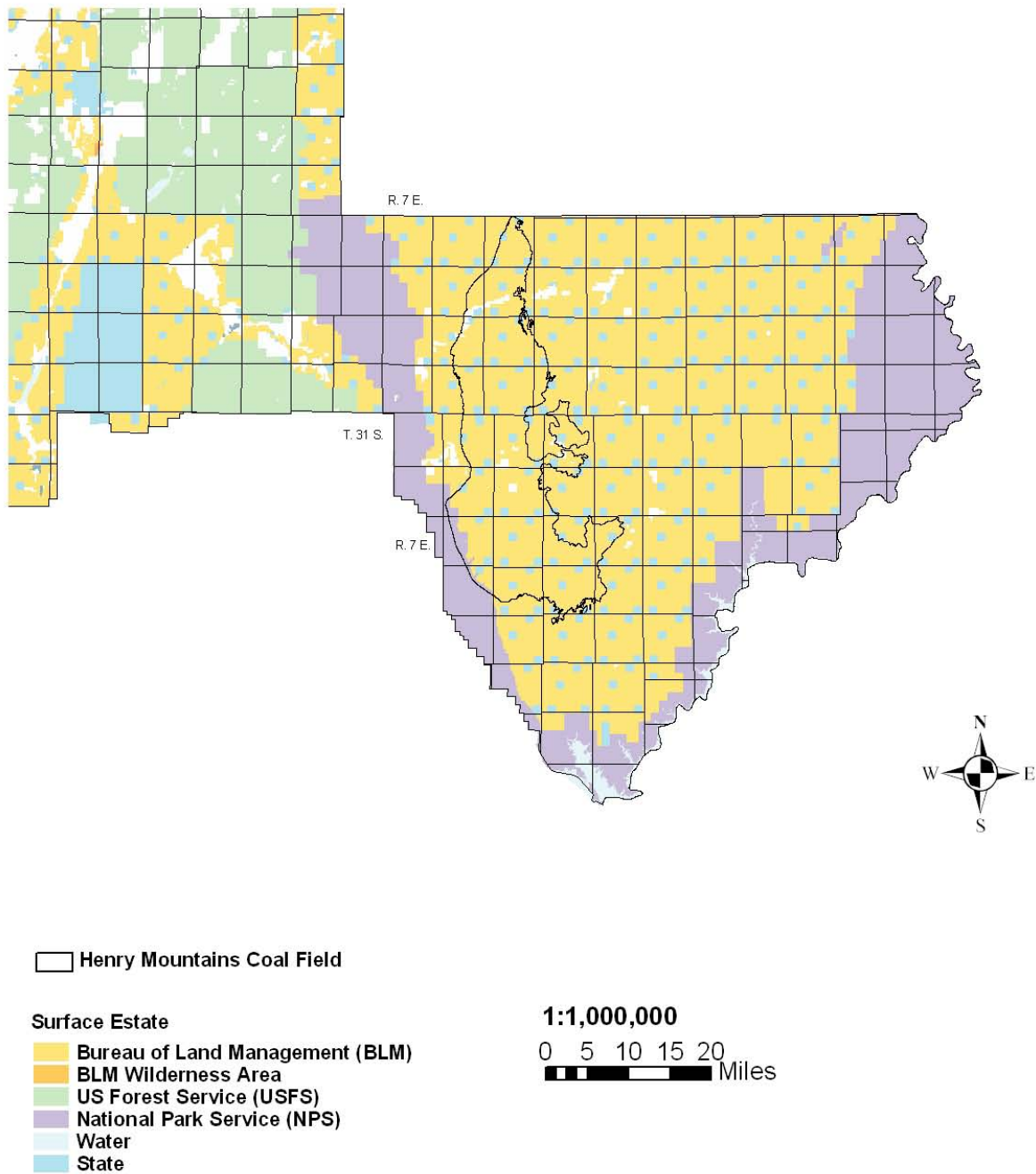
1:3,600,000

0 25 50 75 100 Miles

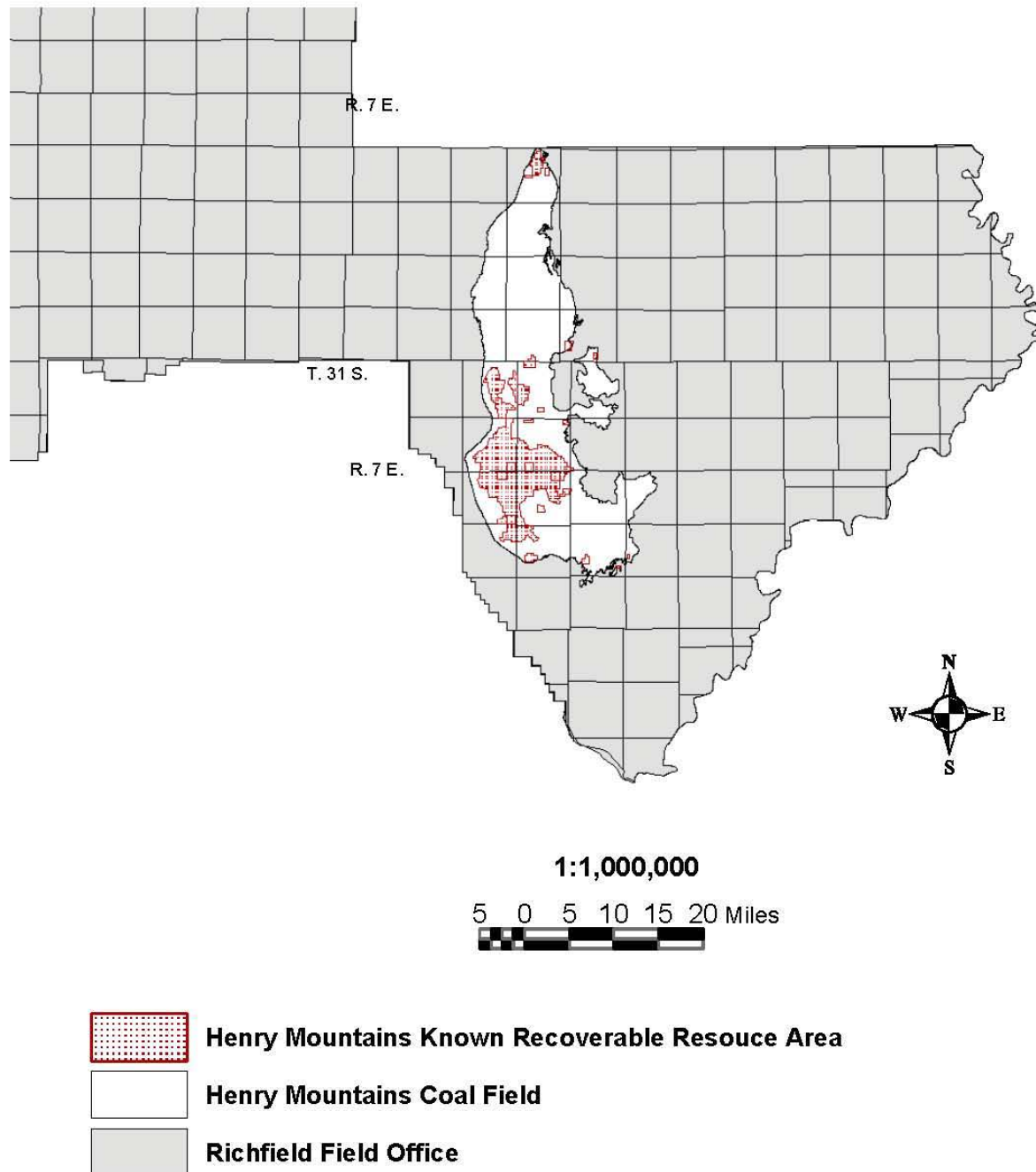
Source: BLM GIS Data Base  
and Tabet, 2000



**Figure 2: Surface Estate  
in the Vicinity of the  
Henry Mountains Coal Field**



**Figure 3: Henry Mountains  
Known Recoverable Coal Resource Area**



Source: BLM GIS Data Base, and Tabet (2000)

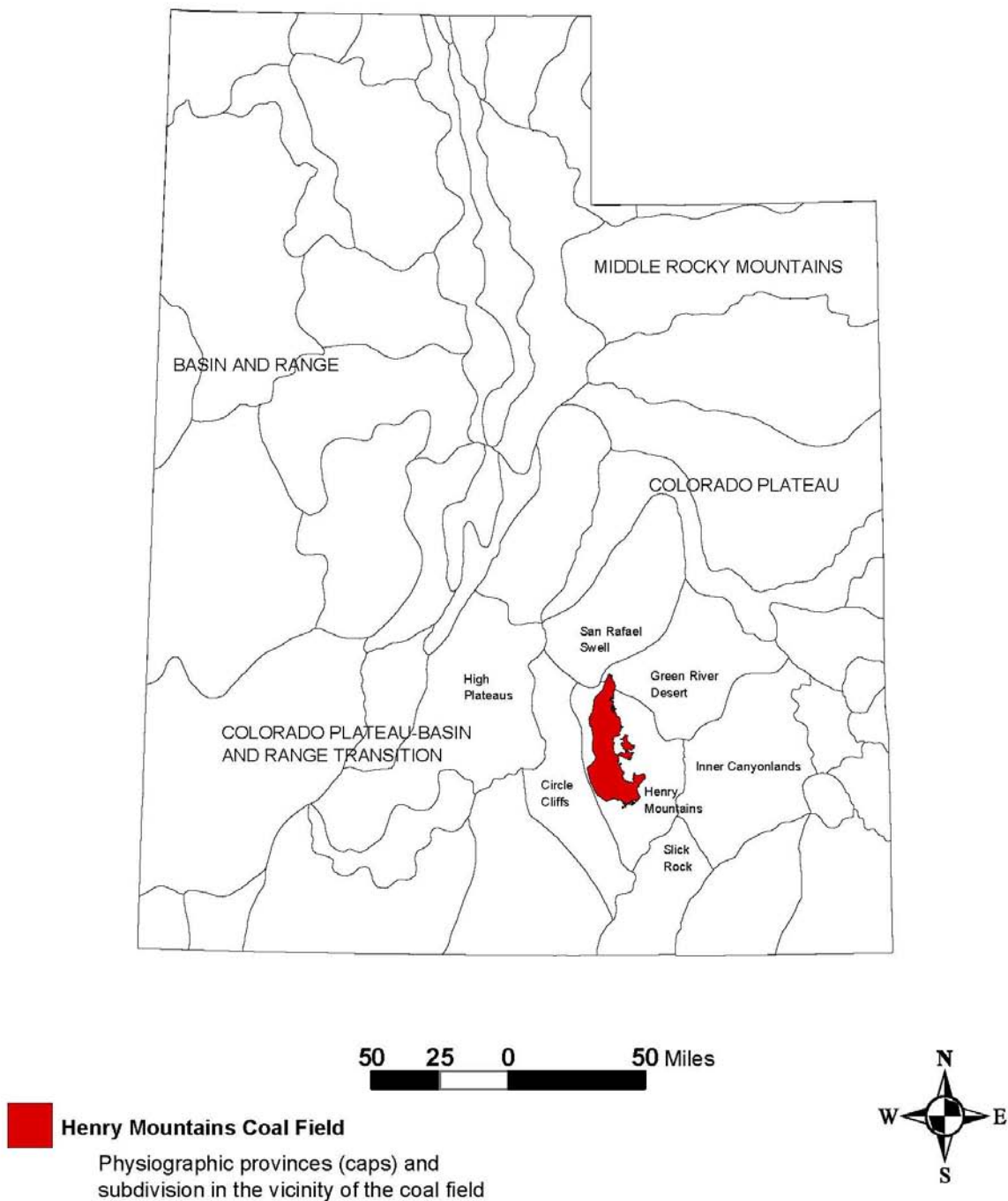
**Figure 4: Physiographic Provinces and Subdivisions of Utah**



Figure 5: Regional Geologic Map

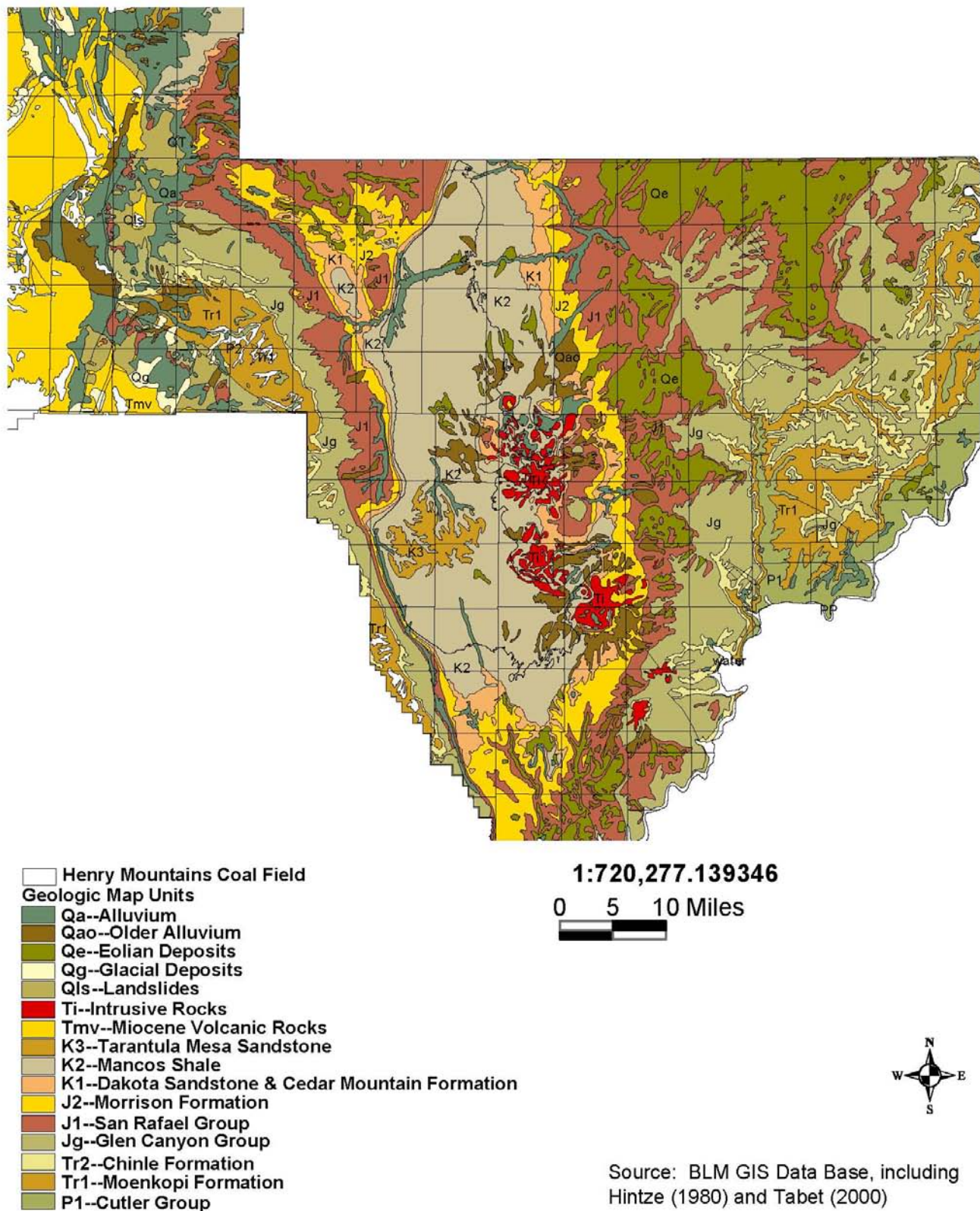


Figure 6: Regional Stratigraphic Section (Hintze, 1988)

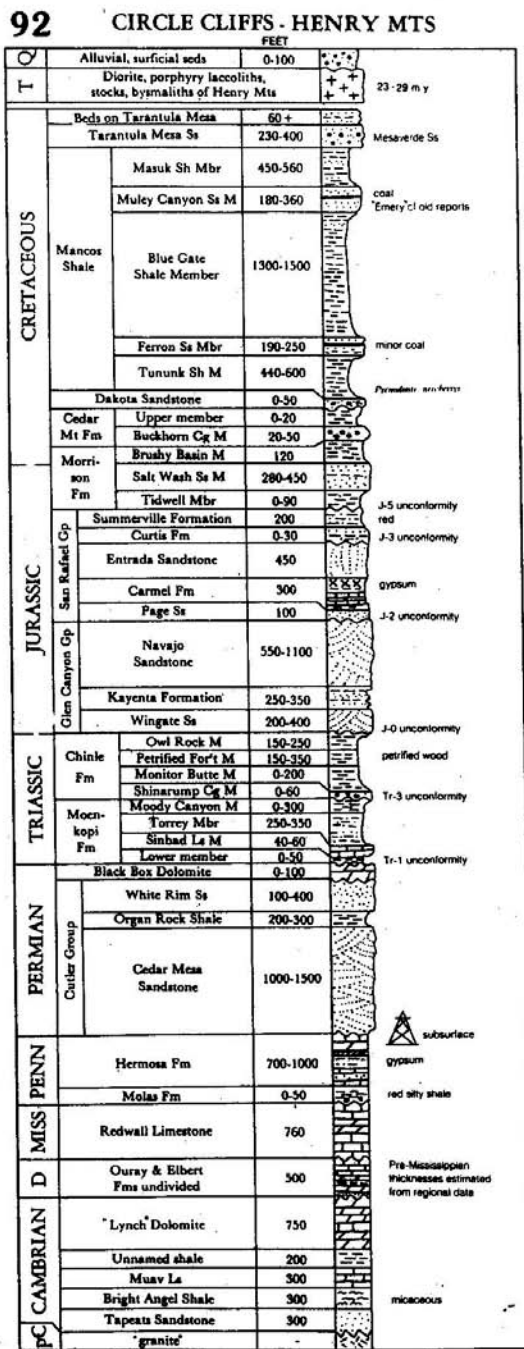
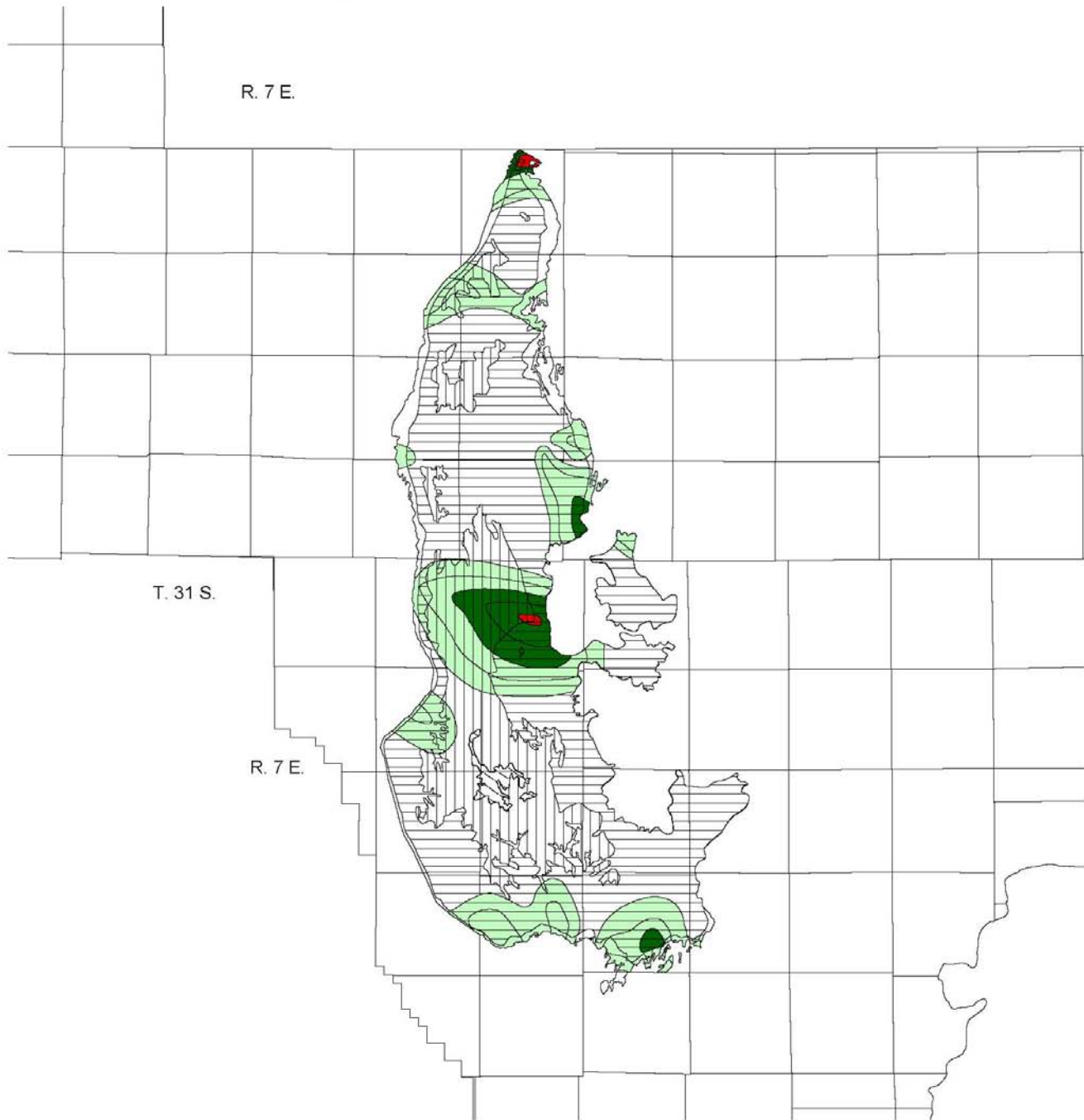


Figure 7: Upper Cretaceous Stratigraphic Nomenclature

Gilbert (1872)	Spieker and Reeside (1926)	THIS STUDY Smith (1983)	PROPOSED Eaton (1990)
Masuk Sandstone	Mesaverde Formation	Tarantula Mesa Sandstone	Tarantula Mesa Sandstone
Masuk Shale	Masuk Member	Masuk Member	Masuk Formation
Blue Gate Sandstone	Emery Sandstone Member	coal-bearing Muley Canyon Sandstone Member	Muley Canyon Sandstone
Blue Gate Shale	Blue Gate Member	Blue Gate Member	Blue Gate Member
Tununk Sandstone	Ferron Sandstone Member	Ferron Sandstone Member	Ferron Sandstone Member
Tununk Shale	Tununk Member	Tununk Member	Tununk Member
Dakota Sandstone	Dakota Sandstone	Dakota Sandstone	Dakota Sandstone

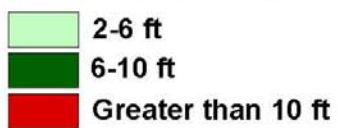
From Tabet (2000). This Study refers to Tabet (2000) and is the nomenclature used in this report as well.

**Figure 8: Ferron Coal Zone**

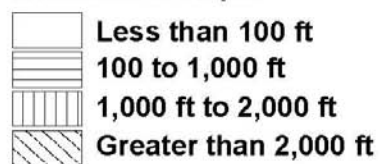


**Ferron Coal Zone**

**Isopachs of Coal Zone**



**Overburden Depth**



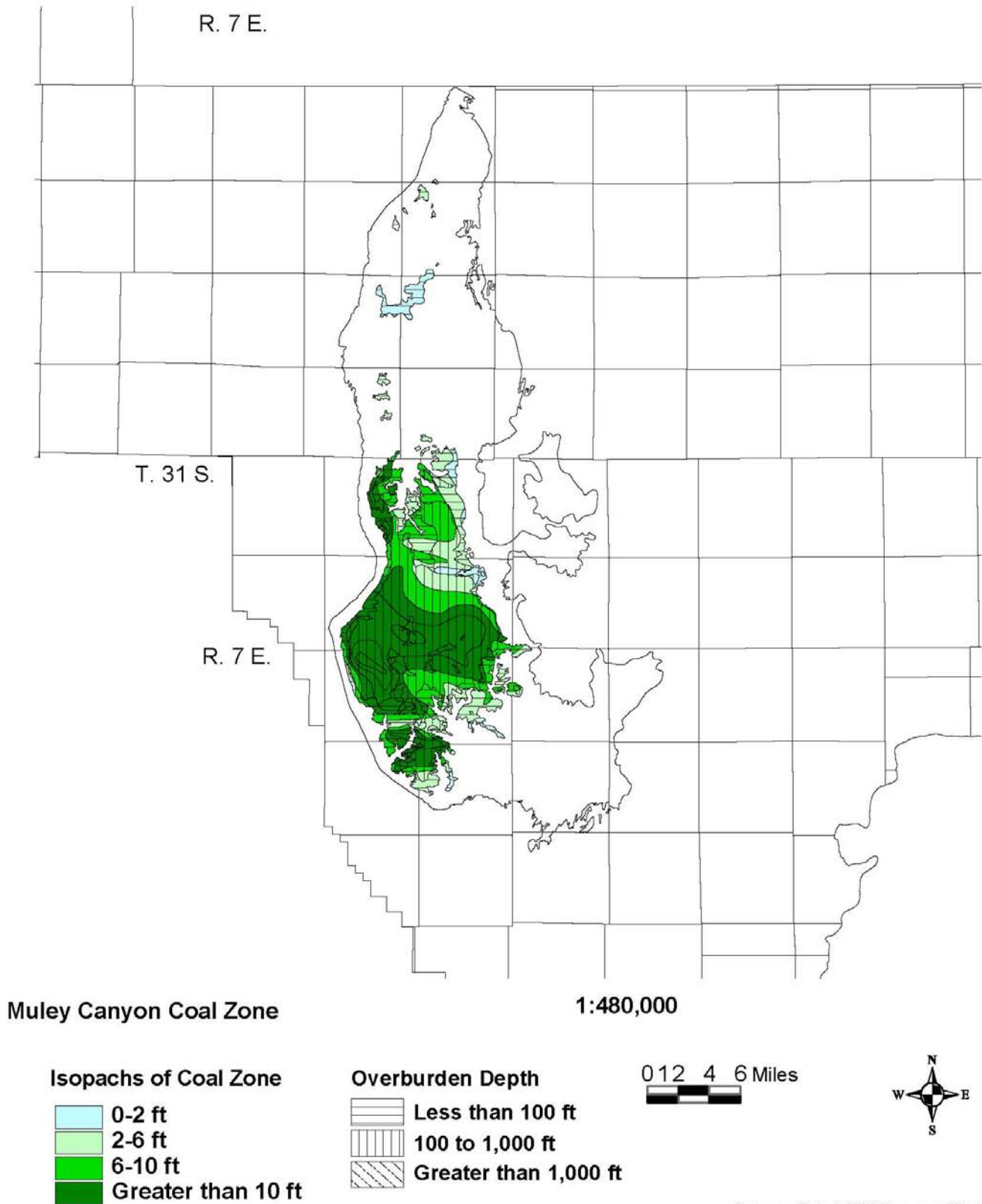
1:480,000

0 12 4 6 Miles



Source: Tabet (2000) as modified



**Figure 9: Muley Canyon Coal Zone****COAL RESOURCES OF THE BLM RICHFIELD**

# PLANNING AREA

---

## EXECUTIVE SUMMARY

All or parts of three coal fields occur within the Richfield planning area: the Wasatch Plateau, Emery, and Henry Mountains coal fields. More than 290 million tons of unleased, recoverable coal remains in the southern Wasatch Plateau coal field, and these resources have the highest development potential. From 2003 through 2017, the coal immediately around the Southern Utah Fuel Company (SUFCO) mine will likely be developed to extend the life of that operation. In the 15 years beyond 2017, other minable resources near the SUFCO mine will also likely be mined to further sustain that operation. Additional coal resources in the southern Wasatch Plateau coal field that could support new mines in the next 30 years occur in the area west of the SUFCO mine once called the Skumpah Canyon tract, the area to the west of the Joes Valley graben around Ferron Canyon, and the area a few miles north of Interstate 70 under the Old Woman Plateau.

The area with the second highest development potential is the Sevier County portion of the Emery coal field, where 190 million tons of recoverable coal resources have been identified. These resources will probably be developed after the Emery County portion of the Emery coal field resources are exhausted around 2030.

Attractive, but more remote coal resources occur in the Henry Mountains coal field, where 130 million tons of recoverable coal resources have been identified. These resources will probably become more important as the resources in the Book Cliffs, Wasatch Plateau, and Emery coal fields are approaching exhaustion—possibly starting by 2030.

## INTRODUCTION

### Background

To assist the U.S. Bureau of Land Management (BLM) in updating its management plan for the Richfield area, which covers all or parts of Garfield, Piute, Sanpete, Sevier, and Wayne counties in Utah, the Utah Geological Survey (UGS) was asked to generate information on the unleased, recoverable coal resources in the area and provide a reasonably foreseeable development scenario for those resources. The UGS used location and thickness data from its geographic informational system (GIS), information on previously mined areas, fault locations, and natural and cultural features that might inhibit future mining that had been compiled for coal availability studies of the Emery and Wasatch Plateau coal fields with funding from the U.S. Geological Survey (USGS), to examine those fields. The analysis of the coal resources for the Henry Mountains coal field was modified from an earlier resource study by the UGS (Tabet 1999); rather than generating coal thickness maps by gridding and contouring via computer, hand-drawn coal isopach maps were digitized to provide thickness data for the new estimate of available coal in the Henry Mountains coal field. BLM mining engineers provided the engineering guidance used by the UGS for its evaluation to derive the coal resources that would be economical to mine under current and reasonably foreseeable market conditions.

### Study Methods

This study was undertaken using ArcView™ software (version 3.2, Environmental Systems Research Institute [ESRI]) with ESRI's Spatial Analyst™ software extension running on a personal computer with

a Windows 98™, or higher, operating system. This GIS software allows for the simultaneous analysis of various combinations of resource parameters and the ability to easily repeat an analysis using different assumptions and parameters. Specific details related to the current GIS methodology employed follow.

Calculation of coal resources requires the determination of three parameters: the extent of minable coal in each bed (area), the distribution of the bed thickness in that area, and an estimate of the density of the coal. Maps showing the extent and thickness of identified coal beds were constructed from scattered points of observation (drill hole records and outcrop measurements), or digitized from existing hand drawn coal isopach maps. ESRI's Spatial Analyst software extension allows the choice of different mathematical methods to interpolate between, and extrapolate beyond, point data to construct coal thickness maps of various individual coal beds. An inverse distance weighting method (set to examine the six nearest neighbors and using a fourth-order, distance-weighting function) was selected to assign thickness values to individual 30-meter by 30-meter cells in a grid covering the areal extent of the coal formations in the study area. To define the remaining coal resources, the coal thickness information was combined with information on past mining, current leases, faulting, depth of cover, and other technical and cultural features that would potentially limit future mining.

Using these various individual coal bed thickness maps, polygonal areas were outlined to define the coal that would likely be economical to mine in the future. These polygonal areas generally had to contain coal thicker than 6 feet, cover greater than 100 feet and less than 2,500 feet, and contain resources that could be classified in the USGS's "demonstrated" resource reliability category (Wood et al., 1983) for at least 80% of the resource area. The resulting grids of the areas likely to be mined were converted from a floating-point (decimal) format to integer values. For example, all cells with coal bed thickness values greater than 6 but less than 8 feet were reclassified to the integer 7; for resource calculations, these cells were assigned a thickness of 7 feet of coal. This approximation significantly reduces the size of the resulting data sets and allows subsequent analyses to be undertaken in a reasonable amount of computation time (minutes rather than hours). Classification of coal bed thickness as integer data also allows convenient tabulation in ArcView™ of the areal extent of these thickness intervals; tables containing these data were exported to a spreadsheet for final calculation of the total tons of coal in each thickness interval. The coal resource calculations were accomplished by applying the USGS standard coal density factor for bituminous coal of 1,800 tons of coal per acre-foot (Wood, et al. 1983).

For the resource areas identified for future mining in the Wasatch Plateau coal fields, BLM mining engineers provided the recovery factor to apply to the identified resources to determine the recoverable resources; slightly lower recovery factors were applied to the Emery and Henry Mountains fields because less is known about mining conditions there. In general, coal in tracts suitable for surface mining were assigned an 80% recovery factor, those suitable for longwall mining were assigned a 60 to 70% recovery factor, and tracts suitable for extraction with continuous miners were assigned a 50% recovery factor. Only general information is available at this time regarding the quality of the coal and the roof and floor conditions in the various delineated minable tracts. Specific information about the quality of the coal and roof and floor conditions in the various tracts would help identify areas with quality problems or difficult mining conditions that might further restrict the recoverable coal in the tracts delineated. Some attempt to account for these factors was made in applying slightly different recovery factors to some tracts. Detailed mine planning and study of the economic aspects of extracting and marketing the resources identified is warranted to actually classify them as reserves; however, this study identifies the maximum area likely to be of interest for coal development in the next 30 years and gives an idea of the magnitude of recoverable resources remaining.

## Point Data Preparation

Point data used in this study originate from a database compiled by the UGS over the past 20 years for the National Coal Resources Data System (NCRDS), which is a state cooperative program funded in part by the USGS. This database includes information from both unpublished and published sources. The BLM provided additional records as part of a cooperative data sharing agreement.

Keypunched NCRDS files in ASCII format, as well as BLM files in dBase format, were imported into a spreadsheet for simplification as a table of X, Y, Z data (easting, northing, and thickness or elevation) for each coal bed and exported as dBase (\*.dbf) files for use in the ArcView™ GIS program. All data records were reexamined to verify correlations and spatial accuracy. Where necessary, spatial coordinates were converted to the Universal Transverse Mercator zone 12 coordinate system, and bed identifications were revised or assigned. Bed thickness is recorded to the nearest tenth of a foot. Elevation (mean sea level) and spatial coordinates are uniformly recorded to the nearest tenth of a meter. However, the overall precision of the elevation and spatial data is probably closer to tens (rather than tenths) of meters; varied sources and vintages of the data hinder more exacting precision estimates.

Data from thousands of point locations were examined for possible use, and only the most reliable data records were selected. Drill hole data were preferentially selected because they provide the most reliable coal bed thickness, depth, and location values. Measured section data were selected in areas where drill hole data were lacking; such data indicate minimum coal thickness because coal beds in Utah commonly thin at the outcrop as a result of weathering, slumping, or burning (Doelling 1968). Furthermore, the precise elevation of coal beds in the measured sections was often difficult to determine. Accordingly, where it was judged an elevation record for a measured section record was unreliable, the record was not used to construct a coal bed elevation map. The selected point data were used to prepare coal bed elevation, interburden, and thickness maps.

## Setting

Garfield, Piute, Sanpete, Sevier, and Wayne counties include all or part of 3 of the state's 22 coal fields: the Emery, Henry Mountains, and the southern part of the Wasatch Plateau coal fields. These three coal fields together originally contained a resource estimated at more than 12.8 billion tons of minable coal (see Table A8-4), and were estimated by Doelling (1972a, b) to make up about one-third of the state's coal resources. As of 2003, mining occurs only in the Book Cliffs, Emery, and Wasatch Plateau coal fields.

Table A8-4 shows selected Utah coal fields with original minable resources in billions of tons. (coal beds < 3,000 feet deep and > 4 feet thick; from Doelling 1972a, Anderson 1983, Tabet 1999)

Table A8-4. Selected Utah Coal Fields With Original MInable R esources in Billions of T ons.

Coal Field	Identified Resources	Hypothetical Resources	Grand Total
Alton	1.870	0.279	2.149
Book Cliffs	3.527	0.157	3.684
*Emery	1.430	0.635	2.065
*Henry Mountains	0.543	0.000	0.543
Kaiparowits Plateau	7.878	7.320	15.198

Kolob	2.014	0.000	2.014
*Wasatch Plateau	6.379	3.888	10.267
<b>TOTAL</b>	<b>23.641</b>	<b>12.279</b>	<b>35.920</b>
* Field has resources in the Richfield Resource Area			

The Emery, Henry Mountains, and Wasatch Plateau coal fields have numerous thick coal zones, some in excess of 15 feet thick. However, most of the coal zones are lenticular and commonly split into several thinner beds and then disappear over a distance of a few miles. The lenticular nature of the coal, the non-uniformity of floor and roof strata over even small areas, the intertonguing stratigraphic relations of the coal-bearing rocks, and faulting make correlation of individual coal beds difficult. The average thickness of the coal beds included in the resource estimates given above is slightly more than 6 feet. At present, nearly all Utah coal operations are mining beds thicker than 6 feet. The coal beds of the Richfield District planning area occur in Upper Cretaceous strata; those of the Henry Mountains coal field occur in both the Ferron Sandstone Member of the Mancos Shale and the Muley Canyon Sandstone; the Wasatch Plateau coals occur in the Blackhawk Formation; and the coals of the Emery coal field are found in the Ferron Sandstone Member of the Mancos Shale.

The heat content of the Richfield planning area's bituminous coal is high compared with that of the sub-bituminous coals typically produced in Montana, New Mexico, and Wyoming. Typical as-received heat contents range from 10,000 to 12,700 British thermal units (Btu) per pound of coal. Sulfur content is usually low (< 1 weight percent) in the coal fields of the planning area, but there are some areas with medium to high (1 to 3 weight percent) sulfur, particularly in the Emery and Henry Mountains coal fields. Near-surface coal quality is commonly degraded by oxidation and it may be burned for a considerable distance from the outcrop.

## KNOWN OCCURRENCES AND CHARACTERISTICS

### Henry Mountains Coal Field

#### Setting

The remote Henry Mountains coal field occurs in an area of scenic beauty. The striking Waterpocket Fold to the west has been set aside, in part, as Capitol Reef National Park, while to the south and southeast are parts of Glen Canyon National Recreation Area (NRA). BLM administers the majority of the coal-bearing lands in the coal field. The Henry Mountains coal field area has few paved roads and no railroads. State Highway 24 crosses the northern part of the coal field and is the only paved road in the area. State Routes 95 and 276 run parallel to and 10 miles east of the eastern margin of the coal field. Access to most parts of the coal field is limited to dirt roads. The nearest rail line is the Union Pacific line at Green River about 60 miles to the north. The remote, relatively roadless nature of the Henry Mountains coal field area led the BLM in 1990 to delineate three proposed wilderness areas covering parts of the coal field. The wilderness alternatives proposed by the Utah State Office of the BLM in 1990 for portions of the three Wilderness Study Areas (WSAs) in the Henry Mountains coal field constrain potential development of the coal resources of only a few sections of land, leaving the majority of the area open for future development. Although the BLM (1999) conducted a re-inventory of Utah lands for wilderness that substantially increased the areas in the Henry Mountains coal field considered to have wilderness potential, those lands have been withdrawn from wilderness protection as the result of settlement of a lawsuit brought by the State of Utah against the U.S. Department of the Interior (DOI).

Elevations in the area of the Henry Mountains coal field range from about 4,600 feet at the far northern end of the field to more than 11,000 feet in the central Henry Mountains. The topography varies from steep, rugged terrain in the Henry Mountains on the east, to a series of dissected mesas and buttes in the central part of the coal field, to cuestas and hogback ridges along the western margin of the coal field.

The principal Cretaceous coal-bearing strata of the Henry Mountains coal field cover parts of central Wayne and Garfield counties. Cretaceous strata are preserved in a structural basin, the Henry Mountains syncline, which is bounded on the west by the monocline of the Waterpocket Fold, and on the east by the Monument upwarp. This north-south elongated basin extends about 50 miles along its axis and is 2 to 18 miles wide.

Along the Waterpocket Fold on the west, the Cretaceous strata have an average inclination of 25 to 30 degrees to the east (Doelling 1972b). Within the center of the basin the strata are nearly horizontal, while the strata on the eastern flank of the basin generally dip gently to the west at less than 10 degrees, except near the Henry Mountains intrusive bodies, where they may be steeply folded and faulted. The only significant faulting unrelated to the intrusive bodies of the Henry Mountains is at the far northern end of the basin near Factory Butte, where a series of east-west trending normal faults with displacements of less than 30 feet have been mapped (Doelling 1972b).

## Coal Geology

A small amount of unminable coal occurs in the Dakota Sandstone, and minable quantities occur in the Ferron Sandstone Member of the Mancos Shale and Muley Canyon Formation. The unminable coal in the Dakota Sandstone extends into a very small portion of south central Emery County. The Dakota coals are very thin and discontinuous and are an insignificant resource. The coals of the Ferron are locally thick, but not very continuous, and have limited potentially minable resources. Muley Canyon coals are the thickest, most continuous, and have the largest potentially minable resource (Doelling 1972b).

Ferron Coals—the coals in the Ferron Sandstone Member of the Mancos Shale occur in the upper nonmarine strata, in a 50-foot-thick zone immediately above the lower marine part of the Ferron. The coal interval contains one to five beds that have an aggregate thickness ranging from zero to 16.5 feet. Coal beds seldom exceed 4 feet in thickness and commonly average 1 to 3 feet thick.

The areal distribution of coal is patchy, with isolated, east-west elongated pods found in three separate locations across the Henry Mountains basin. The pods are approximately 1 to 5 miles wide and from 3 to 10 miles long. Although the coal thickness data are primarily from the margins of the coal field, it appears that the coal is best developed in three widely separated areas in the northern, central, and southern parts of the field. The coal estimates in the central area are more speculative than the other two because they rely heavily on data from a single, deep petroleum well. The Ferron coal in the northern area near Factory Butte is the thickest and occurs under cover of less than 200 feet of overburden over an area of a few square miles.

Because the depositional environment for the Ferron in the Henry Mountains basin has been interpreted as a fluvial-deltaic complex (Uresk 1979, Hill 1982), the east-west elongate coal pods might reflect interfluvial swamps formed on eastward prograding fluvial-deltaic lobes that formed in the northern, central, and southern parts of the basin. However, the original distribution of coal near the top of the Ferron might have been altered by erosion prior to the deposition of the overlying Blue Gate Member, leaving a coal bearing unit of variable thickness.

The coal in the Ferron Sandstone generally occurs in its upper portion, but in many places throughout the field no coal is present. Therefore, the top of the Ferron was mapped because it approximated the depth to

the coal zone throughout the whole coal field. The top of the Ferron is exposed around the margins of the Henry Mountains basin, and it reaches a maximum depth of slightly more than 2,000 feet under a several-square-mile area beneath the highest portions of Tarantula Mesa in the central part of the basin. Thus, all the Ferron coal deposits of the Henry Mountains coal field, where thick enough to mine, occur at potentially minable depths.

**Muley Canyon Coals**—The upper part of the Muley Canyon Sandstone is a nonmarine coal-bearing interval, which ranges from 92 to 209 feet thick and averages about 150 feet thick. This stratigraphic interval is considered the Muley Canyon coal zone in this report. Coal in this zone commonly occurs in 3 to 4 beds, but as many as 10 coal beds can be found locally. Individual coal beds range from zero to 13.4 feet thick but are commonly 2 to 5 feet thick. The aggregate thickness of all the coal beds in the Muley Canyon zone ranges from zero to 27.5 feet. Most of area underlain by this zone has at least 5 feet of total coal, and about half of the area has 10 feet or more of total coal.

Unlike the Ferron, coal occurs throughout the area underlain by the Muley Canyon Sandstone. The Muley Canyon coals are thickest in elongate pods oriented in an east–west direction that tend to be thicker on the west side of the basin and that thin gradually to the east (Tabet 1999). The largest thick pod of coal lies in the center of the basin, as was the case with the Ferron coals.

Potentially surface-minable coal is found under broad areas at the northern and southern ends of the Muley Canyon coal zone's extent, where less than 100 feet of cover is common (Tabet 1999). The extensive, thick Muley Canyon coal under Tarantula Mesa reaches a maximum depth of slightly more than 1,000 feet, and therefore is extractable via underground mining methods at shallow to moderate depths.

## Coal Quality

**Chemistry of the Ferron Coals**—The analytical data provided here comes from a UGS coal quality database, now in digital form, much of which was originally compiled by Doelling (1972a). Only four coal sample analyses from the Ferron have been published for the Henry Mountains coal field (see Table A8-5). These coals have an apparent rank of high-volatile C bituminous. The four samples are from the northern (three samples) and southern (one sample) edges of the field. The mean values for the sample analyses indicate the coals are high in ash (14.5%) and sulfur (2.5%) contents.

Table A8-5. Proximate Analyses of Ferron Coal Samples from the Henry Mountains Basin

<b>Cadastral Location</b>	<b>Moisture (%)</b>	<b>Volatile Matter (%)</b>	<b>Fixed Carbon (%)</b>	<b>Ash (%)</b>	<b>Sulfur (%)</b>	<b>Btu per Pound (%)</b>
02-27S-09E	8.3	34.1	43.8	13.8	1.6	10,650
11-27S-09E	4.9	33.5	48.7	12.9	2.6	10,920
11-27S-09E	5.5	33.6	44.9	16.0	2.5	10,840
36-34S-10E	4.6	38.1	42.2	15.1	3.2	11,743
<b>Mean</b>	<b>5.8</b>	<b>34.8</b>	<b>44.9</b>	<b>14.5</b>	<b>2.5</b>	<b>11,038</b>
<b>Minimum</b>	<b>4.6</b>	<b>33.5</b>	<b>42.2</b>	<b>12.9</b>	<b>1.6</b>	<b>10,650</b>
<b>Maximum</b>	<b>8.3</b>	<b>38.1</b>	<b>48.7</b>	<b>16.0</b>	<b>3.2</b>	<b>11,743</b>
<b>STD.DEV.</b>	<b>1.7</b>	<b>2.2</b>	<b>2.8</b>	<b>1.4</b>	<b>0.7</b>	<b>483</b>

Chemistry of the Muley Canyon Coals—The coal beds in the Muley Canyon have been more extensively sampled than those in the Ferron, but the samples are not uniformly distributed over the whole area underlain by these coals. The samples come primarily from the northern and southern ends of the field (from areas with shallow cover) and not as many are from the deeper central portion of the field. The Muley Canyon analyses come from 3 shallow prospects and 29 drill cores (see Table A8-6).

The Muley Canyon coal has an apparent rank of sub-bituminous A to high-volatile bituminous C (Hatch, et al. 1979, Law 1980). This slightly lower rank than the Ferron coals translates to a lower heat content and higher moisture content for the Muley Canyon coals.

The mean ash content of the Muley Canyon coals, at 12.1%, is less than that of the Ferron coals, but is higher than the coals produced from the Wasatch Plateau and Book Cliffs coal fields, which typically have an average ash content of about 10%. The ash content of the Muley Canyon coals varies across the coal field, and is highest in two east–west trending lobate-shaped areas—one each in the northern and southern parts of the field.

The sulfur content of the Muley Canyon coals can range as high as 3.2% (see Table A8-6), which is as high as the Ferron coals, but the mean sulfur content of the Muley Canyon samples is considerably less at 0.94%. In comparison, the sulfur content of coal presently produced from the Wasatch Plateau and Book Cliffs coal fields ranges from 0.5 to 1.0%. The sulfur content of the Muley Canyon coals across the coal field is highest in one east–west trending area that occurs in the same area as the northern high-ash area (Tabet 1999).

Table A8-6. Proximate Analyses of Muley Canyon Coal Core and Prospect Samples

<b>Cadastral Location</b>	<b>Moisture (%)</b>	<b>Volatile Matter (%)</b>	<b>Fixed Carbon (%)</b>	<b>Ash (%)</b>	<b>Sulfur (%)</b>	<b>Btu per Pound (%)</b>
22-31S-8E	11.5	35.3	40.3	12.9	0.8	10,110
22-31S-8E	11.0	35.4	37.0	16.6	0.4	9,440
22-31S-8E	9.5	32.7	33.3	24.5	2.0	8,510
23-31S-8E	11.6	36.6	42.7	9.1	0.6	10,620
23-31S-8E	10.3	36.0	36.3	17.4	0.7	9,400
23-31S-8E	10.9	38.2	42.4	8.5	1.0	10,790
36-31S-8E	13.51	31.99	35.69	18.81	0.53	9,015
36-31S-8E	13.87	34.37	41.33	10.43	1.0	10,204
07-31S-9E	13.1	34.0	45.1	7.8	0.7	10,210
17-31S-9E	13.0	35.0	37.7	14.3	0.7	9,670
18-31S-9E	12.5	33.6	35.7	18.2	0.7	9,300
18-31S-9E	12.7	32.2	32.0	23.1	3.2	8,520
19-31S-9E	12.5	34.6	39.3	13.6	0.5	9,990
19-31S-9E	13.7	36.5	42.7	7.1	0.6	10,600
20-31S-9E	11.6	35.4	36.3	16.7	2.8	9,610
20-31S-9E	12.1	37.1	41.4	9.4	0.4	10,660
30-31S-9E	10.9	36.5	45.9	6.8	0.8	10,700
30-31S-9E	11.5	38.5	40.8	7.7	1.5	12,491



05-32S-9E	13.6	32.56	39.3	14.54	0.8	9,597
05-32S-9E	13.6	35.25	36.19	14.96	0.69	9,652
12-33S-8E	14.7	27.4	30.6	27.3	0.4	7,710
24-33S-8E	14.37	35.57	35.14	16.92	0.99	9,156
24-33S-8E	14.37	34.92	42.47	8.24	1.16	10,231
24-33S-8E	14.37	35.61	45.48	4.54	1.09	10,759
02-33S-9E	10.48	38.29	45.25	5.98	0.78	11,468
11-33S-9E	11.34	36.09	43.86	8.71	0.46	10,856
11-33S-9E	13.7	37.2	44.19	4.91	0.47	11,121
14-33S-9E	12.29	36.65	45.49	5.57	0.55	11,147
22-33S-9E	13.3	36.23	39.33	11.14	1.05	8,178
23-33S-9E	13.48	34.45	43.61	8.46	0.83	10,660
23-33S-9E	13.3	36.36	43.36	5.97	0.67	11,010
23-33S-9E	14.28	34.89	43.51	7.32	1.12	10,718
<b>Mean</b>	<b>12.1</b>	<b>35.2</b>	<b>40.1</b>	<b>12.1</b>	<b>0.94</b>	<b>10,067</b>
<b>Minimum</b>	<b>9.5</b>	<b>27.4</b>	<b>30.6</b>	<b>4.54</b>	<b>0.40</b>	<b>7,710</b>
<b>Maximum</b>	<b>14.7</b>	<b>38.5</b>	<b>45.9</b>	<b>27.3</b>	<b>3.20</b>	<b>12,491</b>
<b>STD. DEV.</b>	<b>1.4</b>	<b>2.2</b>	<b>4.3</b>	<b>6.0</b>	<b>0.64</b>	<b>1,030</b>
(Statistics for 28 samples with less than 20% ash)						
<b>Mean</b>	<b>12.6</b>	<b>35.6</b>	<b>41.0</b>	<b>10.8</b>	<b>0.84</b>	<b>10,255</b>
<b>Minimum</b>	<b>10.3</b>	<b>31.99</b>	<b>35.14</b>	<b>4.54</b>	<b>0.46</b>	<b>8,178</b>
<b>Maximum</b>	<b>14.4</b>	<b>38.5</b>	<b>45.9</b>	<b>18.81</b>	<b>2.8</b>	<b>12,491</b>
<b>STD. DEV.</b>	<b>1.3</b>	<b>1.5</b>	<b>3.5</b>	<b>4.5</b>	<b>0.46</b>	<b>876</b>

The heat content of Muley Canyon coals ranges from 7,710 to 12,491 Btu per pound and averages 10,067 Btu per pound (see Table A8-6). The average heat content of these coals is considerably below the 11,400 to 12,000 Btu/lb range currently produced at mines in Carbon and Emery counties. The heat content distribution across the coal field consists of east–west trends with low heat areas corresponding directly with areas having high-ash contents (Tabet 1999). In addition to the primary east–west trend of the heat content values, the heat content of the Muley Canyon coals appears to be slightly higher on the eastern side of the field than on the west, suggesting that the coals on the eastern side of the field were possibly thermally upgraded by the intrusion of the Henry Mountains laccoliths.

The ash chemistry of some of the Muley Canyon coals has also been analyzed (Hatch, et al. 1979). This allows for an evaluation of the boiler slagging and fouling characteristics of these coals. Table A8-7 gives the analyzed values of the major oxides in the coal ash that can be used to predict coal utilization characteristics.

The physical and chemical transformations that the minerals in the coal ash undergo during combustion are complex processes. Vaninetti and Busch (1981) define slagging as the buildup of molten ash materials within the lower furnace section of a boiler, and fouling as the accumulation of sintered ash in the convective passes section of a boiler. Both of these problems reduce boiler efficiency, increase operating

costs, and shorten boiler life. Various indices can predict the combustion characteristics of coal ash, and two of them are presented in

Table A8-8. The first step in analyzing ash combustion properties is to determine the type of coal ash present. Coal ash is characterized as either lignitic or bituminous, depending on the value determined by summing CaO and MgO values, and dividing the result by the Fe<sub>2</sub>O<sub>3</sub> value. Coal ash is termed lignitic when the resulting value of this calculation is greater than 1.0, and bituminous when the value is less than 1.0. Most of the Muley Canyon ash analyses fall in the lignitic ash category, although two ash samples fall in the bituminous ash category. Both of these bituminous ash analyses come from coal samples with high iron and sulfur contents, indicating high pyrite content.

Table A8-7. Major Oxide Composition of the Ash (in Percent) From 13 Muley Canyon Coal Samples From the Henry Mountains Coal Field

Cadastral Location	Acidic Oxides			Basic Oxides					Ash
	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	Fe <sub>2</sub> O <sub>3</sub>	
22-31S-8E	60.0	12.0	1.00	8.9	2.00	0.75	0.44	5.8	13.0
22-31S-8E	54.0	27.0	0.79	9.0	1.03	0.95	1.20	1.0	19.6
22-31S-8E	57.0	24.0	1.00	6.0	1.18	0.28	1.10	1.0	10.2
23-31S-8E	53.0	14.0	0.88	13.0	2.09	2.75	0.43	3.5	9.8
23-31S-8E	51.0	23.0	0.88	14.0	1.27	1.09	0.66	1.9	20.0
23-31S-8E	38.0	22.0	1.20	16.0	2.53	1.62	0.31	4.9	9.1
17-31S-9E	58.0	17.0	0.87	10.0	1.96	0.13	0.73	3.3	14.5
18-31S-9E	61.0	17.0	1.00	6.2	1.58	0.54	1.20	2.5	19.7
18-31S-9E	50.0	12.0	0.70	6.5	1.49	0.92	1.20	17.0	19.6
19-31S-9E	65.0	14.0	1.00	8.4	1.76	0.51	0.62	2.5	15.6
19-31S-9E	30.0	11.0	0.60	29.0	2.80	1.30	0.48	4.4	8.3
20-31S-9E	65.0	7.8	1.20	12.0	2.31	0.24	0.54	3.1	10.8
20-31S-9E	46.0	18.0	1.10	7.5	1.36	0.40	0.74	15.0	18.3
<b>Mean</b>	<b>52.9</b>	<b>16.8</b>	<b>0.94</b>	<b>11.3</b>	<b>1.80</b>	<b>0.88</b>	<b>0.74</b>	<b>5.5</b>	<b>14.5</b>
<b>Minimum</b>	<b>30.0</b>	<b>7.8</b>	<b>0.60</b>	<b>6.0</b>	<b>1.03</b>	<b>0.13</b>	<b>0.31</b>	<b>1.0</b>	<b>8.3</b>
<b>Maximum</b>	<b>65.0</b>	<b>27.0</b>	<b>1.20</b>	<b>29.0</b>	<b>2.80</b>	<b>2.75</b>	<b>1.20</b>	<b>17.0</b>	<b>20.0</b>
<b>STD. DEV.</b>	<b>10.2</b>	<b>5.8</b>	<b>0.18</b>	<b>6.2</b>	<b>0.54</b>	<b>0.71</b>	<b>0.32</b>	<b>4.9</b>	<b>4.6</b>

Table A8-8. Ash Type, Fouling, and Slagging Evaluation of the Oxide Composition of Muley Canyon Coal Ash

Cadastral Location	Ash Type (CaO+MgO/Fe <sub>2</sub> O <sub>3</sub> )	Fouling Severity (Percent Na <sub>2</sub> O)	Slagging Severity (Base/Acid ratio*)
22-31S-8E	1.88(lignitic)	0.75(low)	0.245(low)
22-31S-8E	10.03(lignitic)	0.95(low)	0.161(low)
22-31S-8E	1.14(lignitic)	0.28(low)	0.181(low)

23-31S-8E	4.31(lignitic)	2.75(low)	0.320(med-severe)
23-31S-8E	8.04(lignitic)	1.09(low)	0.253(med-severe)
23-31S-8E	3.78(lignitic)	1.62(low)	0.414(med-severe)
17-31S-9E	3.62(lignitic)	0.13(low)	0.212(low)
18-31S-9E	3.11(lignitic)	0.54(low)	0.152(low)
18-31S-9E	0.47(bituminous)	0.92(medium)	0.432(low)
19-31S-9E	4.06(lignitic)	0.51(low)	0.172(low)
19-31S-9E	7.23(lignitic)	1.30(low)	0.913(low)
20-31S-9E	4.62(lignitic)	0.24(low)	0.246(low)
20-31S-9E	0.59(bituminous)	0.40(low)	0.384(low)
<b>Mean</b>	<b>4.07(lignitic)</b>	<b>0.88(low)</b>	<b>0.314(med-severe)</b>
* Base/Acid Ratio = $\text{CaO}+\text{MgO}+\text{Na}_2\text{O}+\text{K}_2\text{O}+\text{Fe}_2\text{O}_3/\text{SiO}_2+\text{Al}_2\text{O}_3+\text{TiO}_2$			

Sodium content in the ash is critical to various indices of ash-fouling potential; the simplest indicator of fouling is the total sodium oxide content of the ash alone. Bituminous and lignitic ash coals respond differently to increased sodium oxide content. Coals in the bituminous category are much more sensitive to small increases in sodium oxide. The change in ash-fouling tendency with increasing sodium oxide content, according to Vaninetti and Busch (1981), is illustrated in Table A8-9.

Table A8-9. Fouling Tendency

Factor	Ash Type	Low	Medium	High	Severe
Na <sub>2</sub> O% in ash	bituminous	<0.5	0.5–1.0	1.0-2.5	>2.5
Na <sub>2</sub> O% in ash	lignitic	<3.0	3.0–5.0	>5.0	

When examining just the sodium content of the ash, all but one of the Muley Canyon coal ash samples fall in the low-fouling potential range.

If coal from the Muley Canyon were mined, various quality control strategies including blending, selective mining, or selective washing could probably produce a low-ash, low-sulfur coal product similar to that presently produced in central Utah. The foregoing analysis of the ash chemistry predicts that most of the Muley Canyon coal produced would have low- to moderate-slugging and low-fouling boiler combustion properties, but detailed, site-specific sampling is needed for each area to be mined.

## Coal Resources

**Ferron Sandstone Member Resources**—The Ferron Sandstone contains an estimated 683.5 million short tons of in-place coal resources. About three-quarters of the coal resources lie in Garfield County. Because of limited exploration data, only 27%, or 187.3 million tons, of the total resources fall into the demonstrated resource category (occurring within 0.75 miles of a thickness measurement point). The bulk of the coal resource, 67%, falls into the inferred resource category (occurring between 0.75 and 3 miles from a thickness measurement point). Only a few percent of the resources lie more than 3 miles from a thickness measurement point, or within the hypothetical category.

Eleven percent of Ferron Sandstone coal resources, or 75.1 million short tons, lie under 100 feet or less of cover. Most of the coal resources, 89%, have cover exceeding 100 feet. Although most of the coal is deeper than 100 feet, all the coal is less than 2,000 feet deep.

As mentioned above, the coal beds in the Ferron Sandstone are generally thin, and this is reflected by the fact that 68% of the resources fall into the 2- to 6-foot thick resource category. Less than one-third of the coal resources have an aggregate thickness greater than 6 ft. The thickest coal occurs at the far northern extent of the Ferron Sandstone near Factory Butte.

In summary, the majority of the Ferron coal resources are poorly defined by USGS reliability standards, and are primarily less than 6 feet thick, deeper than 100 feet, and lie within Garfield County. The in-place coal resources for the Ferron zone are summarized by thickness, depth, and reliability categories, as well as by county, in Table A8-10,

Table A8-11, and

Table A8-12. Readers are cautioned that the individual resource categories in the tables may not sum to totals at the bottoms of the tables due to independent rounding.

Table A8-10. In-place Ferron Coal Zone Resources by Thickness and County

County	Thickness (ft)									Total
	2–6			6–10			10+			
	DEM1	INF2	HYP3	DEM	INF	HYP	DEM	INF	HYP	
Wayne	65.1	71.2	0.0	12.0	8.8	0.0	8.6	0.0	0.0	165.7
Garfield	74.8	224.6	28.8	19.1	153.0	9.8	7.7	0.0	0.0	517.8
Total	139.9	295.8	28.8	31.1	161.8	9.8	16.3	0.0	0.0	683.5
1 DEM = Demonstrated, 2 INF = Inferred, 3 HYP = Hypothetical (coal beds > one foot thick; figures in millions of short tons).										

Table A8-11. In-place Ferron Coal Zone Resources by Thickness and Depth of Cover

	Thickness (ft)									
Depth (ft)	2–6			6–10			10+			Total
	DEM1	INF2	HYP3	DEM	INF	HYP	DEM	INF	HYP	
0-100	54.2	5.1	0.0	6.7	2.2	0.0	6.9	0.0	0.0	75.1
100-1,000	81.3	187.4	12.8	20.0	84.4	0.0	5.5	0.0	0.0	391.3
1-2,000	4.3	103.3	16.0	4.5	75.3	9.8	4.0	0.0	0.0	217.2
Total	139.9	295.8	28.8	31.1	161.8	9.8	16.3	0.0	0.0	683.5
1 DEM = Demonstrated, 2 INF = Inferred, 3 HYP = Hypothetical (coal beds > one foot thick; figures in millions of short tons).										

Table A8-12. In-place Ferron Coal Zone Resources by Thickness and Township Tier

	Thickness (ft)									
Tier	2–6			6–10			10+			TOTAL
	DEM1	INF2	HYP3	DEM	INF	HYP	DEM	INF	HYP	
T. 27 S.	13.3	4.4	0.0	7.6	0.0	0.0	8.6	0.0	0.0	33.9
T. 28 S.	19.8	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.2
T. 29 S.	13.2	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6
T. 30 S.	18.8	35.0	0.0	4.4	8.8	0.0	0.0	0.0	0.0	67.0
T. 31 S.	13.8	102.4	15.4	12.4	149.1	9.8	7.7	0.0	0.0	310.6
T. 32 S.	11.2	44.8	13.5	0.0	0.0	0.0	0.0	0.0	0.0	69.5
T. 33 S.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T. 34 S.	49.8	77.3	0.0	6.7	3.9	0.0	0.0	0.0	0.0	137.7
Total	139.9	295.8	28.8	31.1	161.8	9.8	16.3	0.0	0.0	683.5
1 DEM = Demonstrated, 2 INF = Inferred, 3 HYP = Hypothetical (coal beds > one foot thick; figures in millions of short tons).										

**Muley Canyon Resources**—The Muley Canyon Sandstone contains 1,526.1 million short tons of in-place coal resources. Because of fairly uniformly spaced exploration data, 62%, or 945.6 million tons, of the total coal resources fall into the demonstrated, or the most reliable, resource category. The remaining 38% of the coal resources, 580.5 million tons, fall into the inferred resource category, or those resources occurring at between 0.75 and 3 miles from a thickness measurement point. None of the coal resources fall into the hypothetical category (more than 3 miles from a thickness measurement point). There are ample minable coal resources in the Muley Canyon Sandstone, but only half of one percent occur within the Wayne County portion of the field.

Looking at the coal resources by depth of cover shows that 25.6%, or 391 million short tons, lie under 100 feet or less of cover. Most of the coal resources, 74.4%, are under more than 100 feet of overburden. Although most of the coal is deeper than 100 feet, all of the coal in the Muley Canyon zone is less than 1,500 feet deep, and most of the deep coal lies under less than 1,000 feet of overburden.

Ninety-one percent of the Muley Canyon resources have a total coal thickness of 6 feet or greater. In fact, about 70% of the coal resources have a total coal thickness of more than 10 feet. Under much of the area below Tarantula Mesa, the Muley Canyon coal zone consists primary of one 6 to 12 feet thick bed (Tabet 1999). Only 9% of the coal resources have a thickness of less than 6 feet.

In summary, the Muley Canyon coal resources are mostly well defined according to the USGS reliability standards, greater than 6 feet thick, deeper than 100 feet, and lie within Garfield County. The in-place coal resources for the total Muley Canyon coal zone are summarized by thickness, depth, reliability, and county categories in Table A8-13,

Table A8-14, and Table A8-15. Note that the individual resource categories in the tables below may not sum to totals at the bottoms of the tables due to independent rounding.

Table A8-13. Total Muley Canyon Coal Zone Resources by Thickness and Depth of Cover

Depth (ft)	Thickness (ft)						Total
	2–6		6–10		10+		
	DEM1	INF2	DEM	INF	DEM	INF	
0-100	78.3	4.4	107.4	7.6	172.4	20.9	391.0
100-1,000	42.1	11.3	118.5	75.7	383.7	449.4	1,080.7
1-2,000	1.6	0.0	4.9	1.2	36.8	9.9	54.4
Total	121.9	15.8	230.9	84.5	592.8	480.2	1,526.1
1 DEM = Demonstrated, 2 INF = Inferred. (coal beds > one foot thick; figures in millions of short tons).							

Table A8-14. Total Muley Canyon Coal Zone Resources by Thickness and County

	Thickness (ft)						
County	2–6		6–10		10+		Total
	DEM1	INF2	DEM	INF	DEM	INF	
Wayne	7.3	0.0	0.2	0.0	0.0	0.0	7.5
Garfield	114.6	15.8	230.7	84.5	592.8	480.2	1,518.6
TOTAL	121.9	15.8	230.9	84.5	592.8	480.2	1,526.1
1 DEM = Demonstrated, 2 INF = Inferred. (coal beds > one foot thick; figures in millions of short tons).							

Table A8-15. Total Muley Canyon Coal Zone Resources by Thickness and Township Tier

	Thickness (ft)						
Tier	2–6		6–10		10+		Total
	DEM1	INF2	DEM	INF	DEM	INF	
T. 30 S.	7.3	0.0	0.2	0.0	0.0	0.0	7.5
T. 31 S.	45.5	2.5	89.1	6.5	86.0	0.0	229.6
T. 32 S.	21.5	10.9	61.0	44.4	205.1	293.8	636.7
T. 33 S.	40.7	0.6	77.0	27.5	259.8	169.2	574.8
T. 34 S.	6.9	1.8	3.6	6.1	41.9	17.2	77.5
Total	121.9	15.8	230.9	84.5	592.8	480.2	1,526.1
1 DEM = Demonstrated, 2 INF = Inferred. (coal beds > one foot thick; figures in millions of short tons).							

## Wasatch Plateau Coal Field

### Setting

The Wasatch Plateau coal field extends southwest about 90 miles from western Carbon County, through western Emery County, and into eastern Sanpete and Sevier counties (Doelling and Smith 1982). The field, as defined by Doelling and Smith (1982), is 13 to 22 miles wide. The outcrop of the coal-bearing Blackhawk Formation forms the eastern edge of the field, and the western edge is bounded by a series of faults forming the Musinia graben near the western edge of the plateau in Sanpete and Sevier counties. Sanpete and Sevier counties contain roughly the southwestern half of the “larger” Wasatch Plateau coal field.

Only the northern third of the field is directly served by rail transportation. One spur leaves the main line of the Union Pacific Railroad at the town of Colton and heads 15 miles southwest to serve the mines near Scofield. Three other spurs branch off at the town of Helper, two running 5 miles west, and one running 20 miles south. The longest one, which runs south to the town of Hiawatha, formerly served the Plateau mine of RAG Coal Company. Rail shipment of coal production from the southern end of the field first requires a truck haul 55 miles westward to a loadout on a branch of the Union Pacific Railroad west of the town of Levan.

### Coal Geology

Most of the coal in the Wasatch Plateau field is found in the lower third of the Blackhawk Formation. Eight individual beds have been identified that contain coal more than 6 feet thick. A greater number of thick beds occur in the northern portion of the field than in the southern portion. Major coal bed groups of the Wasatch Plateau include, in ascending order, the Hiawatha zone (consisting of the Knight, Acord Lakes, Axel Anderson, and Cottonwood beds), the Blind Canyon zone, the Wattis zone, the Gordon zone, the Castlegate A zone, and the Castlegate D zone. The thickness range of minable coal for the major zones of the southern part of the Wasatch Plateau field in Sanpete and Sevier counties can be found in Table A8-16.

Table A8-16. Thickness Range of Movable Coal for the Major Zones of the Southern Part of the Wasatch Plateau Field in Sanpete and Sevier Counties

<b>Southern Wasatch Plateau beds</b>	<b>Thickness Range (ft)</b>
Axel Anderson	6 to 15
Acord Lakes (Upper Hiawatha)	6 to 20
Knight (Hiawatha)	6 to 17

The coal beds generally have shallow dips to the west but are cut by several major north–south trending fault zones, or grabens, with displacements ranging from a few feet to a several hundred feet. These normal faults offset the coal beds and interfere with mining; however, there is usually sufficient room between the faults to conduct mining (Doelling 1972a).

## Coal Quality

Coal beds of the Wasatch Plateau field generally have good quality, with low ash and sulfur contents, and high heat contents. Most of the coals are high-volatile C bituminous in rank, although locally, some coals in the northern part of the field are high-volatile B bituminous.

The Wasatch Plateau coal beds are often resin-rich with resin contents of 2 to 15%. Although not presently used, the resin has been historically recovered as a by-product for use in adhesives, paints and coatings, and as a binder in printing ink (Tabet, et al. 1995a). Coal quality statistics are summarized in Table A8-17 and Table A8-18 for two southern Wasatch Plateau field coal beds that have a sample population of more than 30 proximate analyses, and usually more than 20 ultimate analyses (UGS coal quality database, in preparation). The names reported for the Wasatch Plateau coal beds in the coal quality database do not reflect the new names assigned to the beds based on newer understanding of the stratigraphic relations of the beds. Time constraints did not allow the analytical data to be updated with new bed names, and thus the analyses reported here use the older bed names originally assigned. Those two Wasatch Plateau coal beds (using original names) are the Hiawatha, and the Upper Hiawatha.

Table A8-17. Coal Quality Statistics for the Hiawatha Bed From the Upper Cretaceous Blackhawk Formation in the Wasatch Plateau Coal Field (As-received Basis)

Characteristic	Mean	Maximum	Minimum	Standard Deviation	Sample Population
Ash (%)	6.67	25.72	0.05	1.98	521
Btu/lb	12,689	14,530	9,073	487	521
Fixed Carbon (%)	45.64	54.40	31.26	1.89	502
Volatile Matter (%)	42.0	47.4	4.4	2.3	509
Sulfur (%)	0.63	4.06	0.29	0.25	479
Moisture (%)	5.55	14.24	0.70	1.58	537
Carbon (%)	71.60	81.88	51.38	6.05	58
Hydrogen (%)	5.51	6.30	3.89	0.51	58
Nitrogen (%)	1.3	1.7	0.3	0.2	58
Oxygen (%)	12.18	17.18	9.25	2.18	58
Chlorine (%)	0.05	0.13	0.00	0.04	22

Table A8-18. Blackhawk Formation in the Wasatch Plateau Coal Field (As-received Basis)

Characteristic	Mean	Maximum	Minimum	Standard Deviation	Sample Population
Ash (%)	8.99	25.09	2.79	5.07	34
Btu/lb	11,503	12,396	9,443	750	29
Fixed Carbon (%)	45.28	51.95	34.66	4.03	30
Volatile Matter (%)	37.73	44.52	33.10	2.45	32
Sulfur (%)	0.54	1.46	0.28	0.24	34
Moisture (%)	8.04	12.9	2.66	1.87	31
Carbon (%)	64.90	69.75	53.09	4.80	22
Hydrogen (%)	4.59	5.20	3.99	0.32	22



Nitrogen (%)	1.13	1.44	0.96	0.12	22
Oxygen (%)	11.07	18.0	9.22	1.67	22
Chlorine (%)	0.01	0.11	0.00	0.02	21

The Wasatch Plateau coal beds have similar mean proximate and ultimate analytical values, but the Upper Hiawatha bed, which mainly occurs in the southern part of the field, shows the greatest quality differences. This bed is slightly higher in ash and moisture, and slightly lower in heat content and volatile matter content than the other bed reported here. In general, the coals of the Wasatch Plateau decrease slightly in rank and heat content from north to south.

## Coal Resources

The Wasatch Plateau coal field is a major Utah coal field with original, in-place coal resources in excess of 10.2 billion tons (Doelling 1972a). Based on UGS work carried out using BLM criteria, at the end of 2002, the Wasatch Plateau contained 1,122.5 billion tons of remaining, unleased, in-place coal resources that were in coal beds at least 6 feet thick and that occurred between depths of 200 to 2,500 feet. The amount of coal likely to be mined and recovered in the near future is discussed in the reasonably foreseeable development scenario at the end of this report. Some of the coal resources in the Sevier County portion of the Wasatch Plateau field are likely to be mined in the next 30 years to provide extended life for the SUFCO mine there. There are also additional resources that could support at least two new mines in the Sanpete and Sevier counties portion of the Wasatch Plateau, but their development would likely occur in the more distant part of the 30-year planning horizon.

## Emery Coal Field

### Setting

The Emery coal field was originally defined from the surface exposures of the Ferron Sandstone Member of the Mancos Shale (Lupton 1916). The surface exposures cover an area 25 miles long and 2 to 10 miles wide near the Sevier-Emery County border. This area lies about 45 miles southwest of Price and the site of the nearest rail loadout. The field, as originally defined, is bounded on the east by an erosional escarpment, and on the west by a fault zone (Doelling 1972a). Surface exposures show the coal thinning and pinching out to the north; however, published drilling data show that similar thick coal beds also occur in the Upper Cretaceous Ferron Sandstone in the subsurface extending northward all the way to Price (Bunnell and Holberg 1991, Tabet, et al, 1995b). Based on published coal thickness data, the northern boundary of the field should be defined near Price and could potentially extend farther north into the Uinta Basin.

### Coal Geology

The coal of the Emery field occurs in the upper part of the 300- to 900-foot-thick Ferron Sandstone Member of the Mancos Shale. Where exposed, this unit contains 13 coal beds, 4 of which exceed 7 feet in thickness. Lupton (1916) gave the beds letter designations from A to M in ascending order of occurrence. Beds I and J are the most important, and the separation between them is minimal in many areas, resulting in a single bed up to 25 feet thick (Doelling 1972a). The dip of the coal beds varies from 2 to 12 degrees to the west, with most between 4 and 7 degrees. Faulting is minor and presents little difficulty to mining. In the southern end of the field, 76% of the resources are under less than 1,000 feet of cover, and very thin overburden in some areas makes surface mining possible. The reported thickness ranges of the major coal beds in the Emery coal field are given in Table A8-19.

Table A8-19. Thickness Ranges of the Major Coal Beds in the Emery Coal Field

Emery Field Beds	Thickness Range (ft)
<b>Upper Group</b>	
J bed	6 to 13
I bed	6 to 30
<b>Lower Group</b>	
C bed	6 to 20
A bed	6 to 16

## Coal Quality

The quality of coal from the Emery field, particularly the sulfur and ash contents, is quite variable throughout the field. Generally the sulfur and ash contents of the beds from this field are somewhat higher than those for coals from the Book Cliffs and Wasatch Plateau coal fields. The rank of the coal is considered to be high-volatile C bituminous when fresh and unweathered. Shallow coal beds are commonly oxidized or burned for a considerable distance away from the outcrop. Summary coal quality data for several beds from the southern Emery coalfield are shown in Table A8-20, Table A8-21, Table A8-22, and Table A8-23.

Table A8-20. Coal Quality Statistics for the A Bed From the Upper Cretaceous Ferron Sandstone Member of the Mancos Shale in the Southern Emery Coal Field (As-received Basis)

Characteristic	Mean	Maximum	Minimum	Standard Deviation	Sample Population
Ash (%)	13.22	29.33	4.70	8.76	10
Btu/lb	11,979	13,529	9,504	1,393	10
Fixed Carbon (%)	46.32	51.01	37.88	4.38	10
Volatile Matter (%)	37.04	41.97	28.65	4.63	10
Sulfur (%)	0.78	1.46	0.37	0.33	10
Moisture (%)	3.43	5.10	2.60	0.87	10
Carbon (%)	66.63	74.84	53.44	7.70	9
Hydrogen (%)	4.85	5.50	3.88	0.66	9
Nitrogen (%)	1.25	1.47	0.88	0.17	9
Oxygen (%)	10.48	15.50	8.52	2.46	9
Chlorine (%)	0.03	0.06	0.00	0.02	8

Table A8-21. Coal Quality Statistics for the C Bed From the Upper Cretaceous Ferron Sandstone Member of the Mancos Shale in the Southern Emery Coal Field (As-received Basis)

Characteristic	Mean	Maximum	Minimum	Standard Deviation	Sample Population
Ash (%)	14.54	23.60	6.60	6.81	6
Btu/lb	11,275	12,300	9,965	913	6
Fixed Carbon (%)	43.42	47.90	39.60	3.39	6
Volatile Matter (%)	37.79	40.70	33.40	2.79	6
Sulfur (%)	1.26	2.10	0.66	0.63	6
Moisture (%)	4.25	5.21	2.30	1.14	6
Carbon (%)	64.98	68.60	58.90	4.48	4
Hydrogen (%)	5.30	5.70	4.80	0.42	4
Nitrogen (%)	1.18	1.30	1.00	0.15	4
Oxygen (%)	14.65	16.40	12.70	1.74	4
Chlorine (%)	---	---	---	---	---

Table A8-22. Coal Quality Statistics for the G Bed From the Upper Cretaceous Ferron Sandstone Member of the Mancos Shale in the Emery Coal Field (as-received basis).

Characteristic	Mean	Maximum	Minimum	Standard Deviation	Sample Population
Ash (%)	14.15	39.09	3.74	9.40	12
Btu/lb	11,630	13,319	8,020	1,520	12
Fixed Carbon (%)	43.48	50.49	29.69	5.71	12
Volatile Matter (%)	38.06	43.81	25.72	4.62	12
Sulfur (%)	1.03	2.22	0.09	0.83	7
Moisture (%)	4.30	8.80	3.14	1.60	12
Carbon (%)	61.96	72.81	44.81	9.43	7
Hydrogen (%)	4.67	5.10	3.35	0.64	7
Nitrogen (%)	1.24	1.52	1.06	0.18	7
Oxygen (%)	10.06	18.90	5.35	4.28	7
Chlorine (%)	0.03	0.06	0.00	0.03	7

**Table A8-23. Coal Quality Statistics for the I Bed From the Upper Cretaceous Ferron Sandstone Member of the Mancos Shale in the Southern Emery Coal Field (As-received Basis)**

<b>Characteristic</b>	<b>Mean</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Standard Deviation</b>	<b>Sample Population</b>
Ash (%)	8.20	17.26	4.01	2.95	47
Btu/lb	12,179	13,139	8,467	889	43
Fixed Carbon (%)	47.4	51.9	37.3	2.9	46
Volatile Matter (%)	38.91	43.89	34.30	1.72	46
Sulfur (%)	1.12	6.58	0.31	1.11	46
Moisture (%)	5.5	16.7	2.8	2.4	47
Carbon (%)	68.58	73.8	61.25	3.87	13
Hydrogen (%)	5.2	5.7	4.8	0.3	13
Nitrogen (%)	1.26	1.35	1.10	0.07	13
Oxygen (%)	13.06	18.80	5.82	3.42	13
Chlorine (%)	0.05	0.07	0.03	0.02	2

## **Coal Resources**

The Emery coal field is also a major Utah coalfield; Quick, et al. (in preparation) estimate remaining, in-place, minable coal resources for the southern portion of the field to be 948 million tons. Emery County contains 68% of the in-place, minable coal resources of the Emery coal field, or 644 million tons. The Sevier County portion of the Emery coal field contains the remaining 32% of the resource, or 304 million tons, and this portion of the field is likely to be mined later than the Emery County portion of the field.

## **PAST PRODUCTION AND TRENDS**

### **Introduction**

Historically, most Utah coal production has come from underground mines in central Utah, and future production will probably continue to be predominantly from the Book Cliffs, Wasatch Plateau, and the Emery fields in this region. However, most of the easy-to-mine coal in this region will likely be depleted in the next 20 to 25 years, and coal from elsewhere in Utah will likely need to be mined to provide fuel for the state's power plants. One nearby field with coal resources favorable for mining is the Henry Mountains coal field.

### **Henry Mountains Coal Field**

Coal in the Henry Mountains coal field has been mined in the past on a very limited scale from both the Ferron Sandstone Member of the Mancos Shale and Muley Canyon Sandstone. This coal was used locally to supply ranchers and residents of nearby towns (Doelling 1972b). Doelling (1972b) estimated the total tonnage removed from the field at about 9,000 tons, with most of it coming from the Ferron.

Ferron coal was first developed at the south end of the coal field at the Stanton mine. A couple thousand tons of coal was mined intermittently between 1888 and 1900 to supply gold dredges on the Colorado River to the south (Doelling 1972b). Small-scale mining of Ferron coal took place over a longer period at the far northern end of the field near Factory Butte. Mining in this area began in 1908 and continued sporadically up through the 1970s. From 1908 through the 1950s, underground coal mining removed about 5,900 tons for local use. Later, the Atlas-Dirty Devil Mining Company briefly attempted strip mining the coal near Factory Butte in the late 1970s. This company opened a surface mine in June 1978, trucked the coal to Green River, and sent a test shipment by rail to the power plant at Moapa, Nevada (Uresk 1979). Problems with coal quality prevented this operation from reaching full production.

The Muley Canyon coals were first developed around 1914 by tunneling into outcrops at the northern extent of this unit. Several small mines were opened along Sweetwater and Dugout creeks to supply coal for local use (Hunt, et al. 1953). Hunt et al. (1953) claim this coal was also later used to fuel a rig drilling a couple of test wells in the Green River Desert. The last known activity at these mines was in the 1940s (Doelling 1972b), and the total coal removed from these mines is estimated to be about 1,000 tons.

During the mid 1970s, AMAX Coal Company, Cayman Corporation, Consolidation Coal Company, Gulf Mineral Resources Company, and the Federal Government carried out widespread exploration on lands covering most of the Muley Canyon coal area. The primary interest at the time was evaluating surface-minable coal deposits, but environmental concerns and limitations, particularly bison herd habitat, eventually caused all prospecting areas to be dropped by 1983. The availability of the exploration data from the combined efforts of all the parties active in the 1970s has allowed the delineation of more than 120 million tons of deep Muley Canyon coal resources that could be mined with less surface disturbance than the originally anticipated surface mines.

## **Wasatch Plateau Coal Field**

The Wasatch Plateau coal field covers parts of Carbon, Emery, Sanpete, and Sevier counties. Overall, this field has both the greatest annual and greatest cumulative coal production of any coal field in the State of Utah (Utah Department of Natural Resources 2003). Coal in this field was first developed in Carbon County during the late 19th century. Over the years, production has expanded from the northern, Carbon County portion of the field to the central and southern parts of the field in Emery and Sevier counties. The Sanpete County portion of the field is generally deep and has not been mined. Cumulative production from more than 80 mines through 2001 has totaled 523.7 million tons.

In 2001, eight active mines in this field produced 21.92 million tons of coal, or about 81% of the state's total. Production from this field has increased rapidly since the mid-1980s, doubling since 1986.

## **Emery Coalfield**

Consolidation Coal Company idled the Emery coal mine in 1990, and through 1994 the activity at the mine was limited to shipping a very small quantity of coal from its stockpile. In 1995, Consolidation Coal decided to seal the portals of the mine and limit maintenance to pumping water to keep the mine from flooding. In early 2002, the company announced plans to re-open the Emery mine and did so by the end of that year.

Production from the Emery coal field has been erratic. Falling coal prices and the lack of nearby rail transportation have undoubtedly hindered large-scale development of the abundant coal resources from this field. Total production from the field through 2001 was about 9.5 million tons (Utah Department of Natural Resources 2003).

## **CURRENT PRODUCTION ACTIVITIES**

### **Introduction**

According to U.S. Mine Safety and Health Administration records, Utah's 2002 coal production was 24.7 million tons, a significant drop from the 2001 level of 27.0 million tons. A weak U.S. economy in 2002 led the average mine-mouth coal price to drop a few percent from 2001, but coal prices should rebound if the U.S. economy starts to grow in late 2003. Most of Utah's coal production comes from large, highly productive mines equipped with longwall mining machines. Four of Utah's mines produced more than 3 million tons in 2002 and rank among the nation's largest underground coal mines.

### **Coal Industry Structure**

The Utah coal industry is highly competitive and production over time has steadily become concentrated among fewer companies with fewer, but larger mines. For example, Utah had 29 mines operated by 16 companies in 1982; however, by 2001 only 11 coal mines were operated by 5 parent coal companies. In addition to raw coal producers, one company, DTE Utah Synfuel (a subsidiary of Detroit Edison), processes and pelletizes coal for sale as a synthetic fuel. As of 2003, the five parent coal companies operating Utah coal mines are Andalex Resources Incorporated (three mines), Canyon Fuel Company (three mines), CONSOL Energy Incorporated (1 mine), CO-OP Mining Company (one mine), and Interwest Mining Company (one mine). Cyprus Plateau Mining Company exited the Utah coal mining business as recently as 2000, and Lodestar Mining Incorporated shut its last Utah coal mine in early 2003 as a result of bankruptcy.

#### **Andalex Resources Incorporated**

Andalex Resources has operated coal mines in Utah since 1980, when it opened the Tower Division to operate the Aberdeen, Apex, Centennial, and Pinnacle mines in the Book Cliffs field northeast of Price. In 2003, mining at the Tower Division is currently limited to continuous miner operations, but the mine has requested some new Federal leases to the north of the existing leases in the hope of restarting longwall mining there. Andalex, through its subsidiary Genwal Resources, operates a second coal mine, the Crandall Canyon mine, which is located in the Wasatch Plateau coal field. Andalex purchased its 50% interest in this company in 1994 from Nevada Power; the Intermountain Power Agency (IPA) owns the remaining 50% of Genwal Resources. Longwall reserves at this mine were exhausted in early 2003, and the mine will decrease production as it reverts to a continuous miner operation. Andalex's third mine, West Ridge, was opened in the Book Cliffs coal field in 2000 on leases it purchased from British Petroleum in 1997. Like the Crandall Canyon mine, West Ridge mine is operated by Andalex, but jointly owned by Andalex and the IPA through a company named West Ridge Resources. The West Ridge mine had a longwall mining machine installed in 2001. Production in 2002 from the Tower Division, Crandall Canyon, and West Ridge mines was 0.7, 3.3, and 2.3 million tons, respectively. These three mine sites accounted for 25% of Utah's 2002 coal production.

#### **Canyon Fuel Company, LLC**

Canyon Fuel Company operated three coal mines with longwall machines in Utah in 2002. Canyon Fuel Company is owned by the parent company Arch Coal Company (>99%). The company originally included a 9% interest in the Los Angeles Export Terminal Company, but during 2001, Canyon Fuel wrote off the value of its investment in that bankrupt terminal, and the terminal was dismantled in 2003. The three Utah mines operated by Canyon Fuel are the Dugout Canyon, Skyline, and SUFCO mines.

The Dugout Canyon mine, opened in 1998, is in the Book Cliffs coal field, while the Skyline and SUFCO mines are in the Wasatch Plateau coal field. During 2002, these three mines produced a combined total of 13.15 million tons, with 2.08 at Dugout Canyon, 3.48 at Skyline, and 7.60 at SUFCO. Canyon Fuel's mines accounted for 53% of the annual tonnage of coal produced in Utah in 2002. However, in 2003, low coal prices, a depressed market, and difficult mining conditions caused Canyon Fuel to announce that the Skyline mine would be idled in the second quarter of 2004. Although that mine has undeveloped resources on leases to the north, they will not be developed until the coal market improves according to the company statement.

### **CO-OP Mining Company**

The CO-OP Mining Company, a family-owned company, operates the Bear Canyon #1 and #3 mines; the Bear Canyon #2 was idled in 2001. These mines use continuous mining machinery to recover the coal. During 2002, these two mines in the Wasatch Plateau coal field produced a combined total of 0.96 million tons, or about 4% of the state's total for that year. In 1997, the company purchased the Mohrland property from the IPA to provide at least 30 million tons of coal resources for future mining development. This 3,000-acre tract lies due east of the Bear Canyon #1 mine, but is separated from it by a major fault.

### **Interwest Mining Company**

In 2002, PacifiCorp subsidiary Interwest Mining Company operated just one longwall mine in Utah, the Deer Creek mine. This mine produced 3.98 million tons of coal in 2002, or 16% of the state's total coal production for that year. This mine is located in the Wasatch Plateau coal field. The life of the Deer Creek mine was extended in 1999 with the acquisition of the Mill Fork Federal lease tract, which added another 46 million tons of coal to the company holdings.

### **CONSOL Energy Incorporated**

CONSOL Energy reopened the Emery mine in late 2002 after being idle since 1990. Production from this mine in 2002 totaled 0.03 million tons, or one-tenth of one percent of the state's total for that year. This is the only mine operating in the Emery coal field. From 1998 through 2002, Utah has seen the closure of the Star Point, Trail Mountain, and White Oak mines in the Wasatch Plateau coal field, and the Soldier Canyon and Willow Creek mines in the Book Cliffs coal field; the loss of all this productive capacity probably has created a market opportunity that the Emery mine can exploit to remain competitive. This market opportunity will also be enhanced as the Crandall Canyon mine stops longwall production in 2003 and reverts to a smaller, continuous miner operation. CONSOL hopes that the loss of productive capacity at other Utah mines in recent years will allow the Emery mine to ramp up production and eventually install a longwall machine.

### **Coal Markets**

Since the beginning of the new millennia, Utah has experienced a contraction in the number of market segments consuming its coal (Utah Department of Natural Resources 2003). During the late 1990s, coal exports to Pacific Rim nations accounted for 10% of Utah coal production, but by 2003 a strong U.S. dollar, strong competition from Australian and Indonesian producers, and weak Asian economies combined to eliminate an overseas market for Utah coal. Also, the late-2002 final closure of the Geneva Steel coke ovens permanently ended the small coking market for Utah coal.

Utah's main coal market is at electric utility and cogeneration plants primarily in Utah, Nevada, and California. This market segment has traditionally consumed about 75% of the coal produced in Utah, and with the loss of the export market, this market segment's share will increase. The second largest market

for Utah coal is the industrial sector, which has historically consumed about 13% of Utah coal production. The final segment supplied by Utah coal producers is the residential and commercial market; this segment has traditionally consumed 1 or 2% of annual production. Even with the loss of the export and coking coal markets, demand for Utah coal is likely to require annual coal production near 25 million tons for the foreseeable future. Should the plans to expand Utah's electric generation capacity at the Hunter or IPA power stations materialize in the next 10 years, the annual demand for Utah coal could rise to the 30 million ton level. In spite of increasing environmental regulation of emissions from coal-fired power plants, coal still remains a low-cost fuel for electricity generation.

Extraction of Utah coal has been accelerating at a rapid pace in the last 20 years. A time span of 111 years was needed to produce the first 415 million tons of coal from Utah, but only 20 more years were required to produce the second 415 million tons (e.g., by 2001). The next 415 million tons will probably be extracted in 15 years, or by about 2016. Previous UGS work for the BLM identified about 960 million tons of potentially recoverable coal in the Carbon and Emery counties portion of the Book Cliffs and Wasatch Plateau. This estimate was optimistic because it did not take into account site-specific problems in certain areas such as inferior coal quality, losses owing to problems like unmanageable roof and floor, lands that may be unacceptable for leasing, or difficulties such as unexpectedly high levels of water or gas infusions that may hinder actual coal recovery in some areas. At best, these reserves could provide all the coal needed to supply traditional markets for the next 30 years. However, in spite of the potential of the Book Cliffs and Wasatch Plateau fields in Carbon and Emery counties to hypothetically provide all the coal needed by current markets, one mine has reopened in 2002 in the Emery coal field, showing that other market forces such as ease of permitting, proximity to specific customers, or restrictive coal ownership patterns may push coal production into fields outside the Book Cliffs and Wasatch Plateau fields in the next 30 years before the reserves in the latter fields are fully depleted. Therefore, alternative supply regions, such as the Emery and Henry Mountains coal fields, need to be kept open for potential future development in the event there is unanticipated early reserve depletion or abandonment in currently operating areas.

## **REASONABLY FORESEEABLE DEVELOPMENT**

### **Introduction**

While it is impossible to know precisely when and where minable coal resources will be developed in the next 15 or 30 years, the coal resources that are of minable thickness and at favorable depths can be identified as potentially recoverable in the fields outside the traditional mining areas of the Book Cliffs and Wasatch Plateau coal fields in Carbon and Emery counties. Within the Richfield planning area, there are three coal areas that are attractive for future coal mining development. They are, in decreasing order of development potential, the Wasatch Plateau coal field of Sanpete and Sevier counties, the Emery coal field of Sevier County, and the Henry Mountains coal field of Garfield and Wayne counties.

### **Wasatch Plateau Coal Field (Sanpete and Sevier Counties)**

Based on work by the UGS for the BLM, an estimated recoverable resource base of 773.8 million tons of unleased coal is available for mining in the Wasatch Plateau coal field. About 162.8 million tons are likely to be mined in the period from 2003 through 2017, along with the already leased coal resources. Of the coal to be mined in the first 15-year period, about 101 million tons will come from the Carbon-Emery portion to the Wasatch Plateau, while 51.5 million tons is estimated to be recovered from the Sevier County portion near the SUFCO mine (see Table A8-24).



Another 621.0 million tons of recoverable coal is available for mining from 2018 through 2032 and beyond. About 61% of the coal to be recovered in the second 15-year period is expected to come from Carbon and Emery counties, and 39% is expected to come from Sanpete and Sevier counties (see Table A8-24). More than 95% of the coal identified as available for mining in the next 30 years lies within 0.75 miles of a thickness measurement point or in the demonstrated resource reliability category (Wood, et al. 1983). In total, the Sanpete and Sevier counties portion of the Wasatch Plateau contains about 291.1 million tons of recoverable coal.

Table A8-24. Remaining, In-place, Demonstrated (95%) Unleased Resources by Mining Period for the Wasatch Plateau Coal Field

Mining Period	Counties	In-place	Recoverable
2003-2017	Carbon-Emery	148.7	101.3
2018-2032+	Carbon-Emery	558.0	381.3
2003-2017	Sanpete-Sevier	73.5	51.5
2018-2032+	Sanpete-Sevier	342.3	239.7
<b>Total</b>	<b>All Counties</b>	<b>1,122.5</b>	<b>773.8</b>

Given in millions of short tons (for coal beds mostly > 6 feet thick, and with > 200 feet, but < 2,500 feet of overburden).

## Emery Coal Field

The UGS has recently reappraised the available coal in the Emery coal field with funding provided by the USGS. Within the Emery coal field, the UGS identified 948 million tons of demonstrated in-place coal resources, the majority of which occur in Emery County (644 million tons), but there are also 304 million tons identified in Sevier County (see Table A8-25). The coal was broken out as either surface or deep minable, with 96% being deep or underground minable. The deep minable coal occurs in eight beds that are 6 feet thick or greater, and the surface minable coal occurs in one bed that is 4 feet thick or greater. The majority of the coal in Sevier County occurs in the A bed (58%), the lowest one stratigraphically. Another 31% of the in-place coal resource occurs in the I bed, with small amounts in the other six coal beds. Recoverable coal was estimated at 65% of the in-place deep coal and 80% of the in-place surface minable coal. Using these recovery factors, there are about 190 million tons of deep recoverable coal, and 9 million tons of surface minable coal in the Sevier County portion of the Emery coal field. The Sevier County minable resources would probably be mined after the Emery County portion of the field, which contains an estimated 304 million tons of recoverable deep minable coal and 141 million tons of recoverable surface minable coal. The Emery County portion of the Emery coal field reserves is sufficient to last at least 30 years, so the Sevier County reserves are likely to be mined only near the end of the 30-year planning horizon.

Table A8-25. Original, In-place, Demonstrated, Movable Coal Resources (Millions of Tons) Given by County for the Southern Emery Coal Field

Mining Period	County	In-place		Recoverable		Total Recoverable
		Surface	Deep	Surface (80%)	Deep (65%)	
2003-17	Emery	0	49	0	32	32
2018-32	Emery	176	419	141	272	413

Mining Period	County	In-place		Recoverable		Total Recoverable
		Surface	Deep	Surface (80%)	Deep (65%)	
2030-50	Sevier	11	292	9	190	199
<b>TOTAL</b>		<b>188</b>	<b>760</b>	<b>150</b>	<b>494</b>	<b>644</b>
From Quick, et al. in preparation; for coal beds averaging > 6 feet thick and with < 2,500 feet of cover.						

## Henry Mountains Coal Field

The Henry Mountains coal field contains two areas in the Richfield planning area that have a slim chance of being mined in the next 30 years, but that may draw some serious attention in the next 50 years. One area, located to the north of Factory Butte in Wayne County, contains surface minable Ferron Sandstone coal. The second area, primarily in Garfield County, contains deep minable Muley Canyon Sandstone coal.

While the Henry Mountains coal field contains hundreds of millions of tons of in-place coal in the Ferron zone, only a small portion of these resources have any chance of being mined in the next 30 years. The Ferron Sandstone Member resources with the best development potential are the surface-minable resources near Factory Butte. These resources are the closest to rail transport and the central Utah power plants, they are thickest and shallowest, and they have been extensively drilled, which would allow for adequate and prompt mine planning. The major drawbacks of these resources are their moderately high sulfur content (2 to 3%) and the small size of the resource. However, as the resources in Carbon and Emery counties dwindle, this area could produce one million tons annually over a 14-year period, and the higher sulfur coal could be blended at a power plant with lower sulfur coal from elsewhere. The in-place and strip-mine recoverable coal resources from the Factory Butte area of the Ferron Sandstone Member are summarized in Table A8-26.

Table A8-26. In-place and Recoverable Coal Resources by Mining Period for the Ferron Sandstone Member in the Henry Mountains Coal Field

Mining Period	In-place	Recoverable (80%)
2030 or beyond	17.60	14.08
Given in millions of short tons (for coal in beds mostly > 6 feet thick and with <100 feet of overburden).		

The coal resources of the Muley Canyon Sandstone in Garfield County originally attracted industry attention for the significant surface-minable tonnages that occur around the periphery of Tarantula Mesa; however, it is unlikely that future surface mining will be permitted within sight of nearby Capitol Reef National Park. Therefore, the deeper Muley Canyon coal resources found under Tarantula Mesa have the best chance of being mined in the foreseeable future because they could be mined with little or no visual impact on Capitol Reef National Park if developed from the east side of Tarantula Mesa. These deep minable resources generally occur as one bed that is 8 to 14 feet thick and has overburden of less than 1,500 feet, which would be ideal for high-efficiency longwall mining methods. While the whole area under Tarantula Mesa contains more than 500 million tons of in-place, deep minable resources in the Muley Canyon, only 179.5 million tons meet the BLM criterion requiring that at least 80% of the resources fall in the demonstrated reliability category. Because little is known of the ease or difficulty of underground mining of coal from the Muley Canyon, a conservative mining recovery factor of 65% was

applied to the demonstrated resources to arrive at an estimated recoverable coal resource of 116.7 million tons (see Table A8-27). This is enough coal to support a longwall mine producing 4 million tons per year for nearly 30 years. The earliest date any potential development of the Muley Canyon coal could occur is estimated to be about 2030.

Table A8-27. In-place and Recoverable Coal Resources by Mining Period for the Muley Canyon Sandstone in the Henry Mountains Coal Field

<b>Mining Period</b>	<b>In-place</b>	<b>Recoverable (65%)</b>
2030 or beyond	179.5	116.7
Given in millions of short tons (for coal in beds mostly > 6 feet thick and between 100 feet and 1,500 feet of overburden).		

## REFERENCES

- Anderson, P.B., 1983, Geologic map of the Pine Canyon quadrangle, Carbon County, Utah: Utah Geological and Mineral Survey Map 72, 14 p., 2 pl.
- Bunnell, M.D., and Holberg, R.J., 1991, Coal beds of the Ferron Sandstone Member in the northern Castle Valley, east-central Utah, in, Chidsey, T.C., Jr., ed., *Geology of east-central Utah*: Utah Geological Association Publication 19, p. 157–172
- Doelling, H.H., 1968, Carcass Canyon coal area, Kaiparowits Plateau, Garfield and Kane Counties, Utah: Utah Geological and Mineralogical Survey Special Studies 25, 23p.
- , 1972a, Central Utah coal fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs, and Emery: Utah Geological and Mineralogical Survey Monograph 3, 572 p.
- , 1972b, Henry Mountains coal field; in Doelling, H.H., and Graham, R.L., eds., *Eastern and northern Utah coal fields*, Utah Geological and Mineralogical Survey Monograph Series no. 2, p. 97–190.
- , and Smith, M.R., 1982, Overview of Utah coal fields, 1982: in Gurgel, K.D., ed., *Proceedings, fifth symposium on the geology of Rocky Mountain coal*, Utah Geological and Mineralogical Survey Bulletin 118, p. 1–26.
- Hatch, J.R., Affolter, R.H., and Law, B.E., 1979, Chemical analyses of coal from the Emery and Ferron Sandstone Members of the Mancos Shale, Henry Mountains field, Wayne and Garfield counties, Utah: U.S. Geological Survey Open-File Report 79-1097, 24 p.
- Hill, R.B., 1982, Depositional environments of the Upper Cretaceous Ferron Sandstone south of Notom, Wayne County, Utah: *Brigham Young University Geology Studies*, v. 29, pt. 2, p. 59–83.
- Hunt, C.B., Averitt, Paul, and Miller, R.L., 1953, *Geology and Geography of the Henry Mountains region*: U.S. Geological Survey Professional Paper 228, 234 p.
- Law, B.E., 1980, Tectonic and sedimentological controls of coal bed depositional patterns in Upper Cretaceous Emery Sandstone, Henry Mountains coal field, Utah: in Picard, M.D., ed., *Henry Mountains Symposium*, Utah Geological Association Guidebook 8, p. 323–335.
- Lupton, C.T., 1916, *Geology and coal resources of the Castle Valley in Carbon, Emery, and Sevier counties*, Utah: U.S. Geological Survey Bulletin 628, 84 p.
- Quick, J.C., Wakefield, S., Hucka, B.P., and Tabet, D.E., in preparation, *Available coal resources in seven 7.5 minute quadrangles in the southern Emery coalfield, Emery and Sevier counties, Utah*: Utah Geological Survey Special Study.
- Tabet, D.E., 1999, *Coal resources of the Henry Mountains coalfield*: Utah Geological Survey Open-File Report 362, 32 p., 6 plates, scale 1:100,000.
- , Hucka, B.P., and Sommer, S.N., 1995a, *The resinite resources of selected coal seams of the Book Cliffs and Wasatch Plateau coal fields of central Utah*: Utah Geological Survey Report of Investigation 225, 19 p.

- , 1995b, Maps of total Ferron coal, depth to the top, and vitrinite reflectance for the Ferron Sandstone Member of the Mancos Shale, central Utah: Utah Geological Survey Open-file Report 329, 3 plates, 1:250,000.
- Uresk, Jack, 1979, Sedimentary environment of the Cretaceous Ferron Sandstone near Caineville, Utah: Brigham Young University Geology Studies, v. 26, pt. 2, p. 81–100.
- Utah Department of Natural Resources, 2003, 2001 Annual review and forecast of Utah coal production and distribution: Department of Natural Resources report, 24 p., 6 appendices, 2 maps.
- Vaninetti, G.E., and Busch, C.F., 1981, A utility perspective on the significance of mineral analysis of ash data: preprint of a paper presented at the First Coal Testing Conference, Lexington, Kentucky, March 1981, 10 p.
- Wood, G.H., Jr., Kehn, T.H., Carter, M.D., and Culbertson, W.C., 1983, Coal resource classification system of the U.S. Geological Survey: U.S. Geological Survey Circular 891, 65 p.

# COAL UNSUITABILITY REPORT HENRY MOUNTAINS COAL FIELD

---

## INTRODUCTION

The Bureau of Land Management has the responsibility for implementing Federal regulations 43 CFR 3461, Federal Lands Review: Unsuitability for Mining. The general unsuitability criteria, the Federal land review, and the prohibitions against mining are derived from the applicable sections of the Surface Mining Control and Reclamation Act of 1977 [30 U.S.C. 1272(a), (b), (e)]. This review of coal unsuitability is in conjunction with the revision of the existing land use plan and the development of a Resource Management Plan for the Richfield Field Office.

As addressed at 43 CFR 3420.1-4, the Secretary of the Interior may not hold a lease sale of public land containing coal deposits, unless the land is subject to a comprehensive land use plan. Only those lands that have coal resources with development potential may be considered as acceptable for further consideration for leasing. The coal resources, which are evaluated for unsuitability, have been delineated in a report, Coal Resource Evaluation of the Henry Mountains Coal Field, Garfield and Wayne Counties, Utah (2004). The coal report identifies public land that has a coal resource that is to be considered for coal leasing through the land use planning.

This report addresses the unsuitability of the coal resources that have potential for development in the Henry Mountains coal field. Following the identification of the coal resources with development potential, the Bureau of Land Management shall determine whether areas are unsuitable for all or certain stipulated methods of mining. The Department of the Interior has developed 20 criteria that are used for this determination, which are presented at 43 CFR 3461.5.

## GEOLOGIC SETTING

The Henry Mountains coal field contains predominately sedimentary strata, which are Jurassic and Cretaceous in age. The coal field is ovate in general outline with dimensions that are approximately 48 miles long in a north-south direction and as much as 18 miles wide in an east-west direction. The Jurassic strata crop out around the perimeter of the field, and the Cretaceous strata are exposed in the central part. The coal-bearing strata are mapped as part of the Ferron Sandstone and the Muley Canyon Sandstone Members of the Mancos Shale.

The Henry Mountains coal field is in a structural basin, centered on the Henry Mountains syncline. The west limb is defined by the Waterpocket Fold; the east limb coincides with the intrusive rocks of the Henry Mountains. The coal-bearing strata between the limbs of the basin are nearly horizontal.

## LANDS CONSIDERED

Generally, the Henry Mountains coal field is at T. 27-34 S., R. 8-11 E., SLM, Garfield and Wayne Counties, Utah (Map 1), and the coal field contains 302,876 acres. Most of the land in the coal field is owned by the U.S., but State and privately owned lands are also interspersed with the Federal lands. The Federal lands are administered by the Richfield Field Office of the Bureau of Land Management. Currently, no Federal coal leases are authorized on public lands located within the Henry Mountains coal field.

## COAL RESOURCES

A total of 2,209.6 million tons of in-place coal has been identified in the Henry Mountains coal field. This estimate is from the coal report, which is based mostly on resource information from Tabet (1999, 2000).

In the coal report, coal resources that are greater than 2 feet in thickness and that have less than 100 feet of overburden are considered to have potential for development by surface mining methods. Underground, conventional, mining methods are considered applicable to coal resources that are 6 feet or greater in thickness and that have a depth of 100 feet or more.

An exception to the surface and underground parameters was made at Factory Butte at T. 27 S., R. 9 E, where a 270 acre area has slightly greater than 100 feet of overburden. Since the majority of the coal resource at Factory Butte meets the parameters for surface mining, this coal resource that exceeded the 100-foot depth parameter was designated as a surface minable resource.

Surface minable coal resources total approximately 466.1 million tons and by underground minable coal resources total approximately 1,283.6 million tons. Thus, the total coal resource that is considered favorable for mining by surface or underground methods is 1,749.7 million tons. The coal resources that are considered to have development potential are displayed on Map 2. Ownership of the land with coal resources that has development potential is shown in Table A8-28.

Table A8-28. Henry Mountains Coal Resources

<b>Land Status</b>	<b>Surface Minal Acres</b>	<b>Underground Minal Acres</b>
BLM	36,028	50,512
NPS	1,170	756
State	5,556	3,869
Private	414	1,253
<b>Total</b>	<b>43,168</b>	<b>56,390</b>

Split ownership of private surface and Federal minerals is not presented in the above totals, due to limitations of the current GIS data base. The unsuitability criteria are applied to the Federal lands containing coal resources, as defined at 43 CFR 3400.0-5(o) and required by the regulations at 43 CFR 3461.2-1.

## EVALUATION OF THE UNSUITABILITY CRITERIA

The coal resources with development potential are assessed for the unsuitability criteria as outlined at 43 CFR 3461.5. Underground mining of coal deposits is exempt from the criteria, where there would be no surface coal mining operations as stated at 3461.1.1(a). Surface mining operations include surface operations and surface impacts incident to an underground mine as stated at 43 CFR 3400.0-5(mm). In addition, at 43 CFR 3461.1(b), where underground mining will include surface operations and surface impacts on Federal lands to which a criterion applies, the lands shall be assessed as unsuitable unless an exception or exemption applies. Each criterion is subject to exceptions and/or exemptions as prescribed in the regulations.

As stated above, the criteria are applied to the Federal lands with coal resources that are identified as having development potential.

## Criterion 1

**Summary of the Criterion:** All Federal lands included in the following land systems or categories shall be considered unsuitable: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers System, National Recreation Areas, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and Federal lands in incorporated cities, towns, and villages.

1,926 acres of land with the identified coal resources are included within Capitol Reef National Park (Map 1). This land is deemed to be unsuitable for coal leasing. None of the remaining coal resources with development potential are contained within any of the other listed land systems or categories.

The exemptions for valid existing rights do not apply.

## Criterion 2

**Summary of the Criterion:** Federal lands that are within rights-of-way, easements or surface leases for residential, commercial, industrial, or other public purposes on Federally owned surface shall be considered unsuitable.

Several authorized rights-of-way encompass Federal lands with coal resources having development potential (Map 3). These are listed in Table A8-29 below.

Table A8-29. Authorized Rights-of-Way

Serial Number	Holder	Legal Description	Type	Width (ft)
UTU-047320	Garfield County	T. 31 S., R. 9 E., Sec. 30, 31 T. 32 S., R. 9 E., Sec. 5, 6	Road	50
UTU-051955	Tercero Corp	T. 31 S., R. 9 E., Sec. 33	Water Facility	10
UTU-051980	Garfield County	T. 31 S., R. 8 E., Sec. 23-26	Road	50
UTU-0 094714	Federal Highway Administration	T. 28 S., R. 9 E., Sec. 22	Federal Aid Highway	200
UTU-0 057537	Garkane Power Association	T. 28 S., R. 9 E., Sec. 22	Power Transmission Line	50

The coal resources subject to a right-of-way are considered unsuitable; however, exceptions may be applicable where:

- All or certain types of coal development (e.g., underground mining) will not interfere with the purpose of the right-of-way or easement, or
- The right-of-way or easement was issued for a purpose for which it is not being used,
- The parties involved in the right-of-way or easement agree, in writing, to leasing,
- It is impractical to exclude such areas due to the location of coal and method of mining and such areas or uses can be protected through appropriate stipulations.



The above-listed rights-of-way are subject to surface and/or underground mining methods. Mining by underground methods is exempt and should not interfere with the intended use of a right-of-way facility. Where there could be surface operations and surface impacts associated with underground mining, the impacts would be mitigated, subject to an agreement with the right-of-way holder at the time of a specific leasing proposal. Where the coal resources would be mined by surface methods, the facility could be moved during the mining operations and re-located when the land is reclaimed, again, subject to an agreement with the right-of-way holder. Any agreements with the affected holder of the right-of-way would be negotiated at the time of the specific leasing proposal. The Federal lands subject to the above rights-of-way are considered suitable.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not currently present or authorized.

### Criterion 3

**Summary of the Criterion:** The terms used in this criterion have their meaning set out in the Office of Surface Mining Reclamation and Enforcement regulations at Chapter VII of Title 30 of the Code of Federal Regulations. Federal lands affected by Section 522(e) (4) and (5) of the Surface Mining Control and Reclamation Act of 1977 shall be considered unsuitable. This includes lands within 100 feet of the outside boundary of a public road right-of-way, lands within 100 feet of a cemetery, or lands within 300 feet of any public building, school, church, community or institutional building, public park, or occupied dwelling.

Exceptions are allowed, if a lease may be issued for lands:

- Used as mine access roads or haulage roads that join the right-of-way for a public road;
- For which the Office of Surface Mining and Reclamation and Enforcement has issued a permit to have public roads relocated;
- If, after public notice and opportunity for public hearing in the locality, a written finding is made by the authorized officer that the interests of the public and the landowners affected by mining within 100 feet of a public road will be protected;
- For which owners of occupied dwellings have given written permission to mine within 300 feet of their buildings.

The coal lands of the Henry Mountain Coal Field do not fall within the stated distances of a cemetery, public building, school, church, community or institutional building, or public park.

Federal lands with development potential for coal resources are located within the 100-foot extension of the rights-of-way for a road or highway, which are listed under Criterion 2. Those road and highway rights-of-way are subject to surface and/or underground mining methods. Mining by underground methods is exempt from this review and should not interfere with the intended use of a right-of-way facility. Where the coal resources would be mined by surface methods or a surface operation or impact would be associated with underground mining, the coal would only be leased in compliance with the Office of Surface Mining Reclamation and Enforcement following a public notice and hearing. The Federal lands within the 100-foot extension of road or highway rights-of-way, as listed under Criterion 2, are considered suitable for leasing under this Criterion.

Occupied dwellings are located at T. 31 S., R. 9 E., Sec. 21 at the Starlight Ranch, and T. 31 S., R. 9 E., sec. 32 at the King Ranch. These are furnished dwellings that are not occupied on a long-term basis. Specific distances to the dwellings from the coal resource on Federal land are unknown at this time; however, the distance to the dwellings is believed to be more than 300 feet.

At this time, the Federal lands are considered suitable for mining. If a proposal for leasing is submitted, then appropriate review would be completed with the involvement of the Office of Surface Mining and Reclamation and Enforcement and the public.

## Criterion 4

**Summary of the Criterion:** Federal lands designated as wilderness study areas shall be considered unsuitable while under review by the Administration and the Congress for possible wilderness designation.

Three WSAs encompass lands with coal resources that have development potential by surface or underground mining methods (Map 4). As stated in the Federal regulations at 43 CFR 3461.1, underground mining is exempt from the unsuitability criteria; however, surface operations and surface impacts, which could be associated with underground mining, are unsuitable.

Coal leasing is subject to the Interim Management Policy for Land under Wilderness Review (IMP) in Section B.2.c. of Chapter 3 (Rel. 8-67, 7/5/95), as stated:

*“The coal unsuitability criteria will be applied to all coal lands being considered in the BLM’s planning system. The only BLM-administered lands that will be offered for competitive lease sale are those on which a final wilderness inventory decision has determined that the lands lack wilderness characteristics. Once the Congress has determined that a WSA will not be designated as wilderness, the area may be considered for competitive lease.” (Italics added.)*

All lands that are presently included within the boundaries of a WSA have been determined to have wilderness characteristics.

Under Federal regulation the general exemption for underground mining applies to Federal land in a WSA if there are no surface operations or surface impacts. However, based on IMP, coal lands within a WSA cannot be offered for leasing at the present time.

The total acreage of land within WSAs that is unsuitable by either surface or underground methods is 28,683 acres. Approximately 1,400 acres of State land are included in that figure. However, State land is not part of a WSA and unsuitability under the Federal regulations does not apply to the State minerals.

A WSA is a temporary designation, pending Congress either legislatively designating the land as part of the National Wilderness System or releasing the land from consideration under the Wilderness Act. Federal land that is released by act of Congress would then be considered suitable for coal leasing under this Criterion, because such land would no longer be within a WSA or subject to IMP.

As authorized leases are not present on Federal lands, valid existing rights are non-existent. An exemption for existing leases is not applicable.

## Criterion 5

**Summary of the Criterion:** Scenic Federal lands designated by visual resource management (VRM) analysis as Class I (an area of outstanding scenic quality or high visual sensitivity) but not currently on the National Register of Natural Landmarks shall be considered unsuitable.

Federal lands are being considered for designation as VRM Class I under all the alternatives in the Environmental Impact Statement for the Richfield Field Office Resource Management Plan (RMP) (Map 4). The lands, which are proposed for VRM Class I, are coincident with the designated WSAs.

An exception is allowed for the issuance of a lease if the surface management agency determines that surface coal mining operations will not significantly diminish or adversely affect the scenic quality of the designated area. The Federal lands that would be mined by underground methods are exempt; however, the location of the surface facilities would need to be considered in applying the visual resource objectives of Class I. The lands that would be mined by surface methods are considered unsuitable with the VRM Class I objectives. However, all lands that would be designated as VRM Class I in the RMP are unsuitable for surface and underground mining methods under Criterion 4 due to the coincidental boundaries of WSAs and VRM Class I and due to the non-impairment standard of IMP that would disallow the issuance of a lease within WSAs at the present time.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not currently present or authorized.

## Criterion 6

**Summary of the Criterion:** Federal lands under permit and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments shall be considered unsuitable for the duration of the study.

None of the subject lands are under permit for the described scientific studies. This criterion is not applicable to the subject lands.

## Criterion 7

**Summary of the Criterion:** All publicly or privately owned places which are included in the National Register of Historic Places shall be considered unsuitable.

There are no listed sites within the subject lands that are included on the National Register of Historic Places. This criterion is not applicable.

## Criterion 8

**Summary of the Criterion:** Federal lands designated as natural areas or as National Natural Landmarks shall be considered unsuitable.

None of the subject lands are designated as part of a National Natural Landmark. This criterion is not applicable.

## Criterion 9

**Summary of the Criterion:** Federally designated critical habitat for listed threatened or endangered (T&E) plant and animal species, and habitat proposed to be designated as critical for listed threatened or endangered plant and animal species or species proposed for listing, and habitat for Federal threatened or endangered species which is determined by the Fish and Wildlife Service and the surface management agency to be of essential value and where the presence of threatened or endangered species has been scientifically documented, shall be considered unsuitable.

An exception allows that a lease may be issued and mining operations approved if, after consultation with the Fish and Wildlife Service, it is determined that the proposed activity is not likely to jeopardize the continued existence of the listed species and/or its critical habitat.

Designated critical habitat for the Mexican spotted owl (*Strix occidentalis*) has been delineated by the U.S. Fish and Wildlife Service (Map 5). This critical habitat overlaps 13,753 acres of surface minable coal resources and 22,317 acres of underground minable coal resources.

BLM has completed inventories of Federal land and has identified areas within designated critical habitat which contains the constituent elements for Mexican spotted owl (Attachment 1). The critical habitat, based on the constituent elements and survey work, is also shown on Map 5. The critical habitat with the constituent elements as inventoried by BLM encompasses 576 acres of surface minable coal and 52 acres of underground minable coal.

The lands with coal resources that would be developed by underground mining are exempt from review. Surface operations and impacts are considered unsuitable, unless at the time of leasing, the Fish and Wildlife Service determines that the proposed activity is not likely to jeopardize the continued existence of the listed species.

If surface mining were to occur, the mining would be completed in stages, or mining units, with mining in one area while an adjacent, previously mined-out area would be reclaimed to restore the critical habitat. Thus, with concurrent mining and reclamation, surface mining would not impact all the acreage within a given lease at one time. Also, all of the above listed land with an identified potential for surface mining may not be developed, because the coal reserves that would support a mine could be less than the currently identified coal resource. However, the coal lands contained within the designated critical habitat with the constituent elements for Mexican spotted owl are considered unsuitable for surface coal mining and surface operations and impacts associated with underground mining. The inventoried habitat is also contained within a WSA and is unsuitable for leasing under Criterion 4.

Occurrences of Wright's fishhook cactus (*Sclerocactus wrightiae*) are known and documented in the vicinity of Factory Butte (Attachment 2). Habitat that is considered to be of essential value for this species encompasses the surface minable resource at T. 27-28 S., R. 8-9 E. These documented occurrences and habitat of essential value are not shown on Map 5 because the species could be further threatened by collection if the specific locations or habitat of essential value is included in a public document. The coal resources in vicinity of Factory Butte encompass 2,895 acres of Federal coal resources that are considered unsuitable for leasing.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not currently present or authorized.

## Criterion 10

**Summary of the Criterion:** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as endangered or threatened shall be considered unsuitable.

Habitat for the Mexican spotted owl is determined to be critical or essential by the State of Utah. This land is the same as identified for Criterion 9 (Map 5). The coal lands contained within the identified Mexican spotted owl habitat are considered unsuitable for surface coal mining and surface operations and impacts associated with underground mining. This habitat is also contained within a WSA and is unsuitable for leasing under Criterion 4.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not currently present or authorized.

## Criterion 11

**Summary of the Criterion:** A bald or golden eagle nest or site on Federal lands that is determined to be active, and an appropriate buffer zone of land around the nest site, shall be considered unsuitable. Consideration of availability of habitat of prey species and of terrain shall be included in the determination. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Active eagle nests are not known to be present on the Federal lands under consideration for leasing, based on surveys and knowledge of BLM biologists (Attachment 3). Therefore, this criterion does not apply to the subject lands. If active nests or sites are found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the RMP will be applied.

## Criterion 12

**Summary of the Criterion:** Bald or golden eagle roost and concentration areas on Federal lands, used during migration and wintering, shall be considered unsuitable.

Eagle roosts are not known to be present on the subject lands, therefore, this criterion does not apply. If roosts or concentration areas are found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the RMP will be applied.

## Criterion 13

**Summary of the Criterion:** Federal lands containing a falcon (excluding kestrel) cliff nesting site with an active nest shall be considered unsuitable. A buffer zone will be included around the nest site which considers the availability of habitat for prey species and terrain. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Falcon cliff nesting sites with an active nest are not known to be present on the Federal lands (Attachment 3). This criterion does not apply to the subject lands. If an active cliff nesting site is found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the RMP will be applied.

## Criterion 14

**Summary of the Criterion:** Federal lands which are high priority habitat for a migratory bird species of high Federal interest on a regional or national basis, as determined by the surface management agency and the Fish and Wildlife Service, shall be considered unsuitable.

There is no high priority habitat for migratory bird species on the subject lands. This criterion is not applicable.

## Criterion 15

**Summary of the Criterion:** Federal lands which the surface management agency and state jointly agree are habitat for resident species of fish, wildlife, and plants of high interest to the state and which are

essential for maintaining these priority wildlife and plant species shall be considered unsuitable. Examples of such lands include:

- Active dancing and strutting grounds for sage grouse,
- Winter ranges crucial for deer, antelope, and elk,
- Migration corridor for elk, and
- Extremes of range for plant species.

A lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant long-term impact on the species being protected.

In accordance with the Utah Division of Wildlife Resources, crucial habitat is necessary to sustain the existence and/or perpetuation or introduction of one or more species of historic or existing high interest wildlife during crucial periods of their life cycle. This classification includes all habitats that are highly sensitive to surface disturbance and areas where fish or wildlife management considerations dictate that surface disturbance could not be tolerated by the species.

Coal resources with development potential by surface and underground mining methods are overlain by habitat that is crucial for bison and deer on the Henry Mountains (Maps 6 & 7). The acreage of crucial habitat is identified in Table A8-30.

Table A8-30. Acreage of M inable C oal R esour ces

<b>Crucial Habitat</b>	<b>Surface Methods</b>	<b>Underground Methods</b>
Bison	33,588	56,877
Deer	14,085	30,408

The coal resources within the crucial deer habitat are also included within the boundaries of the crucial bison habitat; thus, the acreage above for the deer is included in the acreage for the bison.

If surface mining were to occur, the mining would be completed in stages, or mining units, with mining in one area while an adjacent, previously mined-out area would be reclaimed to restore the crucial habitat. Thus, with concurrent mining and reclamation, surface mining would not impact all the acreage within a given lease at one time. Also, all the above land with an identified potential for surface mining may not be developed, because the coal reserves that would support a mine could be less than the currently identified coal resource.

This criterion provides that a lease may be issued, if after consultation with the state, a determination is made that all or certain stipulated methods of coal mining will not have a significant long-term impact on the species being protected. Given that exception, depending on the location, acreage, and specifics of an application to lease coal, impacts to the crucial habitat may be mitigated such that surface coal mining would not have a long-term impact to the species.

Underground mining is exempt. However, surface facilities associated with the coal mining could be located within the crucial habitat and could include a mine portal, buildings, and construction of roads. Haulage of mined coal would also be necessary. The location of these facilities and associated haulage roads could be located as to minimize or reduce the impact to the habitat. Surface operations and impacts would not have an adverse, long-term impact on the bison and deer habitat.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not authorized.

## Criterion 16

**Summary of the Criterion:** Federal land in riverine, coastal and special floodplains (100-year recurrence interval) on which the surface management agency determines that mining could not be undertaken without substantial threat of loss of life or property shall be considered unsuitable for all or certain stipulated methods of coal mining.

Federal lands with a coal resource having development potential may be present along some streams, most notably the Fremont River in T. 28 S., R. 9 E., Section 22. Surface mining could be undertaken without substantial threat of loss to life or property. Any mining which is authorized would need to contain lease stipulations to control flooding and potential hazards associated with such events. Underground mining is exempt from review, and surface operations would not result in a substantial threat of loss of life or property. The coal resources having development potential are considered suitable for leasing.

The exemption for substantial legal and financial commitments and on-going mining operations does not apply, since coal exploration and development are not currently present or authorized.

## Criterion 17

**Summary of the Criterion:** Federal lands which have been committed by surface management agency to use as municipal watersheds shall be considered unsuitable.

None of the subject lands with coal resources that have potential for development are within a municipal watershed. This criterion is not applicable.

## Criterion 18

**Summary of the Criterion:** Federal lands with National Resource Waters, including areas identified by states in their water quality management plans and a buffer zone of Federal lands ¼ mile from the outer edge of the far banks of the water, shall be considered unsuitable.

None of the subject lands with coal resources that have potential for development include National Resource Waters which the State of Utah considers as High Quality Waters. This criterion is not applicable.

## Criterion 19

**Summary of the Criterion:** Federal lands identified by the surface management agency, in consultation with the state in which they are located, as alluvial valley floors according to the definition in §3400.0-5(a) of this title, the standards in 30 CFR 822, the final alluvial valley floor guidelines of the Office of Surface Mining Reclamation and Enforcement when published, and approved state programs under the Surface Mining Control and Reclamation Act of 1977, where mining would interrupt, discontinue, or preclude farming, shall be considered unsuitable. Additionally, when mining Federal land outside an alluvial valley floor would materially damage the quantity or quality of water in the surface or underground water systems that would supply alluvial valley floors, the land shall be considered unsuitable.

There are no known conflicts with farming. The Fremont River has a relatively small alluvial valley floor. If surface mining were to occur within the alluvial valley floor, then mining and reclamation would be completed in a manner to minimize disturbances to the hydrologic balance within the permit area by reestablishing the essential hydrologic functions of the alluvial valley floors. Similarly, if mining were to occur outside of the alluvial valley floor, then mining and reclamation would be completed in a manner to minimize disturbances to the hydrologic balance by preserving the essential hydrologic functions. This criterion is not applicable.

## Criterion 20

**Summary of the Criterion:** Federal lands in a state to which is applicable a criterion (i) proposed by the state or Indian tribe located in the planning area, and (ii) adopted by rulemaking by the Secretary, shall be considered unsuitable.

The State of Utah has adopted unsuitability criteria under rule R645-103-300, Utah Criteria for Designating Areas as Unsuitable for Coal Mining and Reclamation Operations. The criteria are similar to the Federal criteria at 43 CFR 3461, which are addressed in this report.

The coal resources that are assessed in this report are not located on tribal lands. An Indian tribe has not proposed or adopted any criteria for coal mining unsuitability that would be applicable to the subject Federal lands.

## SUMMARY OF THE UNSUITABILITY EVALUATION

The coal resources with development potential in the Henry Mountains coal field have been evaluated in consideration of the 20 unsuitability criteria. Based on the criteria, the coal resources which are considered suitable for leasing are shown on Map 8. Coal resources have been determined to be unsuitable for leasing, based on Criteria 4 (WSAs) and 9 (T&E plants). The coal resources criteria were applied to Federal land only. The summary of acreage by land ownership is identified in Table A8-31.

Table A8-31. Acreage of M inable C oal R esour ces

Land Status	Surface Methods	Underground Methods
BLM	4,683	41,842
NPS	0	0

Only Federal surface estate is included in the above totals, since the criteria only apply to Federal lands. Some split estate (private surface and Federal minerals) may not be reflected in the above total, since the GIS data base does not include such information. There is not a significant acreage of split estate in the Henry Mountains coal field.



# 1   **MAPS FOR HENRY MOUNTAINS COAL UNSUITABILITY EVALUATION**

2   Map 1 – Location

3   Map 2 – Land Ownership

4   Map 3 – Rights of Way

5   Map 4 – Wilderness Study Areas

6   Map 5 – Threatened and Endangered Species

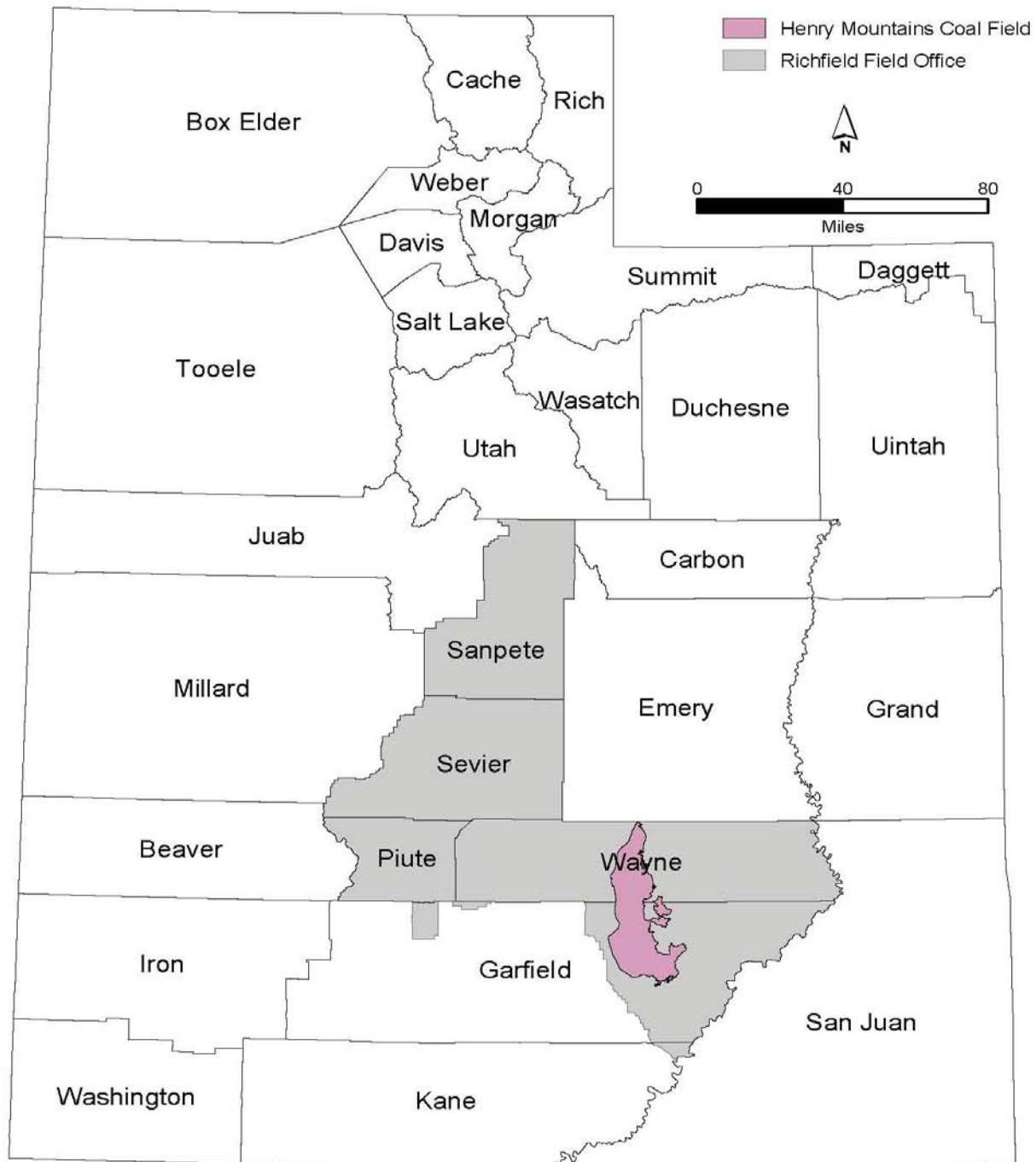
7   Map 6 – Deer Habitat

8   Map 7 – Bison Habitat

9   Map 8 – Henry Mountains Coal Suitability

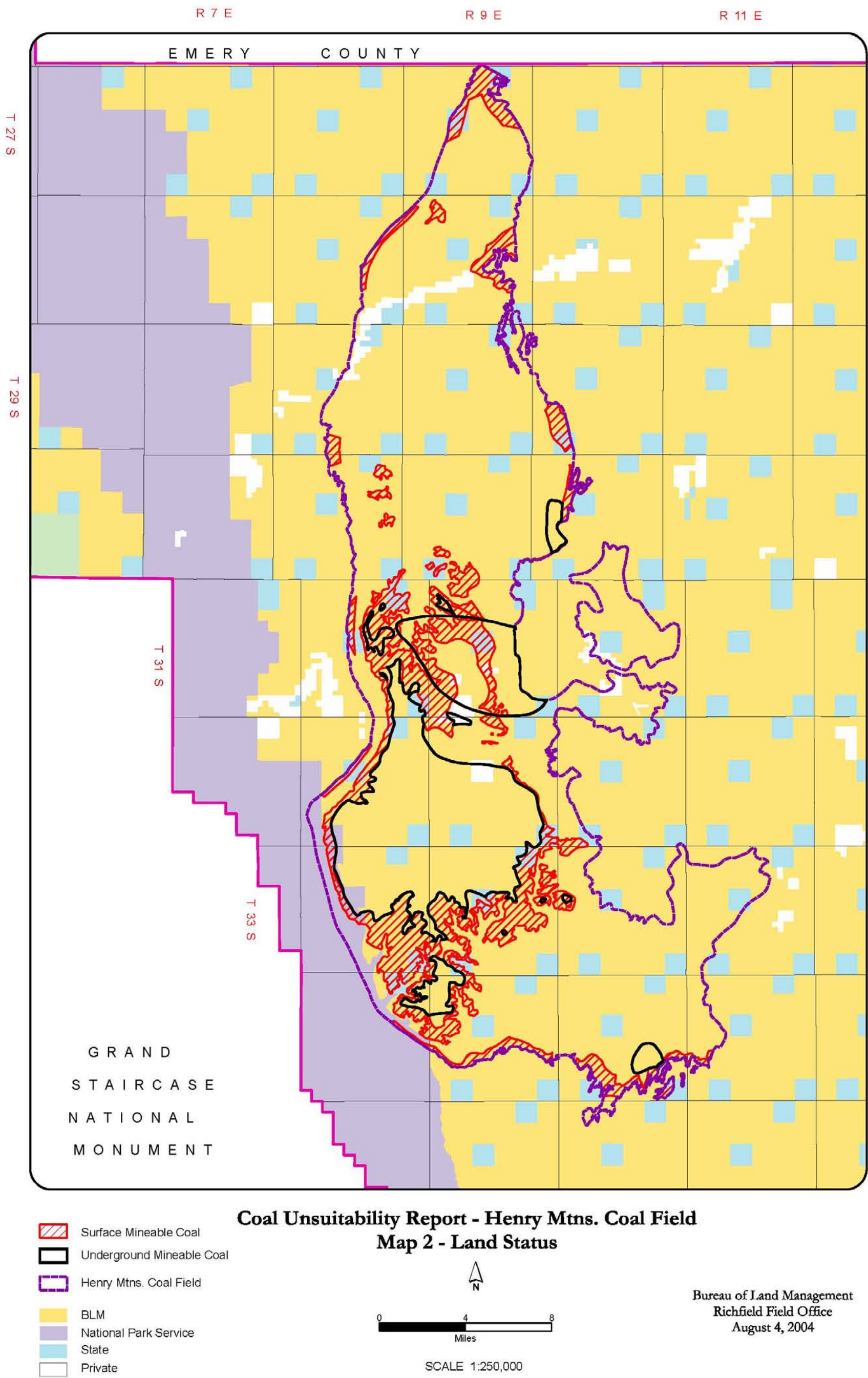
10

Map 1 - General Location Map

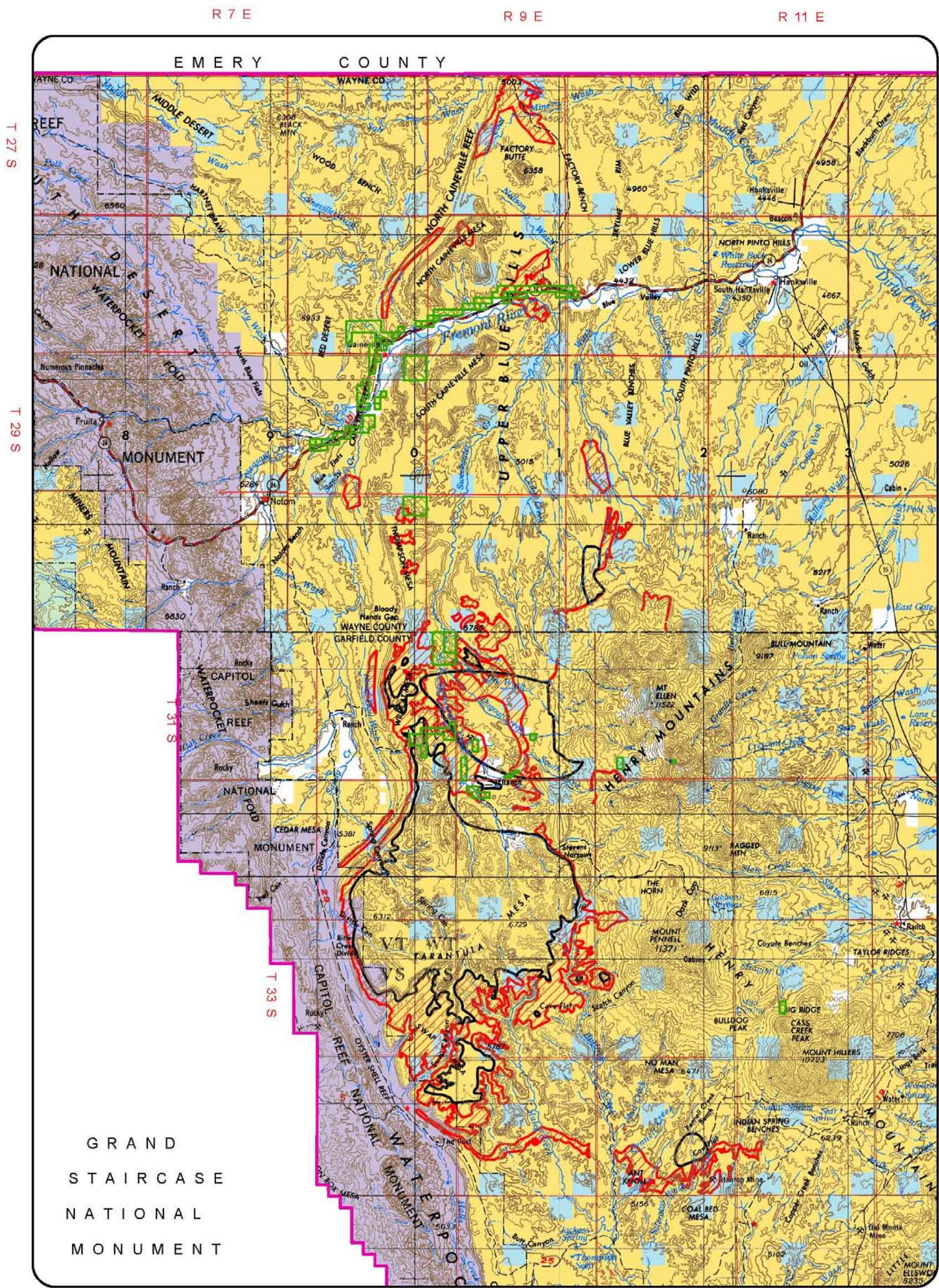


1  
2  
3  
4  
5  
6  
7  
8  
9

**This page intentionally left blank**

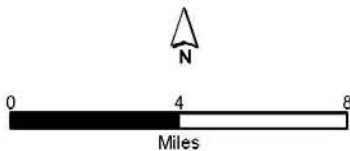






**Coal Unsuitability Report - Henry Mtns. Coal Field**  
**Map 3 - Rights of Way (Criterion 2)**

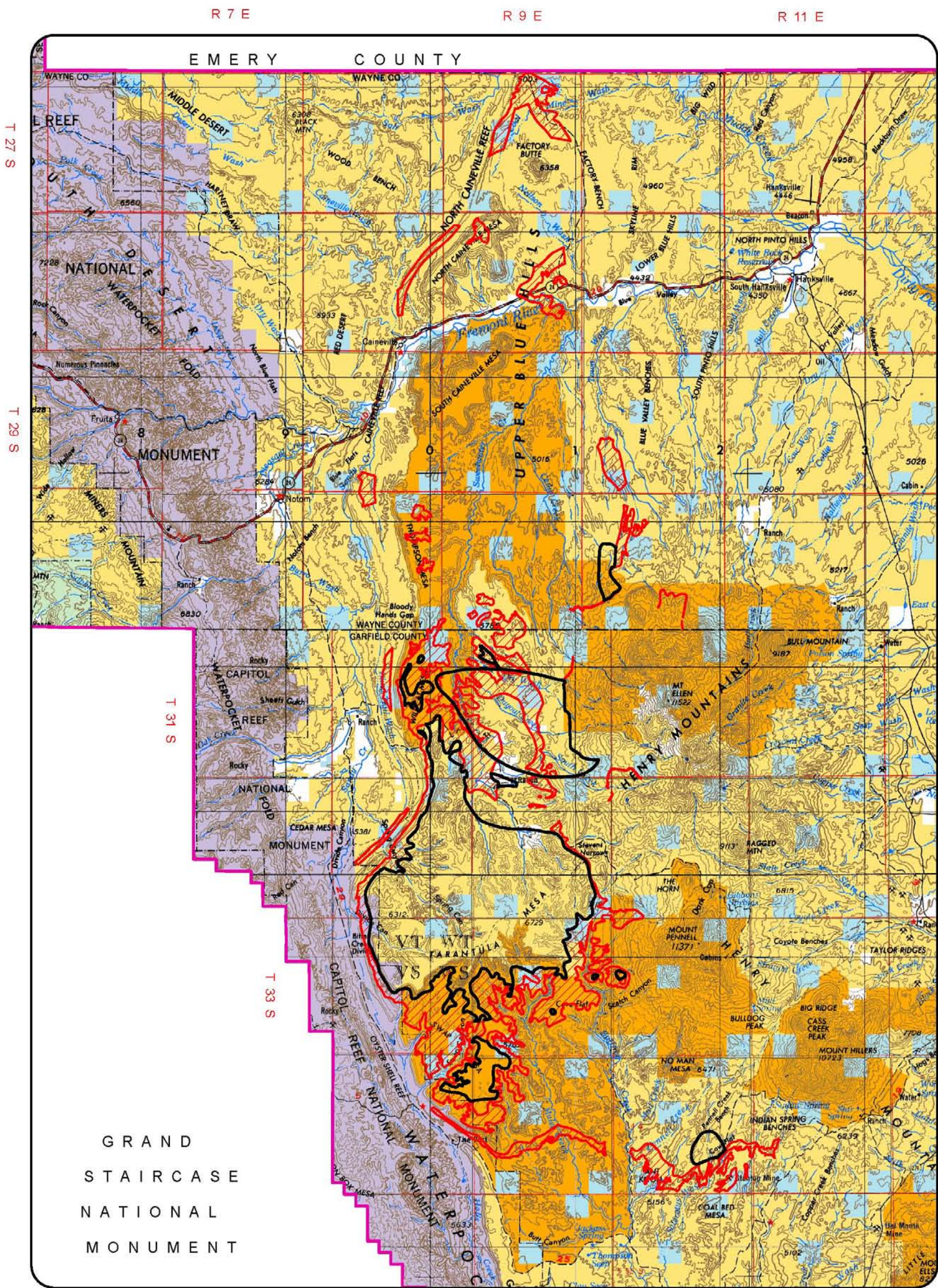
- Surface Mineable Coal
- Underground Mineable Coal
- Rights of Way
- BLM
- National Park Service
- State
- Private



SCALE 1:250,000

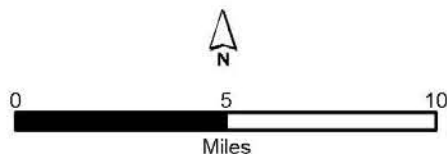
Bureau of Land Management  
Richfield Field Office  
August 4, 2004





- Surface Mineable Coal
- Underground Mineable Coal
- WSA and VRM Class I
- BLM
- National Park Service
- State
- Private

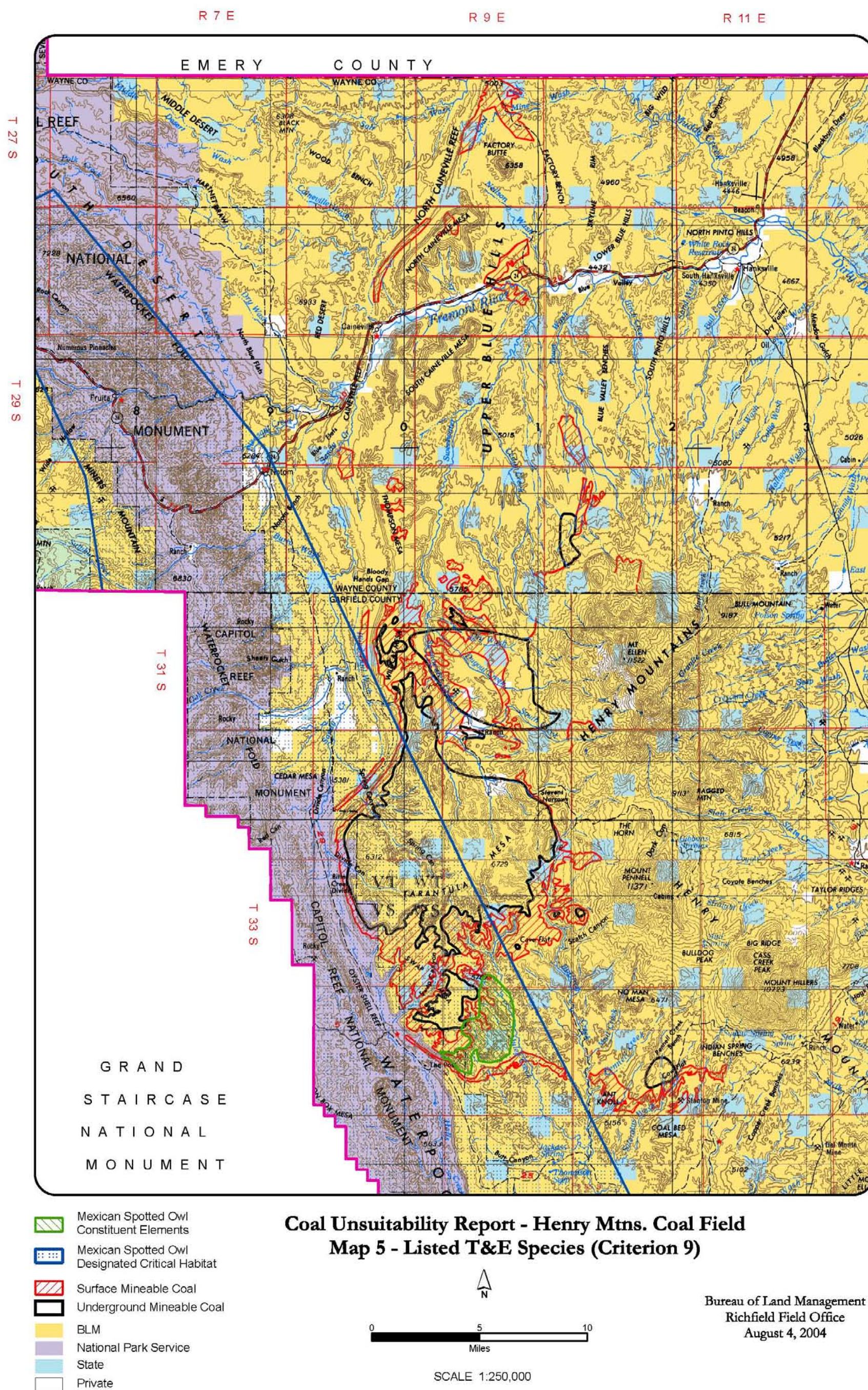
**Coal Unsuitability Report - Henry Mtns. Coal Field**  
**Map 4 - WSA's and VRM Class I (Criteria 4 & 5)**



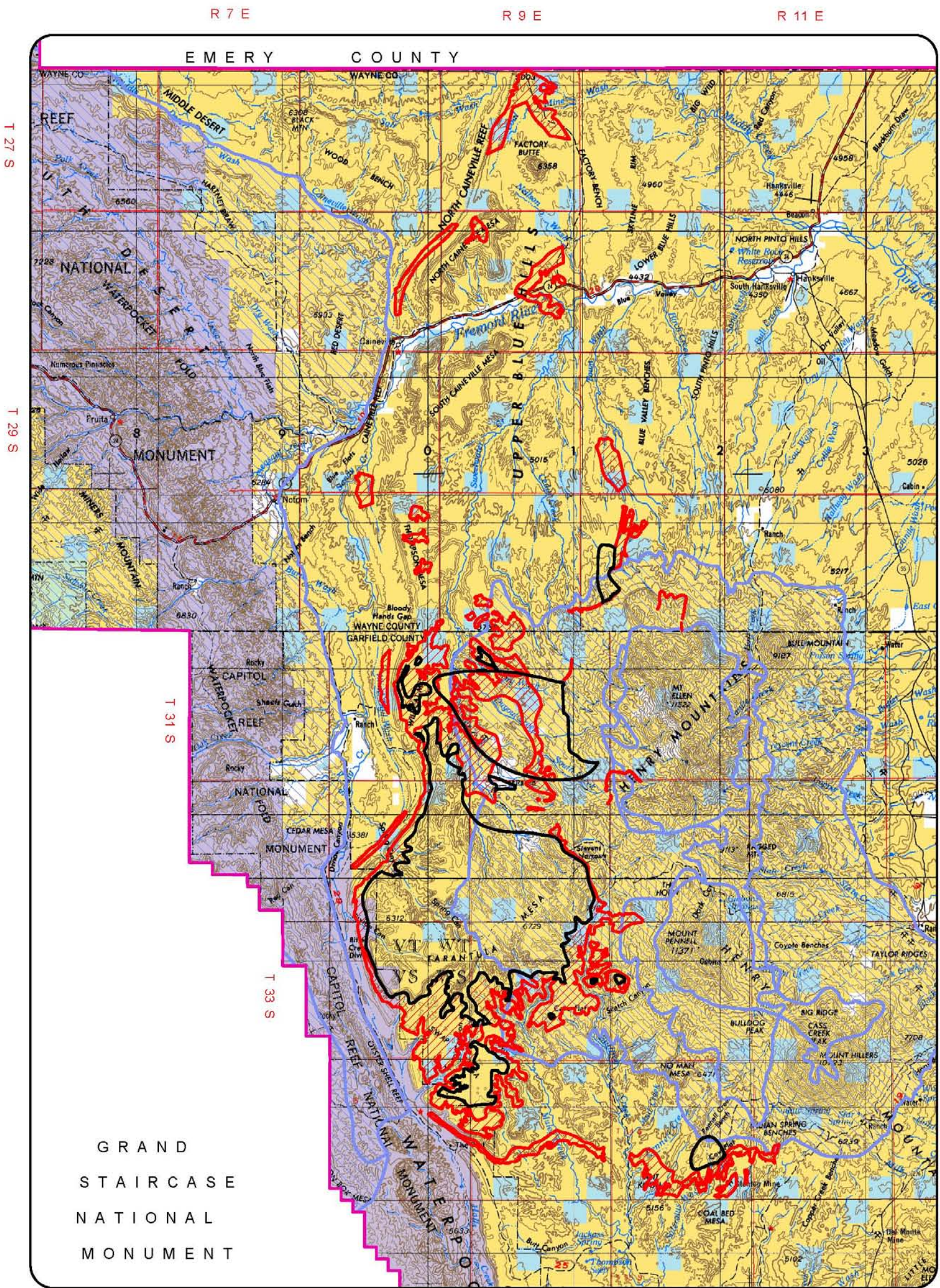
SCALE 1:250,000

Bureau of Land Management  
Richfield Field Office  
August 4, 2004



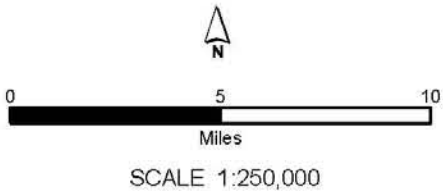






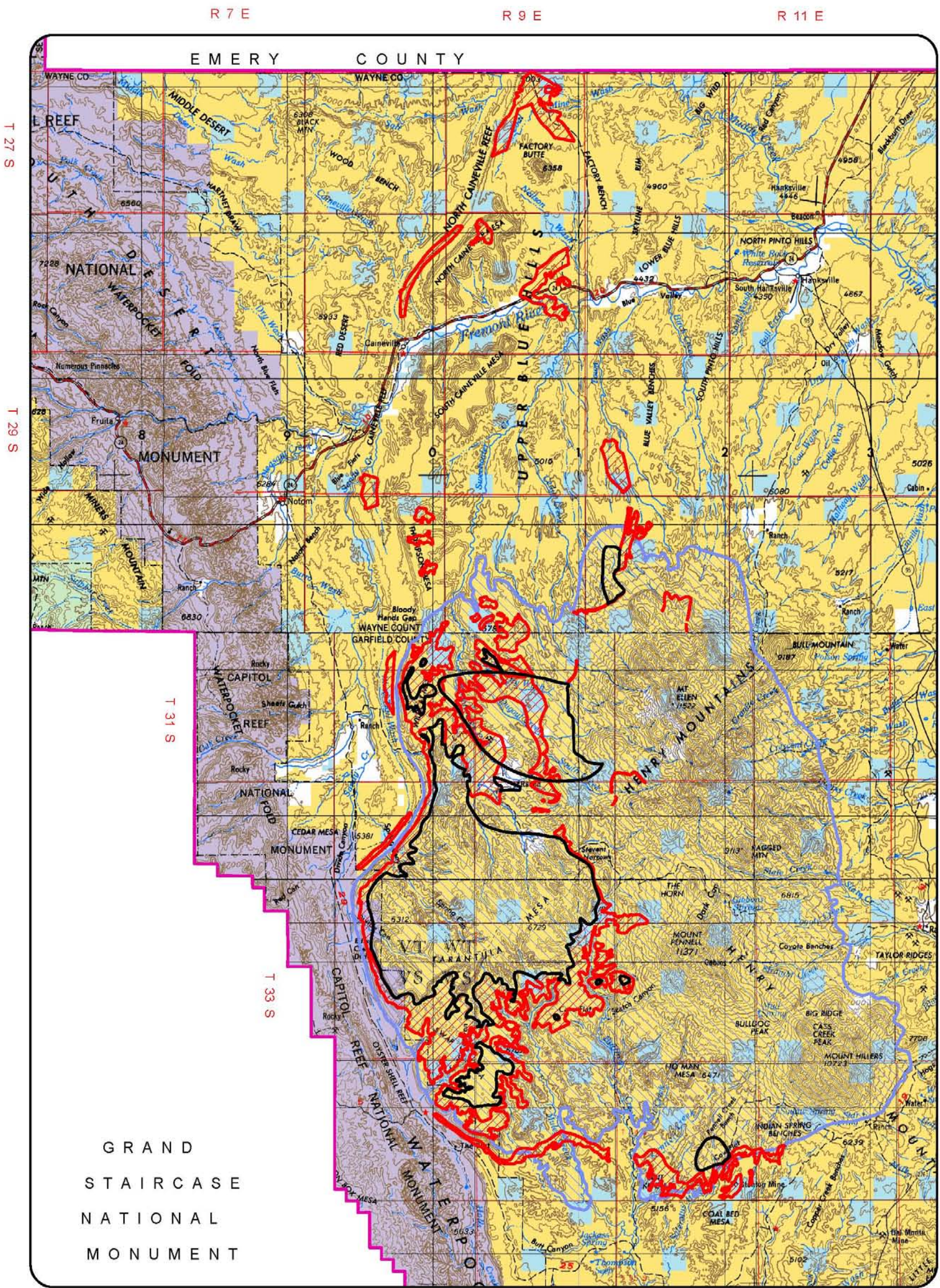
- Crucial Mule Deer Habitat
- Surface Mineable Coal
- Underground Mineable Coal
- BLM
- National Park Service
- State
- Private

**Coal Unsuitability Report - Henry Mtns. Coal Field**  
**Map 6 - Mule Deer Crucial Habitat (Criterion 15)**



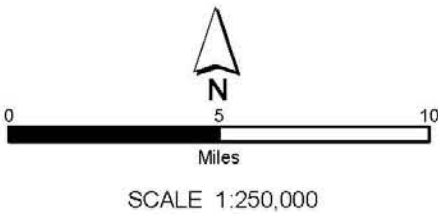
Bureau of Land Management  
Richfield Field Office  
August 4, 2004





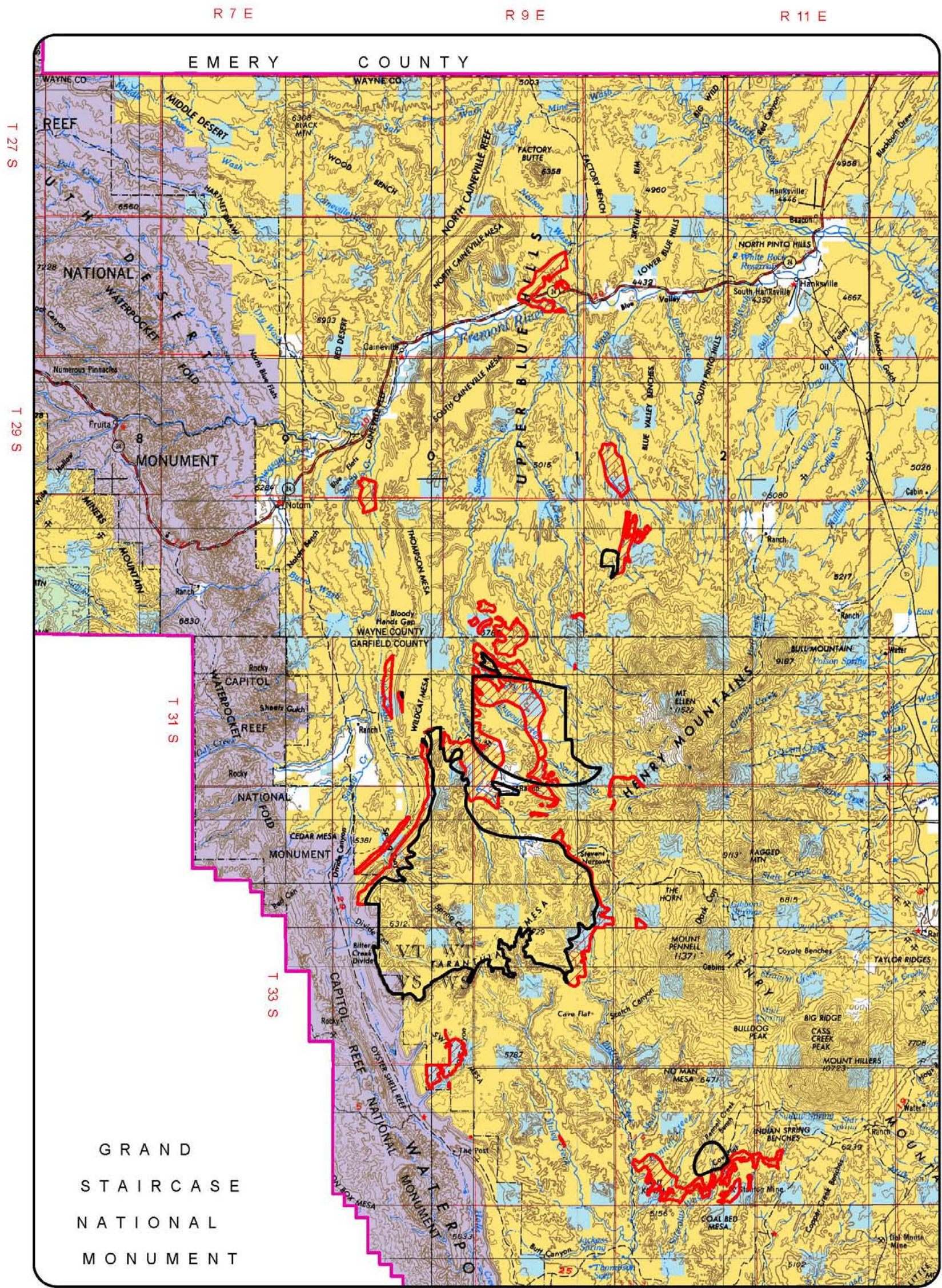
**Coal Unsuitability Report - Henry Mtns. Coal Field**  
**Map 7 - Crucial Bison Habitat (Criterion 15)**

- Crucial Bison Habitat
- Surface Mineable Coal
- Underground Mineable Coal
- BLM
- National Park Service
- State
- Private



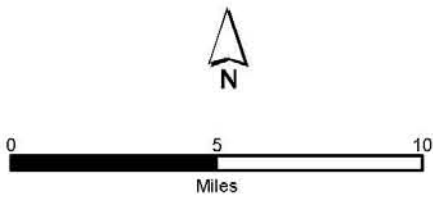
Bureau of Land Management  
Richfield Field Office  
August 4, 2004





**Coal Unsuitability Report - Henry Mtns. Coal Field**  
**Map 8 - Coal Resources Considered Suitable for Leasing**

- Surface Mineable Coal
- Underground Mineable Coal
- BLM
- National Park Service
- State
- Private



SCALE 1:250,000

Bureau of Land Management  
Richfield Field Office  
August 4, 2004



# COAL UNSUITABILITY REPORT WASATCH PLATEAU AND EMERY COAL FIELDS

---

## INTRODUCTION

The Bureau of Land Management (BLM) has the responsibility for implementing Federal regulations 43 CFR 3461, Federal Lands Review: Unsuitability for Mining. The general unsuitability criteria, the Federal land review, and the prohibitions against mining are derived from the applicable sections of the Surface Mining Control and Reclamation Act of 1977 [30 U.S.C. 1272(a), (b), (e)]. This review of coal unsuitability is in conjunction with the revision of the existing land use plan and the development of a Resource Management Plan for the Richfield Field Office.

As addressed at 43 CFR 3420.1-4, the Secretary of the Interior may not hold a lease sale of public land containing coal deposits, unless the land is subject to a comprehensive land use plan. Only those lands that have coal resources with development potential may be considered as acceptable for further consideration for leasing. The coal resources, which are evaluated for unsuitability, have been delineated in a report, Coal Resources of the BLM Richfield Planning Area (2003). The coal report identifies public land that has a coal resource that is to be considered for coal leasing through the land use planning.

This report addresses the unsuitability of the coal resources that have potential for development in the Wasatch Plateau and Emery coal fields. Following the identification of the coal resources with development potential, the Bureau of Land Management shall determine whether areas are unsuitable for all or certain stipulated methods of mining. The Department of the Interior has developed 20 criteria that are used for this determination, which are presented at 43 CFR 3461.5.

## GEOLOGIC SETTING

The Wasatch Plateau coal field is on the eastern side of the Wasatch Plateau, whereas the Emery coal field overlaps the Wasatch Plateau and a portion of the Mancos Shale Lowland. The coal fields are elongated in a northeast direction.

The coal deposits in the Emery and Wasatch Plateau coal fields are Cretaceous in age. The Emery coal beds are in the Ferron Sandstone Member of the Mancos Shale and stratigraphically below the Wasatch Plateau coal beds which are in the Blackhawk Formation.

The Wasatch Plateau is an escarpment on the east side of the plateau, and the coal beds have gentle westward dips with local displacement by faulting. The Emery field is located to the east of and topographically lower than the Wasatch Plateau field.

## LANDS CONSIDERED

The Emery and Wasatch Plateau coal fields are located in central Utah (Map 1). The Emery coal field is in Sevier, Emery, and Carbon Counties, whereas the Wasatch Plateau coal field is also in Sanpete County (Map 1). This unsuitability report addresses only the coal resources which have development potential in Sevier and Sanpete County (Map 2). The coal resources in these two counties are within the planning area for the Richfield Field Office, Bureau of Land Management.

Within the planning area, the Emery coal field includes Federal land that is managed by the Bureau of Land Management Richfield Field Office and the US Forest Service Fishlake National Forest. The Wasatch Plateau coal field includes Federal land that is managed by BLM Richfield Field Office, and the Fishlake and Manti-La Sal National Forests. Within the planning area, the Emery coal field contains 41,849 acres, and the Wasatch Plateau coal field contains 103,808 acres. The acreage of land with development potential for coal resources is given for each coal field in the subsequent Coal Resources Section.

Within the planning area, Federal coal leases are not currently authorized within the Emery coal field; There are currently seven Federal coal leases authorized within the Wasatch Plateau and none in the Emery coal field. Most of the approximately 23,937 acres under Federal coal leases, are within the boundaries of the Fishlake and Manti-LaSal National Forests (Map 2). The existing Federal coal leases (UTSL-0062583, UTU-028297, UTU- 047080, UTU-062453, UTU-0149084, UTU-063214, and UTU-076195) are not subject to this unsuitability review (43 CFR 3461.3-2).

Further reference in this report to coal fields and coal resources is only to the portions within the subject planning area.

## COAL RESOURCES

The Emery coal field contains an estimated 303 million tons of in-place, unleased, minable coal resources; the Wasatch Plateau contains 415.8 million tons of in-place, unleased, minable coal resources (Tabet 2003, p. 41). These estimates include only coal beds of an average thickness of 6 feet or greater with less than 2,500 feet of overburden for underground mining and coal beds of a minimum thickness of a 4 feet and a maximum overburden of 100 feet for surface mining.

In the Emery field, approximately 11 million tons could be mined by surface methods and 292 million tons by underground methods. The coal resources in the Wasatch Plateau field could be mined by underground methods only.

Ownership of lands with coal resources that have development potential is summarized in Table A8-32 and Table A8-33 below.

Table A8-32. Emery Coal Field Coal Resources

Land Status	Surface Minable Acres	Underground Minable Acres
BLM	149	9,624
USFS	534	3,542
State	0	1,673
Private	28	1,164
<b>Total</b>	<b>711</b>	<b>16,003</b>

Table A8-33. Wasatch Plateau Coal Field Coal Resources

Land Status	Surface Minable Acres	Underground Minable Acres
BLM	0	0

USFS	0	18,672
State	0	0
Private	0	3,956
<b>Total</b>	<b>0</b>	<b>22,628</b>

Split ownership of private surface and Federal minerals is not included in the above totals, due to limitations of the current GIS data base. The largest tract of split estate with Federal coal resources is in the vicinity of Acord Lakes. The unsuitability criteria are applied to Federal lands, as defined at 43 CFR 3400.0-5(o) and required by the regulations at 43 CFR 3461.2-1.

## EVALUATION OF THE UNSUITABILITY CRITERIA

The coal resources with development potential are assessed for the unsuitability criteria as outlined at 43 CFR 3461.5. Underground mining of coal deposits is exempt from the criteria, where there would be no surface coal mining operations as stated at 3461.1(a). Surface mining operations include surface operations and surface impacts incident to an underground mine as defined at 43 CFR 3400.0-5(mm). In addition, at 43 CFR 3461.1(b), where underground mining will include surface operations and surface impacts on Federal lands to which a criterion applies, the lands shall be assessed as unsuitable unless an exception or exemption applies. Each criterion is subject to exceptions and/or exemptions as prescribed in the regulations.

As stated above, the criteria are applied to the Federal lands with coal resources that are identified as having development potential, not to all the coal deposits within the coal fields.

### Criterion 1

**Summary of the Criterion:** All Federal lands included in the following land systems or categories shall be considered unsuitable: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers System, National Recreation Areas, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and Federal lands in incorporated cities, towns, and villages.

Federal lands with coal resources with development potential are located within the Fishlake and Manti La-Sal National Forests (Map 2 and Table A8-32 and Table A8-33 above). An exception for leasing on National Forest is allowed, if:

“\* \* \* the Secretary finds no significant recreational, timber, economic or other values which may be incompatible with the lease; and (A) surface operations and impacts are incident to an underground coal mine, or (B) where the Secretary of Agriculture determines, with respect to lands which do not have significant forest cover within those National Forests west of the 100th Meridian, that surface mining may be in compliance with Multiple-Use Sustained Yield Act of 1960, the Federal Coal Leasing Amendments of 1976 and the Surface Mining Control and Reclamation Act of 1977.”

The USFS has determined that no significant recreational, timber, economic or other values which may be incompatible with the lease are present within both National Forests. The coal resources that have development potential by underground methods meet the underground exemption, and any associated surface operations and impacts meet the above exception. Coal resources within the Fishlake National

Forest at T. 25 S., R. 4 E. that have development potential by surface mining methods would meet the exception, since significant forest cover is not present and coal mining would be in compliance with the stated laws.

## Criterion 2

**Summary of the Criterion:** Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial, or other public purposes, on Federally-owned surface shall be considered unsuitable.

Within the Emery coal field, several authorized rights-of-way encompass BLM-administered, Federal lands with coal resources which have development potential (Map 3). These are listed in Table A8-34 below.

Table A8-34. BLM-Administered, Authorized Rights-of-Way within Emery Coal Field

Serial Number	Holder	Legal Description	Type	Acres (ac) or Width (ft)
UTSL-0062677	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 1, 11, 12, 14, 22, 27	Highway	400 ft
UTSL-0062873	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 27, 34	Highway	400 ft
UTU-008966	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 33, 34, 35 T. 24 S., R. 5 E., Sec. 3	Highway	400 ft
UTU-043522	Sevier County	T. 23 S., R. 5 E., Sec. 11, 12, 13	Road	100 ft
UTU- 0107441	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 25	Material Site	166 ac
UTU- 0110883	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 25, 26, 35	Highway	500 ft
UTU- 0136803	Federal Highway Administration	T. 23 S., R. 5 E., Sec. 25	Material Site	203 ac
UTU- 072941	Sevier County	T. 24 S., R. 5 E., Sec. 13	Road	45 ft
UTU- 057036	Federal Highway Administration	T. 25 S., R. 5 E., Sec. 6	Highway	200 ft

This criterion is subject to exceptions. A lease may be issued and mining operations approved, in such areas, if the surface management agency determines that:

- All or certain types of coal development (e.g., underground mining) will not interfere with the purpose of the rights-of-way or easement, or
- The right-of-way or easement was granted for mining purposes,
- The right-of-way or easement was issued for a purpose for which it is not being used,
- The parties involved in the right-of-way or easement agree, in writing, to leasing,
- It is impractical to exclude such areas due to the location of coal and method of mining and such areas or used can be protected through appropriate stipulations.

All the above-listed rights-of-way on BLM-administered lands are subject to development by underground mining, and right-of-way UTU-72941 is also subject to surface mining. Mining by underground methods is exempt and should not interfere with the intended use of a right-of-way facility. Where there could be surface operations and surface impacts associated with underground mining, the impacts would be mitigated, subject to an agreement with the right-of-way holder at the time of a specific leasing proposal. Where the coal resources would be mined by surface methods, the right-of-way facility could be moved during the mining operations and re-located when the land is reclaimed, again, subject to an agreement with the right-of-way holder. The Federal lands subject to the above rights-of-way are considered suitable.

There are no current rights-of-way or easements on NFS lands considered in this report.

The existing coal leases on the Fishlake National Forest are exempt from this criterion.

### Criterion 3

**Summary of the Criterion:** The terms used in this criterion have their meaning set out in the Office of Surface Mining Reclamation and Enforcement regulations at Chapter VII of Title 30 of the Code of Federal Regulations. Federal lands affected by Section 522(e) (4) and (5) of the Surface Mining Control and Reclamation Act of 1977 shall be considered unsuitable. This includes lands within 100 feet of the outside line of a right-of-way of a public road, within 100 feet of a cemetery, or within 300 feet of any public building, school, church, community or institutional building, public park or occupied dwelling.

Exceptions are allowed, if a lease may be issued for lands:

- Used as mine access roads or haulage roads that join the right-of-way for a public road;
- For which the Office of Surface Mining Reclamation and Enforcement has issued a permit to have public roads relocated;
- If, after public notice and opportunity for public hearing in the locality, a written finding is made by the authorized officer that the interests of the public and the landowners affected by mining within 100 feet of a public road will be protected;
- For which owners of occupied dwellings have given written permission to mine within 300 feet of their buildings.

The subject coal lands do not fall within the stated distances of a cemetery, public building, school, church, community or institutional building, or public park.

BLM-administered, Federal lands with development potential for coal resources are located within 100 feet of the rights-of-way for a road or highway, which are listed under Criterion 2. The listed road and highway rights-of-way are subject to underground mining methods, and the right-of-way UTU- 072941 is also subject to surface mining. Mining by underground methods is exempt from this review. Where the coal resources would be mined by surface methods or a surface operation or impact would be associated with underground mining, the coal would only be leased in compliance with the Office of Surface Mining Reclamation and Enforcement and following a public notice and hearing. The Federal lands within 100 feet of road or highway rights-of-way, as listed under Criterion 2, are considered suitable for leasing under this Criterion.

Occupied dwellings are located at T. 22 S., R. 4 E., at Acord Lakes on private surface estate and Federal coal estate. This land would be developed by underground mining methods, and as stated previously, underground mining is exempt from this review, except for surface operations and impacts. Under the exception for this criterion, written permission is required from the owner of an occupied dwelling if

surface operations of coal mining are within 300 feet of the occupied dwelling. If surface operations associated with the underground mining are necessary within the 300-foot distance, then that will be addressed as an impact at the time of leasing, and permission from the affected landowner(s) will be sought. However, it is likely that the design of a mine would involve locating surface facilities and impacts on unoccupied lands.

A dwelling is also located at T. 25 S., R. 4 E., Section 22 NE $\frac{1}{4}$ SE $\frac{1}{4}$  at Paradise Valley on private land. This structure is more than 300 feet from the identified lands with a potentially developable coal resource as determined from the USGS Geyser Peak 7.5 minute topographic quadrangle (scale 1:24,000).

## Criterion 4

**Summary of the Criterion:** Federal lands designated as wilderness study areas shall be considered unsuitable while under review by the Administration and the Congress for possible wilderness designation.

None of the subject Federal lands are presently within designated wilderness study areas. Some lands administered by the U.S. Forest Service are however being evaluated (inventoried) to determine if those lands have the characteristics of a wilderness study area. In accordance with the criterion, for any Federal land which is to be leased or mined prior to completion of the wilderness inventory by the surface management agency, the environmental assessment or impact statement on the lease sale or mine plan shall consider whether the lands have the characteristics of a wilderness study area. If the finding is affirmative, the land shall be considered unsuitable, unless issuance of noncompetitive coal leases and mining on leases is authorized under the Wilderness Act and the Federal Land Policy and Management Act of 1976 (FLPMA).

None of the subject Federal lands are within a designated wilderness study area.

## Criterion 5

**Summary of the Criterion:** Scenic Federal lands designated by visual resource management analysis as Class I (an area of outstanding scenic quality or high visual sensitivity) but not currently on the National Register of Natural Landmarks shall be considered unsuitable.

None of the BLM-administered Federal lands are presently located within areas designated as visual resource management Class I, and none of the National Forest lands are presently located within areas designated as visual resource management Class A, which is equivalent to Class I in the BLM classification. Therefore, this criterion is not applicable to the subject lands.

## Criterion 6

**Summary of the Criterion:** Federal lands under permit and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments shall be considered unsuitable for the duration of the study.

None of the subject lands are under permit for the described scientific studies. This criterion is not applicable to the subject lands.



## Criterion 7

**Summary of the Criterion:** All publicly or privately owned places which are included in the National Register of Historic Places shall be considered unsuitable.

Presently, there are no listed sites on the subject lands that are included on the National Register of Historic Places. This criterion is not applicable. Any subsequently listed sites and eligible sites will be further evaluated at the time of leasing.

## Criterion 8

**Summary of the Criterion:** Federal lands designated as natural areas or as National Natural Landmarks shall be considered unsuitable.

None of the subject lands are designated as a National Natural Landmark.

## Criterion 9

**Summary of the Criterion:** Federally designated critical habitat for listed threatened or endangered plant and animal species, habitat proposed to be designated as critical for listed threatened or endangered plant and animal species or species proposed for listing, and habitat for Federal threatened or endangered species which is determined by the Fish and Wildlife Service and the surface management agency to be of essential value and where the presence of threatened or endangered species has been scientifically documented, shall be considered unsuitable.

Based upon data currently available, the Federal lands do not meet the guidelines for this criterion. Surveys have been completed in these areas for several other projects. No listed threatened or endangered plant or animal species have been definitely found. No critical habitat is presently designated on the subject lands. Therefore, this criterion does not apply to the subject lands. Subsequently designated critical habitat, proposed critical habitat, and essential-value habitat will be further evaluated at the time of leasing.

## Criterion 10

**Summary of the Criterion:** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state, pursuant to state law, as endangered or threatened shall be considered unsuitable.

The State of Utah has not listed any plant species as endangered or threatened, pursuant to State law. Therefore, the criterion does not apply to plant species. The State has listed endangered or threatened animal species, but these are the same as the Federally listed animal species. The State of Utah recognizes the Federal listings and habitat designations. As stated in Criterion 9, no listed endangered or threatened animal species have been found. No critical habitat has presently been designated which on subject lands with coal resources. Therefore, the criterion does not apply to the subject lands. Subsequently designated critical habitat and essential-value habitat will be further evaluated at the time of leasing.

## Criterion 11

**Summary of the Criterion:** A bald or golden eagle nest or site on Federal lands that is determined to be active, including an appropriate buffer zone of land around the nest site, shall be considered unsuitable.

Consideration of availability of habitat of prey species and of terrain shall be included in the determination. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Eagle nests are not known to be present on the subject lands, therefore this criterion does not apply. If nests or sites are found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the RMP will be applied. The subject Federal lands will be subject to inventory and site-specific analysis at the time of leasing.

## Criterion 12

**Summary of the Criterion:** Bald or golden eagle roost and concentration areas on Federal lands used during migration and wintering shall be considered unsuitable.

Eagle roosts are not known to be present on the subject Federal lands, therefore this criterion does not apply. If roosts or concentration areas are found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the RMP will be applied.

## Criterion 13

**Summary of the Criterion:** Federal lands containing a falcon (excluding kestrel) cliff nesting site with an active nest and including a buffer zone of Federal land around the nest site shall be considered unsuitable. Consideration of availability of habitat for prey species and of terrain shall be included in the determination of buffer zones. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Active falcon nesting sites are not known to be present on the subject Federal lands, therefore this criterion does not apply to the subject lands. If active nesting sites are found at the time of leasing, then consultation will occur with the U.S. Fish and Wildlife Service and appropriate mitigations as outlined in the land use plan will be applied.

## Criterion 14

**Summary of the Criterion:** Federal lands which are high priority habitat for a migratory bird species of high Federal interest on a regional or national basis, as determined by the surface management agency and the Fish and Wildlife Service, shall be considered unsuitable.

High priority habitat for migratory birds overlaps a portion of the underground minable coal resource in the vicinity of Old Woman Plateau. The acreage involved is 2,048. The exemption for underground mining applies to this habitat; however surface operations and surface impacts may be unsuitable or be mitigated at the time of leasing. The Federal lands will be subject to inventory and site-specific analysis at the time of leasing.

## Criterion 15

**Summary of the Criterion:** Federal lands which the surface management agency and state jointly agree are habitat for resident species of fish, wildlife, and plants of high interest to the state and which are essential for maintaining these priority wildlife and plant species shall be considered unsuitable. Examples of such lands include:

- Active dancing and strutting grounds for sage grouse,

- Winter ranges crucial for deer, antelope, and elk,
- Migration corridor for elk, and
- Extremes of range for plant species.

A lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant long-term impact on the species being protected.

Underground mining is exempt. Surface facilities associated with the coal mining could be located within the crucial habitat and could include a mine portal, buildings, and construction of roads. Haulage of mined coal would also be necessary. The location of these facilities and associated haulage could be located as to minimize or reduce the impact to the habitat. Surface operations and impacts would not have an adverse, long-term impact on the crucial habitats.

Crucial habitat for deer, elk, and black bear overlaps Federal lands with coal resources that would be mined by underground methods (Maps 5, 6, and 7). The coal resources that would be developed by underground mining on BLM and National Forest lands are exempt from this criterion. Surface operations and surface impacts that would be associated with this type of mining would not have a long-term effect on the species, as determined in consultation with the USFS and the Division of Wildlife Resources, State of Utah. Underground mining meets the exception of this criterion, and surface operations and surface impacts would be subject to a site-specific review as part of the consideration of an application to lease coal.

Crucial habitat for deer, elk, and black bear is present on the Fishlake National Forest at T. 25 S., R. 4 E., in an area that could be mined by surface methods (Maps 5, 6, and 7). The maximum area that would be surface mined would involve approximately 534 acres of National Forest lands. If surface mining were to occur, the mining would probably be completed in stages, or mining units, with mining in one area while an adjacent, previously mined-out area would be reclaimed to restore the crucial habitat. Thus, with concurrent mining and reclamation, surface mining would not impact all the acreage within a given lease at one time. Also, all the above land with an identified potential for surface mining may not be developed, because the coal reserves that would support a mine could be less than the currently identified coal resource. However, this land that could have surface mining is unsuitable, as determined in consultation with the USFS and the Division of Wildlife Resources, State of Utah.

Crucial habitat for deer and elk is present on BLM-administered lands at T. 24 S., R. 5 E. that could be mined by surface methods (Maps 5 and 6). The surface minable coal resource is approximately 149 acres. Whereas, the elk habitat only partially overlaps the surface minable coal, the deer habitat encompasses all of the land with the surface minable coal resource. The surface minable coal resource at this location is considered unsuitable, as determined in consultation with the USFS and the Division of Wildlife Resources, State of Utah.

The existing Federal leases are exempt from this criterion.

## Criterion 16

**Summary of the Criterion:** Federal land in riverine, coastal and special floodplains (100-year recurrence interval) on which the surface management agency determines that mining could not be undertaken without substantial threat of loss of life or property shall be considered unsuitable for all or certain stipulated methods of coal mining.

None of the subject lands are on lands where mining would result in substantial loss of life or property. Therefore, this criterion is not applicable.

## Criterion 17

**Summary of the Criterion:** Federal lands which have been committed by surface management agency to use as municipal watersheds shall be considered unsuitable.

None of the subject lands with coal resource that has potential for development are within a municipal watershed. Therefore this criterion is not applicable.

## Criterion 18

**Summary of the Criterion:** Federal lands with National Resource Waters, as identified by states in their water quality management plans including a buffer zone of Federal lands  $\frac{1}{4}$  mile from the outer edge of the water bodies shall be considered unsuitable.

The State of Utah considers National Resource Waters as High Quality Waters (State Code R317-2-12). High Quality Waters are considered to be all surface waters geographically located within the boundaries of National Forests and certain designated stream channels or basins. Underground minable coal resources are exempt from this criterion. An exception to this criterion may be granted when the surface management agency determines that a buffer zone is unnecessary.

Surface streams cross many of the coal resource tracts in the Wasatch Plateau within the National Forests (Map 8). These National Forest System lands have development potential by underground mining. A coal resource at T. 25 S., R. 4 E. has potential by surface mining. Surface mining and surface operations and surface impacts that could be associated with underground mining would be subject to site-specific analysis and the consideration of buffers as mitigation at the time of leasing; therefore, impacts to High Quality Waters could be mitigated at the time of leasing.

None of the coal resources with development potential on BLM land are classified as High Quality Waters by the State. Therefore, the coal resources with development potential on BLM land are considered available for leasing under this criterion.

## Criterion 19

**Summary of the Criterion:** Federal lands identified by the surface management agency, in consultation with the state in which they are located, as alluvial valley floors according to the definition in §3400.0-5(a) of this title, the standards in 30 CFR 822, the final alluvial valley floor guidelines of the Office of Surface Mining Reclamation and Enforcement when published, and approved state programs under the Surface Mining Control and Reclamation Act of 1977, where mining would interrupt, discontinue, or preclude farming, shall be considered unsuitable. Additionally, when mining Federal land outside an alluvial valley floor would materially damage the quantity or quality of water in the surface or underground water systems that would supply alluvial valley floors, the land shall be considered unsuitable.

No alluvial valley floors occur on lands, considered in this report and there are no known conflicts between minable land and farming land. Impacts to water quality can be addressed at the time of evaluating specific mining proposals and can be mitigated at that time. Therefore, this criterion is not applicable.

## Criterion 20

**Summary of the Criterion:** Federal lands in a state to which is applicable a criterion (i) proposed by the state or Indian tribe located in the planning area, and (ii) adopted by rulemaking by the Secretary, shall be considered unsuitable.

The State of Utah under State rule, R645-103-300, Utah Criteria for Designating Areas as Unsuitable for Coal Mining and Reclamation Operations, has developed unsuitability criteria, which are similar to the Federal criteria at 43 CFR 3461 as addressed in this report. No Indian tribe has proposed a criterion for coal mining unsuitability. Therefore, this criterion is not applicable at this time.

## SUMMARY OF THE UNSUITABILITY EVALUATION

The coal resources with development potential in the Emery and Wasatch Plateau coal fields have been evaluated in consideration of the 20 unsuitability criteria. Based on the criteria, the coal resources which could be developed by surface mining methods in the Emery coal field at T. 25 S., R. 4 E., on the Fishlake National Forest and at T. 24 S., R. 5 E. on the BLM are considered to be unsuitable for leasing. Thus, 534 acres on the National Forest and the 149 acres on BLM would not be available for coal leasing. The other coal resources within Sanpete and Sevier Counties with development potential by underground methods are considered suitable for leasing (Map 9). The acreage considered suitable for the consideration of leasing of Federal coal resources is listed below in Table A8-35 and Table A8-36.

Table A8-35. Emery Coal Field Federal Coal Resources

Land Status	Surface Minable Acres	Underground Minable Acres
BLM	149	9,624
USFS	534	3,542
<b>Total</b>	<b>683</b>	<b>13,166</b>

Table A8-36. Wasatch Plateau Coal Field Federal Coal Resources

Land Status	Surface Minable Acres	Underground Minable Acres
USFS	0	18,672
<b>Total</b>	<b>0</b>	<b>18,672</b>

Private and state lands are not subject to the unsuitability criteria for Federal lands and are not included in the above totals.

## **MAPS FOR WASATCH PLATEAU AND EMERY COAL UNSUITABILITY**

Map 1 – Location

Map 2 – Land Ownership

Map 3 – Rights-of-Way

Map 5 – Deer Habitat

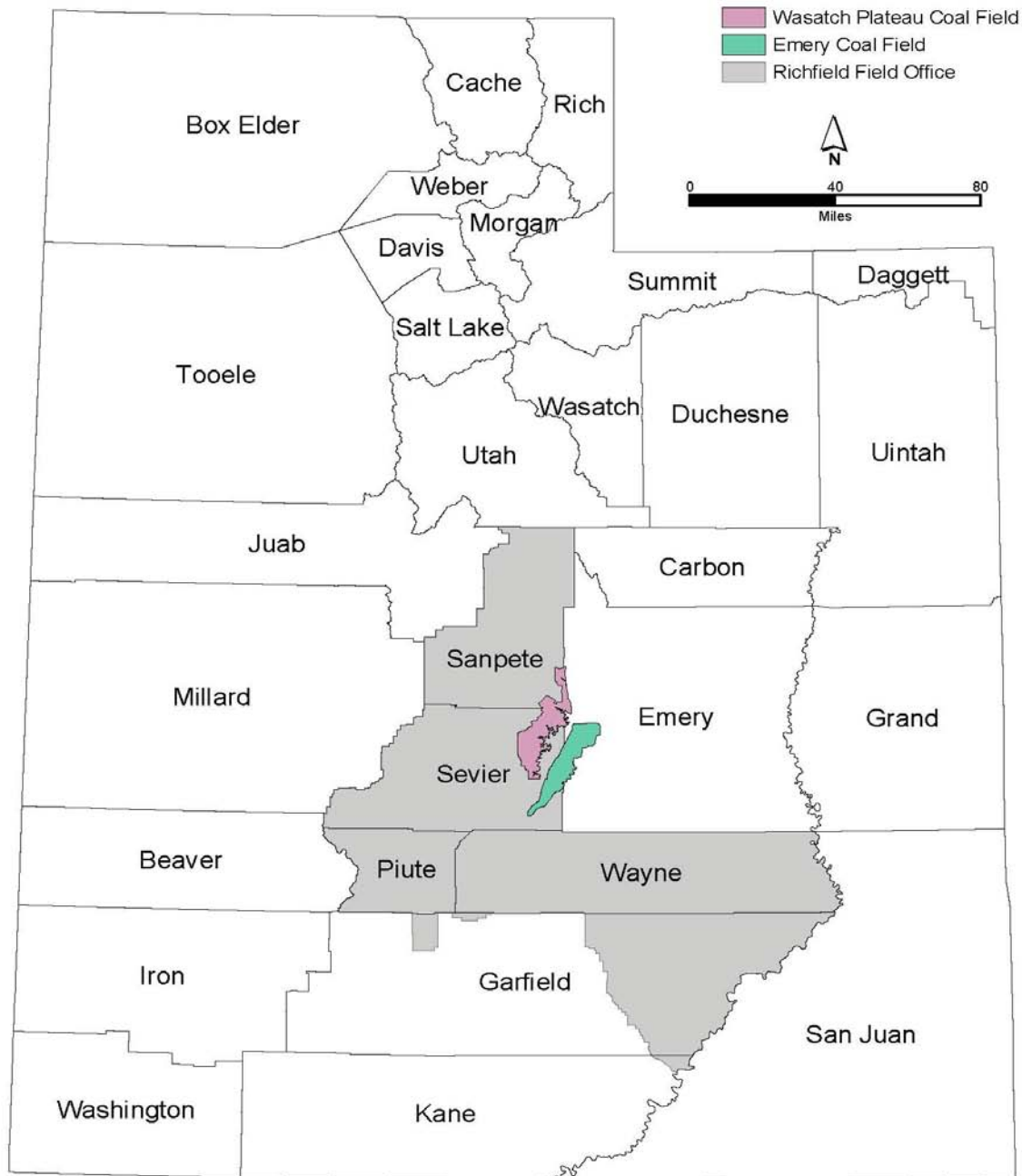
Map 6 – Elk Habitat

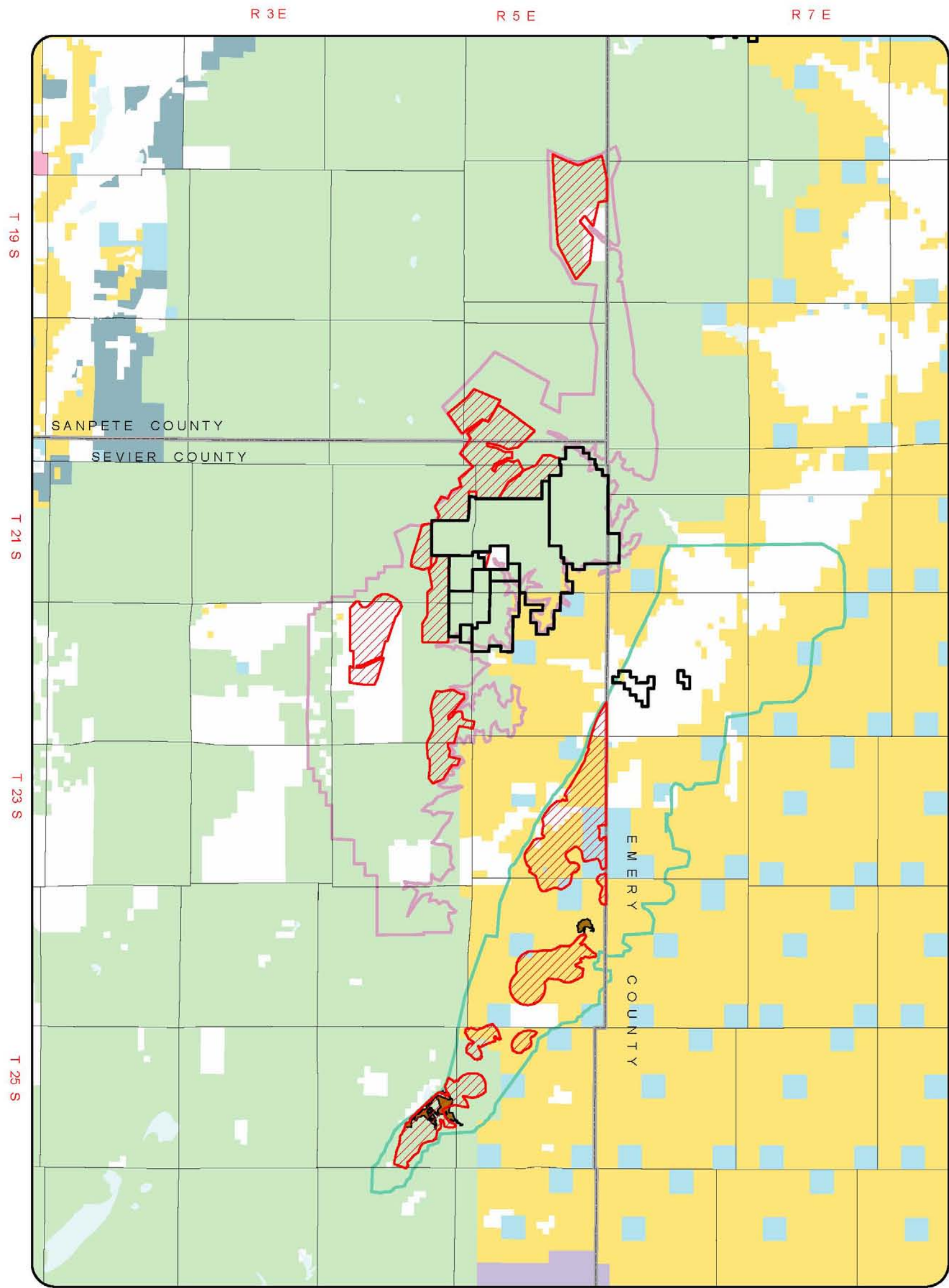
Map 7 – Bear Habitat

Map 8 – Natural Resource Waters

Map 9 – Coal Suitability

Map 1 - General Location Map

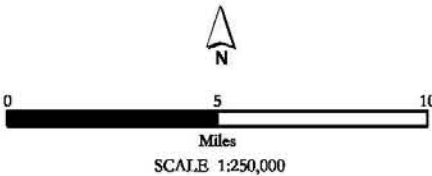




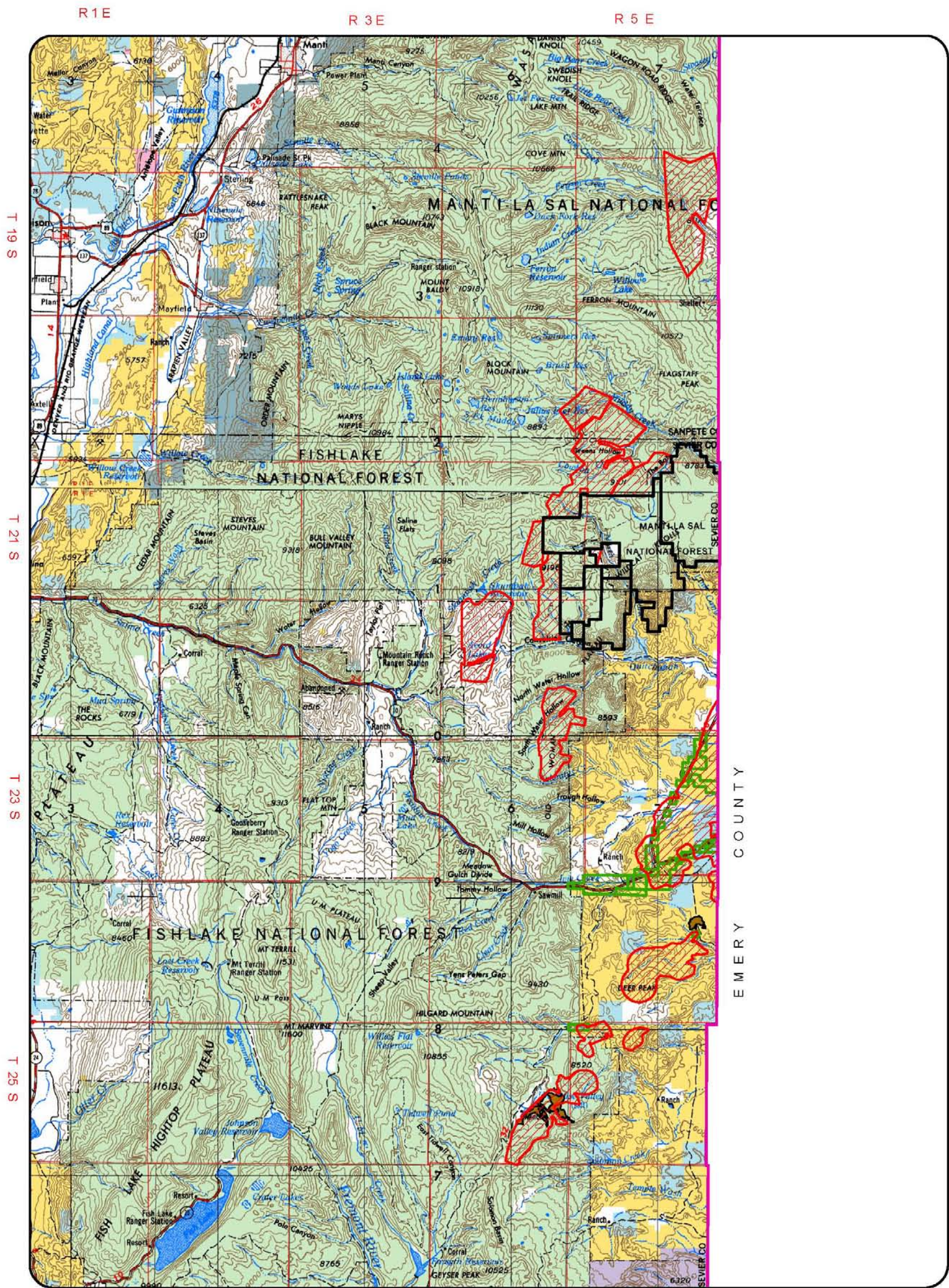
Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 2 - Land Status

- |                            |                |
|----------------------------|----------------|
| Underground Mincable Coal  | BLM            |
| Surface Mincable Coal      | Forest Service |
| Coal Leases                | State          |
| Wasatch Plateau Coal Field | National Park  |
| Emery Coal Field           | Private        |

Bureau of Land Management  
Richfield Field Office  
August 3, 2004



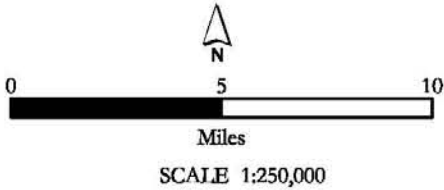




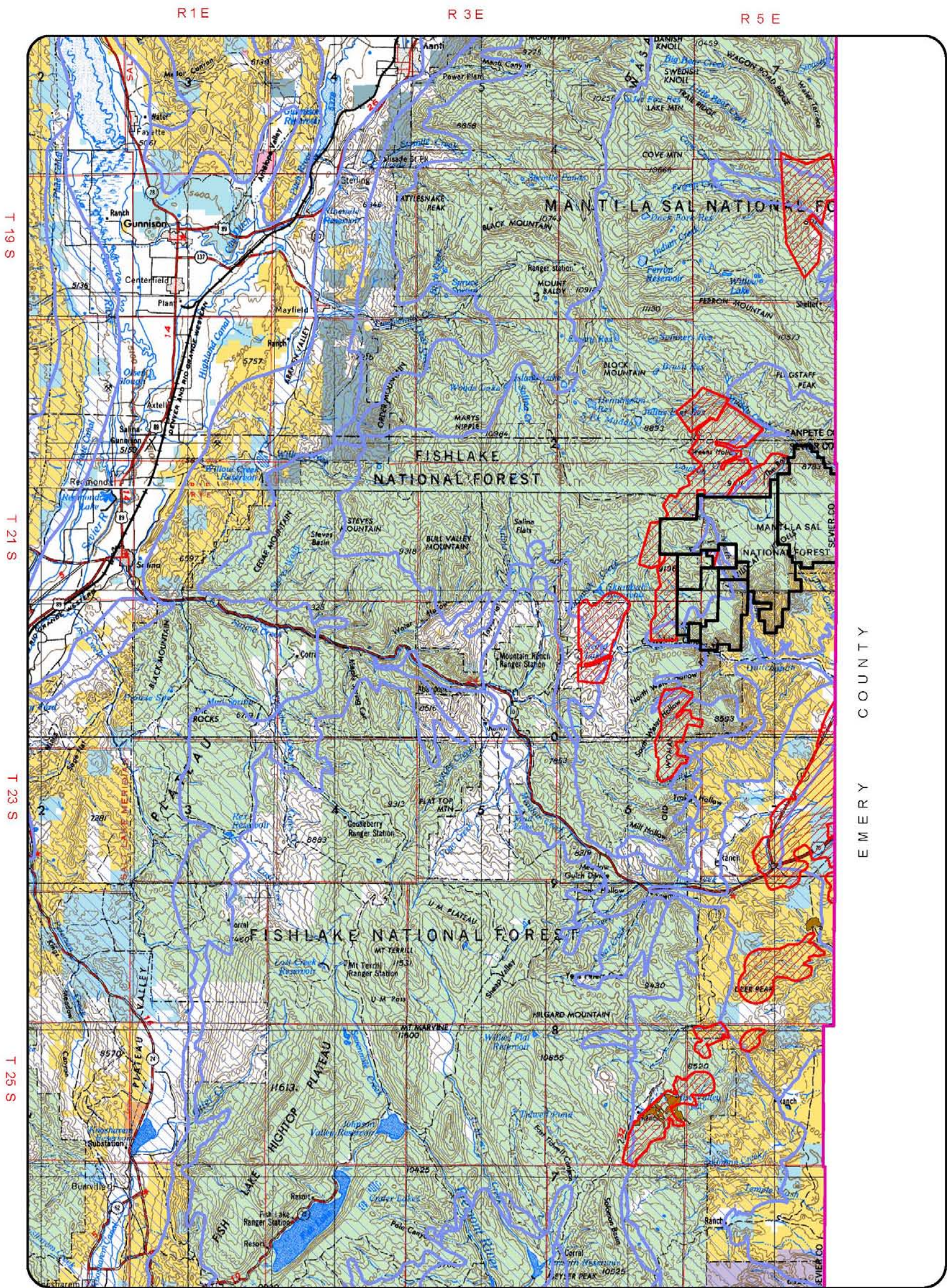
Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 3 - Rights of Way (Criterion 2)

Bureau of Land Management  
Richfield Field Office  
August 3, 2004

- |                           |                |
|---------------------------|----------------|
| Underground Mineable Coal | BLM            |
| Surface Mineable Coal     | Forest Service |
| Federal Coal Leases       | State          |
| Rights of Way             | National Park  |
|                           | Private        |



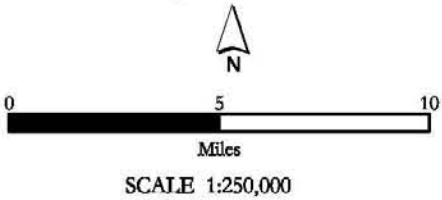




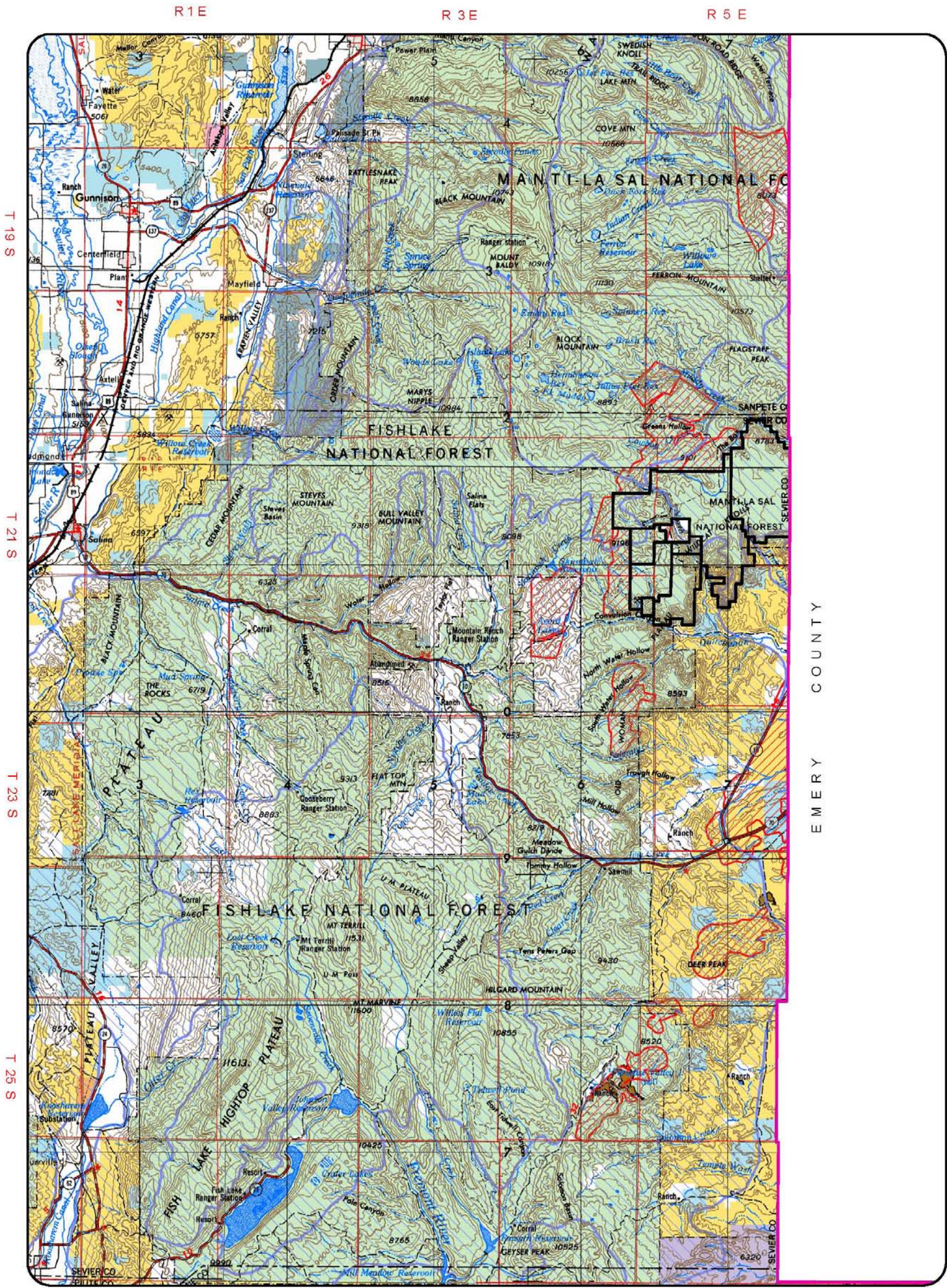
Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 5 - Crucial Deer Habitat (Criterion 15)

Bureau of Land Management  
Richfield Field Office  
August 3, 2004

- |                           |                |
|---------------------------|----------------|
| Underground Mineable Coal | BLM            |
| Surface Mineable Coal     | Forest Service |
| Federal Coal Leases       | State          |
| Crucial Deer Habitat      | National Park  |
|                           | Private        |












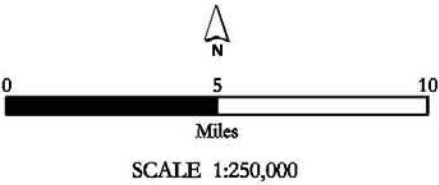




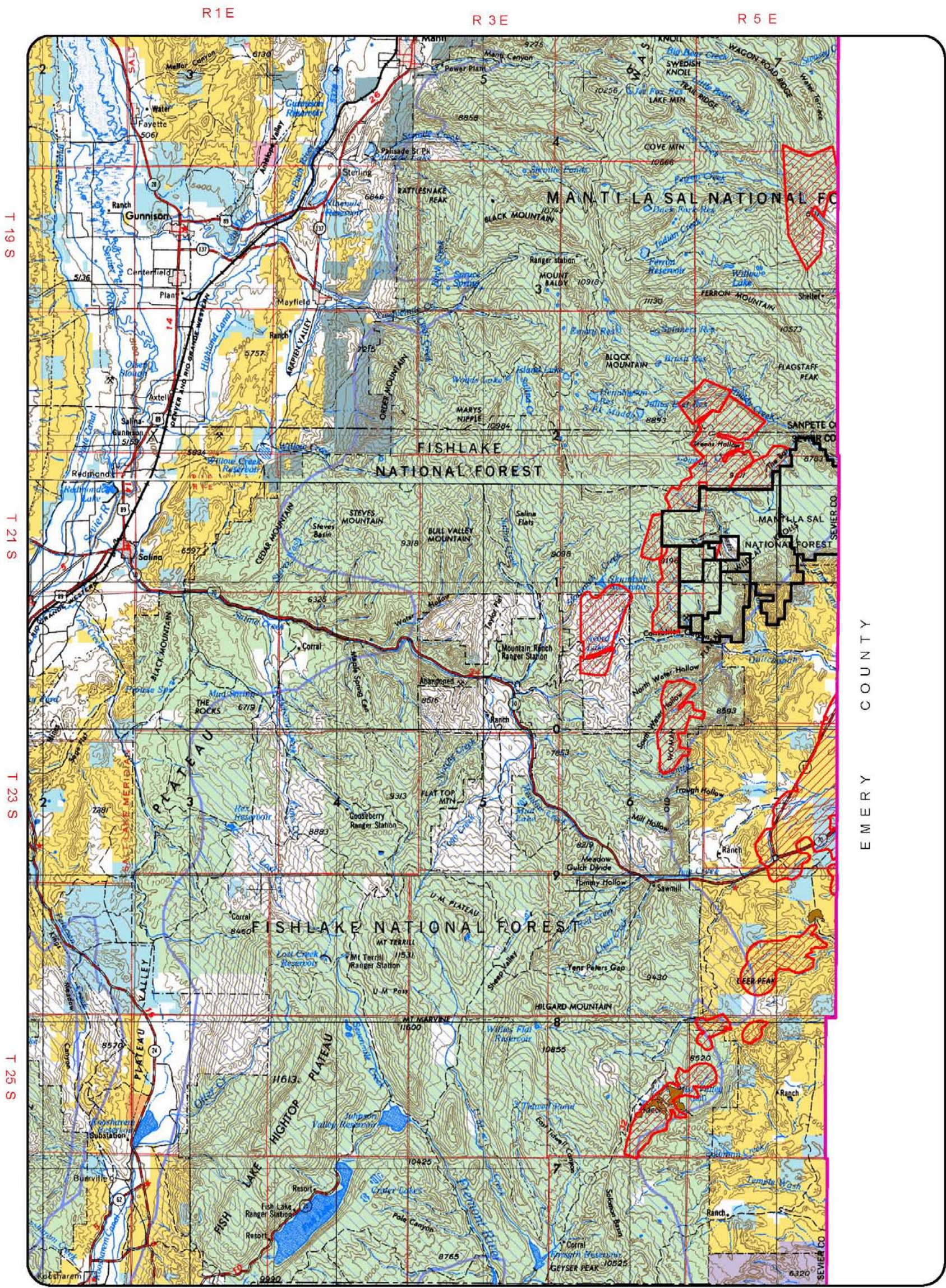
Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 6 - Crucial Elk Habitat (Criterion 15)

Bureau of Land Management  
Richfield Field Office  
August 3, 2004

- |                                                                                                               |                                                                                                    |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  Underground Mineable Coal |  BLM            |
|  Surface Mineable Coal     |  Forest Service |
|  Federal Coal Leases       |  State          |
|  Crucial Elk Habitat       |  National Park  |
|                                                                                                               |  Private        |



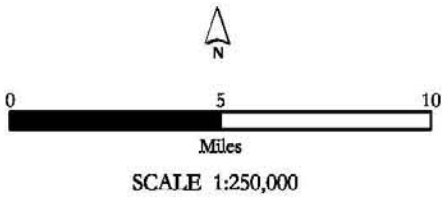




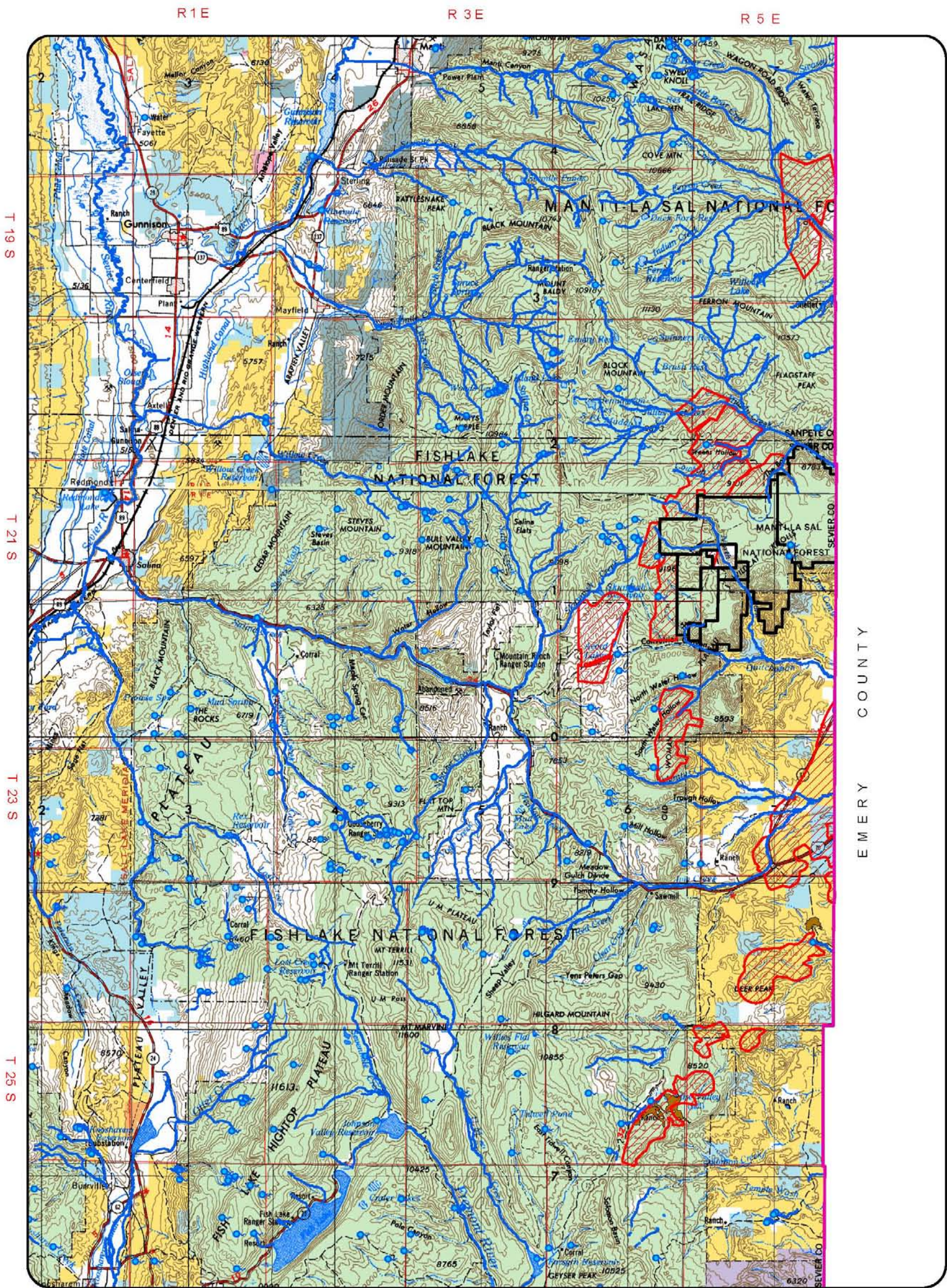
Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 7 - Crucial Black Bear Habitat (Criterion 15)

Bureau of Land Management  
Richfield Field Office  
August 3, 2004

- |                            |                |
|----------------------------|----------------|
| Underground Mineable Coal  | BLM            |
| Surface Mineable Coal      | Forest Service |
| Federal Coal Leases        | State          |
| Crucial Black Bear Habitat | National Park  |
|                            | Private        |





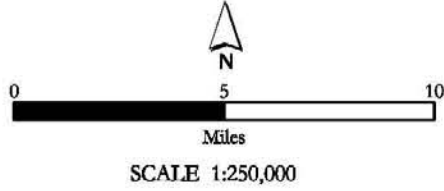


Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 8 - National Resource Waters (Criterion 18)\*

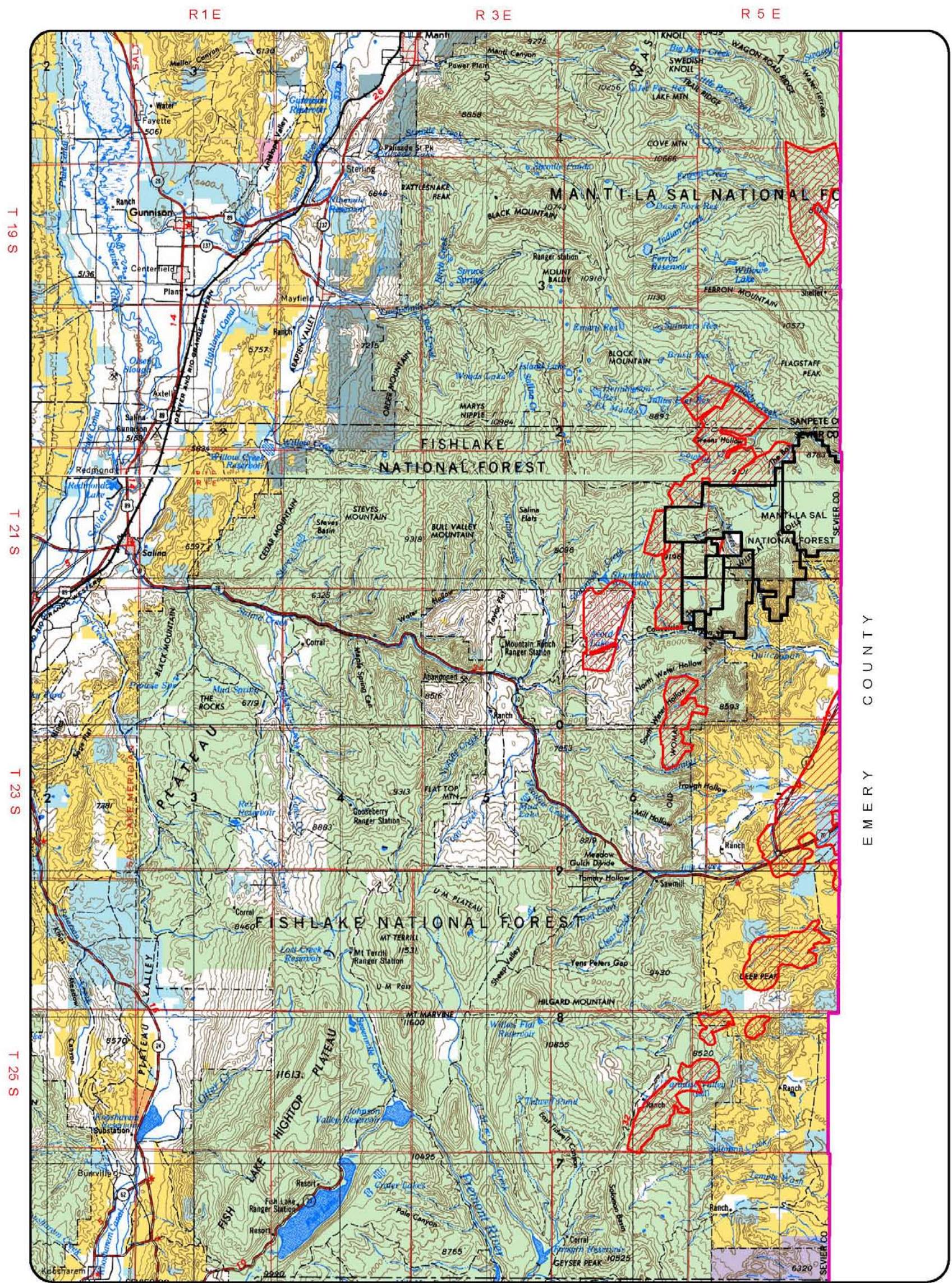
\* Only Waters on National Forest Lands are considered National Resource Waters

Bureau of Land Management  
Richfield Field Office  
August 3, 2004

- Springs
- Perennial Streams
- Underground Mineable Coal
- Surface Mineable Coal
- Federal Coal Leases
- BLM
- Forest Service
- State
- National Park
- Private



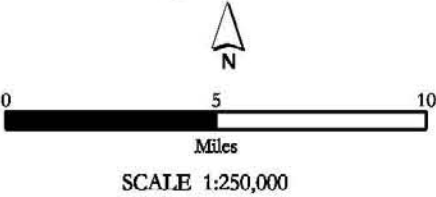




Coal Unsuitability Report - Emery and Wasatch Plateau Coal Fields  
Map 9 - Coal Resources Considered Suitable for Leasing

- Underground Mineable Coal
- Federal Coal Leases
- BLM
- Forest Service
- State
- National Park
- Private

Bureau of Land Management  
Richfield Field Office  
August 3, 2004





## **APPENDIX 9—TRAVEL MANAGEMENT/ROUTE DESIGNATION PROCESS**

---

The Richfield Field Office (RFO) used the following process for route designation alternatives during the development of the Richfield Resource Management Plan (RMP) and Environmental Impact Statement (EIS). This process included route inventory, interdisciplinary team assessment, and cooperating agency coordination.

### **ROUTE INVENTORY**

The RFO conducted a route inventory beginning in 2002, to develop a route baseline for use in the planning process. The Bureau of Land Management (BLM) used a variety of methods to inventory existing routes/ways within the RFO for consideration in the planning process, including Global Positioning System (GPS) (when available), data provided by the counties, map and orthophoto data, and staff/cooperator knowledge. BLM employees with GPS equipment digitized the routes while traveling on off-highway vehicles (OHV) and by foot. While inventorying the routes, staff collected surface type and primary and secondary usage associated with each route. The digitized route data was verified and prepared for interdisciplinary review. The counties provided route data in a Geographic Information System (GIS) data layer. Data from the BLM inventory was overlaid with the county route data, and discrepancies were identified, reviewed, and resolved through interdisciplinary team review. In the more remote areas of the RFO for which GPS/GIS data was not available, map and orthophoto data was used.

### **INTERDISCIPLINARY TEAM ASSESSMENT**

Team members, who included BLM staff specialists and county cooperators, reviewed the route inventory during a series of interdisciplinary team meetings. These meetings were held in each county to address the specific routes within that county. The following assumptions were applied:

- Prohibit motorized vehicle cross-country travel, except in designated open areas
- Designate existing routes for motorized use unless closed or restricted (permanently, seasonally, or by size) as appropriate to address specific resource concerns
- Evaluate parallel, duplicative, or redundant routes for potential closure
- Allow closed or non-designated routes to rehabilitate naturally unless a specific resource impact is occurring that warrants expedited rehabilitation of the route (e.g., soil erosion, water quality concerns, and/or continued illegal use)
- Prohibit motorized use of designated closed routes, except for BLM administrative and emergency use
- Sign and map designated routes as motorized or nonmotorized; travel maps should be user friendly and easily accessible
- May be changes in existing route designations pursuant to land management objectives.

The interdisciplinary team applied the following factors to the route inventory and used other BLM inventories and natural and cultural resource information to identify routes for designation. The team considered the following:

- Environmental sensitivity of the areas surrounding the route, including soil type/condition, riparian areas and their condition, wilderness study areas (WSA), and sensitive plant species

- Wildlife habitat sensitivity of the areas surrounding the route, including designated critical habitat, sensitive status species habitat, crucial habitat, and sensitive season
- Current and anticipated use levels, as well as travel and transportation needs and desires
- Management objectives for the area, as well as the potential for user and resource conflicts
- Access needs for BLM-permitted or -authorized activities (e.g., range permittees, recreation permittees, mineral developments)
- Access needs for non-BLM administered lands
- Cultural resources and specific sites that require protection.

## PLAN MAINTENANCE AND CHANGES TO ROUTE DESIGNATIONS

The Proposed RMP includes criteria to be considered when conducting plan maintenance, amendments, or revisions related to OHV area designations or the approved road and trail system within “Limited” areas. Future conditions may require the designation or construction of new routes or closure of existing routes to better address resources and resource use conflicts. Actual route designations within the Limited category can be modified without completing a plan amendment, although compliance with the National Environmental Policy Act (of 1969) (NEPA) is still required.

The RFO is aware that the current inventory of roads and trails being used for the route designation process is not 100 percent correct or complete. The RFO anticipates that in spite of intensive quality control and review, there will be errors. Some undesirable unintended consequences may result from the final configuration of the Travel Route Designations. Adjustments may be needed to make the travel designation compatible with adjacent landowners. For example, edge matching has occurred with adjacent BLM and United States Forest Service (USFS) jurisdictions, but continued review and coordination will be required as changes resulting from continued motorized travel planning occur in the future. Routes currently not in the inventory may need to be added and designated as part of the implementation process. An adaptive management process that will allow adjustments to the final decision and will maintain the validity and integrity of the analyses and public disclosure presented in the Final EIS is outlined below. This process includes pre-defining actions for the disposition of routes discovered after the decision date, adding new routes, correcting errors, and adjusting the route designations that lead to undesirable, unintended consequences.

As IM 2004-061 notes, plan maintenance can be accomplished through additional analysis and land use planning (e.g., activity-level planning). BLM will collaborate with affected and interested parties in evaluating the designated route network for suitability for active OHV management and envisioning potential changes in the existing system or adding new trails that would help meet current and future demands. In conducting such evaluations, the following factors would be considered:

- The travel management plan should be flexible to allow designating existing routes that were not identified in the baseline data.
- The travel management plan should be flexible about the location of new routes needed to provide access for new activities, to new areas, or to reduce resource and/or user conflicts.
- Route designations would be coordinated and made consistent with criteria and resource decisions identified in the Proposed RMP.
- Measures needed to meet the objectives stated in the Proposed RMP (e.g., cultural resources, soil resources, special status species, and recreation).



- Where and when appropriate, plan, develop, and designate (in cooperation with user groups and cooperating agencies) new routes and trails that enhance and expand recreational opportunities and encourage responsible use.
- Routes suitable for various categories of OHVs (e.g., motorcycles, all-terrain vehicles [ATVs], dune buggies, and 4-wheel drive touring vehicles) and opportunities for joint trail use.
- Needs for parking, trailheads, informational and directional signs, mapping and profiling, and development of brochures or other materials for public dissemination.
- Opportunities to tie into existing or planned route networks.
- Public land roads or trails determined to cause considerable adverse effects or to constitute a nuisance or threat to public safety would be considered for relocation or closure and rehabilitation after appropriate coordination with applicable agencies and partners.
- Those areas managed as closed will not be available for new motorized designation.

Regulations at 43 *Code of Federal Regulations* (CFR) 8342.2 require BLM to monitor the effects of OHV use. Changes should be made to the Travel Plan based on the information obtained through monitoring. Site-specific NEPA documentation is required for changing the route designations in this Travel Plan.

## COOPERATING AGENCY COORDINATION

Interdisciplinary route assessment meetings were held by county, with county representatives in attendance. BLM managers and planners also met with cooperating agency representatives to review the proposed RMP and discuss concerns. Specifically, Garfield County representatives raised concerns regarding routes they claimed under Revised Statute 2477 (R.S. 2477). In addition, concerns were raised regarding routes not included in the baseline data, and access to the counties' resources and state lands.

## IMPLEMENTATION PROCESS

Implementation decisions are actions that BLM takes to implement land use plans and generally constitute BLM's final approval for allowing on-the-ground actions to proceed. These types of decisions, which are based on site-specific planning and NEPA analyses, are subject to the administrative remedies set forth in the regulations that apply to each BLM resource management program. Implementation decisions are not subject to protest under the planning regulations; rather, they are subject to various administrative remedies. Where implementation decisions are made as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by specific resource program regulations after BLM resolves the protests to land use plan decisions and makes a decision to adopt or amend the Proposed RMP.

Travel planning and the implementation process include the following:

- The monitoring of the transportation system and modifying as appropriate
- A map of roads and trails for all travel modes
- Notations of any limitation for specific roads and trails
- Criteria to select or reject roads and trails in the final travel management network, add new roads or trails, and specify limitations
- Guidelines for management, monitoring, and maintenance of the transportation system
- Needed easements and rights-of-ways (to be issued to BLM or others) to maintain the existing road and trail network providing public land access.

The Approved RMP completes the initial route designation component of the Travel Management Plan and implementation process. These routes would be the initial basis for signing and enforcement. The RFO will prioritize additional implementation actions, resources, and geographic areas based on RMP goals and objectives and the guidelines noted above.

## APPENDIX 10—RAPTOR BEST MANAGEMENT PRACTICES

---

### INTRODUCTION

Raptors, or *Birds of Prey*, are found on public lands throughout Utah. Approximately 31 species of raptors use public lands for at least a portion of their life cycle. These species include 20 diurnal raptors, including the eagles, hawks, falcons, osprey, turkey vulture, and California condor in addition to 11 mostly nocturnal owl species. At least 16 of the diurnal raptors are known to nest, roost, and forage on public lands, while two others are probable nesters within the southern part of the state. The California condor is known to use public lands for roosting and foraging but is not currently known to nest within the state. The rough-legged hawk is a winter resident that uses public lands for foraging. All of the owl species nest, roost, and forage on public lands in Utah.

The Bureau of Land Management (BLM) considers eight of Utah's raptors to be special status species. These raptors currently receive enhanced protection in addition to the regulatory authority the Migratory Bird Treaty Act (MBTA) provides in covering all raptor species. The Mexican spotted owl is listed as a federally threatened species and is afforded the protection, as well as the Section 7 consultation requirements, of the Endangered Species Act (ESA). The bald eagle has been delisted by the U.S. Fish and Wildlife Service (USFWS), but remains on the Sensitive Species list. Both the bald eagle and golden eagle are protected by the provisions of the Eagle Protection Act. The California condor is a federally endangered species; however, the birds found in southern Utah are part of an Experimental Non-essential Population reintroduced to northern Arizona under Section 10(j) of the ESA. BLM is required to treat the condor as a species proposed for listing for Section 7 purposes of the ESA. The northern goshawk is managed by a multi-agency Conservation Agreement. The ferruginous hawk, short-eared owl, and burrowing owl are listed as Wildlife Species of Concern by the Utah Division of Wildlife Resources (UDWR 2006), and are therefore recognized as BLM state-sensitive species under the Bureau's 6840 Manual. The BLM's 6840 Policy states that "*BLM shall...ensure that actions authorized, funded, or carried out...do not contribute to the need for the species to become listed.*"

Future raptor management on BLM lands in Utah will be guided by using Best Management Practices (BMPs), which are BLM-specific recommendations for implementing the USFWS Utah Field Office's, "*Guidelines for Raptor Protection From Human and Land Use Disturbances*" ("*Guidelines*") (USFWS 1999). USFWS originally developed the "*Guidelines*" in 1999 and updated them in 2002 to reflect changes brought about by court and policy decisions and to incorporate Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The "*Guidelines*" were provided to BLM and other land-managing agencies in an attempt to provide raptor management consistency, while ensuring project compatibility with the biological requirements of raptors and encouraging an ecosystem approach to habitat management.

These BMPs, or specific elements of the BMPs that pertain to a proposal, should be attached as Conditions of Approval to all BLM use authorizations that have the potential to adversely affect nesting raptors, or would cause occupied nest sites to become unsuitable for nesting in subsequent years.

Raptor management is a dynamic and evolving science, and consequently, as the science evolves, these BMPs will undergo subsequent revision. As more information becomes available through implementation of these raptor BMPs, and as our knowledge of raptor life-cycle requirements increases, findings will be incorporated into future revisions of the BMP document. In addition, BLM and the Department of Energy

are initiating a 3-year Raptor Radii study, which will test traditional spatial and seasonal nest buffers during actual oil and gas development activities for a select suite of species. Study results would be incorporated into new BMP revisions as well.

To adequately manage raptors and their habitats and to reduce the likelihood of a raptor species being listed under the ESA, BLM-authorized or proposed management activities and/or land-disturbing actions would be subject to the criteria and processes specified within these BMPs. The implementation of raptor spatial and seasonal buffers under the BMPs would be consistent with Table 2 of the “*Guidelines*,” included here as Attachment 2. As specified in the “*Guidelines*,” modifications of spatial and seasonal buffers for BLM-authorized actions would be permitted if the protection of nesting raptors was ensured. State and/or federally listed, proposed, and candidate raptor species, as well as BLM state-sensitive raptor species, should be afforded the highest level of protection through this BMP process; however, all raptor species would continue to receive protection under the Migratory Bird Treaty Act. Modification of the buffers for threatened or endangered species would be considered, pending the results of Section 7 consultation with USFWS.

As stated in the “*Guidelines*,” spatial and seasonal buffers should be considered as the best available recommendations for protecting nesting raptors under a wide range of activities statewide. However, they are not necessarily site-specific to proposed projects. Land managers should evaluate the type and duration of the proposed activity, the position of topographic and vegetative features, the sensitivity of the affected species, the habituation of breeding pairs to existing activities in the proposed project area, and the local raptor nesting density when determining site-specific buffers. BLM would be encouraged to coordinate informally with UDWR and USFWS any time a site-specific analysis shows that an action may adversely affect nesting raptors. The coordination would determine whether the impact could be avoided or must be mitigated, and if so, to determine appropriate and effective mitigation strategies.

Potential modifications of the spatial and seasonal buffers identified in the “*Guidelines*” may provide a viable management option. Modifications would ensure that nest protection would occur, while allowing various management options that may deviate from the suggested buffers within the “*Guidelines*.” These options, if adequately monitored, could provide valuable information for incorporation into future management actions.

Local raptor nesting authorities who know the raptor nesting chronologies within their local area should review the seasonal raptor buffers provided in Attachment 2. For those nesting raptors for which local nesting chronologies remain uncertain, the Attachment 2 seasonal buffers should serve as the default. However, for those raptor species whose known nesting chronologies differ from the seasonal buffers provided in Attachment 2, the local seasonal buffers may be used as a modification of the “*Guidelines*.”

Criteria that would need to be met before implementing modifications to the spatial and seasonal buffers in the “*Guidelines*” would include the following:

1. A wildlife biologist or other qualified individual will complete a site-specific assessment. See example in Attachment 1.
2. The BLM field office wildlife biologist will write documentation identifying the proposed modification and affirming that implementing the proposed modification(s) would not affect nest success or the suitability of the site for future nesting. Modification of the “*Guidelines*” would not be recommended if it is determined that adverse impacts to nesting raptors would occur or that the suitability of the site for future nesting would be compromised.

3. A BLM biologist or other raptor biologist will develop a monitoring and mitigation strategy. Impacts of authorized activities would be documented to determine whether the modifications were implemented as described in the environmental documentation or Conditions of Approval and were adequate to protect the nest site. If adverse impacts are identified during monitoring of an activity, BLM would follow an appropriate course of action, which may include cessation or modification of activities that would avoid, minimize, or mitigate the impact. Or, with the approval of UDWR and USFWS, BLM could allow the activity to continue while requiring monitoring to determine the full impact of the activity on the affected raptor nest. A monitoring report would be completed and forwarded to UDWR for incorporation into the Natural Heritage Program (NHP) raptor database.

In a further effort to provide additional support and expertise to local BLM field biologists, a network of biologists from various agencies with specific expertise in raptor management has been identified and included as Attachment 3. The personnel identified have extensive backgrounds in raptor management issues and are available, upon request, to assist BLM field biologists on a case-by-case basis. Field biologists are encouraged to use this network, via informal conference, with one or more of the individuals identified. This coordination should be clearly distinguished from the consultation process required under Section 7 of the ESA. Individuals on the expert panel should not be expected to provide formal advice, but should serve as a sounding board for discussing potential affects of a proposal as well as potential mitigation measures on specific projects which may be useful to BLM biologists.

## HABITAT ENHANCEMENT

As recommended in the “*Guidelines*,” raptor habitat management and enhancement, both within and outside of buffers, would be an integral part of these BMPs, with the understanding that for raptors to maintain high densities and maximum diversity, it is necessary that the habitat upon which they and their prey species depend be managed to promote healthy and productive ecosystems. Habitat loss or fragmentation would be minimized and/or mitigated to the extent practical, and may include such measures as drilling multiple wellheads per pad, limiting access roads and avoiding loop roads to well pads, effectively rehabilitating or restoring plugged and abandoned well locations and access roads that are no longer required, and rehabilitating or restoring wildland fires to prevent domination by nonnative invasive annual species, vegetation treatments, and riparian restoration projects to achieve Rangeland Health Standards.

In some cases, artificial nesting structures, located in areas where preferred nesting substrates are limited but where prey base populations are adequate and human disturbances are limited, may enhance some raptor populations, or may serve as mitigation for impacts occurring in other areas.

## PROTECTION OF NEST SITES AND BUFFER ZONES

As stated in the “*Guidelines*,” protecting both occupied and unoccupied nests is important because not all raptor pairs breed every year, nor do they always use the same nest within a nesting territory. Individual raptor nests left unused for a number of years are frequently reoccupied, if all of the nesting attributes which originally attracted a nesting pair to a location are still present. Nest sites are selected by breeding pairs for the preferred habitat attributes provided by that location.

Raptor nest buffer zones are established for planning purposes because the nest serves as the focal point for a nesting pair of raptors. The buffer should serve as a threshold of potential adverse affect to nest



initiation and productivity. Actions proposed within these buffer zones are considered potentially impacting and, therefore, trigger the need for consideration of site-specific recommendations.

Seasonal (temporal) buffer zones are conservation measures intended to schedule potentially impacting activities to periods outside of the nesting season for a particular raptor species. These seasonal limitations are particularly applicable to actions proposed within the spatial buffer zone of a nest for short duration activities. These activities include pipeline or power line construction, seismic exploration activity, vegetative treatments, fence or reservoir construction, permitted recreational events, where subsequent human activity would not be expected to occur.

Spatial buffer zones are those physical areas around raptor nest sites where seasonal conservation measures or surface occupancy restrictions may be applied, depending on the type and duration of activity, distance and visibility of the activity from the nest site, adaptability of the raptor species to disturbance, etc. Surface occupancy restrictions should be used for actions that would involve human activities within the buffer zone for a long duration (more than one nesting season) and that would cause an occupied nest site to become unsuitable for nesting in subsequent years.

## **Unoccupied Nests**

### **All Activities, Including All Mineral Leases**

Surface disturbing activities occurring outside the breeding season (seasonal buffer), but within the spatial buffer, would be allowed during a minimum 3-year nest monitoring period if a wildlife biologist determines that the activity would not cause the nest site to become unsuitable for future nesting. Facilities and other permanent structures would be allowed if they meet the above criteria.

Some examples of typical surface disturbing actions occurring outside of the seasonal buffer which may not be expected to affect nest production or future nesting suitability would include pipelines, power lines, seismographic exploration, communication sites, an oil or gas well with offsite facilities which does not require routine visitation, recreation events, fence or reservoir construction, vegetative treatments, and other actions with discreet starting and ending times, and for which subsequent human activity or heavy equipment operation within the spatial buffer would not be expected to occur, or could be scheduled outside of the seasonal buffer in subsequent years.

Surface-disturbing activities that would be expected to potentially affect nest production or nest site suitability include oil and gas facilities requiring regular maintenance, sand and gravel operations, road systems, wind energy projects, mining operations, and other actions requiring continual, random human activity or heavy equipment operation during subsequent nesting seasons.

A nest site that does not exhibit evidence of use—such as greenery in the nest, fresh whitewash, obvious nest maintenance or the observed presence of adults or young at the nest—for three consecutive years (verified through monitoring) would be deemed abandoned, and all seasonal and spatial restrictions would cease to apply to that nest. All subsequent authorizations for permanent activities within the spatial buffer of the nest could be permitted. If the nest becomes reoccupied after authorized activities are completed, conservation measures would be considered to reduce potential adverse effects and to comply with the Migratory Bird Treaty Act and the Eagle Protection Act.

The 3-year non-use standard varies from the “*Guidelines*” suggested 7-year non-use standard before declaring nest abandonment. This variation is based on a similar standard that has been applied for more than 20 years in two administrative areas within Utah. Empirical evidence would suggest the 3-year non-use standard has been effective in conserving raptor species. The 3-year standard has been applied

without legal challenge or violation of “Take” under the Migratory Bird Treaty Act or the Eagle Protection Act.

Because prey base populations are known to be cyclic and because raptor nest initiation or nesting success can be affected by drought and other random natural events, care should be taken when applying the 3-year non-activity standard. The 3-year nest occupancy monitoring requirement should be viewed as a minimum time period during those years of optimal raptor nesting conditions. During suboptimal raptor nesting years, when nesting habitat may be affected by drought, low prey base populations, fire, or other events, the monitoring standard should be increased to allow raptors the opportunity to reoccupy nesting sites when nesting conditions become more favorable.

## **Occupied Nests**

### **All Activities**

Land use activities that would adversely affect an occupied raptor nest would not be allowed within the spatial or seasonal buffer.

## **CONSIDERATION OF ALTERNATIVES AND MITIGATION MEASURES**

Alternatives, including denial of the proposal, should be identified, considered, and analyzed in a National Environmental Policy Act (NEPA) document any time an action is proposed within the spatial buffer zone of a raptor nest. Selecting a viable alternative that avoids an impact to nesting raptors should be chosen over attempting to mitigate those impacts. If unavoidable impacts are identified, mitigation measures should be applied as necessary to lessen adverse impacts of resource uses and development on nesting raptors. Monitoring the effectiveness of the mitigation measures should be mandatory and should be included as a Condition of Approval.

## **SPECIFIC STRATEGIES TO BE IMPLEMENTED REGARDING OTHER RESOURCE USES**

The following management strategies are designed to reduce or eliminate potential conflicts between raptors and other resource uses. This list of examples is not intended to be all-inclusive. In all cases, when an activity on BLM lands is proposed and a NEPA document is developed, the site-specific analysis process identified in Attachment 1 may be implemented to identify and either avoid or mitigate impacts to raptors from the proposal. These strategies apply to both BLM and applicant-generated proposals. The strategies are as follows.

### **Cultural Resources**

Excavation and studies of cultural resources in caves and around cliff areas should be delayed until a qualified biologist surveys the area to be disturbed or impacted by the activity for the presence of raptors or nest sites. If nesting raptors are present, the project should be rescheduled to occur outside of the seasonal buffer recommended by the “*Guidelines*.”

## **Forestry and Harvest of Woodland Products**

Timber harvest would be subject to NEPA analysis and would be conducted in a manner that would avoid impacts to raptor nests. This could also apply to areas identified for wood gathering and firewood sales.

## **Hazardous Fuel Reduction/Habitat Restoration Projects**

Hazardous fuels reduction projects and shrub-steppe restoration projects should be reviewed for possible impacts to nesting raptors. Removal of trees containing either stick nests or nesting cavities, through prescribed fire or mechanical or manual treatments, should be avoided.

It is important to note that certain raptor species are tied to specific habitat types, and that consideration must be made on a site-specific basis when vegetation manipulation projects are proposed to determine which raptor species may benefit and which may be adversely affected by the vegetation composition post-treatment.

## **Livestock Grazing**

Manage rangelands and riparian areas in a manner that promotes healthy, productive rangelands and functional riparian systems. Rangeland Health Assessments should be conducted on each grazing allotment, and rangeland guidelines should be implemented where Rangeland Health Standards are not being met to promote healthy rangelands.

Locations of sheep camps and other temporary intrusions would be located in areas away from raptor nest sites during the nesting season. Placement of salt and mineral blocks would also be located away from nesting areas.

Season of use, kind of livestock, and target utilization levels of key species affect vegetative community attributes (percent cover, composition, etc.) and influence small mammal and avian species diversity and density. While not all raptor species would be affected in the same way, livestock management practices that maintain or enhance vegetative attributes will preserve prey species density and diversity, which will benefit the raptor resource.

## **Off-Highway Vehicle Use**

Special Recreation Management Areas (SRMAs) that are developed for off-highway vehicle (OHV) use would not be located in areas that have important nesting, roosting, or foraging habitat for raptors.

OHVs use would be limited to designated roads, trails, and managed open areas. Lands categorized as “open” for OHV use should not be in areas important to raptors for nesting, roosting, and foraging.

When proposals for OHV events are received, a qualified wildlife biologist would survey the area to be impacted to determine if the area is used by raptors. Potential conflicts would be identified and either avoided or mitigated prior to the issuance of any permit.

## **Oil and Gas Development**

The Code of Federal Regulations (CFR), 43 CFR 3101.1-2, allows for well site location and timing to be modified from that requested by the lessee to mitigate conflicts at the proposed site, and states that the location can be moved up to 200 meters, and the timing of the actual drilling can be delayed for up to 60

days to mitigate environmental concerns. The regulation also allows BLM to move a location more than 200 meters, or delay operations more than 60 days to protect sensitive resources, with supporting rationale and where lesser restrictions are ineffective. The Site-Specific Analysis (Attachment 1) would provide the supporting rationale. Provisions are also present within Sections 3 and 6 of the Standard Lease Form that require compliance with existing laws and would allow BLM to impose additional restrictions at the permitting phase if the restrictions will prevent violation of law, policy, or regulation, or if they avoid undue and unnecessary degradation of lands or resources.

## **Realty**

Lands proposed for disposal, which include raptor nesting, roosting, or important foraging areas, would be analyzed and evaluated for the relative significance of these resources before a decision is made for disposal or retention.

A priority list of important raptor habitat areas, especially for federally listed or state-sensitive raptor species, on state and private lands should be developed and used as lands to be acquired by BLM when opportunities arise to exchange or otherwise acquire lands.

Lands and realty authorizations would include appropriate conservation measures to avoid and/or mitigate impacts to raptors.

## **Recreation**

Development of biking trails near raptor nesting areas would be avoided.

Rock climbing activities would be authorized only in areas where there are no conflicts with cliff-nesting raptors.

In high recreation use areas where raptor nest sites have been made unsuitable by existing disturbance or habitat alteration, mitigation should be considered to replace nest sites with artificial nest structures in nearby suitable habitat, if it exists, and consider seasonal protection of nest sites through fencing or other restrictions.

Dispersed recreation would be monitored to identify where this use may be affecting nesting success of raptors.

## **Wild Horse Program**

In areas where wild horse numbers are determined to be in excess of the carrying capacity of the range, removal of horses, as described in the various herd management area plans, would continue to prevent further damage to rangelands.

## **INVENTORY AND MONITORING**

- a) Each Field Office should cooperatively manage a raptor database, with UDWR and USFWS, as part of the BLM Corporate database. Raptor data should be collected and compiled using the Utah Raptor Data Collection Standards developed by the Utah State Office so that personnel from other agencies can access the data. Appropriate survey and monitoring protocols should be followed, when available. This database should be updated as new inventory and monitoring data

becomes available. The data should also be forwarded to UDWR and the NHP, which has been identified as the central repository for raptor data storage for the State of Utah.

- b) Use of seasonal employees and volunteers, as well as “Challenge Cost Share” projects, should be used to augment the inventory and monitoring of raptor nests within a planning area, with the data entered into the above-mentioned databases at the close of each nesting season. Project proponents, such as energy development interests, would be encouraged to participate and help support an annual raptor nest monitoring effort within their areas of interest.
- c) Active nest sites should be monitored during all authorized activities that may have an impact on the behavior or survival of the raptors at the nest site. A qualified biologist would conduct the monitoring and document the impacts of the activity on the species and to determine if adjustments to a site-specific project may be necessary. A final report of the impacts of the project should be placed in the environmental assessment (EA) file, with a copy submitted to the NHP. The report would be made available for review and should identify what activities may affect raptor nesting success, and should be used to recommend appropriate buffer zones for various raptor species.
- d) As data are gathered, and impact analyses are more accurately documented, “adaptive management” principles should be implemented. Authorization of future activities should take new information into account, better protecting raptors while potentially allowing more development and fewer restrictions, if data indicates that current restrictions are beyond those necessary to protect nesting raptors, or conversely indicates that current guidance is inadequate for protection of nesting raptors.



**ATTACHMENT 1 – SITE-SPECIFIC ANALYSIS DATA SHEET**

Observer(s)\_\_\_\_\_ Date\_\_\_\_\_

1. Conduct a site visit to the area of the proposed action and complete the raptor nest site data sheet according to BLM data standards.

2. Area of Interest Documentation (**Bold** items require completion, other information is optional)

State\_\_\_\_\_ Office\_\_\_\_\_ Management Unit \_\_\_\_\_

**Project ID#****Location (Description)**

Legal T\_\_\_\_, R\_\_\_\_, Sec.\_\_\_\_, 1/4,\_\_\_\_ 1/4,\_\_\_\_

or UTM Coordinates Latitude\_\_\_\_\_ Longitude\_\_\_\_\_

**Photos Taken** Y( ) N( )

Description of photos:

---

---

---

---

---

---

---

**Raptor Species**\_\_\_\_\_ **Confirmed**\_\_\_\_\_ **Unconfirmed**\_\_\_\_\_**Distance From Proposed Disturbance to:** **Nest** \_\_\_\_\_**Perch** \_\_\_\_\_**Roost** \_\_\_\_\_**Line of Site Evaluation From:** **Nest** \_\_\_\_\_**Perch** \_\_\_\_\_**Roost** \_\_\_\_\_**Extent of Disturbance:** Permanent\_\_\_\_\_ Temporary\_\_\_\_\_

Distance from Nest/Roost \_\_\_\_\_ Acreage \_\_\_\_\_

Length of Time \_\_\_\_\_ Timing Variations \_\_\_\_\_ Disturbance  
Frequency \_\_\_\_\_

**Other Disturbance Factors:** Yes (If yes, explain what and include distances from nest to disturbances) No

**Approximate Age of Nest:** New \_\_\_\_\_ **Historical:** (Number of Years) \_\_\_\_\_

**Evidence of Use (Describe):**

**Habitat Values Impacted:**

**Proportion of Habitat Impacted** (Relate in terms of habitat available):

**Estimated Noise Levels of Project (db):** \_\_\_\_\_

**Available Alternative(s)** (e.g., location, season, technology):

**Associated Activities:** \_\_\_\_\_

---

---

**Cumulative Effects of Proposal and Other Actions in Habitat Not Associated With the Proposal:**

---

---

**Potential for Site Rehabilitation: High \_\_\_\_\_ Low \_\_\_\_\_**

Notes/Comments:

---

---

**Summary of Proposed Modifications:**

Possible modifications to the spatial and seasonal buffers within the USFWS “Guidelines” include the following:

---

---

Rationale:

---

---

**Summary of Proposed Mitigation Measures:**

Possible mitigation measures related to the proposal include the following:

---

---

Rationale:

**Summary of Alternatives Considered:**

Possible alternatives to the proposal include the following:

---

---

---

---

Rationale:

---

---

---

**Recommendation to FO Manager Based on Above Findings:**

---

---

---

---

---

\_\_\_\_\_  
Field Office Wildlife Biologist

\_\_\_\_\_  
Date

## ATTACHMENT 2 – NESTING PERIODS AND RECOMMENDED BUFFERS FOR RAPTORS IN UTAH

Species	Spatial Buffer (miles)	Seasonal Buffer	Incubation, # Days	Brooding, # Days Post-Hatch	Fledging, # Days Post-Hatch	Post-fledge Dependency to Nest, # Days <sup>1</sup>
Bald eagle	1.0	1/1-8/31	34-36	21-28	70-80	14-20
Golden eagle	0.5	1/1-8/31	43-45	30-40	66-75	14-20
N. Goshawk	0.5	3/1-8/15	36-38	20-22	34-41	20-22
N. Harrier	0.5	4/1-8/15	32-38	21-28	42	7
Cooper's hawk	0.5	3/15-8/31	32-36	14	27-34	10
Ferruginous hawk	0.5	3/1-8/1	32-33	21	38-48	7-10
Red-tailed hawk	0.5	3/15-8/15	30-35	35	45-46	14-18
Sharp-shinned hawk	0.5	3/15-8/31	32-35	15	24-27	12-16
Swainson's hawk	0.5	3/1-8/31	33-36	20	36-40	14
Turkey vulture	0.5	5/1-8/15	38-41	14	63-88	10-12
California condor	1.0	NN yet	56-58	5-8 weeks	5-6 months	2 months
Peregrine falcon	1.0	2/1-8/31	33-35	14-21	35-49	21
Prairie falcon	0.25	4/1-8/31	29-33	28	35-42	7-14
Merlin	0.5	4/1-8/31	28-32	7	30-35	7-19
American kestrel	NN <sup>2</sup>	4/1-8/15	26-32	8-10	27-30	12
Osprey	0.5	4/1-8/31	37-38	30-35	48-59	45-50
Boreal owl	0.25	2/1-7/31	25-32	20-24	28-36	12-14
Burrowing owl	0.25	3/1-8/31	27-30	20-22	40-45	21-28
Flammulated owl	0.25	4/1-9/30	21-22	12	22-25	7-14
Great horned owl	0.25	12/1-9/31	30-35	21-28	40-50	7-14
Long-eared owl	0.25	2/1-8/15	26-28	20-26	30-40	7-14
N. saw-whet owl	0.25	3/1-8/31	26-28	20-22	27-34	7-14
Short-eared owl	0.25	3/1-8/1	24-29	12-18	24-27	7-14
Mex. Spotted owl	0.5	3/1-8/31	28-32	14-21	34-36	10-12
N. Pygmy owl	0.25	4/1-8/1	27-31	10-14	28-30	7-14
W. Screech owl	0.25	3/1-8/15	21-30	10-14	30-32	7-14
Common Barn-owl	NN <sup>2</sup>	2/1-9/15	30-34	20-22	56-62	7-14

<sup>1</sup> Length of post-fledge dependency period to parents is longer than reported in this table. Reported dependency periods reflect the amount of time the young are still dependent on the nest site; e.g., they return to the nest for feeding.

<sup>2</sup> Due to apparent high population densities and ability to adapt to human activity, a spatial buffer is not currently considered necessary for maintenance of American kestrel or Common barn-owl populations. Actions resulting in direct mortality of individual birds or take of known nest sites are unlawful.



## ATTACHMENT 3 – UTAH RAPTOR MANAGEMENT EXPERTS FROM VARIOUS AGENCIES

The personnel listed are from various agencies in Utah who are recognized experts in the field of raptor ecology or who have extensive field experience in managing raptor resources with competing land uses. BLM field biologists and managers can use this network of specialized expertise to assist, as time permits, with specific raptor management issues. Individuals in this Utah raptor network also have well-established contacts with an informal extended network of highly qualified raptor ecologists outside the state (e.g., USGS, state wildlife agencies, universities) to provide an additional regional perspective.

This list is not intended to replace or interfere with established lines of communication but rather supplement these lines of communication.

Utah BLM	David Mills	<a href="mailto:david_mills@blm.gov">david_mills@blm.gov</a>	435-896-1571
Utah BLM	Steve Madsen	<a href="mailto:steve_c_madsen@blm.gov">steve_c_madsen@blm.gov</a>	801-539-4058
Utah DWR	Dr. Jim Parrish	<a href="mailto:jimparrish@utah.gov">jimparrish@utah.gov</a>	801-538-4788
Utah DWR (NERO)	Brian Maxfield	<a href="mailto:brianmaxfield@utah.gov">brianmaxfield@utah.gov</a>	435-790-5355
USFWS	Laura Romin	<a href="mailto:laura_romin@usfws.gov">laura_romin@usfws.gov</a>	801-975-3330
USFWS	Diana Whittington	<a href="mailto:diana_whittington@usfws.gov">diana_whittington@usfws.gov</a>	801-975-3330
USFS	Chris Colt	<a href="mailto:ccolt@fs.fed.us">ccolt@fs.fed.us</a>	801-896-1062
HawkWatch Intl	Jeff Smith	<a href="mailto:jsmith@hawkwatch.org">jsmith@hawkwatch.org</a>	801-484-6808

## REFERENCES

Code of Federal Regulations; 43 CFR 3101.1-2, Leasing Regulations.

Endangered Species Act (ESA); 16 U.S.C. 1513-1543.

Migratory Bird Treaty Act (MBTA); 16 U.S.C. 703-712.

Romin, Laura A. and James A. Muck, 2002, "Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances." U.S. Department of Interior, U.S. Fish and Wildlife Service, Utah Field Office, Salt Lake City, Utah.

Standards for Rangeland Health and Guidelines for Grazing Management; 1997. U.S. Department of Interior, Bureau of Land Management.

U.S. Department of the Interior, Bureau of Land Management; 6840 Manual.

## APPENDIX 11—OIL AND GAS LEASING STIPULATIONS AND LEASE NOTICES

---

This appendix lists the stipulations on oil and gas leasing referenced in Approved Resource Management Plan. Oil and gas lease notices regarding listed plant and animal species have also been included in this document. These notices will be made a part of any oil and gas leases issued by the Field Office. Applicable stipulations would be appended to permits and leases issued for oil and gas resources on the public lands.

### DESCRIPTION OF SURFACE STIPULATIONS

Three types of surface stipulations can be applied to oil and gas leases: (1) no surface occupancy (NSO), (2) timing limitations (TL), and (3) controlled surface use (CSU).

- **No Surface Occupancy:** Areas closed to placement of surface facilities such as roads, oil and gas wells, and other facilities.
- **Timing Limitations:** Areas closed to construction and developmental activities during identified time frames. Timing limitation areas may be open to maintenance activities, including associated vehicle travel, during the closed period unless otherwise specified in the stipulation.
- **Controlled Surface Use:** Areas where surface uses are subject to specified controls or constraints to protect identified resource values.

Table A11-1 shows resources of concern, stipulations for addressing those concerns, and criteria for considering exceptions, modifications, and waivers.

### Exceptions, Modifications, and Waivers

An operator submitting a plan of operations to the Bureau of Land Management (BLM) may request an exception, modification, or waiver of a stipulation included in a lease.

- **Exception:** A one-time exemption to a lease stipulation determined on a case-by-case basis.
- **Modification:** A change to the provisions of a lease stipulation, either temporarily or for the term of the lease.
- **Waiver:** A permanent exemption to a lease stipulation.

The resource management plan (RMP) serves as the vehicle for explaining to industry and the public the conditions under which waivers, exceptions, or modifications of lease stipulations may be granted. All circumstances for granting a waiver, exception, or modification must be documented in the RMP.

The person requesting the exception, modification, or waiver is encouraged to submit information that might assist the authorized official in making a decision. The authorized officer reviews information submitted in support of the request and other pertinent information. The authorized officer may modify, waive, or grant an exception to a stipulation if:

- The action is consistent with federal laws.
- The action is consistent with the RMP.
- The management objectives that led the BLM to require the lease stipulation can be met without restricting operations in the manner provided for by the stipulation given changes in the condition

of the surface resources involved, or given the nature, location, timing, or design of the proposed operations.

- The action is acceptable to the authorized officer based on a review of the environmental consequences.

Table A11-1 includes criteria for considering requests for exceptions, modifications or waivers. Where there are overlapping stipulations on the same land, the more stringent stipulation applies.

Table A11-1. Oil and Gas Lease Stipulations—Richfield Field Office

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
Soil and Water	Slopes 30% or greater	CSU	<p>Surface disturbing proposed projects involving construction on slopes greater than 30% will be avoided. If the action cannot be avoided, rerouted, or relocated then a proposed project will include an erosion control strategy, reclamation and a site plan with a detailed survey and design completed by a certified engineer. This proposed project must be approved by the BLM prior to construction and maintenance.</p> <p>Exception: None Modification: None Waiver: None</p>
Soil and Water	Soils identified by National Resources Conservation Service (NRCS) as having high potential for wind erosion through research studies or monitoring	CSU	<p>If surface disturbing activities cannot be avoided on areas identified as having high potential for wind erosion, require a plan of operation that addresses erosion control strategies or mitigation measures, such as signing along roadways.</p> <p>Exception: None <b>Modification:</b> Consider modification if site-specific environmental analysis shows that alternatives would cause undue or unnecessary degradation to surface resources and impacts from wind erosion would not affect long-term soil productivity, would not impact air quality in nearby Class I airsheds, nor pose safety hazards to recreationists or motorists. Waiver: None</p>
Soil and Water	Riparian and wetland areas	NSO	<p>Maintain buffer zones of no surface disturbance and/or occupancy around natural springs. Base the size of the buffer on hydrological, riparian, and other factors necessary to protect the water quality of the springs. If these factors cannot be</p>



Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>determined, maintain a 330-foot buffer zone from outer edge.</p> <p><b>Exception:</b> Consider exceptions if it can be shown that (1) there are no practical alternatives to the disturbance, (2) all long-term impacts can be fully mitigated, and (3) the activity will benefit and enhance the riparian area. Consider compensatory mitigation where surface disturbance cannot be avoided within riparian wetland habitats on a site-specific basis.</p> <p>Modification: None</p> <p>Waiver: None</p>
Soil and Water	Wetland soils or soils identified as having hydric soil properties	NSO	<p>Allow NSO on wetland soils or soils identified as having hydric soil properties.</p> <p><b>Exception:</b> Consider exceptions to NSO if a site-specific environmental analysis determines that other placement alternatives would cause undue or unnecessary degradation to resources. In addition, require the operator to submit a plan prior to commencing operations that addresses:</p> <ul style="list-style-type: none"> <li>• Erosion control strategies</li> <li>• Mitigation to protect surface from rutting, compaction, and displacement, and disruption of surface and subsurface hydrologic function</li> <li>• Mitigation or restoration measures to restore hydrologic function to site</li> <li>• Proper survey and design by a certified engineer.</li> </ul> <p>Modification: None</p> <p>Waiver: None</p>
Special Status Species	Bald Eagle Nesting and Winter Roosting Habitat	Timing and CSU Notices	<p>Implement measures outlined in Attachment A, Lease Notice for Bald Eagles.</p> <p>Exception: None</p>

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			Modification: None Waiver: None
Special Status Species	Mexican Spotted Owl Designated Critical Habitat	Timing and CSU Notices	Implement measures outlined in Attachment B, Lease Notice for Mexican Spotted Owls. Exception: None Modification: None Waiver: None
Special Status Species	Southwestern Willow Flycatcher Habitat	Timing and CSU Notices	Implement measures outlined in Attachment C, Lease Notice Southwestern Willow Flycatcher Conservation Measures. Exception: None Modification: None Waiver: None
Special Status Species	Colorado River Fish Critical Habitat	Timing and CSU Notices	Implement measures outlined in Attachment D, Lease Notice for Colorado River Fish. Exception: None Modification: None Waiver: None
Special Status Species	Historic or Occupied Utah Prairie Dog Habitat	CSU Notices	Implement measures outlined in Attachment E, Lease Notice for Utah Prairie Dog. Exception: None Modification: None Waiver: None
Special Status Species	Suitable Habitat for Federally-listed plant species	CSU Notices	Implement measures outlined in Attachment F, Lease Notice for Listed Plant Species. Exception: None Modification: None Waiver: None
Special Status Species	Known or Suspected California Condor Habitat	Timing and CSU	Implement measures outlined in Attachment G, Lease Notice for California Condor. Exception: None Modification: None

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Barneby Reed Mustard.	Timing and CSU	Implement measures outlined in Attachment H, Lease Notice for Barneby Reed Mustard. Exception: None Modification: None Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Last Chance Townsendia	Timing and CSU	Implement measures outlined in Attachment I, Lease Notice for Last Chance Townsendia. Exception: None Modification: None Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Wright Fishhook Cactus	Timing and CSU	Implement measures outlined in Attachment J, Lease Notice for Wright Fishhook Cactus. Exception: None Modification: None Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Winkler Pincushion Cactus	Timing and CSU	Implement measures outlined in Attachment K, Lease Notice for Winkler Pincushion Cactus. Exception: None Modification: None Waiver: None
Special Status Species	Suitable or Occupied Habitat for the San Rafael Cactus	Timing and CSU	Implement measures outlined in Attachment L, Lease Notice for San Rafael Cactus. Exception: None Modification: None Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Ute Ladies' Tresses	Timing and CSU	Implement measures outlined in Attachment M, Lease Notice for Ute Ladies' Tresses. Exception: None Modification: None

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			Waiver: None
Special Status Species	Suitable or Occupied Habitat for the Maguire Daisy	Timing and CSU	Implement measures outlined in Attachment N. Lease Notice for Maguire Daisy. Exception: None Modification: None Waiver: None
Special Status Species	Sage Grouse Leks	NSO	Manage oil and gas leasing as open subject to major constraints (NSO) within ½ mile of greater sage-grouse leks. <b>Exception:</b> An exception may be granted by the Field Manager if the operator submits a plan that demonstrates that impacts from the proposed action can be adequately mitigated. <b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area if (1) portions of the area do not include lek sites, (2) the lek site(s) have been completely abandoned or destroyed, or (3) occupied lek site(s) occur outside the current defined area, as determined by the BLM. <b>Waiver:</b> A waiver may be granted if there are no active lek site(s) in the leasehold and it is determined the site(s) have been completely abandoned or destroyed or occur outside current defined area, as determined by the BLM.
Special Status Species	Sage Grouse Brooding Habitat	TL	Allow no surface disturbing or otherwise disruptive activities within 2 miles of a greater sage-grouse lek from March 15 to July 15 to protect sage grouse breeding and brood-rearing habitat. <b>Exception:</b> An exception could be granted if surveys determine that the Greater sage-grouse lek in nesting and brood-rearing habitat is not occupied. An exception may also be granted by the Field Manager if the operator submits a plan that demonstrates

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>that impacts from the proposed action can be adequately mitigated or it is determined the lek sites are not active.</p> <p><b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area if portions of the area do not include habitat or are outside the current defined area, as determined by the BLM.</p> <p><b>Waiver:</b> A waiver may be granted if it is determined the habitat no longer exists or has been destroyed.</p>
Special Status Species	Sage Grouse Brooding Habitat	TL	<p>Allow no surface disturbing or otherwise disruptive activities in greater sage-grouse winter habitat from December 15 through March 14.</p> <p><b>Exception:</b> An exception could be granted if surveys determine that the Greater sage-grouse lek in winter habitat is not occupied, and that snow depths in the area allow continued sage-grouse use. An exception may also be granted by the Field Manager if the operator submits a plan that demonstrates that impacts from the proposed action can be avoided, sufficiently minimized, or adequately mitigated.</p> <p><b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area if portions of the area do not include habitat or are outside the current defined area, as determined by the BLM.</p> <p><b>Waiver:</b> A waiver may be granted if it is determined the habitat no longer exists or has been destroyed.</p>
Fish and Wildlife	Crucial Bison Habitat	TL	<p>Restrict oil and gas exploration and development activities in crucial bison habitat from November 1 through May 15.</p> <p><b>Exception:</b> This stipulation does not apply to the maintenance and operation of existing</p>



Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>and ongoing facilities. An exception may be granted by the Field Manager if the operator submits a plan that demonstrates that impacts from the proposed action can be adequately mitigated or it is determined the habitat is not being used during the winter period for any given year.</p> <p><b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area if (1) a portion of the area is not being used as crucial range by bison, (2) habitat outside of stipulation boundaries is being used as crucial range and needs to be protected, or (3) the migration patterns have changed causing a difference in the season of use.</p> <p><b>Waiver:</b> A waiver may be granted if the crucial range habitat is unsuitable or unoccupied during winter months by bison and there is no reasonable likelihood of future winter range use.</p>
Fish and Wildlife	Crucial Mule Deer and Elk Habitat	TL	<p>Restrict surface disturbing activities in crucial mule deer and elk habitats from December 15 through April 15 to protect winter habitats.</p> <p><b>Exception:</b> This stipulation does not apply to the maintenance and operation of existing and ongoing facilities. An exception may be granted by the Field Manager if the operator submits a plan that demonstrates that impacts from the proposed action can be adequately mitigated or it is determined the habitat is not being used during the winter period for any given year.</p> <p><b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area if (1) a portion of the area is not being used as crucial winter range by deer/elk, (2) habitat outside of stipulation boundaries is being used as crucial winter range and needs to be protected, or (3) the migration patterns have changed causing a difference</p>

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>in the season of use.</p> <p><b>Waiver:</b> A waiver may be granted if the winter range habitat is unsuitable or unoccupied during winter months by deer/elk and there is no reasonable likelihood of future winter range use.</p>
Fish and Wildlife	Crucial Pronghorn Habitat	TL	<p>Restrict surface disturbing activities in crucial pronghorn antelope habitat from May 15 through June 15 to protect species sensitivity during fawning season.</p> <p><b>Exception:</b> The Field Manager may grant an exception if the operator submits a plan that demonstrates that impacts from the proposed action can be adequately mitigated.</p> <p><b>Modification:</b> The Field Manager may modify the boundaries of the stipulation area (1) if a portion of the area is not being used as crucial pronghorn habitat during kidding season or (2) if habitat outside of stipulation boundaries is being used for crucial pronghorn habitat and needs to be protected.</p> <p><b>Waiver:</b> A waiver may be granted if the habitat is determined as unsuitable for crucial pronghorn habitat and there is no reasonable likelihood of future use as crucial pronghorn habitat.</p>
Fish and Wildlife	Crucial Desert Bighorn Sheep Habitat	TL	<p>Prohibit surface disturbing activities in crucial desert bighorn sheep habitat from April 15 through June 15 to protect species sensitivity during lambing season.</p> <p><b>Exception:</b> The Field Manager may grant an exception if the operator submits a plan that demonstrates that impacts from the proposed action can be adequately mitigated.</p> <p><b>Modification:</b> The Field Manager may</p>

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>modify the boundaries of the stipulation area (1) if a portion of the area is not being used as crucial Desert bighorn sheep habitat during lambing season or (2) if habitat outside of stipulation boundaries is being used for crucial Desert bighorn sheep habitat and needs to be protected.</p> <p><b>Waiver:</b> A waiver may be granted if the habitat is determined to be unsuitable for crucial Desert bighorn sheep habitat and there is no reasonable likelihood of future use as crucial Desert bighorn sheep habitat.</p>
Cultural Resources	Bull Creek National Historic District	NSO	<p>Allow NSO within the Bull Creek National Historic District.</p> <p>Exception: None</p> <p>Modification: None</p> <p>Waiver: None</p>
Special status species	Sage grouse leks	NSO	<p>Prohibit surface disturbing activities within 1/2 mile of sage grouse leks to protect species sensitivity around leks.</p> <p>Exception: None</p> <p>Modification: None</p> <p>Waiver: None</p>
Scenic and Recreational Resources	Dirty Devil SRMA	NSO	<p>Lease with NSO VRM Class II areas and canyon rims within viewshed of canyons (approximately one-quarter mile) to protect scenic values and opportunities for primitive and semi-primitive recreation.</p> <p><b>Exception:</b> Consider exceptions if oil and gas exploration and development would not impair identified scenic and primitive or semi-primitive recreational resources.</p> <p>Modification: None</p> <p>Waiver: None.</p>
Visual Resources	VRM Class II Areas	CSU	<p>Surface disturbing activities must meet the objectives of Visual Resource Management</p>

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
			<p>(VRM) Class II.</p> <p><b>Exception:</b> The level of change to the landscape should be low; management activities may be seen, but should not attract the attention of the casual observer. Any change to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Surface disturbing activities that are determined to be compatible and consistent with the protection or enhancement of the resource values are exempted. Also, recognized utility corridors are exempted only for utility projects, which would be managed according to VRM Class III objectives.</p> <p>Modification: None</p> <p>Waiver: None.</p>
Lands	Cemeteries Culinary water sources Landfills—existing and closed Lands managed under Recreation and Public Purpose Act leases Sites listed on the National Register of Historic Places Incorporated municipalities Developed recreation sites BLM administrative sites	NSO	<p>Lease with NSO.</p> <p>Exception: None</p> <p>Modification: None</p> <p>Waiver: None</p>

Resource of Concern	Applicable Area	Stipulation	Stipulation Description
Non-WSA lands with wilderness characteristics	Lands managed as non-WSA lands with wilderness characteristics (78,600 acres)	NSO	<p>Lease with NSO the lands managed as non-WSA lands with wilderness characteristics (78,600 acres) to protect, preserve, and maintain their wilderness characteristics.</p> <p>Exception: None Modification: None Waiver: None</p>
Special Designations (Relict Vegetation)	North Caineville Mesa Area of Critical Environmental Concern (ACEC) (part of Badlands ACEC in Alternative C)	NSO	<p>Allow NSO within North Caineville Mesa ACEC to protect relict vegetation.</p> <p>Exception: None Modification: None Waiver: None</p>



## Attachment A—Lease Notice for Bald Eagle

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Bald Eagle

The Lessee/Operator is given notice that the lands in this parcel contains nesting/winter roost habitat for the bald eagle, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside the bald eagle breeding or roosting season. A temporary action is completed prior to the following breeding or roosting season, leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding or roosting season and/or causes a loss of eagle habitat or displaces eagles through disturbances (e.g., creation of a permanent structure). The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act (ESA). Integration of, and adherence to, these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations, unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s), and be conducted according to protocol.
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Water production will be managed to ensure maintenance or enhancement of riparian habitat.
4. Temporary activities within 1.0 mile of nest sites will not occur during the breeding season of January 1 to August 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5. Temporary activities within 0.5 miles of winter roost areas, e.g., cottonwood galleries, will not occur during the winter roost season of November 1 to March 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
6. No permanent infrastructure will be placed within 1.0 mile of nest sites.
7. No permanent infrastructure will be placed within 0.5 miles of winter roost areas.
8. Remove big game carrion to 100 feet from on lease roadways occurring within bald eagle foraging range.
9. Avoid loss or disturbance to large cottonwood gallery riparian habitats.
10. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat. Utilize directional drilling to avoid direct impacts to large cottonwood gallery riparian habitats. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
11. All areas of surface disturbance within riparian areas and/or adjacent uplands should be re-vegetated with native species.

Additional measures may also be employed to avoid or minimize effects to the species between the lease sale stage and lease development stage. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment B—Lease Notice for Mexican Spotted Owl

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Mexican Spotted Owl

The Lessee/Operator is given notice that the lands in this lease contain suitable habitat for Mexican spotted owl, a federally listed species. **Insert the following if lease contains Designated Critical Habitat:** *[The Lessee/Operator is given notice that the lands in this lease contain Designated Critical Habitat for the Mexican spotted owl, a Federally listed species. Critical habitat was designated for the Mexican spotted owl on August 31, 2004 (69 FR 53181-53298).]* Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside the owl nesting season. A temporary action is completed prior to the following breeding season, leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of owl habitat or displaces owls through disturbances (e.g., creation of a permanent structure). The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act (ESA). Integration of, and adherence to, these measures, will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations, unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s).
2. Assess habitat suitability for both nesting and foraging using accepted habitat models in conjunction with field reviews. Apply the conservation measures below if project activities occur within 0.5 mile of suitable owl habitat. Determine potential effects of actions to owls and their habitat.
  - a. Document type of activity, acreage and location of direct habitat impacts, type and extent of indirect impacts relative to location of suitable owl habitat.
  - b. Document if the action is temporary or permanent.
3. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
4. Water production will be managed to ensure maintenance or enhancement of riparian habitat.
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in canyon habitat suitable for Mexican spotted owl nesting.
6. For all temporary actions that may impact owls or suitable habitat:
  - a. If the action occurs entirely outside of the owl breeding season (March 1 to August 31) and leaves no permanent structure or permanent habitat disturbance, action can proceed without an occupancy survey.
  - b. If the action will occur during a breeding season, survey for owls prior to commencing activity. If owls are found, activity must be delayed until outside of the breeding season.
  - c. Rehabilitate access routes created by the project through such means as raking out scars, revegetation, gating access points, etc.
7. For all permanent actions that may impact owls or suitable habitat:
  - a. Survey two consecutive years for owls according to accepted protocol prior to commencing activities.
  - b. If owls are found, no actions will occur within 0.5 mile of identified nest site. If nest site is unknown, no activity will occur within the designated Protected Activity Center (PAC).
  - c. Avoid drilling and permanent structures within 0.5 mile of suitable habitat unless surveyed and not occupied.
  - d. Reduce noise emissions (e.g., use hospital-grade mufflers) to 45 dBA at 0.5 mile from suitable habitat, including canyon rims. Placement of permanent noise-generating facilities should be determined by a noise analysis to ensure noise does not encroach upon a 0.5 mile buffer for suitable habitat, including canyon rims.
  - e. Limit disturbances to and within suitable habitat by staying on approved routes.
  - f. Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

## Attachment C—Lease Notice for Southwestern Willow Flycatcher

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Southwestern Willow Flycatcher

The Lessee/Operator is given notice that the lands in this parcel contain riparian habitat that falls within the range for southwestern willow flycatcher, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside the nesting season. A temporary action is completed prior to the following breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of habitat or displaces flycatchers through disturbances (e.g., creation of a permanent structure). The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act (ESA). Integration of, and adherence to, these measures, will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations, unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s), and be conducted according to protocol.
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Water production will be managed to ensure maintenance or enhancement of riparian habitat.
4. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
5. Drilling activities will maintain a 300 ft. buffer from suitable riparian habitat year long.
6. Drilling activities within 0.25 mile of occupied breeding habitat will not occur during the breeding season of May 1 to August 15.
7. Ensure that water extraction or disposal practices do not result in change of hydrologic regime that would result in loss or degradation of riparian habitat.
8. Revegetate with native species all areas of surface disturbance within riparian areas and/or adjacent uplands.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

## Attachment D—Lease Notice for Colorado River Fish

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Endangered Fish of the Upper Colorado River Drainage Basin

The Lessee/Operator is given notice that the lands in this parcel contain Critical Habitat for the Colorado River fish (bonytail chub, humpback chub, Colorado pike minnow, and razorback sucker, listed as endangered under the Endangered Species Act (ESA), or these parcels have watersheds that are tributary to designated habitat. Critical habitat was designated for the four endangered Colorado River fishes on March 21, 1994 (59 FR 13374-13400). Designated critical habitat for all the endangered fishes includes those portions of the 100-year floodplain that contain primary constituent elements necessary for survival of the species. Avoidance or use restrictions may be placed on portions of the lease. The following avoidance and minimization measures have been designed to ensure activities carried out on the lease comply with the ESA. Integration of, and adherence to, these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations, unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s).
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Water production will be managed to ensure maintenance or enhancement of riparian habitat.
4. Avoid loss or disturbance of riparian habitats.
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
6. Conduct watershed analysis for leases in designated critical habitat and overlapping major tributaries in order to determine toxicity risk from permanent facilities.
7. Implement the Utah Oil and Gas Pipeline Crossing Guidance (from BLM National Science and Technology Center).
8. Drilling will not occur within 100-year floodplains of rivers or tributaries to rivers that contain listed fish species or critical habitat.
9. In areas adjacent to 100-year flood plains, particularly in systems prone to flash floods, analyze the risk for flash floods to impact facilities, and use closed loop drilling, and pipeline burial or suspension according to the Utah Oil and Gas Pipeline Crossing Guidance, to minimize the potential for equipment damage and resulting leaks or spills.

Water depletions from any portion of the Upper Colorado River drainage basin above Lake Powell are considered to adversely affect or adversely modify the critical habitat of the four resident endangered fish species, and must be evaluated with regard to the criteria described in the Upper Colorado River Endangered Fish Recovery Program. Formal consultation with U.S. Fish and Wildlife Service (USFWS) is required for all depletions. All depletion amounts must be reported to BLM.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the USFWS between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

## Attachment E—Lease Notice for Utah Prairie Dog

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Utah Prairie Dog

The Lessee/Operator is given notice that lands in this lease may contain historic and/or occupied Utah prairie dog habitat, a threatened species under the Endangered Species Act (ESA). Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs when prairie dogs are active or hibernating. A temporary action is completed prior to the following active season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one activity/hibernation season and/or causes a loss of Utah prairie dog habitat or displaces prairie dogs through disturbances (e.g., creation of a permanent structure). The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the ESA. Integration of, and adherence to, these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s).
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in prairie dog habitat.
4. Surface occupancy or other surface disturbing activity will be avoided within 0.5 mile of active prairie dog colonies.
5. Permanent surface disturbance or facilities will be avoided within 0.5 mile of potentially suitable, unoccupied prairie dog habitat, identified and mapped by Utah Division of Wildlife Resources since 1976.
6. The lessee/operator should consider if fencing infrastructure on well pad, e.g., drill pads, tank batteries, and compressors, would be needed to protect equipment from burrowing activities. In addition, the operator should consider if future surface disturbing activities would be required at the site.
7. Within occupied habitat, set a 25 mph speed limit on operator-created and maintained roads.
8. Limit disturbances to and within suitable habitat by staying on designated routes.
9. Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.



## Attachment F—Lease Notice for Listed Plant Species

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Listed Plant Species

The Lessee/Operator is given notice that the lands in this parcel contain suitable habitat for federally listed plant species under the Endangered Species Act (ESA). The following avoidance and minimization measures have been developed to facilitate review and analysis of any submitted permits under the authority of this lease

1. Site inventories:
  - a. Must be conducted to determine habitat suitability
  - b. Are required in known or potential habitat for all areas proposed for surface disturbance before initiating project activities, at a time when the plant can be detected, and during appropriate flowering periods
  - c. Should include documentation on individual plant locations and suitable habitat distributions
  - d. Must have qualified individuals conduct all surveys.
2. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Project activities must be designed to avoid direct disturbance to populations and to individual plants:
  - a. Designs will avoid concentrating water flows or sediments into plant occupied habitat.
  - b. Construction will occur downslope of plants and populations where feasible; if well pads and roads must be sited upslope, buffers of 100 feet minimum between surface disturbances and plants and populations will be incorporated.
  - c. Where populations occur within 200 feet of well pads, a buffer or fence will be established between the individuals or groups of individuals and the well pads during and post-construction.
  - d. Areas for avoidance will be visually identifiable in the field, e.g., flagging, temporary fencing, rebar.
  - e. For surface pipelines, a 10-foot buffer will be used from any plant locations:
    - i. If on a slope, stabilizing construction techniques will be used to ensure the pipelines do not move toward the population.
4. For riparian/wetland-associated species, e.g. Ute ladies'-tresses, avoid loss or disturbance of riparian habitats:
  - a. Water extraction or disposal practices will not result in change of hydrologic regime.
5. Disturbances to and within suitable habitat will be limited by staying on designated routes.
6. New access routes created by the project will be limited.
7. To limit OHV travel in sensitive areas, signing will be placed appropriately.
8. Dust abatement practices will be implemented near occupied plant habitat.
9. All disturbed areas will be revegetated with native species composed of species indigenous to the area.
10. Post-construction monitoring for invasive species will be required.
11. Where technically and economically feasible, directional drilling or multiple wells will be used from the same pad to reduce surface disturbance and eliminate drilling in plant habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
12. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

## Attachment G—Lease Notice for California Condor

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – California Condor

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the California Condor, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease if the area is known or suspected to be used by condors. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside potential habitat. A temporary action is completed prior to the following important season of use, leaving no permanent structures and resulting in no permanent habitat loss. This would include consideration for habitat functionality. A permanent action continues for more than one season of habitat use, and/or causes a loss of condor habitat function or displaces condors through continued disturbance (i.e. creation of a permanent structure requiring repetitious maintenance, or emits disruptive levels of noise).

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act (ESA). Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the BLM, and must be conducted according to approved protocol.
2. If surveys result in positive identification of condor use, all lease activities will require monitoring throughout the duration of the project to ensure desired results of applied mitigation and protection. Minimization measures will be evaluated during development and, if necessary, Section 7 consultation may be reinitiated.
3. Temporary activities within 1.0 mile of nest sites will not occur during the breeding season.
4. Temporary activities within 0.5 miles of established roosting sites or areas will not occur during the season of use, August 1 to November 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5. No permanent infrastructure will be placed within 1.0 mile of nest sites.
6. No permanent infrastructure will be placed within 0.5 miles of established roosting sites or areas.
7. Remove big game carrion to 100 feet from on lease roadways occurring within foraging range.
8. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat. Utilize directional drilling to avoid direct impacts to large cottonwood gallery riparian habitats. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
9. Reinitiation of section 7 consultation with the Service will be sought immediately if mortality or disturbance to California condors is anticipated as a result of project activities. Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

Additional measures may also be employed to avoid or minimize effects to the species between the lease sale and lease development stages. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment H—Lease Notice for Barneby Reed Mustard

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Barneby Reed-Mustard

In order to minimize effects to the federally threatened Barneby reed-mustard, the Bureau of Land Management (BLM), in coordination with the U.S. Fish and Wildlife Service (Service), has developed the following avoidance and minimization measures. Implementation of these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance operations) are in compliance with the Endangered Species Act (ESA). For the purposes of this document, the follow terms are so defined:

- *Potential habitat* is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at <<http://www.fws.gov/endangered/wildlife.html>>.
- *Occupied habitat* is defined as areas currently or historically known to support clay reed-mustard; synonymous with "known habitat."

The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat<sup>1</sup> prior to any ground disturbing activities (including ATV use) to determine if suitable Barneby reed-mustard habitat is present.
2. Site inventories will be conducted within suitable habitat to determine occupancy. Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc., suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas"); in such cases, in general, 300' buffers will be maintained between surface disturbance and avoidance areas. However, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat. Where conditions allow, inventories:
  - a. Must be conducted by qualified individual(s) and according to BLM and Service accepted survey protocols,
  - b. Will be conducted in suitable and occupied habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected (usually April 15<sup>th</sup> to June 5<sup>th</sup>, however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower ),
  - c. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - d. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - e. Will be valid until April 15<sup>th</sup> the following year.
3. Design project infrastructure to minimize impacts within suitable habitat:
  - a. Where standard surveys are technically infeasible, infrastructure and activities will avoid all suitable habitat (avoidance areas) and incorporate 300' buffers, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - d. Limit new access routes created by the project,
  - e. Roads and utilities should share common right-of-ways where possible,
  - f. Reduce the width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - g. Place signing to limit off-road travel in sensitive areas, and
  - h. Stay on designated routes and other cleared/approved areas.
  - i. All disturbed areas will be revegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.

### Utah's Threatened and Endangered Species Notices

4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above recommendations (#3) for project design within suitable habitats,
  - b. To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged,
  - d. Construction of roads will occur such that the edge of the right of way is at least 300' from any plant and 300' from avoidance areas,
  - e. Roads will be graveled within occupied habitat; the operator is encouraged to apply water for dust abatement to such areas from April 15<sup>th</sup> to June 5<sup>th</sup> (flowering period); dust abatement applications will be comprised of water only,
  - f. The edge of the well pad should be located at least 300' away from plants and avoidance areas, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - g. Surface pipelines will be laid such that a 300' buffer exists between the edge of the right of way and plants and 300' between the edge of right of way and avoidance areas; use stabilizing and anchoring techniques when the pipeline crosses suitable habitat to ensure pipelines don't move towards the population; site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - h. Construction activities will not occur from April 15<sup>th</sup> through June 5<sup>th</sup> within occupied habitat,
  - i. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - j. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - k. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Barneby reed-mustard habitats within 300' of the edge of the surface pipelines' right of ways, 300' of the edge of the roads' right of ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Barneby reed-mustard is anticipated as a result of project activities. Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment I—Lease Notice for Last Chance Townsendia

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Last Chance Townsendia (*Townsendia aprica*)

In order to minimize effects to the federally threatened Last Chance townsendia, the Bureau of Land Management (BLM), in coordination with the U.S. Fish and Wildlife Service (Service), has developed the following avoidance and minimization measures. Implementation of these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance operations) are in compliance with the Endangered Species Act (ESA). For the purposes of this document, the follow terms are so defined:

- *Potential habitat* is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at <<http://www.fws.gov/endangered/wildlife.html>>.
- *Occupied habitat* is defined as areas currently or historically known to support clay reed-mustard; synonymous with "known habitat."

The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat prior to any ground disturbing activities to determine if suitable Last Chance townsendia habitat is present.
2. Site inventories will be conducted within suitable habitat to determine occupancy. Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc., suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas"); in such cases, in general, 300' buffers will be maintained between surface disturbance and avoidance areas. However, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat. Where conditions allow, inventories:
  - a. Must be conducted by qualified individual(s) and according to BLM and Service accepted survey protocols,
  - b. Will be conducted in suitable and occupied habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected (usually April 1<sup>st</sup> to May 30<sup>th</sup>, however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower ),
  - c. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - d. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - e. Will be valid until April 1<sup>st</sup> the following year.
3. Design project infrastructure to minimize impacts within suitable habitat:
  - a. Where standard surveys are technically infeasible, infrastructure and activities will avoid all suitable habitat (avoidance areas) and incorporate 300' buffers, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - d. Limit new access routes created by the project,
  - e. Roads and utilities should share common right-of-ways where possible,
  - f. Reduce the width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - g. Place signing to limit off-road travel in sensitive areas, and
  - h. Stay on designated routes and other cleared/approved areas.
  - i. All disturbed areas will be revegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.



### Utah's Threatened and Endangered Species Notices

4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above recommendations (#3) for project design within suitable habitats,
  - b. To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged,
  - d. Construction of roads will occur such that the edge of the right of way is at least 300' from any plant and 300' from avoidance areas,
  - e. Roads will be graveled within occupied habitat; the operator is encouraged to apply water for dust abatement to such areas from April 15<sup>st</sup> to June 30<sup>th</sup> (flowering period); dust abatement applications will be comprised of water only,
  - f. The edge of the well pad should be located at least 300' away from plants and avoidance areas, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - g. Surface pipelines will be laid such that a 300' buffer exists between the edge of the right of way and plants and 300' between the edge of right of way and avoidance areas; use stabilizing and anchoring techniques when the pipeline crosses suitable habitat to ensure pipelines don't move towards the population; site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - h. Construction activities will not occur from April 15<sup>th</sup> through June 30<sup>th</sup> within occupied habitat,
  - i. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - j. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - k. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Last Chance townsendia habitats within 300' of the edge of the surface pipelines' right of ways, 300' of the edge of the roads' right of ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Last Chance Townsendia is anticipated as a result of project activities. Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment J—Lease Notice for Wright Fishhook Cactus

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Wright Fishhook Cactus (*Sclerocactus wrightii*)

In order to minimize effects to the federally endangered Wright fishhook cactus, the Bureau of Land Management (BLM), in coordination with the U.S. Fish and Wildlife Service (Service), has developed the following avoidance and minimization measures. Implementation of these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance operations) are in compliance with the Endangered Species Act (ESA). For the purposes of this document, the follow terms are so defined:

- *Potential habitat* is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at <<http://www.fws.gov/endangered/wildlife.html>>.
- *Occupied habitat* is defined as areas currently or historically known to support clay reed-mustard; synonymous with "known habitat."

The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat prior to any ground disturbing activities to determine if suitable Wright fishhook cactus habitat is present.
2. Within suitable habitat, site inventories will be conducted to determine occupancy. Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc., suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas"); in such cases, in general, 300' buffers will be maintained between surface disturbance and avoidance areas. However, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat. Inventories:
  - a. Must be conducted by qualified individual(s) approved by BLM using accepted survey protocols,
    - i. Will be conducted in suitable and occupied habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected and during appropriate flowering periods. Inventories should be conducted between April 1<sup>st</sup> to June 15<sup>th</sup>, however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower,
  - b. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - c. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - d. Will be valid until April 1st the following year.
3. Design project infrastructure to minimize impacts within suitable habitat:
  - a. Where standard surveys are technically infeasible, infrastructure and activities will avoid all suitable habitat (avoidance areas) and incorporate 300' buffers, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - d. Limit new access routes created by the project,
  - e. Roads and utilities should share common right-of-ways where possible,
  - f. Reduce the width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - g. Place signing to limit off-road travel in sensitive areas, and
  - h. Stay on designated routes and other cleared/approved areas.
  - i. All disturbed areas will be revegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.

### Utah's Threatened and Endangered Species Notices

4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above recommendations (#3) for project design within suitable habitats,
  - b. To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged,
  - d. Construction of roads will occur such that the edge of the right of way is at least 300' from any plant and 300' from avoidance areas,
  - e. Roads will be graveled within occupied habitat; the operator is encouraged to apply water for dust abatement to such areas from April 1st to June 15<sup>th</sup> (flowering period); dust abatement applications will be comprised of water only,
  - f. The edge of the well pad should be located at least 300' away from plants and avoidance areas, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - g. Surface pipelines will be laid such that a 300' buffer exists between the edge of the right of way and plants and 300' between the edge of right of way and avoidance areas; use stabilizing and anchoring techniques when the pipeline crosses suitable habitat to ensure pipelines don't move towards the population; site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - h. Construction activities will not occur from April 1<sup>st</sup> through June 15<sup>th</sup> within occupied habitat,
  - i. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - j. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - k. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Wright fishhook cactus habitats within 300' of the edge of the surface pipelines' right-of-ways, 300' of the edge of the roads' right-of-ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Wright fishhook cactus is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation.

## Attachment K—Lease Notice for Winkler Pincushion Cactus

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Winkler Pincushion Cactus (*Pediocactus winkleri*)

In order to minimize effects to the federally threatened Winkler pincushion cactus, the Bureau of Land Management (BLM), in coordination with the U.S. Fish and Wildlife Service (Service), has developed the following avoidance and minimization measures. Implementation of these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance operations) are in compliance with the Endangered Species Act (ESA). For the purposes of this document, the follow terms are so defined:

- *Potential habitat* is defined as areas that satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at <<http://www.fws.gov/endangered/wildlife.html>>.
- *Occupied habitat* is defined as areas currently or historically known to support clay reed-mustard; synonymous with "known habitat."

The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat prior to any ground disturbing activities to determine if suitable Winkler pincushion cactus habitat is present.
2. Within suitable habitat, site inventories will be conducted to determine occupancy. Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc., suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas"); in such cases, in general, 300' buffers will be maintained between surface disturbance and avoidance areas. However, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat. Inventories:
  - a. Must be conducted by qualified individual(s) approved by BLM using accepted survey protocols,
  - b. Will be conducted in suitable and occupied<sup>1</sup> habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected, and during appropriate flowering periods. Inventories should be conducted between March 15<sup>th</sup> to June 1st, however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower,
  - c. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - d. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - e. Will be valid until March 15<sup>th</sup> the following year.
3. Design project infrastructure to minimize impacts within suitable habitat:
  - a. Where standard surveys are technically infeasible, infrastructure and activities will avoid all suitable habitat (avoidance areas) and incorporate 300' buffers, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - d. Limit new access routes created by the project,
  - e. Roads and utilities should share common right-of-ways where possible,
  - f. Reduce the width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - g. Place signing to limit off-road travel in sensitive areas, and
  - h. Stay on designated routes and other cleared/approved areas.
  - i. All disturbed areas will be revegetated with native species comprised of species indigenous to the

<sup>1</sup> Occupied habitat is defined as areas currently or historically known to support Winkler pincushion cactus; synonymous with "known habitat."

### Utah's Threatened and Endangered Species Notices

area and non-native species that are not likely to invade other areas.

4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above recommendations (#3) for project design within suitable habitats,
  - b. To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged,
  - d. Construction of roads will occur such that the edge of the right of way is at least 300' from any plant and 300' from avoidance areas,
  - e. Roads will be graveled within occupied habitat; the operator is encouraged to apply water for dust abatement to such areas from March 15<sup>th</sup> to June 1st (flowering period); dust abatement applications will be comprised of water only,
  - f. The edge of the well pad should be located at least 300' away from plants and avoidance areas, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - g. Surface pipelines will be laid such that a 300' buffer exists between the edge of the right of way and plants and 300' between the edge of right of way and avoidance areas; use stabilizing and anchoring techniques when the pipeline crosses suitable habitat to ensure pipelines don't move towards the population; site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - h. Construction activities will not occur from March 15<sup>th</sup> through June 1<sup>st</sup> within occupied habitat,
  - i. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - j. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - k. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Winkler pincushion cactus habitats within 300' of the edge of the surface pipelines' right-of-ways, 300' of the edge of the roads' right-of-ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Winkler pincushion cactus is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.



## Attachment L—Lease Notice for the San Rafael Cactus

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – San Rafael Cactus (*Pediocactus despainii*)

In order to minimize effects to the federally endangered San Rafael cactus, the Bureau of Land Management (BLM) in coordination with the U.S. Fish and Wildlife Service (Service), have developed the following avoidance and minimization measures. Integration of and adherence to these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance) are in compliance with the Endangered Species Act (ESA). The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat<sup>2</sup> prior to any ground disturbing activities to determine if suitable San Rafael cactus habitat is present.
2. Within suitable habitat<sup>3</sup>, site inventories will be conducted to determine occupancy. Inventories:
  - a. Must be conducted by qualified individual(s) approved by BLM using accepted survey protocols,
    - i. Will be conducted in suitable and occupied<sup>4</sup> habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected, and during appropriate flowering periods. Inventories should be conducted between March 15<sup>th</sup> to June 1st, unless extended by the BLM
  - b. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 100' from the perimeter of disturbance for the proposed well pad including the well pad,
  - c. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - d. Will be valid until March 15<sup>th</sup> the following year.
3. Design project infrastructure to minimize impacts within suitable habitat<sup>2</sup>:
  - a. Reduce well pad size to the minimum needed, without compromising safety,
  - b. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - c. Limit new access routes created by the project,
  - d. Roads and utilities should share common right-of-ways where possible,
  - e. Reduce width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - f. Place signing to limit off-road travel in sensitive areas,
  - g. Stay on designated routes and other cleared/approved areas, and
  - h. All disturbed areas will be re-vegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.
4. Within occupied habitat<sup>3</sup>, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above (#3) recommendations for project design within suitable habitats,
  - b. Buffers of 100 feet minimum between the edge of the right of way (roads and surface pipelines) or surface disturbance (well pads) and plants and populations will be incorporated,
  - c. Surface pipelines will be laid such that a 100 foot buffer exists between the edge of the right of way and the plants, use stabilizing and anchoring techniques when the pipeline crosses the habitat to ensure the pipelines don't move towards the population,
  - d. Before and during construction, areas for avoidance should be visually identifiable in the field,

<sup>2</sup> Potential habitat is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.

<sup>3</sup> Suitable habitat is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain San Rafael cactus. Habitat descriptions can be found on the U.S. Fish and Wildlife Service's web site (<http://www.fws.gov/endangered/wildlife.html>) or the Utah Division of Wildlife Resources website (<http://wildlife.utah.gov/index.php>).

<sup>4</sup> Occupied habitat is defined as areas currently or historically known to support San Rafael cactus; synonymous with "known habitat."

**Utah's Threatened and Endangered Species Notices**

- e.g., flagging, temporary fencing, rebar, etc.,
  - e. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - f. Designs will avoid concentrating water flows or sediments into occupied habitat,
  - g. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - h. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied San Rafael cactus habitats within 100' of the edge of the surface pipelines' right-of-ways, 100' of the edge of the roads' right-of-ways, and 100' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the San Rafael cactus is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment M—Lease Notice for the Ute Ladies' Tresses

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Ute Ladies' Tresses (*Spiranthes diluvialis*)

In order to minimize effects to the federally threatened Ute ladies'-tresses, the Bureau of Land Management (BLM) in coordination with the U.S. Fish and Wildlife Service (Service), developed the following avoidance and minimization measures. Integration of and adherence to these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance) are in compliance with the Endangered Species Act (ESA). Ute ladies'-tresses habitat is provided some protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Although plants, habitat, or populations may be afforded some protection under these regulatory mechanisms, the following conservation measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area, including areas where hydrology might be affected by project activities, within potential habitat<sup>5</sup> prior to any ground disturbing activities to determine if suitable Ute ladies'-tresses habitat is present.
2. Within suitable habitat<sup>6</sup>, site inventories will be conducted to determine occupancy. Inventories:
  - a. Must be conducted by qualified individual(s) and according to BLM and Service accepted survey protocols,
  - b. Will be conducted in suitable and occupied<sup>7</sup> habitat for all areas proposed for surface disturbance or areas that could experience direct or indirect changes in hydrology from project activities,
  - c. Will be conducted prior to initiation of project activities and within the same growing season, at a time when the plant can be detected, and during appropriate flowering periods (usually August 1<sup>st</sup> and August 31<sup>st</sup> in the Uintah Basin; however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower),
  - d. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - e. Will include, but not be limited to, plant species lists, habitat characteristics, source of hydrology, and estimated hydroperiod, and
  - f. Will be valid until August 1<sup>st</sup> the following year.
3. Design project infrastructure to minimize direct or indirect impacts to suitable habitat<sup>2</sup> both within and downstream of the project area:
  - a. Alteration and disturbance of hydrology will not be permitted,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Limit new access routes created by the project,
  - d. Roads and utilities should share common right-of-ways where possible,
  - e. Reduce width of right-of-ways and minimize the depth of excavation needed for the road bed,
  - f. Construction and right-of-way management measures should avoid soil compaction that would impact Ute ladies' tresses habitat,
  - g. Off-site impacts or indirect impacts should be avoided or minimized (i.e. install berms or catchment ditches to prevent spilled materials from reaching occupied or suitable habitat through either surface or groundwater),
  - h. Place signing to limit off-road travel in sensitive areas,

<sup>5</sup> Potential habitat is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.

<sup>6</sup> Suitable habitat is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain Ute ladies'-tresses. Habitat descriptions can be found in Recovery Plans and Federal Register Notices for the species at <http://www.fws.gov/endangered/wildlife.html>.

<sup>7</sup> Occupied habitat is defined as areas currently or historically known to support Ute ladies'-tresses; synonymous with "known habitat."

### Utah's Threatened and Endangered Species Notices

- i. Stay on designated routes and other cleared/approved areas, and
  - j. All disturbed areas will be re-vegetated with species approved by FWS and BLM botanists.
4. Within occupied habitat<sup>3</sup>, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
- a. Follow the above (#3) recommendations for project design within suitable habitats,
  - b. Buffers of 300 feet minimum between right of way (roads and surface pipelines) or surface disturbance (well pads) and plants and populations will be incorporated,
  - c. Surface pipelines will be laid such that a 300-foot buffer exists between the edge of the right of way and the plants, using stabilizing and anchoring techniques when the pipeline crosses habitat to ensure the pipelines don't move towards the population,
  - d. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - e. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - f. Designs will avoid altering site hydrology and concentrating water flows or sediments into occupied habitat,
  - g. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, with berms and catchment ditches to avoid or minimize the potential for materials to reach occupied or suitable habitat, and
  - h. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Ute ladies'-tresses habitats within 300' of the edge of the surface pipelines' right-of-ways, 300' of the edge of the roads' right-of-ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Habitat impacts include monitoring any changes in hydrology due to project related activities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Ute ladies'-tresses is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.

## Attachment N—Lease Notice for the Maguire Daisy

### Utah's Threatened and Endangered Species Notices

#### Lease Notice – Maguire Daisy (*Erigeron maguirei*)

In order to minimize effects to the federally threatened Maguire Daisy, the Bureau of Land Management (BLM), in coordination with the U.S. Fish and Wildlife Service (Service), has developed the following avoidance and minimization measures. Implementation of these measures will help ensure the activities carried out during oil and gas development (including but not limited to drilling, production, and maintenance operations) are in compliance with the Endangered Species Act (ESA). For the purposes of this document, the follow terms are so defined:

- *Potential habitat* is defined as areas which satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas which contain or exhibit the specific components or constituents necessary for plant persistence; determined by field inspection and/or surveys; may or may not contain clay reed-mustard; habitat descriptions can be found in Federal Register Notice and species recovery plan links at <<http://www.fws.gov/endangered/wildlife.html>>.
- *Occupied habitat* is defined as areas currently or historically known to support clay reed-mustard; synonymous with "known habitat."

The following avoidance and minimization measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100% of the project disturbance area within potential habitat<sup>1</sup> prior to any ground disturbing activities to determine if suitable Maguire Daisy habitat is present.
2. Site inventories will be conducted within suitable habitat to determine occupancy. Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, etc., suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas"); in such cases, in general, 300' buffers will be maintained between surface disturbance and avoidance areas. However, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat. Where conditions allow, inventories:
  - a. Must be conducted by qualified individual(s) and according to BLM and Service accepted survey protocols,
  - b. Will be conducted in suitable and occupied<sup>3</sup> habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected (usually May 1<sup>st</sup> to June 30<sup>th</sup>, however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower ),
  - c. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - d. Will include, but not be limited to, plant species lists and habitat characteristics, and
  - e. Will be valid until May 1<sup>st</sup> the following year.
3. Design project infrastructure to minimize impacts within suitable habitat:
  - a. Where standard surveys are technically infeasible, infrastructure and activities will avoid all suitable habitat (avoidance areas) and incorporate 300' buffers, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Where technically and economically feasible, use directional drilling or multiple wells from the same pad,
  - d. Limit new access routes created by the project,
  - e. Roads and utilities should share common right-of-ways where possible,
  - f. Reduce the width of right-of-ways and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat,
  - g. Place signing to limit off-road travel in sensitive areas, and
  - h. Stay on designated routes and other cleared/approved areas.
  - i. All disturbed areas will be revegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.

### Utah's Threatened and Endangered Species Notices

4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
  - a. Follow the above recommendations (#3) for project design within suitable habitats,
  - b. To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged,
  - d. Construction of roads will occur such that the edge of the right of way is at least 300' from any plant and 300' from avoidance areas,
  - e. Roads will be graveled within occupied habitat; the operator is encouraged to apply water for dust abatement to such areas from May 1<sup>st</sup> to June 30<sup>th</sup> (flowering period); dust abatement applications will be comprised of water only,
  - f. The edge of the well pad should be located at least 300' away from plants and avoidance areas, in general; however, site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - g. Surface pipelines will be laid such that a 300' buffer exists between the edge of the right of way and plants and 300' between the edge of right of way and avoidance areas; use stabilizing and anchoring techniques when the pipeline crosses suitable habitat to ensure pipelines don't move towards the population; site specific distances will need to be approved by FWS and BLM when disturbance will occur upslope of habitat,
  - h. Construction activities will not occur from May 1<sup>st</sup> through June 30<sup>th</sup> within occupied habitat,
  - i. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - j. Place produced oil, water, or condensate tanks in centralized locations, away from occupied habitat, and
  - k. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
  
5. Occupied Maguire Daisy habitats within 300' of the edge of the surface pipelines' right of ways, 300' of the edge of the roads' right of ways, and 300' from the edge of the well pad shall be monitored for a period of three years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to the BLM and the Service. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and the Service.
  
6. Reinitiation of section 7 consultation with the Service will be sought immediately if any loss of plants or occupied habitat for the Maguire Daisy is anticipated as a result of project activities. Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the ESA.



## **APPENDIX 12—REASONABLY FORESEEABLE DEVELOPMENT SCENARIO FOR OIL AND GAS AND GEOTHERMAL RESOURCES**

---

### **OIL AND GAS**

#### **Summary**

Recent exploration and drilling results in the western portion of the Richfield planning area have precipitated much interest in leasing and exploration. During the past 15 years, the area has received little attention as a potential oil and gas area. On the basis of geology, leasing activity, proposed drilling, and a comparison with the history of development in the Northern Utah–Wyoming Overthrust Belt in the 1970s, Bureau of Land Management (BLM) has projected that 360 wells will be drilled in this area during the next 15 years. The ownership pattern in this belt is a mixture of BLM lands, State of Utah lands, and privately owned lands. Each well pad will disturb about 4 acres and will require about 2 miles of new roads. Early development activity indicates that multiple wells will be drilled from many pads, with the overall effect of reducing total impacts.

The southern half of the planning area will likely receive much less attention, and only 45 wells are projected for that area (again, with 4 acre pads and 2 miles of road per well pad). The remainder of the planning area is the Wasatch Plateau, which is largely national forest. Forty-nine wells are expected in this area, many of which will be coalbed natural gas (CBNG) tests. Each pad will disturb about 2 acres and require about 5 miles of road per well.

The other major source of surface disturbance will be geophysical exploration. Most of this exploration is projected to occur in the western part of the planning area and will disturb approximately 4,500 acres, much of which will likely be on privately owned lands. In the Wasatch Plateau area, helicopters will be used in some areas, and disturbance is expected on about 360 acres. Fewer geophysical surveys are anticipated for the remainder of the planning area, and it is estimated that about 240 acres will be disturbed.

It is assumed that any future pipelines, power lines, etc., would follow roads where possible and that continuing reclamation of surface disturbance would reduce net impacts. Future field discoveries, if any, will result in the construction of production facilities and some additional impacts beyond the well pads.

Total surface impacts are estimated to be about 8,180 acres (5,100 acres from geophysical exploration and 3,080 acres from drilling).

#### **Introduction**

The following Reasonably Foreseeable Development (RFD) scenario projects the level of oil and gas activity that can reasonably be expected during the next 15 years in the planning area. All lands (federal, State of Utah, and private) are included in the projection, following the guidance in BLM Handbook H-1624-1, *Planning for Fluid Mineral Resources* and Instruction Memorandum No. 2004-089, *Policy for Reasonably Foreseeable Development (RFD) Scenario for Oil and Gas*. It is assumed that all potentially productive areas are open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation, or executive order.

Worldwide demand for oil and gas continues to grow and all indications are that growth will continue. Against this background, geology, past and present activity, economics, and other factors will determine the level of activity in the planning area.

## Description of Geology

Geology is the ultimate controlling factor determining future hydrocarbon exploration and development. This discussion will consider the geological differences within the planning area as they relate to oil and gas potential. The basic units considered will be the individual oil and gas “play” (Gautier et al. 1996) and “assessment unit” (Schenk et al. 2003) as these terms are used by the United States Geological Survey (USGS) in its national assessments of oil and gas resources. The Mineral Potential Report for the Richfield Resource Management Plan (RMP) (Booz Allen Hamilton 2004) discusses the geology of the planning area and gives descriptions of most of the plays that are shown in Figure A12-1 of this report.

The geologically oldest play in the planning area is the Late Proterozoic and Cambrian Play (USGS-2403), which was described in the Northern Arizona Province but includes a large portion of southern and central Utah, including the southern part of the planning area. The play is based on the recognition of carbonaceous shale in the Upper Proterozoic Chuar Group in the Grand Canyon and the projection of these units in the subsurface of northern Arizona and southern and central Utah (Rauzi 1990). Given this potential source rock, a potential exists for hydrocarbons in uppermost Proterozoic and lower Cambrian reservoirs. The play received a great deal of attention in the 1990s, and several test wells were drilled in southern Utah. Some of the wells encountered carbon dioxide gas, but no hydrocarbons were reported and interest in the play waned.

Four classic Paradox Basin plays underlie the extreme eastern corner of the planning area, the area generally east of Range 12 East in easternmost Wayne and Garfield counties. The plays are identified as Buried Fault Blocks (USGS-2101), Porous Carbonate Buildup (USGS-2102), Fractured Interbed (USGS-2103), and Salt Anticline Flank (USGS-2105) (Huffman 1996). Play 2101 is exemplified by the prolific Lisbon Field in northern San Juan County, where oil and gas are produced from Devonian and Mississippian age carbonate rocks and sandstones in a faulted anticline (Smouse 1993). Play 2102 is primarily an oil play, characterized by hydrocarbon accumulations in porous algal mounds and related rocks in the Paradox Formation of the Hermosa Group (Pennsylvanian age). Traps are largely stratigraphic in nature, involving porosity and permeability differences in carbonate and evaporitic rocks and organic-rich dolomitic shales. Structures of Pennsylvanian age may have influenced the locations of the algal buildups. The Giant Aneth Field in San Juan County is the largest field in this play, but many other smaller isolated buildups have produced (Huffman 1996).

Play 2103 is a continuous oil and gas play with organic rich dolomitic shales serving as both source and reservoir rocks. Fracturing of the otherwise tight rocks is necessary if the play is to be productive. Dolomitic shales are interbedded with salt in a cyclical sequence, where the salt provides a seal for the fractured reservoirs (Huffman 1996). This play is productive in southwestern Grand County, where current development involves horizontal wells designed to intersect vertical fractures in areas where structures have enhanced fracturing. Play 2105 involves Pennsylvanian and Permian age carbonate and sandstone reservoirs along the flanks of northwest-trending salt anticlines. Production to date has been gas—mostly from Andy’s Mesa Field in Colorado—but the play is lightly explored (Huffman 1996).

The Permo-Triassic Unconformity Play (USGS-2106) was included in the 1995 USGS Assessment of greater Paradox Basin resources even though it is outside the Paradox Basin proper. The Permo-Triassic Unconformity Play includes a large part of the planning area. Known occurrences and shows are in upper Permian and lower Triassic carbonate and sandstone formations. Upper Valley Oil Field south of the planning area produces from this play, and oil and gas shows have been reported over a large area in

southern and central Utah. The trapping mechanism at Upper Valley is anticlinal, but the oil is offset from the crest by a strong hydrodynamic drive. Huffman (1996) described the play as lightly explored and emphasized unanswered questions about source rock and timing.

Two hypothetical Eastern Great Basin Province plays, the Late Paleozoic Play (USGS-1902) and the Sevier Frontal Zone Play (USGS-1907), include western Sevier and Sanpete counties. Both of these plays were nonproductive and hypothetical when first described (Peterson and Grow 1996), but recent drilling has since confirmed the Sevier Frontal Zone Play. Play 1902 is based on the possibility of early-formed traps in middle and upper Paleozoic carbonates and sandstones. Potential source rocks include organic-rich marine shales in Mississippian, Pennsylvanian, and Permian age formations, which may have favorable maturity levels in some areas of the play. A variety of structural and stratigraphic traps may be present, but the play remains hypothetical at this time.

Play 1907 was also hypothetical and was based in large part on similarities in lithology and structural style between this area and productive segments of the Overthrust Belt in northeastern Utah and southwestern Wyoming. Potential traps exist in structures formed along and near the leading edge of Sevier thrust plates, and favorable reservoir rock is present in several formations. Recent drilling has confirmed the presence of oil at one location along this zone, and additional exploration is in progress.

The Cretaceous Sandstone Play (USGS-2107) was also included in the Paradox Basin Assessment (Huffman 1996) although it is outside the geologic boundaries of the basin. This play specifically relates to gas occurrences in sandstone reservoirs in the Wasatch Plateau. Currently, there is interest, not so much in the sandstone reservoirs, but in coalbeds within the sandstones (e.g., for CBNG). The most productive coals have been in the Ferron Sandstone Member of the Mancos Shale in Carbon and Emery counties. Similar coals in the Emery Sandstone in the Wasatch Plateau are prospective targets. Both of these units extend into the planning area in the Wasatch Plateau area. The CBNG resource was evaluated in more detail in the 2003 USGS Assessment, although the area of interest coincides with that of Play 2107.

The USGS completed a new assessment of oil and gas resources in the Uinta-Piceance Province in 2003 and included the Wasatch Plateau and the Ferron Trend in the analysis. Parts of both of these regions extend into the planning area. The Uinta Basin Blackhawk Formation Coalbed Gas Assessment Unit (USGS-AU 50200281) evaluates CBNG resources in the Blackhawk and Emery Sandstone coals in the Book Cliffs and Wasatch Plateau. CBNG production from Blackhawk coals has been established in the Castlegate Field in northern Carbon County, but production has been hampered by problems with dewatering the coal. Coalbeds are also in the Emery Sandstone in the Wasatch Plateau in Carbon, Sanpete, and Sevier counties, which may have favorable maturity levels in some areas (Johnson and Roberts 2003).

Five assessment units (USGS-AU 50200161, AU 50200183, AU 50200184, AU 50200185, and AU 50200101) of the Ferron/Wasatch Plateau Total Petroleum System are partially or wholly in the northeastern part of the planning area. More than 30 wells have been drilled in these assessment units, with only one listed as productive; however, no volumes are listed (Henry and Finn 2003, p. 26). All of these wells were based on the known occurrence of coalbeds in the Ferron Sandstone Member of the Mancos Shale. All of these gas assessments units are included within the area covered by the Cretaceous Sandstone Play (USGS-2107).

## **Past and Present Oil and Gas Activity**

### **Geophysical Exploration**

Richfield Field Office (RFO) records indicate that approximately 90 authorizations for geophysical surveys were issued from 1972 to the present in the western parts of the planning area (the old Sevier River Resource Area). Sixty-five of these were issued between 1976 and 1982, with only four issued after 1988. The surveys resulting from the permits were spread over most of the western part of the planning area.

Fewer surveys, of unknown dates, have been conducted in the eastern part of the planning area (eastern Wayne and Garfield counties) with a concentration in and around T. 30 S., R. 12 E. on the line separating the two counties. Several nonproductive wells have been drilled in this same area.

Since 2004, interest has increased in acquiring geophysical data in the vicinity of Sevier Valley related to the recent discovery of oil. One large project (115 miles) was completed in 2004, and additional proposals by multiple companies are anticipated.

### **Federal Oil and Gas Leasing**

Significant portions of Sanpete and Sevier counties are currently under federal lease (See Table 2 of the Mineral Potential Report for the Richfield RMP [Booz Allen Hamilton 2004]). Leases are clustered in the western and eastern parts of the two counties, with most of the eastern leases located in the Manti-La Sal National Forest and related to the Sevier Frontal Play and the Cretaceous Sandstone and CBNG plays, respectively. Few leases are in the Fishlake National Forest, including the southern part of the Wasatch Plateau. Another block of leases covers the eastern part of the planning area in eastern Wayne and Garfield counties. This latter group has combined hydrocarbon lease conversions in the Tar Sand Triangle Special Tar Sand Area (STSA).

The largest federal lease sale involving lands in the planning area occurred in June 2004. In this sale (the June 25, 2004, BLM Competitive Oil and Gas Lease Sale) 81 parcels, encompassing 146,365 acres in the planning area, were offered for lease. Several of the tracts in the western part of the area received bonus bids of more than \$100 per acre, with a maximum bid of \$360 per acre indicating strong industry interest in this area. The lease tracts extend northward from southwestern Sevier County through western Sanpete County. This area of interest coincides with the Sevier Frontal Zone Play (USGS-1907) described above. Another block of pending leases in northeastern Wayne County resulted from the November 2003 and June 2004 lease sale, but these were obtained for the minimum bonus bid (\$2.00 per acre) or noncompetitively the day after the sale.

### **Oil and Gas Units**

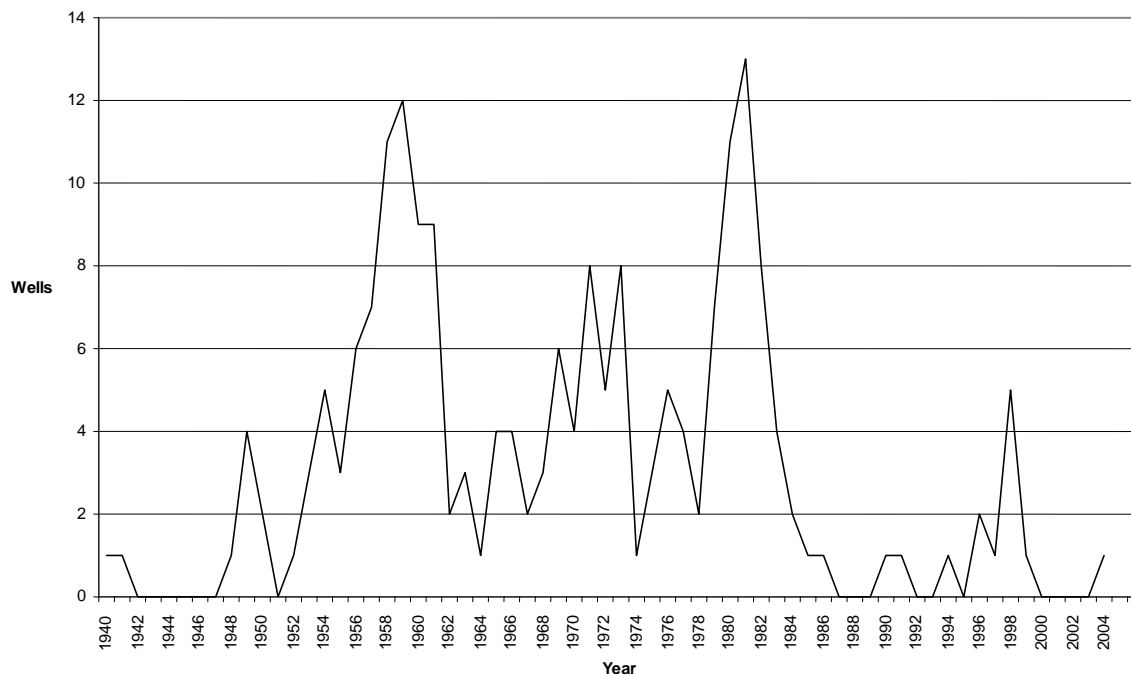
Wolverine Gas and Oil established the Wolverine Unit in June 2003. The Unit Area includes 65,980 acres of federal, state, and private lands in Sevier and Sanpete counties. The first unit obligation well was completed in 2004, and additional wells are currently permitted. No other exploration units were in the planning area as of February 2005.

### **Historical Drilling and Production**

Altogether, approximately 220 exploration wells have been drilled in the planning area (IHS Energy Well Data 2004). Thirteen of these were drilled during 1990 to 2004, yielding an average of 0.9 new wells per year. Drilling activity peaked in the late 1950s (12 wells per year) and again in the early 1980s (13 wells

per year). From 1940 to 2004, the average number of wells drilled each year was slightly over three (see Figure A12-1).

**Figure A12-1. Wells Drilled/Year (1940-2004)**



Utah Division of Oil, Gas, and Mining production data (February 2004) lists only 405 barrels of oil and 3,027,708 thousand cubic feet (mcf) of gas for Sanpete County, with 3,027,183 mcf being from the abandoned Joe's Valley Field. The source of the remaining 525 mcf of gas and 405 barrels of oil is not given. No other historical production is listed for the planning area, and Joe's Valley is the only identified field.

Oil production in the Covenant Field, associated with the Wolverine Unit, began in 2004. Production quantities are not available at this time.

## Infrastructure

The Kern River gas pipeline parallels the western boundary of the planning area at a distance of 2 to 5 miles. This pipeline was built in 1991 and expanded in 2003 to transport natural gas from southwestern Wyoming and Utah to markets in southern Nevada and California. A Questar pipeline follows Highway 89 through the planning area. No oil pipelines are within this part of the State, and if oil is produced, it would probably be trucked to Salt Lake City as has been done for 40 years with oil produced in the Upper Valley Field.

## Oil and Gas Occurrence Potential

The Mineral Potential Report for the Richfield RMP (Booz Allen Hamilton 2004) describes oil and gas occurrence potential and includes maps depicting occurrence potential ratings.

## Potential for Oil and Gas Activity

In the following discussion, the term “oil and gas activity” will be used instead of “development” to avoid possible confusion between “exploration” and “development” in the strict sense. Only one known field in the planning area exists at this time, and many of the future wells will be exploratory in nature. The purpose of the RFD is to arrive at a reasonable estimate of surface impacts resulting from all future oil and gas activity, whether this results from exploration or from development activity. Future activity levels will be determined largely by the outcome of continuing testing of the Sevier Frontal Zone Play (USGS-1907) and the gas resources in the Wasatch/Ferron and Mesaverde Blackhawk assessment units, essentially the area covered by the Play. Energy demand will likely only increase in the future, and if additional economically recoverable resources can be identified in the Sevier Frontal Zone Play and the area covered by Play 2107, significant activity may occur. Other plays would seem to be less promising but will probably continue to be tested periodically. Activity levels will be projected by play, or overlapping groups of plays, and then related to geographic subdivisions in the planning area.

The northwestern corner of the Paradox Basin underlies the extreme eastern portion of Garfield and Wayne counties and includes four partially overlapping plays: 2101 (Buried Fault Blocks), 2102 (Porous Carbonate Buildup), 2103 (Fractured Interbed), and 2105 (Salt Anticline Flank). These plays have been tested by several wells, and it is unlikely that significant drilling will occur there in the next 15 years (although a few tests can be expected). Huffman (1996) gave the following assessment of Plays 2101, 2102, 2103, and 2105 for the Paradox Basin as a whole: Play 2101—low to moderate future potential for small to medium-sized fields with minimal oil columns; Play 2102—small fields in the 1 to 3 million barrels of oil range; Play 2103—greatest potential in the Cane Creek, Chimney Rock, Gothic, and Hovenweep Shales due to organic content and thickness; and Play 2105—low potential for oil, fair to good for gas. Several horizontal wells have produced from Play 2103 in the Kane Springs Unit Area in Grand County southeast of the planning area, but the wells are expensive and production rates declined fairly rapidly.

Plays 2106 (Permo-Triassic Unconformity) and 2403 (Upper Proterozoic Cambrian) underlie large areas in the southern and central parts of the planning area. The northern and western parts of these plays have encountered carbon dioxide gas, and the Paleozoic age rocks of this entire region appear to have been flushed by carbon dioxide generated by igneous activity to the north (Utah Geological Survey 2004). Hydrocarbons may still be present in these reservoirs in the eastern and southern parts of the planning area. In the Upper Valley Oil Field (USGS-2106), near Escalante, a strong hydrodynamic drive has offset the oil onto the flank of an anticlinal structure, and other anticlinal flanks will probably be tested. Huffman (1996) described Play 2106 as lightly explored and projected a low probability of any significant exploration effort until source rock and timing questions were answered.

Two hypothetical Eastern Great Basin plays (USGS-1902 and USGS-1907) cover western Sevier and Sanpete counties. Play 1907 is characterized by structures along the leading edge of Sevier age faults analogous to those productive in the Wyoming Thrust Belt to the north (Peterson and Grow 1996). Several test wells were drilled in this play in the 1970s, but it had received little attention in recent years until Wolverine Gas and Oil established the Wolverine Unit in 2003. Wolverine Gas and Oil has now completed two wells, with oil production reported from the Navajo Sandstone (The Rocky Mountain Oil Journal, vol. 84, no. 27, July 2004; Moulton and Pinnell 2005), and is drilling additional wells while acquiring additional two-dimensional seismic data. Parcels within and near this play received large bonus bids at the June 2004 BLM lease sale, indicating renewed industry interest. Exploration wells will probably be located at different locations along the north-trending play, and if exploration is successful, this will be followed by development wells. Multiple wells are projected from many drill pads, which will minimize surface disturbance.



Much of the land in this play is privately owned, but a block of BLM land in and around Ts. 17 and 18 S., R. 1E. is unleased and would attract a great deal of industry interest if offered for competitive bidding. Other larger blocks of BLM lands are under lease, and the lands mentioned above appear to be the only BLM lands where a lack of leases would be an impediment to exploration and development.

Continuing evaluation of coals and their including sandstones for gas resources can be expected in eastern Sanpete and Sevier counties. The Uinta Basin Blackhawk Coalbed Gas Assessment Unit (AU 50200281) covers parts of three field offices, with approximately 45 percent of the assessment unit located in the planning area. The USGS's estimated mean value for total technically recoverable CBNG in the unit is 499 billion cubic feet (BCF) in the Blackhawk and Emery coals. If it is assumed that the resource is more or less evenly distributed throughout the assessment unit, however questionable this assumption might be, the planning area could contain 225 BCF of this CBNG. Tabet and Quick (2003, p. 10) estimated that the Emery coals under the Wasatch Plateau might contain an in-place gas resource of 0.8 to 3.2 trillion cubic feet (TCF). It appears that roughly 60 percent of the area included in these authors' estimate (or 0.5 to 1.9 TCF of CBNG) lies in the planning area. How much recoverable gas is present remains to be determined, but certainly interest will continue in the CBNG resource in this part of the planning area. These potential resources are in the Wasatch Plateau portion of the planning area, within the Manti-LaSal and Fishlake National Forests. Existing leases already cover significant portions of the Manti-La Sal National Forest in eastern Sanpete County. However, leasing is not allowed under the current Fishlake National Forest Plan unless an environmental analysis is completed for specific leasing proposals. Until a new forest plan is developed, the absence of leasing is an impediment to exploration and development in this national forest.

Several assessment units of the Ferron/Wasatch Plateau Total Petroleum System are partially or completely in the planning area in eastern Sanpete and Sevier counties. These units include Deep Coal and Sandstone Gas (AU 50200161), Southern Coal Fairway (AU 50200183), Joe's Valley and Musinia Grabens (AU 50200184), and Southern Coal Outcrop (AU 50200185). The "EPCA" Inventory, prepared under a provision of the 2000 Energy Policy and Conservation Act (U.S. Departments of the Interior, Agriculture, and Energy 2003, pp. 2–14), assigns undiscovered technically recoverable resources of 223 BCF of gas to these assessment units.<sup>1</sup> Prorating these numbers according to area shows 173 BCF of gas in the planning area. Again, most of this resource lies under the Manti-LaSal and Fishlake National Forests, but a narrow strip of BLM land in extreme eastern Sevier County could contain some gas.

The gas content of the Ferron coals appears to decrease southward from the Drunkards Wash Field in Carbon County (Lamarre 2001, Utah Geological Survey 2004), and Nuccio and Roberts (2003, p. 32) show vitrinite reflectance values of less than 0.60 at the base of the Mancos Shale in much of the eastern and southern parts of the Wasatch Plateau. Higher values are indicated for parts of the northwestern Plateau in Sanpete County. These data suggest that the potential for CBNG occurrence in the Fishlake National Forest is less than the potential in the Manti-LaSal National Forest.

In addition to the coals, gas in conventional sandstone reservoirs in the same stratigraphic sequence may be tested. This area of moderate activity potential is generally the area of Play 2107.

Coalbeds are known to occur in rocks of Cretaceous age in the Henry Mountains Basin in northern Garfield and southern Wayne counties in the eastern part of the planning area. The presence of these coals raises the possibility of CBNG activity in the basin. Coal occurs in three formations, in ascending order: the Dakota Sandstone, the Ferron Sandstone, and the Muley Canyon Sandstone. The thickest and most continuous coals are in the Muley Canyon Sandstone, with the other two zones containing thinner and less continuous beds (Law 1980, p. 326). No information is available on the gas content of the coal, and the USGS has not produced an assessment of the potential resource. In many areas, the Muley Canyon

---

<sup>1</sup> AU 50200184 was not assessed by the USGS.

coal is at or near the surface, often exposed on the tops and flanks of mesas. The coal-bearing rocks are deeper in the southwestern part of the basin, which may provide some potential for CBNG retention. No oil and gas leases currently exist in the Henry Mountains Basin.

The greatest potential for oil and gas activity appears to be in Sevier and Sanpete counties within the Sevier Frontal Zone Play (USGS-1907) and in the Wasatch Plateau area of these same two counties (gas in Cretaceous coals and sandstones). This potential is rated as high in the Sevier Frontal Zone Play and moderate in the northern part of the Wasatch Plateau, decreasing toward the southwest. Less activity is predicted in the remaining parts of the planning area, but exploration wells will probably continue to be drilled at near the historical rate (0.9 to 3.12 per year) if oil and gas prices remain at current levels or increase, as is generally expected.

## **RFD Baseline Scenario Assumptions and Discussion**

In developing the baseline scenario, it was assumed that all potentially productive areas are open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulations, or executive order. The largest block of excluded lands would be the wilderness study areas (WSA), but most of these are in areas where the potential for activity is low.

Long-term well completion rates for 1940 to 2004 have averaged slightly more than three wells per year. When only the past 15 years (1990 to 2004) are considered, the rate drops to slightly less than one well per year (IHS Well Data 2004). Recent interest in parts of the planning area indicates that activity during the next 15 years will be considerably higher than that for either of these intervals.

For purposes of estimating the number of wells to be drilled during the next 15 years, the planning area has been divided into four geographic areas, defined by USGS plays and assessment units. These are (1) the eastern portion of Wayne and Garfield counties (generally east of R. 12 E.), which is underlain by true Paradox Basin plays (USGS-2101, USGS-2102, USGS-2103, and USGS-2105); (2) the southern part of the planning area, as defined by the Permo-Triassic Unconformity Play (USGS-2106); (3) the Wasatch Plateau, defined by the Cretaceous Sandstone Play (USGS-2107), but also including CBNG in the Ferron, Emery, and Blackhawk coals; and (4) the area from the eastern boundary of the Sevier Frontal Zone Play (USGS-1907) to the western boundary of the planning area.

Potential for activity in Areas (plays included in each area are listed in Table A12-1) 1 and 2 (entire southern part of the planning area) is considered to be low, as noted above. Exploration in these areas is expected to continue at near historic rates (considered to be three wells per year). This would produce 45 wells during the projection period (15 years).

Activity levels in Area 3 are expected to be higher because of the existence of coal in the Ferron, Emery, and Blackhawk formations, as well as conventional sandstone reservoirs. The Utah Geological Survey (2004, p. 38) projects four CBNG wells for the Fishlake National Forest during the next 15 years, and this number will be used here for the southern part of the Wasatch Plateau. Potential for drilling activity on the northern part of the plateau (Manti-La Sal National Forest) is considered to be higher, as discussed above. In the northern part of the plateau, 45 wells (three per year) are projected, resulting in a total of 49 wells in Area 3 during the next 15 years.

The Sevier Frontal Zone Play (USGS-1907) and adjacent areas in western Sevier and Sanpete counties are expected to be the focus of activity during the life of the plan. At the time of this report, two wells have been completed in the Covenant Field of the Wolverine Unit. Seven additional, collocated wells are currently permitted. Moulton and Pinnell (2005, p. 42) anticipate six or more additional wells along the play by mid-2005. This would result in a total of at least 13 wells for the first half of 2005.

Play 1907 is geologically similar to the Utah-Wyoming Overthrust Belt, which was the site of major exploration and development in the 1970s, but includes a larger area than the productive area around the Pineview Field (Moulton and Pinnell 2005). This central Utah thrust belt overlaps the hypothetical Late Paleozoic Play (USGS-1902), and the thrust play (USGS-1907) is extended to the western boundaries of Sevier and Sanpete counties. Moulton and Pinnell (2005) seem to concur, showing a lease area, related to this thrust play, extending west of the Sevier and Sanpete county lines. Leases in this area commanded high bonus bids at the June 2004 BLM lease sale. If the analogy holds true, we can expect exploration activity along the length of the play, followed by field development around discoveries. Moulton and Pinnell (2005, p. 42) reported that, during the 5 years after the 1975 discovery of the Pineview Field in northern Utah, 175 wildcat wells were drilled, leading to the discovery of 11 new fields. This averages 16 wildcat wells drilled for each field discovered. The course of development for the Pineview Field area may provide an indication of what will occur in western Sevier and Sanpete counties.

Additional data on the Utah-Wyoming Overthrust Belt indicates that between 1976 and 1997 a total of 485 wells were drilled (Vrona, personal communication, 2005). One hundred thirty-one (27 percent) of these wells were completed as dry holes. This number equates to a rate of 24 wells drilled per year; and if this drilling rate is projected for Area 4, a total of 360 wells would be drilled during the next 15 years.

Table A12-1 provides a summary of these estimates for each area.

Table A12-1. Number of Wells by Area

Area	Number of Wells
Combined Areas 1 and 2a	45
Area 3b	49
Area 4c	360
<b>Total</b>	<b>454</b>

a Plays 2101, 2102, 2103, 2104, 2105, 2106, and 2403.

b Play 2107.

c Plays 1907 and 1902.

Most of the 45 wells in Areas 1 and 2 will probably be on BLM lands. The northern part of Area 3 is in the Manti-La Sal National Forest, and the southern part is in the Fishlake National Forest; therefore, all the 49 projected wells for this area are likely to be on national forest lands. Area 4 (USGS-1907) contains a mixture of BLM, state, and private lands; however, state acreage is much less than BLM and private holdings, which are approximately equal in proportion. The 360 wells in Area 4 are expected to be divided between federal and private lands. Overall, 10 percent of the wells are projected to be on national forest lands, 45 percent on BLM lands, 5 percent on state lands, and 40 percent on private lands.

This projection should not be considered a ceiling for permitting additional wells. Any upper limit on drilling should be based on total surface disturbance and should consider ongoing reclamation, drilling multiple wells from a single pad, and other factors.

## SURFACE DISTURBANCE DUE TO OIL AND GAS ACTIVITY ON ALL LANDS

### Oil and Gas

#### Geophysical Surveys

Future surface disturbance will result largely from geophysical surveys and drilling (and associated access). The Utah Geological Survey (2004) projected that approximately 625 line miles of geophysical surveys would be required in the 1,250 square miles of prospective lands in the Fishlake National Forest. Area 3 is approximately this size; thus, using the above ratio of line miles to square miles, approximately 600 line miles can be projected for the planning area portion of the Wasatch Plateau. Also following the Utah Geological Survey's Fishlake estimates, about 50 percent of the surveys would be buggy mounted and 50 percent would be conducted by helicopter, resulting in approximately 300 line miles for each type of disturbance. The Utah Geological Survey (2004) estimates that buggy-mounted surveys disturb 1.2 acres per line mile, whereas helicopter-conducted surveys disturb only 0.007 acre per line mile.

On the basis of these projections, the total disturbance would be  $(300 \times 1.2) + (300 \times 0.007) = 360 + 2.1 = 362.1$  acres (rounded to 360 acres).

Approximately 1,260 square miles of Play 1907 lies within the planning area, but leasing interest covers a somewhat larger total area. Since the discovery of the Covenant Field, several lessees have expressed interest in obtaining permits for geophysical exploration on BLM lands. Interest in geophysical surveys on private lands in the play area will increase in a similar manner. At this point, it is not clear how much of the work will be conducted by buggy and how much by helicopter, nor is it clear how much will be 2-D and how much will be 3-D. Some surveys will probably be conducted by vibroseis. Early discussions indicate that BLM can expect several hundred miles of seismic surveys during the next few years on BLM and private lands. BLM is estimating an average of 250 miles of survey per year over the 15-year period under consideration. Activity may exceed this average in the near future but is likely to decrease later in the cycle. If most of the surveys are buggy mounted, the total disturbance in Area 4 is likely to be **4,500 acres** (3,750 miles  $\times$  1.2 acres/mile).

Few surveys are expected in the remaining parts of the planning area (Areas 1 and 2) based on past activity and current interest. A total of 200 miles of geophysical surveys is proposed for the 15-year time period, resulting in **240 acres** of disturbance in these areas.

On the basis of these projections, the total surface disturbance expected from **geophysical surveys in the planning area would be  $360 + 4,500 + 240 = 5,100$  acres.**

#### Wells

Forty-nine wells are projected for Area 3 (Wasatch Plateau). The Utah Geological Survey (2004) assumed a drill pad of size of 2 acres and 5 miles of road (4 acres of disturbance per mile) for each well in the Fishlake National Forest. Using these values, the 49 projected wells would impact approximately **1,100 acres**.

Areas 1, 2, and 4 are projected to contain 405 wells overall. For Area 4, many of these wells would probably be directional wells from a single drill pad. Based on the projection of 360 wells for this area, with an average of three wells per pad, the number of well pads for Area 4 is projected at 120. The 45 wells in Areas 1 and 2 are assumed to be single well pads (one well per pad). Thus, the total number of

pads for the three areas is projected at 165. Assuming a pad size of 4 acres plus 2 miles of road (with 4 acres of disturbance per mile) would result in a projected surface disturbance of **1,980 acres**.

On the basis of these projections, the total surface disturbance in the planning area from **drilling 454 wells would be  $1,100 + 1,980 = 3,080$  acres**.

## Summary

Total surface disturbance for the planning area from all oil and gas activity (geophysical surveys and wells) is projected at  $5,100 + 3,080 = 8,180$  acres.

The disturbance estimated above will be future disturbance during the 15-year life of the plan. Current disturbance is minimal, and areas of past disturbance have largely been reclaimed. Disturbance associated with future nonproductive wells should be reclaimed within 3 to 4 years after a well has been plugged and abandoned.

## TAR SANDS

The unconventional resource contained in the Tar Sand Triangle STSA received considerable industry interest in the late 1970s and early 1980s. Applications were received to convert existing oil and gas leases to combined hydrocarbon leases under the terms of the Combined Hydrocarbon Leasing Act of 1981. BLM and the National Park Service initiated an environmental impact statement (EIS) to consider the applications, but the EIS was never completed and the conversions are still pending. No wells are projected for exploration or development, because of the unfinished EIS, the uncertain future of oil sand as an economic resource, and the belief that any proposed activity would not follow conventional oil and gas techniques and would be better considered in a site-specific National Environmental Policy Act (NEPA) document.

## STATEMENT OF QUALIFICATIONS

This RFD was prepared by James Fouts, Geologist in the Utah BLM State Office. Mr. Fouts has B.S., M.S., and Ph.D. degrees in geology and has worked for Shell Oil Co., Essex International Corporation, Auburn University, the U.S. Bureau of Mines Salt Lake City Research Center, the U.S. Geological Survey, the U.S. Minerals Management Service, Westminster College, and Salt Lake City Community College.

## REFERENCES

BLM, 2004, Richfield Field Office Records.

BLM, 2004, Utah State Office Records.

BLM, Utah State Office, Geothermal Files.

Booz Allen Hamilton, 2004, Mineral Potential Report for the Richfield RMP.

<http://www.blm.gov/rmp/ut/richfield/documents.htm>.

Brook, C. A., R. H. Mariner, D. R. Mabey, J. R. Swanson, M. Guffanti, and L. J. P. Muffler, 1979, Hydrothermal Convection Systems with Reservoir Temperatures >90 degrees C In Muffler, L. J. P., ed., Assessment of Geothermal Resources of the United States B 1978, U.S. Geological Survey Circular 790, pp. 18–85.

Doelling, H. H., and R. L. Graham, 1972, Eastern and Northern Utah Coal Fields, Utah Geological and Mineralogical Survey Monograph No. 2, 411 pages.

Gautier, D. L., G. L. Dalton, K. I. Takahashi, and K. L. Varnes, 1996, 1995 National Assessment of United States Oil and Gas Resources—Results, Methodology, and Supporting Data, U.S. Geological Survey Digital Data Series DDS-30, release 2.

Henry, M. E., and T. M. Finn, 2003, Petroleum Assessment of the Ferron/Wasatch Total Petroleum System, Upper Cretaceous Strata, Wasatch Plateau, and Castle Valley, Utah In U.S. Geological Survey Assessment Team, compilers, Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta Piceance Province, Utah and Colorado, U.S. Geological Survey Digital Data Series DDS 69-B, version 1, CD-ROM., 39 pages.

Huffman, A. C., 1996, Paradox Basin Province (021) In Gautier, D. L., G. L. Dalton, K. I. Takahashi, and K. L. Varnes, compilers, 1995 National Assessment of United States Oil and Gas Resources—Results, Methodology, and Supporting Data, U.S. Geological Survey Digital Data Series DDS 30, release 2, unpaginated.

Hulen, J. B., and S. M. Sandburg, 1981, Exploration Case History of the Monroe KGRA, Sevier County, Utah, Earth Science Laboratory/University of Utah Research Institute Report No. DOE/ID/12079-22, 82 pages.

IHS Energy Well Data, 2004, CD-ROM.

Johnson, R. C., and S. B. Roberts, 2003, The Mesaverde Total Petroleum System, Uinta-Piceance Province, Utah and Colorado In U.S. Geological Survey Assessment Team, compilers, Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado, U.S. Geological Survey Digital Data Series DDS 69-B, version 1, CD-ROM, 63 pages.

Law, B. E., 1980, Tectonic and Sedimentological Controls of Coal Bed Deposition Patterns in Upper Cretaceous Emery Sandstone, Henry Mountains Coal Field, Utah In Picard, M. D., editor, Henry Mountains Symposium, Utah Geological Association Publication No. 8., 388 pages.

Mabey, D. R., and K. E. Budding, 1987, High-Temperature Geothermal Resources of Utah, Utah Geological and Mineral Survey Bulletin No. 123, pp. 34–40.



- Moulton, F. C., and M. L. Pinnell, 2005, Stunning Utah Oil, Gas Discovery Focuses Spotlight on Hingeline, *Oil and Gas Journal*, January 17, 2005, pp. 42–49.
- Peterson, J.A., and J. A. Grow, 1996, Eastern Great Basin Province In Gautier, D. L., G. L. Dalton, K. I. Takahashi, and K. L. Varnes, compilers, 1995 National Assessment of United States Oil and Gas Resources-Results, Methodology, and Supporting Data, U.S. Geological Survey Digital Data Series DDS 30, release 2, unpaginated.
- Rauzi, S. L., 1990, Distribution of Proterozoic Hydrocarbon Source Rock in Northern Arizona and Southern Utah, Arizona Oil and Gas Conservation Commission Special Publication No. 5, 38 pages.
- Schenk, C. J. et al., 2003, Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado, U.S. Geological Survey Digital Data Series DDS-69-B.
- Smouse, D., 1993, Lisbon In Hill, B. G., and S. R. Bereskin, eds., *Oil and Gas Fields of Utah*, Utah Geological Association Publication No. 22, unpaginated.
- Tabet, D. E., and J. C. Quick, 2003, Frontier Areas for Coalbed-Gas Exploration in Utah, *Utah Geological Survey, Survey Notes*, vol. 35, no. 2, pp.10–11.
- United States Departments of the Interior, Agriculture, and Energy, 2003, Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to their Development.
- Utah BLM sale nets \$9.9 million; Hingeline acreage draws heavy interest—Salt Lake City, UT, *The Rocky Mountain Oil Journal*, 2004, vol. 84, no. 27, p. 1.
- Utah Division of Oil, Gas and Mining, 2004, Web site.
- Utah Geological Survey, 2004, The Oil, Coalbed Gas, Carbon Dioxide, and Geothermal Resources of the Fishlake National Forest, Southwestern Utah, 63 pages.
- Vrona, J., 2005, Historical Development of the Wyoming Utah Overthrust Belt, written communication.

## APPENDIX 13—LETTER FROM THE STATE OF UTAH REGARDING AIR QUALITY MITIGATION STRATEGIES

---

State of Utah

JON M. HUNTSMAN, JR. *Governor*  
GARY R. HERBERT *Lieutenant Governor*

June 6, 2008

Selma Sierra  
State Director  
BLM Utah State Office  
P.O. Box 45155  
Salt Lake City, Utah 84145-0155

Dear Director Sierra:

This letter addresses air quality mitigation strategies for the six proposed Resource Management Plans being updated within the State of Utah. The state appreciates BLM's interest in this important issue.

It is the policy of the State of Utah to protect public health and the environment from the harmful effects of air pollution, to ensure that the air in Utah meets standards established under federal and state law, and to maintain an environment that is conducive to continued economic vitality and growth.

The Department of Interior monitors ozone at National Parks in the intermountain west, including: Mesa Verde National Park in Colorado, Grand Canyon National Park in Arizona, Great Basin National Park in Nevada, and Canyonlands National Park in Utah. These sites reflect conditions in areas that have not been subject to intensive development and are therefore generally indicative of background conditions. Monitoring data at these locations demonstrates a gradual upward trend in ozone levels, raising questions about ozone levels region-wide. The state believes additional information is needed regarding current conditions and the potential impacts from increasing development activity, including oil and gas activity. This information should inform future BLM decision making, but managers should not defer management actions in anticipation of better information.

Fortunately, ozone related impacts can be reduced if certain mitigation measures are required on new oil and gas related emission sources. In fact, several neighboring states currently encourage application of just such measures. BLM should include interim nitrogen oxide control measures provided by the state as a required condition of lease approval. These control measures are consistent with control measures suggested by neighboring states and jurisdictions. The state recognizes that performance standards will continue to evolve and supports technological flexibility, provided control measures are at least as effective as those in place elsewhere within the region at the time of site-specific authorization. Performance standards representing the current regional standard can be found in the *Four Corners Air - 2 - Quality Task Force Report of Mitigation Options, DRAFT: Version 7*, June 22, 2007. These standards are 2 g/bhp-hr for engines less than 300 HP and 1 g/bhp-hr for engines over 300 HP.

The State of Utah will continue to work with the BLM and others through efforts such as the Four Corners Task Force to address these issues. The state appreciates your cooperation in working to protect air quality related values. If you have any questions about our position, please contact me at (801) 537-9802.

Sincerely,

John Harja  
Cheryl Heying  
Public Lands Policy Coordination Division of Air Quality  
5110 State Office Building 150 North, 1950 West  
Salt Lake City, Utah 84114-1107 Salt Lake City, Utah 84114  
(801) 537-9802 (801) 536-4000

## APPENDIX 14—COMMITTED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES FOR FEDERALLY LISTED SPECIES

---

### CONSERVATION MEASURES

Utah BLM is committed to the conservation of federally listed species. Pursuant to the Endangered Species Act (ESA), this means that BLM will endeavor to use necessary methods and procedures to improve the status of federally listed species and their habitats to a point where the provisions of the ESA are no longer necessary. This includes ensuring that BLM actions requiring permits or approvals are consistent with the objectives of approved recovery plans for listed species.

Conservation measures are part of the programmatic Section 7 consultation with USFWS. BLM, in coordination with USFWS, developed the following list of species-specific conservation measures for activities that will be implemented under this RMP. All implementation proposals potentially impacting listed species will consider these conservation measures. Incorporating these measures will help the BLM meet the standard of “may affect, but not likely to adversely affect” for species listed under the ESA. Where BLM determines that deviation, modification, or waiver of these conservation measures is prudent and necessary, early coordination and Section 7 consultation with USFWS will be necessary. BLM will reinitiate Section 7 consultation at the project level, as necessary, to ensure proper management of listed species.

Conservation measures were developed for the following listed species inhabiting (or potentially inhabiting) lands managed by the Richfield Field Office (RFO):

- Ute ladies'-tresses (*Spiranthes diluvialis*)
- Wright fishhook cactus (*Sclerocactus wrightiae*)
- San Rafael and Winkler cacti (*Pediocactus* spp.)
- Maguire daisy (*Erigeron maguirei*)
- Last chance townsendia (*Townsendia aprica*)
- Barneby reed-mustard (*Schoenocrambe barnebyi*)
- Bald eagle (*Haliaeetus leucocephalus*)
- Colorado River endangered fish
  - Colorado pikeminnow (*Ptychocheilus lucius*)
  - Humpback chub (*Gila cypha*)
  - Bonytail chub (*Gila elegans*)
  - Razorback sucker (*Xyrauchen texanus*)
- Mexican spotted owl (*Strix occidentalis lucida*)
- Utah prairie dog (*Cynomys parvidens*)
- Southwestern willow flycatcher (*Empidonax trailii extimus*).

### Ute ladies'-tresses (*Spiranthes diluvialis*)

#### Conservation Measures

To minimize effects to the federally threatened Ute ladies'-tresses, the BLM, in coordination with USFWS, developed the following avoidance and minimization measures. Integration of and adherence to these measures will help ensure the activities carried out during oil and gas development (including but

not limited to drilling, production, and maintenance) are in compliance with the ESA. Ute ladies'-tresses habitat is provided some protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as Section 404 of the Clean Water Act. Although plants, habitat, or populations may be afforded some protection under these regulatory mechanisms, the following conservation measures should be included in the Plan of Development:

1. Pre-project habitat assessments will be completed across 100 percent of the project disturbance area, including areas where hydrology might be affected by project activities, within potential habitat<sup>1</sup> prior to any ground disturbing activities to determine if suitable Ute ladies'-tresses habitat is present.
2. Within suitable habitat<sup>2</sup>, site inventories will be conducted to determine occupancy. Inventories:
  - a. Must be conducted by qualified individual(s) and according to BLM and Service accepted survey protocols,
  - b. Will be conducted in suitable and occupied<sup>3</sup> habitat for all areas proposed for surface disturbance or areas that could experience direct or indirect changes in hydrology from project activities,
  - c. Will be conducted prior to initiation of project activities and within the same growing season, at a time when the plant can be detected, and during appropriate flowering periods (usually August 1<sup>st</sup> and August 31<sup>st</sup> in the Uintah Basin; however, surveyors should verify that the plant is flowering by contacting a BLM or FWS botanist or demonstrating that the nearest known population is in flower),
  - d. Will occur within 300' from the centerline of the proposed right-of-way for surface pipelines or roads; and within 300' from the perimeter of disturbance for the proposed well pad including the well pad,
  - e. Will include, but not be limited to, plant species lists, habitat characteristics, source of hydrology, and estimated hydroperiod, and
  - f. Will be valid until August 1<sup>st</sup> the following year.
3. Design project infrastructure to minimize direct or indirect impacts to suitable habitat both within and downstream of the project area:
  - a. Alteration and disturbance of hydrology will not be permitted,
  - b. Reduce well pad size to the minimum needed, without compromising safety,
  - c. Limit new access routes created by the project,

---

<sup>1</sup> Potential habitat is defined as areas that satisfy the broad criteria of the species habitat description; usually determined by preliminary, in-house assessment.

<sup>2</sup> Suitable habitat is defined as areas that contain or exhibit the specific components or constituents necessary for plant persistence, determined by field inspection and/or surveys, and may or may not contain Ute ladies'-tresses. Habitat descriptions can be found in Recovery Plans and Federal Register Notices for the species at <<http://www.fws.gov/endangered/wildlife.html>>.

<sup>3</sup> Occupied habitat is defined as areas currently or historically known to support Ute ladies'-tresses; synonymous with "known habitat."

- d. Roads and utilities should share common right-of-ways where possible,
  - e. Reduce width of right-of-ways and minimize the depth of excavation needed for the road bed,
  - f. Construction and right-of-way management measures should avoid soil compaction that would impact Ute ladies' tresses habitat,
  - g. Off-site impacts or indirect impacts should be avoided or minimized (i.e. install berms or catchment ditches to prevent spilled materials from reaching occupied or suitable habitat through either surface or groundwater),
  - h. Place signing to limit off-road travel in sensitive areas,
  - i. Stay on designated routes and other cleared/approved areas, and
  - j. All disturbed areas will be re-vegetated with species approved by FWS and BLM botanists.
4. Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants:
- a. Follow the above (#3) recommendations for project design within suitable habitats,
  - b. Buffers of 300 feet minimum between right of way (roads and surface pipelines) or surface disturbance (well pads) and plants and populations will be incorporated,
  - c. Surface pipelines will be laid such that a 300-foot buffer exists between the edge of the right of way and the plants, using stabilizing and anchoring techniques when the pipeline crosses habitat to ensure the pipelines don't move towards the population,
  - d. Before and during construction, areas for avoidance should be visually identifiable in the field, e.g., flagging, temporary fencing, rebar, etc.,
  - e. Where technically and economically feasible, use directional drilling or multiple wells from the same pad.
  - f. Designs will avoid altering site hydrology and concentrating water flows or sediments into occupied habitat.
  - g. Place produced oil, water, or condensate tanks in centralized locations away from occupied habitat, with berms and catchment ditches to avoid or minimize the potential for materials to reach occupied or suitable habitat.
  - h. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.
5. Occupied Ute ladies'-tresses habitats within 300 feet of the edge of the surface pipelines' ROWs, 300 feet of the edge of the roads' ROWs, and 300 feet from the edge of the well pad shall be monitored for a period of 3 years after ground disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Habitat impacts include monitoring any changes in hydrology due to project related activities. Annual



reports shall be provided to the BLM and USFWS. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between the BLM and USFWS.

6. Reinitiation of section 7 consultation with USFWS will be sought immediately if any loss of plants or occupied habitat for the Ute ladies'-tresses is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with USFWS to ensure continued compliance with the ESA.

## **Wright fishhook cactus (*Sclerocactus wrightiae*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Wright fishhook cactus (*Sclerocactus wrightiae*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Prior to surface disturbing activities in habitat for the species, presence/absence surveys of potentially affected areas will be conducted in accordance with established protocols.
2. Appropriate avoidance/protection/mitigation will be used to manage potential impacts of similar subsequent projects. These measures should include, but are not be limited to:
  - the stabilization of soils to minimize or avoid impacts related to soil erosion;
  - marking/flagging of suitable and/or occupied habitat (including predetermined buffers) prior to development to avoid trampling by crew members or equipment during disturbance related activities; and
  - require project proponents to conduct surveys and monitoring actions using BLM-approved specialists to document population effects and individual impacts.
3. BLM shall continue to document new populations of Wright fishhook cactus as they are encountered.
4. To assist and support recovery efforts, BLM will minimize or avoid surface disturbances in habitats that support the species.
5. BLM will encourage and assist project proponents in development and design of their proposed actions in order to avoid direct disturbance to populations or individuals where feasible. Designs should consider water flow, slope, appropriate buffer distances, possible fencing needs, and pre-activity flagging of sensitive areas that are planned for avoidance.
6. BLM will consider emergency OHV closure or additional restrictions to protect, conserve, and recover the species.

7. In areas where dispersed recreational uses are identified as threats to populations of the species, BLM will consider the development of new recreational facilities/opportunities that concentrate dispersed recreational use away from habitat, especially occupied habitat.
8. Cultural and paleontological survey/recovery technicians (i.e., archeologists and/or paleontologists), conducting work in the vicinity of known populations, will be educated in the identification of listed species in order to avoid inadvertent trampling or removal during survey, mapping, or excavation of cultural or paleontological resources.
9. Areas of viable habitat, in the vicinity of populations considered for prescribed burning, will be surveyed according to established protocols for new or undocumented populations of the species.
10. Lands being considered for exchange or disposal that contain suitable habitat for the species will be surveyed for undocumented populations, according to established protocols, prior to approval of such disposal. Lands supporting populations shall not be disposed of unless it is determined that the action will not threaten the survival and recovery of the species in accordance with the ESA and BLM Guidance and Policy Manual 6840 – *Special Status Species Management*.
11. BLM will encourage the avoidance of key habitats during livestock herding and trailing activities on BLM administered lands. (Key habitats are those that are deemed necessary for the conservation of the species including, but not necessarily limited to, designated critical habitat and other occupied or unoccupied habitats considered important for the species survival and recovery as determined in coordination with the USFWS).
12. As funding permits, BLM will consider research opportunities to determine whether the mortality to recruitment ratio of 2.5 to 1, observed by Kass (2001) persists within studied populations. These observed ratios have resulted in the decline and ultimate loss of some populations. Therefore, future research might study how widespread the decline may be. To accomplish this, several populations should be selected that represent a range of habitats, locations, proximity to potential threats and relative population sizes. Populations should be monitored for changes in number and overall condition to determine whether these observed mortality rates are characteristic of the species throughout its range.
13. As funding permits, monitoring will be continued on the Hebe Devil Dizzy Gypsum Mine area to assess long-term survival and viability of transplanting populations of Wright fishhook cactus.

## **San Rafael and Winkler Cacti (*Pediocactus spp.*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the San Rafael (*Pediocactus despainii*) and Winkler cactus (*Pediocactus winkleri*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Prior to surface disturbing activities in habitat for the species, presence/absence surveys of potentially affected areas will be conducted in accordance with established protocols.

2. Appropriate avoidance/protection/mitigation will be used to manage potential impacts of similar subsequent projects. These measures should include, but are not be limited to:
  - the stabilization of soils to minimize or avoid impacts related to soil erosion;
  - marking/flagging of suitable and/or occupied habitat (including predetermined buffers) prior to development to avoid trampling by crew members or equipment during disturbance related activities; and
  - require project proponents to conduct surveys and monitoring actions using BLM approved specialists to document population effects and individual impacts.
3. BLM shall continue to document new populations of San Rafael and Winkler cacti as they are encountered.
4. To assist and support recovery efforts, BLM will minimize or avoid surface disturbances in habitats that support the species.
5. BLM will encourage and assist project proponents in development and design of their proposed actions in order to avoid direct disturbance to populations or individuals where feasible. Designs should consider water flow, slope, appropriate buffer distances, possible fencing needs, and pre-activity flagging of sensitive areas that are planned for avoidance.
6. BLM will consider emergency OHV closure or additional restrictions to protect, conserve, and recover the species.
7. In areas where dispersed recreational uses are identified as threats to populations of the species, BLM will consider the development of new recreational facilities/opportunities that concentrate dispersed recreational use away from habitat, especially occupied habitat.
8. Cultural and paleontological survey/recovery technicians (i.e., archeologists and/or paleontologists), conducting work in the vicinity of known populations, will be educated in the identification of listed species in order to avoid inadvertent trampling or removal during survey, mapping, or excavation of cultural or paleontological resources.
9. Areas of viable habitat, in the vicinity of populations considered for prescribed burning, will be surveyed according to established protocols for new or undocumented populations of the species.
10. Lands being considered for exchange or disposal that contain suitable habitat for the species will be surveyed for undocumented populations, according to established protocols, prior to approval of such disposal. Lands supporting populations shall not be disposed of unless it is determined that the action will not threaten the survival and recovery of the species in accordance with the ESA and BLM Guidance and Policy Manual 6840 – *Special Status Species Management*.
11. BLM will encourage the avoidance of key habitats during livestock herding and trailing activities on BLM administered lands. (Key habitats are those that are deemed necessary for the conservation of the species including, but not necessarily limited to, designated critical habitat and other occupied or unoccupied habitats considered important for the species survival and recovery as determined in coordination with the USFWS).
12. As additional funding becomes available, BLM should develop a travel management plan specifically for areas of occupied and potential habitat for San Rafael and Winkler cactus.

13. As additional funding becomes available, BLM will conduct or encourage monitoring studies in areas to which topsoil has been placed with the intention of transferring the seed bank from San Rafael and Winkler cactus populations, to mitigate population losses from development activities. The purpose of these studies would be to evaluate mitigation measures for effectiveness in reestablishing populations of the species.

## **Maguire Daisy (*Erigeron maguirei*)**

### **Conservation Measures**

The following conservation measures provide guidance for avoiding, minimizing, or reducing potential adverse impacts to the Maguire daisy from implementing actions authorized in this RMP. This list is not all-inclusive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of Section 7 consultation with USFWS:

1. Prior to approving surface disturbing activities in species habitat, survey for the presence of the species in potentially affected areas in accordance with established protocols.
2. Use appropriate avoidance, protection, and mitigation measures to manage potential impacts of similar, subsequent projects. Measures include, but are not be limited to:
  - a. Stabilizing soils to minimize or avoid impacts related to soil erosion
  - b. Marking/flagging of suitable and/or occupied habitat (including predetermined buffers) prior to development to avoid trampling by crew members or equipment during disturbance-related activities
  - c. Requiring project proponents to conduct surveys and monitoring actions using BLM-approved specialists to document impacts to populations and individuals.
3. Continue documenting new populations of Maguire daisy as they are encountered.
4. To assist and support recovery efforts, minimize or avoid surface disturbances in habitats that support the species.
5. Encourage and assist project proponents in developing and designing their proposed actions to avoid directly disturbing populations or individuals. Designs should consider water flow, slope, appropriate buffer distances, possible fencing needs, and pre-activity flagging of sensitive areas that are planned for avoidance.
6. Consider emergency OHV area closures or other OHV restrictions needed to protect, conserve, and recover the species.
7. In areas where recreational uses are identified as threats to populations of the species, consider developing new recreational facilities and/or opportunities that would direct dispersed recreational uses away from habitat, especially occupied habitat.
8. Cultural and paleontological survey/recovery technicians (e.g., archaeologists and paleontologists) working in the vicinity of known populations would be educated in the

identification of listed species in order to avoid inadvertent trampling or removal during survey, mapping, or excavation of cultural or paleontological resources.

9. Survey areas of viable habitat in the vicinity of populations within areas being considered for prescribed burning for new or undocumented populations of the species.
10. Lands being considered for land tenure adjustments that contain suitable habitat for the species would be surveyed, according to established protocols prior to approval of the land tenure adjustment action. Lands supporting populations would not be disposed of unless it is determined that the action would not threaten the survival and recovery of the species in accordance with the ESA and BLM Guidance and Policy Manual 6840, Special Status Species Management.
11. Encourage the avoidance of key habitats during livestock herding and trailing activities on public lands. Key habitats are those that are deemed necessary for the conservation of the species, including, but not limited to, designated critical habitat and other occupied or unoccupied habitats considered important for the species survival and recovery as determined in coordination with USFWS.

## **Last Chance Townsendia (*Townsendia aprica*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Last chance townsendia (*Townsendia aprica*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Prior to surface disturbing activities in habitat for the species, presence/absence surveys of potentially affected areas will be conducted in accordance with established protocols.
2. Appropriate avoidance/protection/mitigation will be used to manage potential impacts of similar subsequent projects. These measures should include, but are not be limited to:
  - the stabilization of soils to minimize or avoid impacts related to soil erosion;
  - marking/flagging of suitable and/or occupied habitat (including predetermined buffers) prior to development to avoid trampling by crew members or equipment during disturbance related activities; and
  - require project proponents to conduct surveys and monitoring actions using BLM approved specialists to document population effects and individual impacts.
3. BLM shall continue to document new populations of Last chance townsendia (*Townsendia aprica*) as they are encountered.
4. To assist and support recovery efforts, BLM will minimize or avoid surface disturbances in habitats that support the species.
5. BLM will encourage and assist project proponents in development and design of their proposed actions in order to avoid direct disturbance to populations or individuals where feasible. Designs

should consider water flow, slope, appropriate buffer distances, possible fencing needs, and pre-activity flagging of sensitive areas that are planned for avoidance.

6. BLM will consider emergency OHV closure or additional restrictions to protect, conserve, and recover the species.
7. In areas where dispersed recreational uses are identified as threats to populations of the species, BLM will consider the development of new recreational facilities/opportunities that concentrate dispersed recreational use away from habitat, especially occupied habitat.
8. Cultural and paleontological survey/recovery technicians (i.e., archeologists and/or paleontologists), conducting work in the vicinity of known populations, will be educated in the identification of listed species in order to avoid inadvertent trampling or removal during survey, mapping, or excavation of cultural or paleontological resources.
9. Areas of viable habitat, in the vicinity of populations considered for prescribed burning, will be surveyed according to established protocols for new or undocumented populations of the species.
10. Lands being considered for exchange or disposal that contain suitable habitat for the species will be surveyed for undocumented populations, according to established protocols, prior to approval of such disposal. Lands supporting populations shall not be disposed of unless it is determined that the action will not threaten the survival and recovery of the species in accordance with the ESA and BLM Guidance and Policy Manual 6840 – *Special Status Species Management*.
11. BLM will encourage the avoidance of key habitats during livestock herding and trailing activities on BLM administered lands. (Key habitats are those that are deemed necessary for the conservation of the species including, but not necessarily limited to, designated critical habitat and other occupied or unoccupied habitats considered important for the species survival and recovery as determined in coordination with the USFWS).

## **Barneby Reed-Mustard (*Schoenocrambe barnebyi*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Barneby reed-mustard (*Schoenocrambe barnebyi*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Prior to surface disturbing activities in habitat for the species, presence/absence surveys of potentially affected areas will be conducted in accordance with established protocols.
2. Appropriate avoidance/protection/mitigation will be used to manage potential impacts of similar subsequent projects. These measures should include, but are not be limited to:
  - the stabilization of soils to minimize or avoid impacts related to soil erosion;



- marking/flagging of suitable and/or occupied habitat (including predetermined buffers) prior to development to avoid trampling by crew members or equipment during disturbance related activities; and
  - require project proponents to conduct surveys and monitoring actions using BLM approved specialists to document population effects and individual impacts.
3. BLM shall continue to document new populations of each species as they are encountered.
  4. To assist and support recovery efforts, BLM will minimize or avoid surface disturbances in habitats that support the species.
  5. BLM will encourage and assist project proponents in development and design of their proposed actions in order to avoid direct disturbance to suitable habitat, populations or individuals where feasible. Designs should consider water flow, slope, appropriate buffer distances, possible fencing needs, and pre-activity flagging of sensitive areas that are planned for avoidance.
  6. BLM will consider emergency OHV closure or additional restrictions to protect, conserve, and recover the species.
  7. In areas where dispersed recreational uses are identified as threats to populations of the species, BLM will consider the development of new recreational facilities/opportunities that concentrate dispersed recreational use away from habitat, especially occupied habitat.
  8. Cultural and paleontological survey/recovery technicians (i.e., archeologists and/or paleontologists), conducting work in the vicinity of known populations, will be educated in the identification of listed species in order to avoid inadvertent trampling or removal during survey, mapping, or excavation of cultural or paleontological resources.
  9. Areas of viable habitat, in the vicinity of populations considered for prescribed burning, will be surveyed according to established protocols for new or undocumented populations of the species.
  10. Lands being considered for exchange or disposal that contain suitable habitat for the species will be surveyed for undocumented populations, according to established protocols, prior to approval of such disposal. Lands supporting populations shall not be disposed of unless it is determined that the action will not threaten the survival and recovery of the species in accordance with the ESA and BLM Guidance and Policy Manual 6840 – *Special Status Species Management*.
  11. BLM will encourage the avoidance of key habitats during livestock herding and trailing activities on BLM administered lands. (Key habitats are those that are deemed necessary for the conservation of the species including, but not necessarily limited to, designated critical habitat and other occupied or unoccupied habitats considered important for the species survival and recovery as determined in coordination with the USFWS).

## **Bald Eagle (*Haliaeetus leucocephalus*)**

### **Conservation Measures**

The following conservation measures provide guidance for avoiding, minimizing, or reducing potential adverse impacts to the bald eagle from implementing actions authorized in this RMP. This list is not all-inclusive. Additional conservation measures, or other modified versions of these measures, may be

applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of Section 7 consultation with USFWS:

1. Implement restrictions on all authorized (permitted) activities that may adversely impact bald eagles, their breeding habitat, roosting sites, or known winter concentration areas to avoid or minimize the impacts. Measures were adapted from guidance published in the Utah Field Office *Guidelines for Raptor Protection from Human and Land Use Disturbances* (USFWS 2002), and from coordination between BLM and USFWS. Measures include, but are not limited to seasonal and/or daily timing limitations and/or spatial buffers as follows:
  - a. Temporary activities<sup>4</sup> or habitat alterations that could disturb nesting bald eagles would be restricted from January 1 to August 31 within 1 mile of nest sites. Exceptions would be considered where no nesting behavior is initiated prior to June 1.
  - b. Temporary activities or habitat alterations that could disturb bald eagles would be restricted within one-half mile of known eagle winter roost areas from November 1 to March 31. In addition, require daily activities approved through subsequent consultation within these spatial buffers to start after 9 a.m. and terminate at least 1 hour before sunset to ensure that bald eagles using these roosts have the opportunity to vacate their roost in the morning and return undisturbed in the evening.
  - c. Allow no permanent<sup>5</sup> structures within 1 mile of bald eagle nest sites or within one-half mile of bald eagle winter concentration areas (roosts).
  - d. Where activities are authorized within breeding habitats or known winter concentration areas, monitoring efforts would document what, if any, impacts occur during project implementation and to what extent the species was affected. Utilize the monitoring results in designing and implementing future projects as part of the adaptive management process.
2. For all project-related survey and monitoring actions:
  - a. Provide monitoring reports to the RFO within 15 days of completion of surveys or monitoring efforts. Reports must follow BLM-specified formats for written and automated databases.
  - b. Any detection of bald eagle presence during survey or monitoring efforts to the authorized officer within 48 hours of detection.
3. Conduct appropriately timed surveys in suitable bald eagle nesting habitat or identified concentration areas in accordance with approved protocols prior to any activities that may disturb bald eagles. Surveys would only be conducted by BLM-approved individuals or personnel.
4. In coordination with cooperating agencies and/or partners (e.g., Utah Division of Wildlife Resources [UDWR] and USFWS), verify annual status (active versus inactive) of all known bald eagle nests and other identified eagle concentration areas on BLM-administered lands.

---

<sup>4</sup> Temporary activities are defined as those that are completed prior to the start of the following raptor breeding season, leaving no permanent structures and resulting in no permanent habitat loss.

<sup>5</sup> Permanent activities continue for more than one breeding season and/or cause a loss of habitat or displace individuals through disturbance (e.g., creation of a permanent structure including but not limited to well pads, roads, pipelines, and electrical powerlines).

5. When project proposals that may affect threatened and endangered species are received, coordinate with USFWS at the earliest possible date so that USFWS can provide conservation measures needed to minimize or avoid impacts.
6. BLM-administered lands within 1 mile of bald eagle nests or identified communal winter roosts should be retained in federal ownership. If it is imperative that these lands be transferred out of public ownership, make every effort to include conservation easements in conveyance documents or seek voluntary conservation restrictions to protect the bald eagles and support their conservation.
7. Notify proponents of BLM-authorized actions that roadside carrion can attract foraging bald eagles and potentially increase the risk of vehicle collisions with eagles feeding on carrion. When carrion is found on roads, notify the appropriate agency for its removal.
8. Require powerlines to be constructed to standards and guidelines identified by the Avian Protection Plan (APP) Guidelines (USFWS and APLIC 2005).
9. Provide educational information to project proponents and the general public pertaining to the following topics:
  - a. Appropriate vehicle speeds and the associated benefit of reduced vehicle collisions with wildlife
  - b. Use of lead shot (particularly over water bodies)
  - c. Use of lead fishing weights
  - d. General ecological awareness of habitat disturbance.
10. Since bald eagles often prey upon aquatic species, periodically review water quality records (e.g., Utah Department of Environmental Quality [UDEQ], UDWR, and U.S. Geological Survey [USGS]) from monitoring stations at or near important bald eagle habitats (e.g., nests, roosts, and concentration areas) on BLM-administered lands for conditions that could adversely affect eagles or their prey. If water quality problems are identified, contact the appropriate jurisdictional entity to cooperatively monitor the condition and/or take corrective action.

### **Colorado Pikeminnow (*Ptychocheilus lucius*), Humpback Chub (*Gila cypha*), Bonytail Chub (*Gila elegans*), and Razorback Sucker (*Xyrauchen texanus*)**

#### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Colorado pikeminnow, Humpback chub, bonytail, and razorback sucker, herein referred to as the Colorado River fishes. This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Monitoring of impacts of site-specific projects authorized by the BLM will result in the preparation of a report describing the progress of each site-specific project, including implementation of any associated reasonable and prudent measures or reasonable and prudent alternatives. This will be a requirement of project proponents and will be included as a condition of approval (COA) on future proposed actions that have been determined to have the potential for take. Reports will be submitted annually to the USFWS - Utah Field Office, beginning after the first full year of implementation of the project, and shall list and describe:
  - Any unforeseen direct or indirect adverse impacts that result from activities of each site-specific project;
  - Estimated levels of impact or water depletion, in relation to those described in the original project-level Consultation effort, in order to inform the Service of any intentions to reinitiate Section 7 Consultation; and
  - Results of annual, periodic monitoring which evaluates the effectiveness of any site-specific terms and conditions that are part of the formal Consultation process. This will include items such as an assessment of whether implementation of each site-specific project is consistent with that described in the BA, and whether the project has complied with terms and conditions.
2. The BLM shall notify the USFWS immediately of any unforeseen impacts detected during project implementation. Any implementation action that may be contributing to the introduction of toxic materials or other causes of fish mortality must be immediately stopped until the situation is remedied. If investigative monitoring efforts demonstrate that the source of fish mortality is not related to the authorized activity, the action may proceed only after notification of USFWS authorities.
3. Unoccupied, suitable habitat areas should be protected in order to preserve them for future management actions associated with the recovery of the Endangered Colorado River Fish, as well as approved reintroduction, or relocation efforts.
  - BLM will avoid impacts where feasible, to habitats considered most representative of prime suitable habitat for these species.
  - Surface disturbing activities will be restricted within ¼ mile of the channel centerline of the Colorado, Green, Duchesne, Price, White, and San Rafael Rivers
  - Surface disturbing activities proposed to occur within floodplains or riparian areas will be avoided unless there is no practical alternative or the development would enhance riparian/aquatic values. If activities must occur in these areas, construction will be designed to include mitigation efforts to maintain, restore, and/or improve riparian and aquatic conditions. If conditions could not be maintained, offsite mitigation strategies should be considered.
4. BLM will ensure project proponents are aware that designs must avoid as much direct disturbance to current populations and known habitats as is feasible. Designs should include:
  - protections against toxic spills into rivers and floodplains;
  - plans for sedimentation reduction;
  - minimization of riparian vegetation loss or degradation;
  - pre-activity flagging of critical areas for avoidance;
  - design of stream-crossings for adequate passage of fish; and
  - measures to avoid or minimize impacts on water quality at the 25-year frequency runoff

5. Prior to surface disturbing activities, specific principles will be considered to control erosion. These principles include:
  - Conduct long-range transportation planning for large areas to ensure that roads will serve future needs. This will result in less total surface disturbance.
  - Avoid, where possible, surface disturbance in areas with high erosion hazards.
  - Avoid mid-slope location of drill pads, headwalls at the source of tributary drainages, inner valley gorges, excessively wet slopes such as those near springs and avoid areas where large cuts and fills would be required.
  - Design and locate roads to minimize roadway drainage areas and to avoid modifying the natural drainage areas of small streams.
6. Where technically and economically feasible, project proponents will use directional drilling or multiple wells from a single pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such drilling does not intercept or degrade alluvial aquifers. Drilling will not occur within 100 year floodplains that contain listed fish species or their designated critical habitats.
7. The Utah Oil and Gas Pipeline Crossing Guidance (BLM National Science and Technology Center), or other applicable guidance, will be implemented for oil and gas pipeline river/stream crossings.
8. In areas adjacent to 100-year floodplains, particularly in systems prone to flash floods, BLM will analyze the risk for flash floods to impact facilities. Potential techniques may include the use of closed loop drilling and pipeline burial or suspension as necessary to minimize the potential for equipment damage and resultant leaks or spills.
9. Water depletions from any portion of the Upper Colorado River drainage basin above Lake Powell are considered to adversely affect and adversely modify the critical habitat of these endangered fish species. Section 7 consultation will be completed with the Service prior to any such water depletions.
10. Design stream-crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, a 25-year frequency run-off.

## **Mexican Spotted Owl (*Strix occidentalis lucida*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Mexican spotted owl (*Strix occidentalis lucida*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. BLM will place restrictions on all authorized (permitted) activities that may adversely affect the Mexican spotted owl in identified PACs, breeding habitat, or designated critical habitat, to reduce the potential for adverse impacts to the species. Restrictions and procedures have been adapted

from guidance published in the Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (USFWS 2002e), as well as coordination between BLM and the Service. Measures include:

- a. Surveys, according to USFWS protocol, will be required prior to any disturbance related activities that have been identified to have the potential to impact Mexican spotted owl, unless current species occupancy and distribution information is complete and available. All surveys must be conducted by USFWS certified individuals, and approved by the BLM authorized officer.
- b. Assess habitat suitability for both nesting and foraging using accepted habitat models in conjunction with field reviews. Apply the appropriate conservation measures below if project activities occur within 0.5 mile of suitable owl habitat, dependent in part on if the action is temporary<sup>6</sup> or permanent<sup>7</sup>:

For all temporary actions that may impact owls or suitable habitat:

- If action occurs entirely outside of the owl breeding season, and leaves no permanent structure or permanent habitat disturbance, action can proceed without an occupancy survey.
- If action will occur during a breeding season, survey for owls prior to commencing activity. If owls are found, activity should be delayed until outside of the breeding season.
- Eliminate access routes created by a project through such means as raking out scars, revegetation, gating access points, etc. For all permanent actions that may impact owls or suitable habitat:

For all permanent actions that may impact owls or suitable habitat:

- Survey two consecutive years for owls according to established protocol prior to commencing of activity.
- If owls are found, no actions will occur within 0.5 mile of identified nest site.
- If nest site is unknown, no activity will occur within the designated Protected Activity Center (PAC).
- Avoid placing permanent structures within 0.5 mi of suitable habitat unless surveyed and not occupied.
- Reduce noise emissions (e.g., use hospital-grade mufflers) to 45 dBA at 0.5 mile from suitable habitat, including canyon rims (Delaney et al. 1997). Placement of permanent noise-generating facilities should be determined by a noise analysis to ensure noise does not encroach upon a 0.5 mile buffer for suitable habitat, including canyon rims.
- Limit disturbances to and within suitable owl habitat by staying on designated routes.
- Limit new access routes created by the project.

---

<sup>6</sup>Temporary activities are defined as those that are completed prior to the start of the following raptor breeding season, leaving no permanent structures and resulting in no permanent habitat loss.

<sup>7</sup> Permanent activities continue for more than one breeding season and/or cause a loss of owl habitat or displaces owls through disturbances, e.g., creation of a permanent structure including but not limited to well pads, roads, pipelines, electrical power line.



2. BLM will, as a condition of approval (COA) on any project proposed within identified PACs, designated critical habitat, or within spatial buffers for Mexican spotted owl nests (0.5 mile), ensure that project proponents are notified as to their responsibilities for rehabilitation of temporary access routes and other temporary surface disturbances, created by their project, according to individual BLM Field Office standards and procedures, or those determined in the project-specific Section 7 Consultation.
3. BLM will require monitoring of activities in designated critical habitat, identified PACs, or breeding habitats, wherein it has been determined that there is a potential for take. If any adverse impacts are observed to occur in a manner, or to an extent that was not considered in the project-specific Section 7 Consultation, then consultation must be reinitiated.
  - Monitoring results should document what, if any, impacts to individuals or habitat occur during project construction/implementation. In addition, monitoring should document successes or failures of any impact minimization, or mitigation measures. Monitoring results would be considered an opportunity for adaptive management, and as such, would be carried forward in the design and implementation of future projects.
4. For all survey and monitoring actions:
  - Reports must be provided to affected field offices within 15 days of completion of survey or monitoring efforts.
  - Report any detection of Mexican spotted owls during survey or monitoring to the authorized officer within 48 hours.
5. BLM will, in areas of designated critical habitat, ensure that any physical or biological actors (i.e., the primary constituent elements), as identified in determining and designating such habitat, remains intact during implementation of any BLM-authorized activity.
6. For all BLM actions that “*may adversely affect*” the primary constituent elements in any suitable Mexican spotted owl habitat, BLM will implement measures as appropriate to minimize habitat loss or fragmentation, including rehabilitation of access routes created by the project through such means as raking out scars, revegetation, gating access points, etc.
7. Where technically and economically feasible, use directional drilling from single drilling pads to reduce surface disturbance, and minimize or eliminate needing to drill in canyon habitats suitable for Mexican spotted owl nesting.
8. Prior to surface disturbing activities in Mexican spotted owl PACs, breeding habitats, or designated critical habitat, specific principles should be considered to control erosion.

These principles include:

- Conduct long-range transportation planning for large areas to ensure that roads will serve future needs. This will result in less total surface disturbance.
- Avoid surface disturbance in areas with high erosion hazards to the greatest extent possible. Avoid mid-slope locations, headwalls at the source of tributary drainages, inner valley gorges, and excessively wet slopes such as those near springs. In addition, avoid areas where large cuts and fills would be required.
- Locate roads to minimize roadway drainage areas and to avoid modifying the natural drainage areas of small streams.

9. Project developments should be designed, and located to avoid direct or indirect loss or modification of Mexican spotted owl nesting and/or identified roosting habitats.
10. Water production associated with BLM authorized actions should be managed to ensure maintenance or enhancement of riparian habitats.

## Utah Prairie Dog (*Cynomys parvidens*)

### Conservation Measures

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Utah prairie dog (*Cynomys parvidens*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Surveys according to approved protocols and procedures will be required prior to surface disturbance unless species occupancy and distribution information is complete, current, and available. Surveys would be conducted by BLM-approved biologists. In the event species occurrence is verified, the project proponent may be required to modify operational plans, at the discretion of the authorized officer, to include additional, appropriate protection measures or practices for the minimization of impacts to the Utah prairie dog and its habitat.
2. BLM will restrict surface disturbing activities within 0.5 mile of active Utah prairie dog colonies when and where necessary, upon the recommendation of BLM FO staff biologists to BLM management and as necessary in coordination or consultation with USFWS.
3. No permanent surface disturbance or facility will be allowed within 0.5 mile of potentially suitable Utah prairie dog habitat, as identified and mapped by the Utah Division of Wildlife Resources or BLM, since 1976.
4. Unavoidable surface disturbing activities in Utah prairie dog habitat should be conducted between April 1 and September 30 (the period when prairie dogs are most likely to be found above ground). BLM projects will be designed to avoid direct disturbance to Utah prairie dog populations and habitat wherever possible. Designs should consider flow of water, slope, buffers, possible fencing, and pre-activity flagging of critical areas for avoidance.
5. Reclamation and restoration efforts in Utah prairie dog habitat will be conducted using native seed, unless otherwise specified in coordination with USFWS.
6. As funding allows, BLM should complete a comprehensive assessment locating and mapping OHV use areas that interface with Utah prairie dog populations. Comparison of GIS layers for Utah prairie dog populations and OHV use should give BLM personnel another tool to manage and/or minimize impacts from OHV use near known Utah prairie dog populations and habitat. Based on the information that is developed via GIS applications, appropriate actions should be taken to prevent OHV use in occupied territories.
7. BLM will consider emergency OHV closures or additional restrictions to protect, conserve, and recover the species.

8. Where technically and economically feasible, the use of directional drilling or drilling of multiple wells from a single pad will be required to reduce surface disturbance in Utah prairie dog habitat.
9. For existing facilities, BLM and facility operators, will consider if fencing infrastructure on well pads (e.g., drill pads, tank batteries, and compressors) would be needed to protect equipment from burrowing activities. In addition, BLM and project proponents should consider if future surface disturbing activities would be required at the site.
10. BLM will provide educational information for project proponents and the general public pertaining to appropriate vehicle speeds and the associated benefit of reduced vehicle collisions with wildlife, and to improve general ecological awareness of habitat disturbance.
11. Project related vehicle maintenance activities will be conducted in maintenance facilities. Should it become necessary to perform vehicle or equipment maintenance on-site, these activities will avoid identified Utah prairie dog colonies or within a 350-foot distance from colonies. Precautions shall be taken to ensure that contamination of maintenance sites by fuels, motor oils, grease, etc. does not occur and such materials are contained and properly disposed of off-site. Inadvertent spills of petroleum based or other toxic materials shall be cleaned up and removed immediately.
12. BLM will coordinate with interested private and governmental agencies and landowners to identify voluntary opportunities to modify current land stewardship practices that may have detrimental impacts on the Utah prairie dog and its habitat.
11. BLM-authorized equipment and vehicles planned for use within Utah prairie dog habitat will be cleaned to minimize the spread of noxious weeds or other undesirable vegetation types.

## **Southwestern Willow Flycatcher (*Empidonax traillii extimus*)**

### **Conservation Measures**

The following list of measures provides species-specific guidance intended to avoid, minimize, or reduce potential adverse impacts from implementation of BLM actions under the authority of current Utah BLM LUPs on the Southwestern willow flycatcher (*Empidonax traillii extimus*). This list is not comprehensive. Additional conservation measures, or other modified versions of these measures, may be applied for any given BLM-authorized activity upon further analysis, review, coordination efforts, and/or appropriate levels of section 7 consultation with the USFWS.

1. Surveys will be required prior to operations that “*may adversely affect*” the Southwestern willow flycatcher unless species occupancy data and distribution information is complete and available. Surveys will only be conducted by BLM-approved personnel. In the event species occurrence is verified, project proponents may be required to modify operational plans at the discretion of the authorized officer. Modifications may include appropriate measures for minimization of adverse effects to the Southwestern willow flycatcher and its habitat.
2. BLM will monitor and restrict, when and where necessary, authorized or casual use activities that “*may adversely affect*” the Southwestern willow flycatcher, including but not limited to, recreation, mining, and oil and gas activities. Monitoring results should be considered in the design and implementation of future projects.

3. To monitor the impacts of BLM-authorized projects determined “*likely to adversely affect*” the Southwestern willow flycatcher, BLM should prepare a short report describing progress, including success of implementation of all associated mitigation. Reports shall be submitted annually to the USFWS Utah Field Office by March 1<sup>st</sup> beginning one full year from date of implementation of the proposed action. The report shall list and describe the following items:
  - Any unforeseen adverse effects resulting from activities of each site-specific project (may also require reinitiation of formal Consultation);
  - When, and if, any level of anticipated incidental take is approached (as allowed by separate Incidental Take Statements of site-specific Formal Section 7 Consultation efforts);
  - When, or if, the level of anticipated take (as allowed by separate Incidental Take Statements from site-specific formal consultations) is exceeded; and • Results of annual, periodic monitoring which evaluate the effectiveness of the reasonable and prudent measures or terms and conditions of the site-specific Consultation.
4. BLM should avoid granting activity permits or authorizing development actions in Southwestern willow flycatcher habitat. Unoccupied potential habitat should be protected in order to preserve them for future management actions associated with the recovery of the Southwestern willow flycatcher.
5. BLM will ensure project design incorporates measures to avoid direct disturbance to populations and suitable habitats where possible. At a minimum, project designs should include consideration of water flows, slope, seasonal and spatial buffers, possible fencing, and pre-activity flagging of critical areas for avoidance.
6. The BLM will continue to address illegal and unauthorized OHV use and activity upon BLM administered lands. In order to protect, conserve, and recover the Southwestern willow flycatcher in areas of heavy unauthorized use, temporary closures, or use restrictions beyond those which are already in place, may be imposed. As funding allows, BLM should complete a comprehensive assessment of all OHV use areas that interface with Southwestern willow flycatcher populations. Comparison of Southwestern willow flycatcher populations and OHV use areas using GIS would give BLM personnel another tool to manage and/or minimize impacts.
7. All surface disturbing activities should be restricted within a 0.25 mile buffer from suitable riparian habitats and permanent surface disturbances should be avoided within 0.5 mile of suitable Southwestern willow flycatcher habitat.
  - Unavoidable ground disturbing activities in occupied Southwestern willow flycatcher habitat should only be conducted when preceded by current year survey, should only occur between August 16 and April 30 (the period when Southwestern willow flycatcher are not likely to be breeding), and should be monitored to ensure that adverse impacts to Southwestern willow flycatcher are minimized or avoided, and to document the success of project specific mitigation/protection measures. As monitoring is relatively undefined, project specific requirements must be identified.
8. BLM will properly consider nesting periods for Southwestern willow flycatcher when conducting horse gathering operations in the vicinity of habitat.

9. BLM will ensure that plans for water extraction and disposal are designed to avoid changes in the hydrologic regime that would likely result in loss or undue degradation of riparian habitat.
10. Native species will be preferred over non-native for revegetation of habitat in disturbed areas.
11. BLM will coordinate with other agencies and private landowners to identify voluntary opportunities to modify current land stewardship practices that may impact the Southwestern willow flycatcher and its habitats.
12. Limit disturbances to within suitable habitat by staying on designated routes.
13. Ground-disturbing activities will require monitoring throughout the duration of the project to ensure that adverse impacts to Southwestern willow flycatcher are avoided. Monitoring results should document what, if any, impacts to individuals or habitat occur during project construction/implementation. In addition, monitoring should document successes or failures of any impact minimization or mitigation measures. Monitoring results would be considered an opportunity for adaptive management and, as such, would be carried forward in the design and implementation of future projects.
14. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in Southwestern willow flycatcher habitat.
15. Habitat disturbances (i.e., organized recreational activities requiring special use permits, drilling activities, etc.) will be avoided within 0.25 mile of suitable Southwestern willow flycatcher habitat from May 1 to August 15.
16. Grazing allotments that contain habitat for the species will be managed with consideration for recommendations provided by the Southwestern Willow Flycatcher Recovery Plan, and other applicable research.

## POTENTIAL BEST MANAGEMENT PRACTICES

Best management practices (BMP) are those land and resource management techniques determined to be the most effective and practical means of maximizing beneficial results and minimizing conflicts and adverse environmental impacts of management actions. BMPs could include, but are not limited to, structural and nonstructural controls, specific operations, and maintenance procedures. BMPs can be applied before, during, and after activities to reduce or eliminate adverse environmental impacts. BMPs are not one-size-fits-all solutions. BMPs should be matched and adapted through interdisciplinary analysis to determine which management practices would be necessary to meet the goals and objectives in the Resource Management Plan (RMP). The actual practices and mitigation measures that are best for a particular site are evaluated through the site-specific National Environmental Policy Act (NEPA) process and vary to accommodate unique, site-specific and local resource conditions.

BMPs described in this appendix are designed to assist in achieving the RMP objectives. These guidelines could apply, where appropriate, to all use authorizations, including projects initiated by the Bureau of Land Management (BLM). BMPs are dynamic, and should not be interpreted as specific direction at the same level as the RMP decisions. BMPs are selected and implemented as necessary, based on site-specific conditions, to meet resource objectives for specific management actions.

This appendix does not provide an exhaustive list of BMPs. Additional BMPs may be identified during an interdisciplinary process when evaluating site-specific management actions. Implementation and effectiveness of BMPs must be monitored to determine whether the practices are achieving RMP goals and objectives. Adjustments could be made as necessary to ensure RMP goals and objectives are met, as well as to conform with changes in BLM regulations, policy, direction, or new scientific information. BMPs may also be updated as new technology emerges. In addition, applicants can suggest alternate conditions that could accomplish the same result.

Because the management of environmental impacts is an ongoing process, continual refinement of BMP design is necessary. This process can be described in these five steps: (1) selection of design of a specific BMP; (2) application of the BMP; (3) monitoring; (4) evaluation; and (5) feedback. Data gathered through monitoring is evaluated and used to identify changes needed in BMP design or application or in the monitoring program.

BMPs have been developed and used by numerous energy companies and state and federal agencies throughout the nation. BLM and other agencies are continually gathering and developing BMPs and sharing them, allowing for the application of years of experience. Development and sharing of BMPs represents a commitment to the idea that smart planning and responsible follow-through manage and in some cases reduce impacts to resources, both now and in the future. The BMPs developed by other agencies could be considered in addition to those identified in this document. Other BMPs include those contained in the following documents and websites:

- *Utah's Forest Water Quality Guidelines: A Practical User's Guide for Landowners, Loggers, and Resource Managers* (State of Utah, Department of Natural Resources, Division of Forestry, Fire and State Lands). As of September 2007, an electronic version of this document was available at <http://extension.usu.edu/forestry/Management/UtFWQGuide/Assets/PDFDocs/UFWQGBOO.PDF>.
- *Coalbed Methane Best Management Practices: A Handbook – 2006 Update* (Western Governors' Association). As of September 2007, an electronic version of this document was available at [www.westgov.org/wga/initiatives/coalbed/](http://www.westgov.org/wga/initiatives/coalbed/).



- *Low-Volume Roads Engineering Best Management Practices Field Guide* (U.S. Forest Service). As of September 2007, an electronic version of this document was available at [www.blm.gov/bmp/field%20guide.htm](http://www.blm.gov/bmp/field%20guide.htm).
- *Water-Road Interaction Technology Series Documents* (U.S. Forest Service). As of September 2007, electronic versions of these documents were available at [www.stream.fs.fed.us/water-road/](http://www.stream.fs.fed.us/water-road/).
- *National Menu of Stormwater Best Management Practices* (U.S. Environmental Protection Agency). As of September 2007, electronic versions of these documents were available at <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm>.
- *Technical Information Sheets: Specific and Detailed BMP Guidance* (Bureau of Land Management). As of September 2007, an electronic version of this document was available through hyperlinks at [www.blm.gov/bmp/Technical\\_Information.htm](http://www.blm.gov/bmp/Technical_Information.htm).
- *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development: The Gold Book* (Bureau of Land Management). As of September 2007, an electronic version of this document was available through hyperlinks at [www.blm.gov/bmp/Technical\\_Information.htm](http://www.blm.gov/bmp/Technical_Information.htm).

In addition, this appendix contains conservation measures identified jointly by the BLM and the U.S. Fish and Wildlife Service (USFWS) as needed to protect specific threatened or endangered species. These conservation measures are targeted to specific species and must be considered and applied as appropriate.

## Surface Disturbing Activities

- Evaluate areas subject to surface disturbance for the presence of cultural resources or values. This is usually accomplished through the completion of a cultural clearance. An on-the-ground inspection by a qualified archaeologist, historian, or paleontologist is required. In cases where cultural resources are found, the preferred response would be to modify the proposed action to avoid the cultural resource (avoidance). If avoidance is not possible, actions would be taken to preserve the data or value represented by the cultural resource (mitigation).
- Evaluate areas subject to surface disturbance for the presence of threatened, endangered, or candidate animal or plant species. This is usually accomplished through the completion of a biological clearance. An on-the-ground inspection by a qualified biologist is required. In cases where threatened, endangered, or candidate species are affected, the preferred response would be to modify the proposed action to avoid species or their habitat (avoidance). If avoidance of a threatened, endangered, or candidate species or its habitat is not possible, a Section 7 consultation with USFWS would be required, and a biological assessment would be prepared to recommend actions to protect the species or its habitat.
- Consider requiring special design and reclamation measures to protect scenic and natural landscape values. These may include transplanting trees and shrubs, mulching and fertilizing disturbed areas, use of low-profile permanent facilities, and painting to minimize visual contrasts. Surface disturbing activities may be moved to avoid sensitive areas or to reduce the visual effects of the proposal.
- Design above-ground facilities requiring painting to blend in with the surrounding environment.
- Implement reclamation concurrent with construction and site operations to the extent possible. Final reclamation actions shall be initiated within 6 months of the termination of operations unless otherwise approved in writing by the authorized officer.
- Ensure fill material is pushed into cut areas and up over back slopes. Depressions should not be left that would trap water or form ponds.

## Mineral Exploration and Development

- Reduce impacts to wildlife and visual resources by applying the following, as appropriate:

- Directional drilling of oil and gas wells
- Drilling of multiple wells from a single pad
- Closed drilling systems
- Cluster development
- Below-ground wellheads
- Remote well monitoring
- Piping of produced liquids to centralized tank batteries off site to reduce traffic to individual wells
- Transportation planning (e.g., to reduce road density and traffic volumes)
- Compensatory mitigation
- Noise reduction techniques and designs
- Installation of raptor anti-perch devices in Greater sage-grouse habitat
- Monitoring of wildlife populations during drilling operations
- Avoidance of human activity between 8 p.m. and 8 a.m. from March 1 through May 15 within one-quarter mile of the perimeter of occupied Greater sage-grouse leks
- Onsite bioremediation of oil field wastes and spills
- Removal of trash, junk, waste, and other materials not in current use.
- Reclaim all disturbed surface areas promptly, performing concurrent reclamation as necessary, and minimize the total amount of all surface disturbance.
- Ensure all surface soil is stripped prior to conducting operations, stockpiled, and reapplied during reclamation, regardless of soil quality. Minimize the length of time soil remains in stockpiles and the depth or thickness of stockpiles.
- Strip and separate soil surface horizons where feasible and reapply in proper sequence during reclamation.
- Establish vegetation cover on soil stockpiles that are to be in place longer than 1 year.
- Construct and rehabilitate temporary roads to minimize total surface disturbance, consistent with intended use.
- Consider temporary measures such as silt fences, straw bales, or mulching to trap sediment in sensitive areas until reclaimed areas are stabilized with vegetation.
- Reshape to the approximate original contour all areas to be permanently reclaimed, providing for proper surface drainage.

## Road Design and Maintenance

- Keep access roads to a minimum and use to only when necessary.
- Design roads to minimize total disturbance, conform with topography, and minimize disruption of natural drainage patterns.
- Locate roads on stable terrain, such as ridgetops; natural benches; and flatter transitional slopes near ridges, valley bottoms, and moderate sideslopes, and away from slumps, slide-prone areas, concave slopes, clay beds, and where rock layers dip parallel to the slope. Locate roads on well-drained soil types; avoid wet areas.
- Construct roads for surface drainage by using outslopes, crowns, grade changes, drain dips, waterbars, and/or insloping to ditches as appropriate. Maintain drain dips, waterbars, road crown, insloping, and outsloping, as appropriate, during road maintenance. Grade roads only as necessary.
- Sloping the road base to the outside edge for surface drainage is normally recommended for local spurs or minor collector roads where low traffic volume and lower traffic speeds are anticipated. This is also recommended in situations where long intervals between maintenance will occur and where minimum excavation is wanted. Outsloping is not recommended on steep slopes. Sloping the road base to the inside edge is an acceptable practice on roads with steep sideslopes and

where the underlying soil formation is very rocky and not subject to appreciable erosion or failure.

- Crown and ditching is recommended for arterial and collector roads where traffic volume, speed, intensity, and user comfort are considerations. Recommended gradients range from 0 percent to 15 percent where crown and ditching may be applied, as long as adequate drainage away from the road surface and ditch lines is maintained.
- In soil types with a low sand component, construct roads when soils are dry and not frozen, if possible. When these types of soils or road surfaces become saturated to a depth of three inches, BLM-authorized activities should be limited or cease unless otherwise approved by the authorized officer.
- Retain vegetation between roads and streams to filter runoff caused by roads.
- Use culverts that pass, at a minimum, a 50-year storm event and/or have a minimum diameter of 13 inches for permanent stream crossings and a minimum diameter of 18 inches for road cross-drains.
- Strip and stockpile topsoil ahead of construction of new roads, if feasible. Reapply soil to cut and fill slopes prior to revegetation.
- Use existing roads whenever possible rather than constructing new road systems.

## **Right-of-Way and Utility Corridors**

- Ensure rights-of-way (ROW) and utility corridors use areas adjoining or adjacent to previously disturbed areas whenever possible.
- Stabilize disturbed areas within road ROWs and utility corridors with vegetation practices designed to hold soil in place and minimize erosion. Reestablish vegetation cover to increase infiltration and provide additional protection from erosion.
- Construct sediment barriers when needed to slow runoff, allow deposition of sediment, and prevent transport from the site. Straining or filtration mechanisms may also be employed for the removal of sediment from runoff.

## **Noxious Weed Management**

- To reduce the potential for the introduction of noxious weeds, clean off all equipment with pressure washing prior to operating on BLM lands. Removal of all dirt, grease, and plant parts that may carry noxious weed seeds or vegetative parts is required and may be accomplished with a pressure hose.
- Ensure all seed, hay, straw, mulch, or other vegetation material transported and used on public land weed free zones for site stability, rehabilitation, or project facilitation is free of noxious weeds and noxious weed seed as certified by a qualified federal, state, or county officer.

## **Reducing Impacts to Visual Resource Management Class II and Class III Areas**

- Bury distribution powerlines and flow lines in or adjacent to access roads.
- Use repetition of elements of form, line, color, and texture to blend facilities with the surrounding landscape.
- Paint all above-ground structures not requiring safety coloration an environmental color two shades darker than the surrounding environment.
- Reclaim and recontour all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.
- Avoid facility placement on steep slopes, ridge tops, and hilltops.

- Reclaim unused well pads within 1 year.

## Developed Recreation

- Construct recreation sites and provide appropriate sanitation facilities to minimize impacts to resource values, maximize public health and safety, and minimize user conflicts related to approved activities and access within an area as appropriate.
- Use public education and/or physical barriers (such as rocks, posts, and vegetation) to direct or preclude uses and to minimize impacts to resource values.

## Riparian/Wetland Areas

- Avoid locating roads, trails, and landings in wetlands.
- Locate, identify, and mark riparian management areas during design of projects that may cause adverse impacts to riparian management areas.
- Keep open water free from slash.
- Avoid equipment operation in areas of open water, seeps, and springs.
- Use low ground pressure equipment (floatation tires or tracked) as necessary to minimize rutting and compaction.

## Water Developments

- Actual work in springs and stream beds will be done by hand where possible. If machinery is needed in these areas, it will be selected to minimize disturbance.
- After construction of spring head boxes, troughs, pipelines, and well sites, the areas will be cleaned up and refuse removed.
- Cuts, fills, and excavations will be dressed and seeded to blend with surroundings. Pipelines will be buried where possible.
- Original water sources will be protected, fenced if required, and an off-stream watering supply will be provided near the site.
- Size of storage tanks and troughs will be designed to accommodate expected needs of livestock and wildlife using each water source.
- Water will be left at the site for wildlife. Wells will be cased to prevent cave-ins and well sites will be fenced.
- Storage structures will be designed to provide water for wildlife. Drinking ramps will be installed and heights will not prohibit young wildlife from obtaining water.

## APPENDIX 15—FLUID MINERAL DEVELOPMENT BEST MANAGEMENT TYPICAL PRACTICES

---

Best Management Practices (BMP) are state-of-the-art mitigation measures applied on a site-specific basis to reduce, prevent, or avoid adverse environmental or social impacts. BMPs are applied to management actions to aid in achieving desired outcomes for safe, environmentally sound resource development by preventing, minimizing, or mitigating adverse impacts and reducing conflicts. For each proposed action, a number of BMPs may be applied as necessary to mitigate expected impacts. The following typical environmental Best Management Practices (BMP) may be applied on individual Applications for Permit to Drill and associated rights-of-way in the Price Field Office on a case-by-case basis. These procedures are consistent with current national guidance and the Surface Operating Standards and Guidelines for Oil and Gas Development (Gold Book), 2007. This list is not all inclusive and may be modified over time as conditions change and new practices are identified.

- Interim reclamation of the well and access road will begin as soon as practicable after a well is placed in production. Facilities will be grouped on the pads to allow for maximum interim reclamation. Interim reclamation will include road cuts and fills and will extend to within close proximity of the wellhead and production facilities.
- All above ground facilities including power boxes, building doors, roofs, and any visible equipment will be painted a color selected from the latest national color charts that best allows the facility to blend into the background.
- All new roads will be designed and constructed to a safe and appropriate standard, “no higher than necessary” to accommodate intended vehicular use. Roads will follow the contour of the land where practical. Existing oil and gas roads that are in eroded condition or contribute to other resource concerns will be brought to BLM standards within a reasonable period of time.
- Final reclamation of all oil and gas disturbance will involve recontouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography and revegetating all disturbed areas.
- Raptor perch avoidance devices will be installed on all new powerlines and existing lines that present a potential hazard to raptors.
- All powerlines to individual well locations (excluding major power source lines to the operating oil or gas field) and all flow lines will be buried in or immediately adjacent to the access roads where feasible.
- In developing oil and gas fields, all production facilities may be centralized to avoid tanks and associated facilities on each well pad where necessary to address resource issues.
- Multiple wells will be drilled from a single well pad wherever feasible.
- Noise reduction techniques and designs will be used to reduce noise from compressors or other motorized equipment.
- Seasonal restrictions on public vehicular access will be evaluated where there are wildlife conflict or road damage/maintenance issues.
- Monitoring of wildlife to evaluate the effects of oil and gas development
- Avoiding placement of production facilities on hilltops and ridgelines;
- Screening facilities from view;
- Bioremediating oil field wastes and spills; and
- Using common utility or Right-of-Way corridors containing roads, powerlines, and pipelines.

## APPENDIX 16— HYDRAULIC CONSIDERATIONS FOR PIPELINES CROSSING STREAM CHANNELS; TECHNICAL NOTE 423

---

### Suggested citations:

- Fogg, J. and H. Hadley. 2007. Hydraulic considerations for pipelines crossing stream channels. Technical Note 423. BLM/ST/ST-07/007+2880. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, CO. 18 pp. <http://www.blm.gov/nstc/library/techno2.htm>.
- U.S. Department of the Interior. 2007. Hydraulic considerations for pipelines crossing stream channels. Technical Note 423. BLM/ST/ST-07/007+2880. Bureau of Land Management, National Science and Technology Center, Denver, CO. 18 pp. <http://www.blm.gov/nstc/library/techno2.htm>.

### ABSTRACT

High flow events have the potential to damage pipelines that cross stream channels, possibly contaminating runoff. A hydrologic analysis conducted during the design of the pipeline can help determine proper placement. Flood frequency and magnitude evaluations are required for pipelines that cross at the surface. There are several methods that can be used, including reconnaissance, physiographic, analytical, and detailed methods. The method used must be appropriate for the site's characteristics and the objectives of the analysis. Channel degradation and scour evaluations are required for pipelines crossing below the surface. Proper analysis and design can prevent future pipeline damage and reduce repair and replacement costs.

### Production services provided by:

Bureau of Land Management  
National Science and Technology Center  
Branch of Publishing Services  
P.O. Box 25047  
Denver, CO 80225

### Copies available online at:

[www.blm.gov/nstc/library/techno2.htm](http://www.blm.gov/nstc/library/techno2.htm)



## INTRODUCTION

In 2002, the U.S. Fish and Wildlife Service raised concerns about the potential for flash floods in ephemeral stream channels to rupture natural-gas pipelines and carry toxic condensates to the Green River, which would have deleterious effects on numerous special-status fish species (Figure 1). In November of the same year, BLM hydrologists visited the Uinta Basin in Utah to survey stream channels and compute flood magnitudes and depths to better understand possible flooding scenarios. From this they developed construction guidance for pipelines crossing streams in Utah. This guidance was later modified so that it was generally applicable to the arid and semiarid lands of the intermountain west. It may also have general applicability in other areas of the western United States. The purpose of this document is to present the modified guidance for placement of pipelines crossing above or below the surface of stream channels to prevent inundation or exposure of the pipe to the hydraulic forces of flood events.



Figure 1. Pipeline breaks during flooding can release condensate toxic to sensitive fish species.

## SURFACE CROSSINGS

Pipelines that cross stream channels on the surface should be located above all possible floodflows that may occur at the site. At a minimum, pipelines must be located above the 100-year flood elevation and preferably above the 500-year flood elevation. Two sets of relationships are available for estimating flood frequencies at ungaged sites in Utah. Thomas and Lindskov (1983) use drainage basin area and mean basin elevation for flood estimates for six Utah regions stratified by location and basin elevation (Table 1). Thomas et al. (1997) also use drainage area and mean basin elevation to estimate magnitude and frequency of floods throughout the southwestern U.S., including seven regions that cover the entire State of Utah. Results from both sets of equations should be examined to estimate the 100- and 500-year floods, since either of the relations may provide questionable results if the pipeline crosses a stream near the boundary of a flood region or if the drainage area or mean basin elevation for the crossing exceed the limits of the data set used to develop the equations.

Table 1. Examples of Flood Frequency Equations for Ungaged Sites in Utah

Regression equations for peak discharges for Uinta Basin (from Thomas and Lindskov 1983)			
Discharge Q in cubic feet per second, Area in square miles, Elevation in thousands of feet			
Recurrence interval (yrs)	Equation	Number of stations used in analysis	Average standard error of estimate (%)
2	$Q = 1,500 A^{0.403} E^{-1.90}$	25	82
5	$Q = 143,000 A^{0.374} E^{-3.66}$	25	66
10	$Q = 1.28 \times 10^6 A^{0.362} E^{-4.50}$	25	64
25	$Q = 1.16 \times 10^7 A^{0.352} E^{-5.32}$	25	66
50	$Q = 4.47 \times 10^7 A^{0.347} E^{-5.85}$	25	70
100	$Q = 1.45 \times 10^8 A^{0.343} E^{-6.29}$	25	74

Procedures for estimating 100-year and 500-year flood magnitudes for other States are described in the U.S. Geological Survey's National Flood Frequency Program (Ries and Crouse 2002) (Figure 2). Full documentation of the equations and information necessary to solve them is provided in individual reports for each State. The National Flood Frequency (NFF) Website (<http://water.usgs.gov/software/nff.html>) provides State summaries of the equations in NFF, links to online reports for many States, and factsheets summarizing reports for States with new or corrected equations. Background information in each State's flood frequency reports should be checked to ensure that application of the equations is not attempted for sites with independent variables outside the range used to develop the predictive equations.

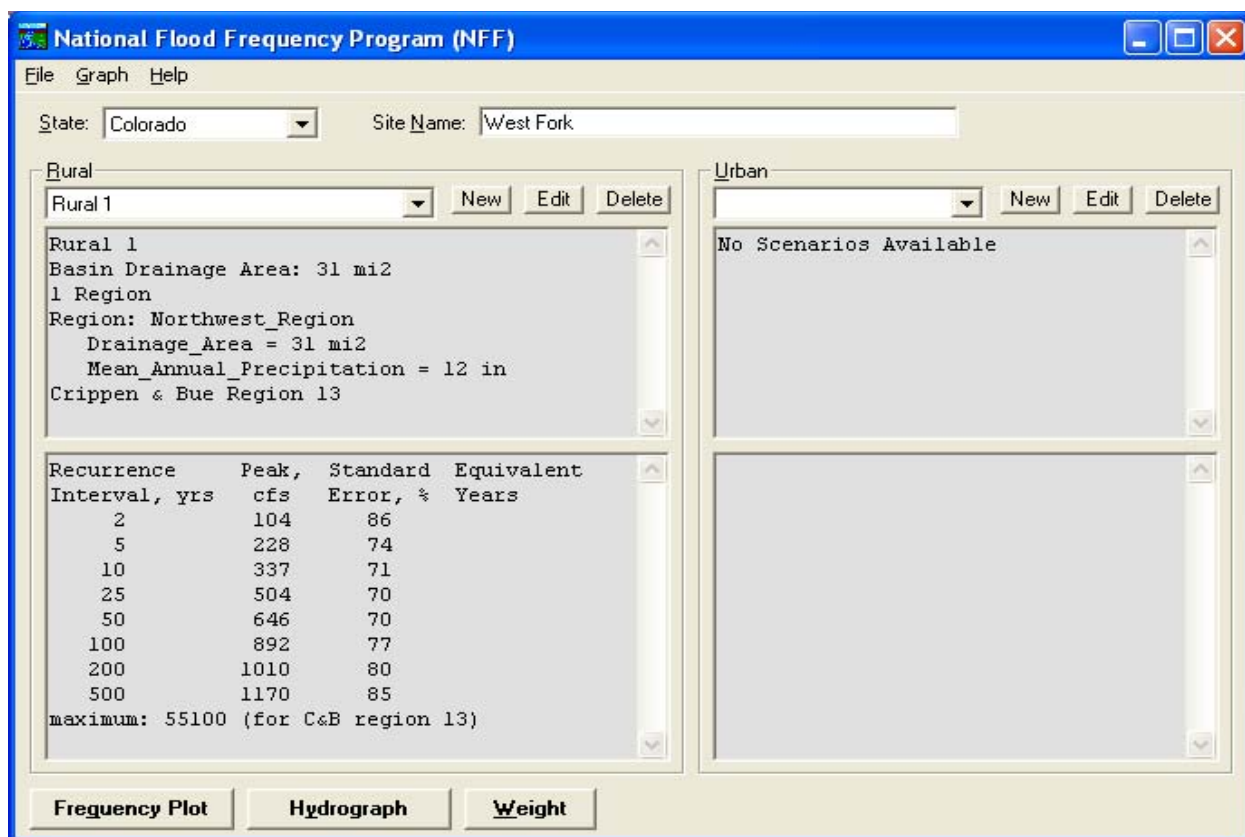


Figure 2. View of the output from NFF.

Once the flood frequency for a site has been estimated, determining the depth of flow associated with an extreme flood (i.e., the elevation of the pipeline at the crossing) may be approached in a number of ways. Procedures for estimating depth of flow for extreme floods in Utah are presented in Thomas and Lindskov (1983). Similar procedures presented in Burkham (1977, 1988) are generally applicable for locations throughout the Great Basin and elsewhere. The reconnaissance, physiographic, analytical, and detailed methods described in those reports will be summarized briefly in this paper. Burkham (1988) describes an additional method (historical method) not presented here, since the data for its use (high-water marks for an extreme historical flood with known discharge and recurrence interval) are rarely available in public land situations for which this guidance is intended.

### **RECONNAISSANCE METHOD**

The reconnaissance method (as the name implies) is a fairly rough and imprecise method for delineating flood-prone areas (Burkham 1988; Thomas and Lindskov 1983). It is most applicable to stable or degrading alluvial channels with multiple terrace surfaces, although such terraces may be difficult to detect on severely degrading streams. In this procedure, the channel of interest is examined to approximate the area that would be inundated by a large flood. A geomorphic reconnaissance of the site is conducted, and it may be supplemented with aerial photos, maps, and historical information available for the reach of interest. In addition to the morphology of the channel, floodplain, and terraces, information on vegetation (e.g., species,



flood tolerance, drought tolerance) and soils (e.g., development, stratification, and drainage) can be helpful for identifying flood-prone areas (Burkham 1988). For best results, the geomorphic analysis should include reaches upstream and downstream of the site and should attempt to determine the general state of the stream channel as aggrading, degrading, or stable. (Additional guidance on detection of stream degradation is presented in the section on subsurface crossings).

In the reconnaissance method, identification of bankfull elevation and the active floodplain (i.e., floodplain formed by the present flow regime) provides **inadequate** conveyance for extreme flood events (Figure 3). Past floodplains or present terraces also must be identified, since these surfaces may be inundated by extreme floods in the present flow regime, especially in arid and semiarid environments. Pipelines should be constructed so that they cross at or above the elevation of the highest and outermost terrace (Figure 4). The highest terrace is unlikely to be accessed in the modern flow regime by any but the most extreme floods.

Practitioners of the reconnaissance method need considerable experience in geomorphology, sedimentation, hydraulics, soil science, and botany. Also, since this method is based on a geomorphic reconnaissance of the site, no flood frequency analysis is required and no recurrence interval can be assigned to the design elevation. An additional drawback to the method is that the accuracy of the results is unknown. However, the reconnaissance method may be the most rational one for delineating flood-prone areas on some alluvial fans and valley floors where channels become discontinuous (Burkham 1988). While this is the quickest approach to designing a pipeline that crosses a channel, it likely will result in the most conservative estimate (i.e., highest elevation and greatest construction cost) for suspension of the pipeline.



Figure 3. Although this pipeline crossed above the bankfull channel indicators, it was not high enough to escape more extreme floods.



Figure 4. This New Mexico pipeline crosses the channel near the elevation of the highest terrace, which places it above even the most extreme flood events.

### **PHYSIOGRAPHIC METHOD**

A slightly more intensive approach to designing pipelines that cross streams is based on the physiographic method for estimating flood depths at ungaged sites described by Thomas and Lindskov (1983) and Burkham (1988). The procedure uses regional regression equations (similar to the flood frequency equations described above) to estimate **maximum** depth of flow associated with a specified recurrence-interval flood (Table 2). Flood depth is then added to a longitudinal survey of the channel **thalweg** in the vicinity of the crossing (10 to 20 channel widths in length), resulting in a longitudinal profile of the specified flood. Elevation of the flood profile at the point of pipeline crossing is the elevation above which the pipeline must be suspended. The method is generally applicable where 1) the project site is physiographically similar to the drainage basins used to develop the regression equations and 2) soil characteristics are the same at the project site as in the basins where the regression equations were developed. While this procedure requires a field survey and calculation of flood depths at points along the channel, it may result in a lower crossing elevation (and possibly lower costs) for the pipeline. Also, since the regional regression equations estimate flood depths for specific recurrence-interval floods, it is possible to place a recurrence interval on the crossing design for risk calculations. However, regional regression equations linking depth of flood to recurrence interval have not been developed for many areas. In States where they have been developed (e.g., Alabama, Colorado, Illinois, Kansas, and Oklahoma), standard errors of the estimates have ranged from 17 to 28 percent, with an average standard error of 23 percent (Burkham 1988).



Table 2. Examples of Depth Frequency Equations for Ungaged Sites in Utah

Regression equations for flood depths for Uinta Basin (from Thomas and Lindskov 1983)			
Flood depth <u>D</u> in feet, <u>A</u> area in square miles, <u>E</u> elevation in thousands of feet			
Recurrence interval (yrs)	Equation	Number of stations used in analysis	Average standard error of estimate (%)
2	$D = 1.03 A^{0.159}$	16	30
5	$D = 13.3 A^{0.148} E^{-1.03}$	16	28
10	$D = 68.6 A^{0.131} E^{-1.69}$	16	26
25	$D = 556 A^{0.128} E^{-2.59}$	16	24
50	$D = 1330 A^{0.123} E^{-2.95}$	15	24
100	$D = 1210 A^{0.130} E^{-2.86}$	14	22

### ANALYTICAL METHOD

The analytical method described by Burkham (1988) uses uniform flow equations to estimate depth of flow associated with a particular magnitude and frequency of discharge. Typically, a trial-and-error procedure is used to solve the Manning uniform flow equation for depth of flow, given a design discharge (i.e., a flood of specified recurrence interval), a field-surveyed cross section and channel slope, and an estimate of the Manning roughness coefficient ( $n$ ). Numerous software packages are available to facilitate the trial-and-error solution procedure (e.g., WinXSPRO). Since the Manning formula is linear with respect to the roughness coefficient, estimating this coefficient can be a significant source of error and is likely the most significant weakness in this approach. Estimating roughness coefficients ( $n$  values) for ungaged sites is a matter of engineering judgment, but  $n$  values typically are a function of slope, depth of flow, bed-material particle size, and bedforms present during the passage of the flood wave. Guidance is available in many hydraulic references (e.g., Chow 1959). Selecting  $n$  values for flows above the bankfull stage is particularly difficult, since vegetation plays a major role in determining resistance to flow. Barnes (1967) presents photographic examples of field-verified  $n$  values, and Arcement and Schneider (1989) present comprehensive guidance for calculating  $n$  values for both channels and vegetated overbank areas (i.e., floodplains). Depth of flow determined with uniform flow equations, such as the Manning equation, represents **mean** depth of flow to be added to the **cross section** at the site of the pipeline crossing.

Burkham (1977, 1988) also presented a simplified technique for estimating depth of flow, making use of the general equation for the depth-discharge relation:

$$d = C Q^f$$

Values of  $f$  (the slope of the relationship when plotted on logarithmic graph paper) can be determined from "at-station" hydraulic geometry relationships at gaging stations in the region. Only the upper portion of the gaging-station ratings should be used to derive the slope ( $f$  value) for application to extreme floods, since a substantial portion of the flow may be conveyed in the overbank area. Alternatively, Burkham (1977, 1988) presents a simplified procedure for estimating  $f$  that requires only a factor for channel shape. Leopold and Langbein (1962)



computed a theoretical value of 0.42 for natural channels, while Burkham (1988) computed a theoretical value of 0.46 for parabolic cross sections. Burkham (1977) earlier reported an average  $f$  value of 0.42 from 539 gaging stations scattered along the eastern seaboard and upper Midwest, while Leopold and Maddock (1953) reported an average  $f$  value of 0.40 for 20 river cross sections in the Great Plains and the Southwest. Park (1977) summarized  $f$  values from 139 sites around the world and found most values occurred in the range of 0.3 to 0.4. Additional assumptions in Burkham (1977, 1988) enable an estimate of the coefficient  $C$  in the depth-discharge relationship with only a single field measurement of width and maximum depth at some reference level in the channel (e.g., bankfull stage) (Burkham 1977, 1988). Depth of flow determined from Burkham's simplified technique represents **maximum** depth of flow to be added to the **thalweg** at the cross section.

The analytical methods described by Burkham (1977, 1988) generally will be more accurate than the physiographic and reconnaissance methods described previously; thus, they may result in lower pipeline elevations and construction costs than the previous methods. However, analysis of flood elevations for the most sensitive situations should probably be conducted with the detailed method described below.

### **DETAILED METHOD**

Additional savings in construction costs for pipelines crossing channels may be realized by applying a detailed water-surface-profile model of flow through the crossing site. The water-surface-profile model requires a detailed survey of both the longitudinal channel profile (at least 20 channel widths in length) and several cross sections along the stream (Figure 5). Design flows (e.g., 100-year and 500-year floods) are calculated for the channel at the crossing with the regional regression equations described above and routed through the surveyed channel reach using a step-backwater analysis. The step-backwater analysis uses the principles of conservation of mass and conservation of energy to calculate water-surface elevations at each surveyed cross section. Computed water-surface elevations at successive cross sections are linked to provide a water-surface profile for the flood of interest through the reach of interest. The computations are routinely accomplished in standard software, such as the U.S. Army Corps of Engineers' HEC-RAS model. Whereas the analytical methods described previously assume steady, uniform flow conditions through the reach, a detailed water-surface-profile model is capable of handling both gradually and (to some extent) rapidly varied flow conditions. Since the computation uses a detailed channel survey, it is the most accurate method to use; however, it is likely the most expensive method for the same reason. Burkham (1988) indicates that the error in flood depths predicted from step-backwater analysis can be expected to be less than 20 percent. The step-backwater computations require an estimate of the Manning roughness coefficient ( $n$ ) as an indicator of resistance to flow and assume fairly stable channel boundaries. Estimation of the roughness coefficient ( $n$ ) includes the same considerations discussed previously for the analytical methods. The assumption of fairly stable channel boundaries is not always met with sand-bed channels and is an issue of considerable importance for designing subsurface pipeline crossings as well.

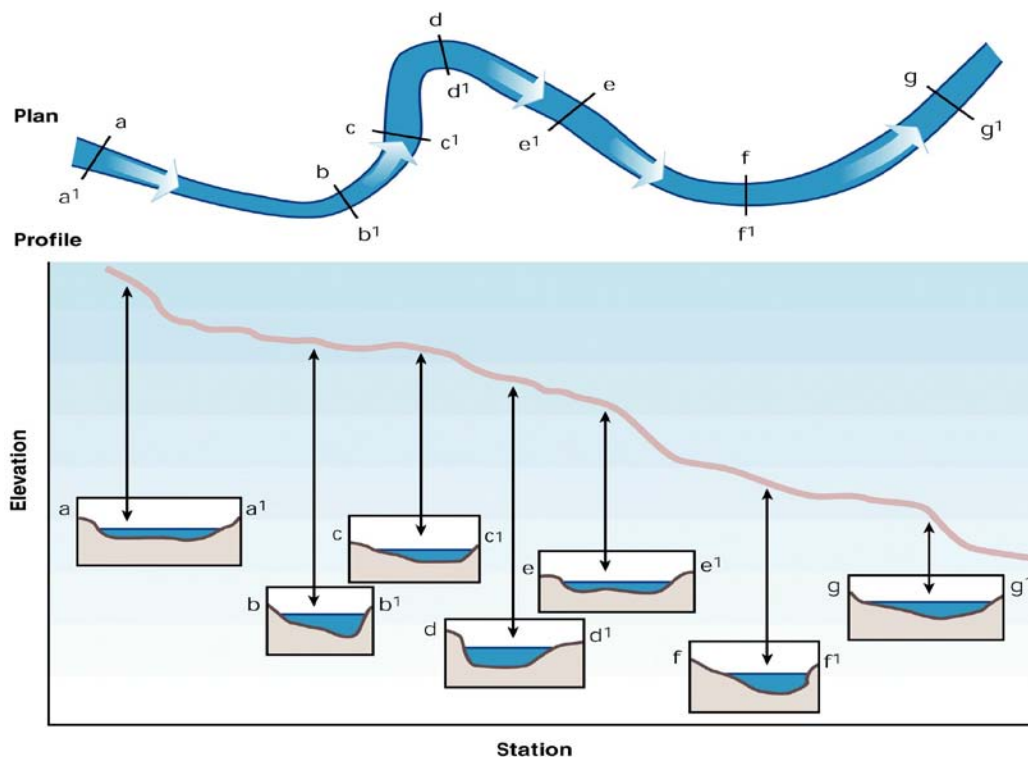


Figure 5. Application of a water-surface-profile model requires both a longitudinal channel profile and several surveyed cross sections (Federal Interagency Stream Restoration Working Group 1998).

Of the methods presented for determining elevation of floods for pipelines crossing channels, the detailed method is the most accurate and should be used for situations with high resource values, infrastructure investment, construction costs, or liabilities in downstream areas. In undeveloped areas, the physiographic and analytical methods may be used to provide quick estimates of flood elevations for sites with fewer downstream concerns. The reconnaissance method provides the roughest estimates but may be all that is warranted in very unstable areas, such as alluvial fans or low relief valley floors (e.g., near playas). The detailed, analytical, and physiographic methods all assume relatively stable channel boundaries but may be used on sand channels with an accompanying loss of accuracy. In very sandy channels, the accuracy of results from the detailed method may not be significantly better than the results from one of the intermediate methods unless a mobile-boundary model is used (Burkham 1988).

### SUBSURFACE (BURIED) CROSSINGS

Since many of the pipelines are small and most of the channels are ephemeral, it is commonplace to bury the pipelines rather than suspending them above the streams. The practice of burying pipelines at channel crossings likely is both cheaper and easier than suspending them above all floodflows; however, an analysis of channel degradation and scour should be completed to ensure the pipelines are not exposed and broken during extreme runoff events (Figure 6). Without such an analysis, channels should be excavated to bedrock and pipelines placed beneath all alluvial material.



Figure 6. Channel degradation or scour during flash-flood events may expose buried pipelines, resulting in costly breaks.

Buried pipelines may be exposed by streambed lowering resulting from channel degradation, channel scour, or a combination of the two. Channel degradation occurs over a long stream reach or even the entire drainage network and is generally associated with the overall lowering of the landscape. Degradation also may be associated with changes in upstream watershed or channel conditions that alter the water and sediment yield of the basin. Channel scour is a local phenomenon associated with passage of one or more flood events or site-specific hydraulic conditions that may be natural or human-caused in origin. Either process can expose buried pipelines to excessive forces associated with extreme flow events, and an analysis of each is required to ensure integrity of the crossing.

### ***CHANNEL DEGRADATION***

Detection of long-term channel degradation must be attempted, even if there is no indication of local scour. Conceptual models of channel evolution (e.g., Simon 1989) have been proposed to describe a more-or-less predictable sequence of channel changes that a stream undergoes in response to disturbance in the channel or the watershed. Many of these models are based on a "space for time" substitution, whereby downstream conditions are interpreted as preceding (in time) the immediate location of interest, and upstream conditions are interpreted as following (in time) the immediate location of interest. Thus, a reach in the middle of the watershed that previously looked like the channel upstream will evolve to look like the channel downstream

(Federal Interagency Stream Restoration Working Group 1998). Since channel evolution models can help predict current trends where a pipeline crosses a channel, they may indicate areas to be avoided when relocation of the crossing is an option. Most conceptual models of channel evolution have been developed for landscapes dominated by streams with cohesive banks; however, the same processes occur in streams with noncohesive banks, with somewhat less well-defined stages.

Geomorphic indicators of recent channel incision (e.g., obligate and facultative riparian species on present-day stream terraces elevated above the water table) also may be helpful for diagnosing channel conditions. However, long-term trends in channel evolution are often reversed during major flood events, especially for intermittent and ephemeral channels in arid and semiarid environments. Thus, a stream that is degrading during annual and intermediate flood events may be filled with sediment (i.e., it may aggrade) from tributary inputs during a major flood, and channels that are associated with sediment storage (i.e., aggrading) during the majority of runoff events may be "blown out" with major degradation during unusual and extreme large floods.

In some situations, a quantitative analysis of channel degradation may be warranted. Plots of streambed elevation against time permit evaluation of bed-level adjustment and indicate whether a major phase of channel incision has passed or is ongoing. However, comparative channel survey data are rarely available for the proposed location for a pipeline to cross a channel. In instances where a gaging station is operated at or near the crossing, it is usually possible to determine long-term aggradation or degradation by plotting the change in stage through time for one or more selected discharges. The procedure is called a specific-gage analysis (Figure 7) and is described in detail in *Stream Corridor Restoration: Principles, Processes, and Practices* (Federal Interagency Stream Restoration Working Group 1998). When there is no gaging station near the proposed channel crossing, nearby locations on the same stream or in the same river basin may provide a regional perspective on long-term channel adjustments. However, specific-gage records indicate only the conditions in the vicinity of the particular gaging station and do not necessarily reflect river response farther upstream or downstream of the gage. Therefore, it is advisable to investigate other data in order to make predictions about potential channel degradation at a site.

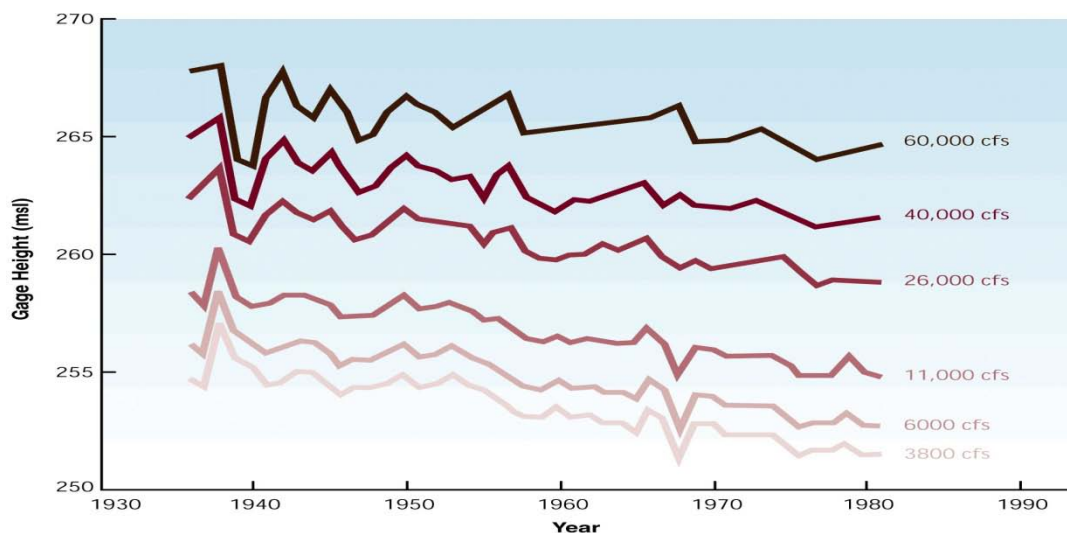


Figure 7. Specific-gage plots of the gage heights associated with index flows through time may indicate general channel lowering in the drainage basin (Federal Interagency Stream Restoration Working Group 1998; Biedenharn et al. 1997).

Other sources of information include the biannual bridge inspection reports required in all States for bridge maintenance. In most States, these reports include channel cross sections or bed elevations under the bridge, and a procedure similar to specific gage analysis may be attempted (Figure 8). Simon (1989, 1992) presents mathematical functions for describing bed-level adjustments through time, fitting elevation data at a site to either a power function or an exponential function of time. Successive cross sections from a series of bridges in a basin also may be used to construct a longitudinal profile of the channel network; sequential profiles so constructed may be used to document channel adjustments through time (Figure 9). Again, bridge inspection reports so used indicate only the conditions in the vicinity of those particular bridges (where local scour may be present) and must be interpreted judiciously for sites upstream, downstream, or between the bridges used in the analysis.

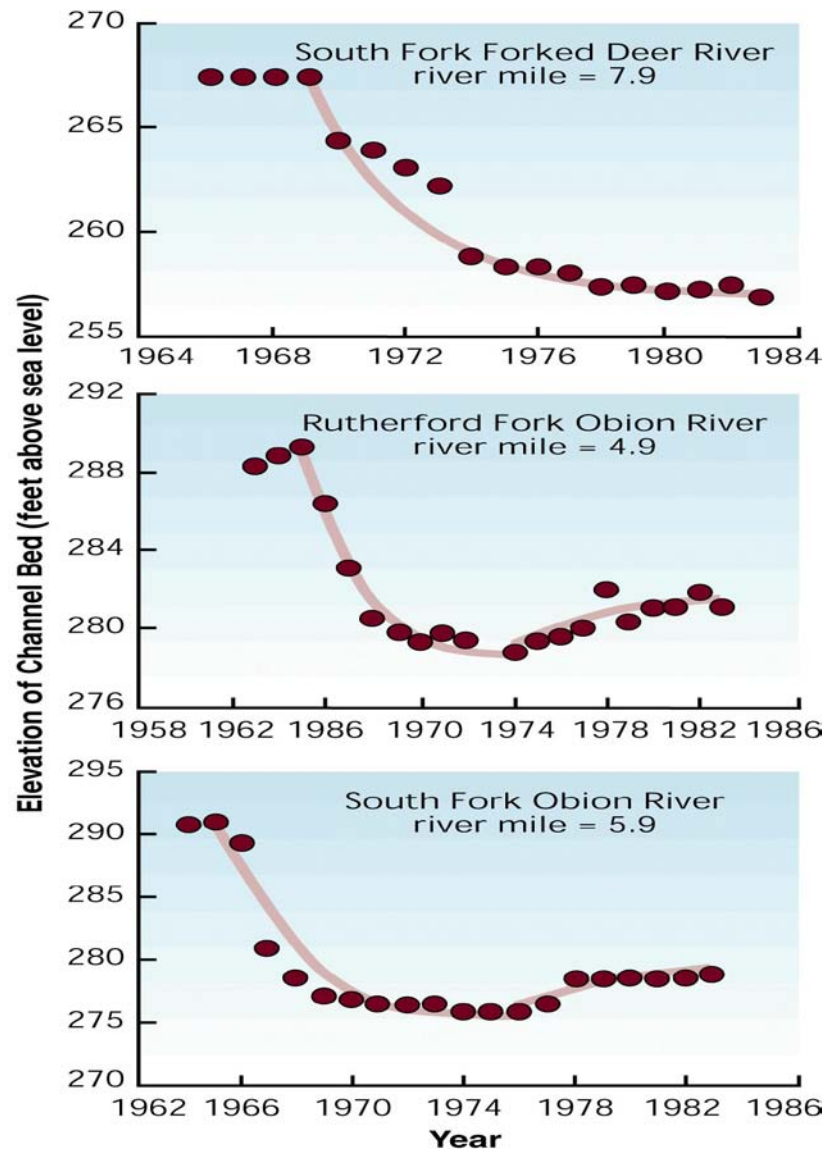


Figure 8. Plots of bed elevation versus time may be developed from biannual bridge inspection reports to document systemwide degradation or aggradation (Federal Interagency Stream Restoration Working Group 1998).



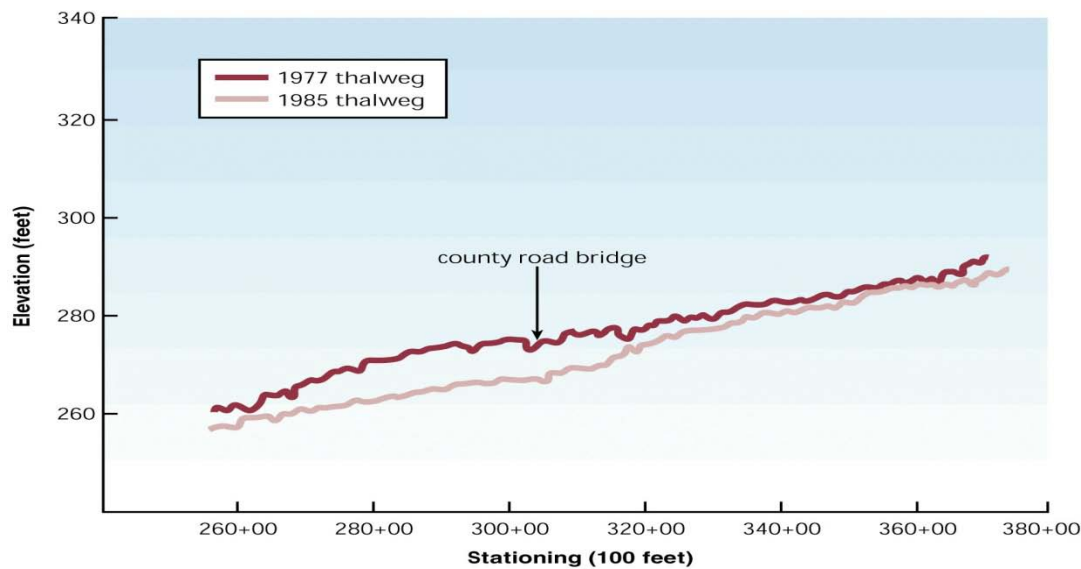


Figure 9. Sequential longitudinal profiles also may be used to document channel lowering through time (Federal Interagency Stream Restoration Working Group 1988; Biedenbarn et al. 1997).

In the absence of channel surveys, gaging stations, and bridge inspection reports (or other records of structural repairs along a channel), it may be necessary to investigate channel aggradation and degradation using quantitative techniques described in Richardson et al. (2001) and Lagasse et al. (2001). Techniques for assessing vertical stability of the channel include incipient motion analysis, analysis of armoring potential, equilibrium slope analysis, and sediment continuity analysis. Incipient motion analysis and analysis of armoring potential are equally applicable to both long-term degradation and short-term scour and fill processes, while equilibrium-slope and sediment-continuity analyses are more closely tied to long-term channel processes (i.e., degradation and aggradation).

### **CHANNEL SCOUR**

In addition to long-term channel degradation at subsurface crossings, general channel scour must be addressed to ensure safety of the pipeline. General scour is different from long-term degradation in that general scour may be cyclic or related to the passing of a flood (Richardson and Davis 2001). Channel scour and fill processes occur naturally along a given channel, and both reflect the redistribution of sediment and short-term adjustments that enable the channel to maintain a quasi-equilibrium form. In other words, channels in dynamic equilibrium experience various depths of scour during the rising stages of a flood that frequently correspond to equal amounts of fill during the falling stages, resulting in minimal changes in channel-bed elevation. Where pipelines cross channels, it is important to determine the potential maximum depth of scour so that the pipeline is buried to a sufficient depth and does not become exposed when bed scour occurs during a flood.

General scour occurs when sediment transport through a stream reach is greater than the sediment load being supplied from upstream and is usually associated with changes in the channel cross section. General scour can occur in natural channels wherever a pipeline crosses a constriction in the channel cross section (contraction scour). Equations for calculating

contraction scour generally fall into two categories, depending on the inflow of bed-material sediment from upstream. In situations where there is little to no bed-material transport from upstream (generally coarse-bed streams with gravel and larger bed materials), contraction scour should be estimated using clear-water scour equations. In situations where there is considerable bed-material transport into the constricted section (i.e., for most sand-bed streams), contraction scour should be estimated using live-bed scour equations. Live-bed and clear-water scour equations can be found in many hydraulic references (e.g., Richardson and Davis 2001). In either case, estimates of general scour in the vicinity of the pipeline crossing must be added to the assessment of channel degradation for estimating the depth of burial for the crossing.

Other components of general scour can result from placement of subsurface crossings relative to the alignment of the stream channel. Pipelines crossing at bends in the channel are particularly troublesome, since bends are naturally unstable and tend to collect both ice and debris (which can cause additional constrictions in the flow). Channel-bottom elevations are usually lower on the outside of meander bends and may be more than twice as deep as the average depth in straighter portions of the channel. Crossings in the vicinity of stream confluences also create difficulties, since flood stages and hydraulic forces may be strongly influenced by backwater conditions at the downstream confluence. For example, sediment deposits from tributary inputs may induce contraction scour opposite or downstream of the deposit. Additional complications are introduced where pipelines are located near other obstructions in the channel. Channel-spanning obstructions (e.g., beaver dams or large wood) may induce plunge-pool scour downstream of the structure, and individual obstructions in the channel induce local scour akin to pier scour characteristic of bridge piers at highway crossings.

Even in the absence of contraction scour, general scour will still occur in most sand-bed channels during the passage of major floods. Since sand is easily eroded and transported, interaction between the flow of water and the sand bed results in different configurations of the stream bed with varying conditions of flow. The average height of dune bedforms is roughly one-third to one-half the mean flow depth, and the maximum height of dunes may nearly equal the mean flow depth. Thus, if the mean depth of flow in a channel was 5 feet, maximum dune height could also approach 5 feet, half of which would be below the mean elevation of the stream bed (Lagasse et al. 2001). Similarly, Simons, Li, and Associates (1982) present equations for antidune height as a function of mean velocity, but limit maximum antidune height to mean flow depth. Consequently, formation of antidunes during high flows not only increases mean water-surface elevation by one-half the wave height, it also reduces the mean bed elevation by one-half the wave height. Richardson and Davis (2001) reported maximum general scour of one to two times the average flow depth where two channels come together in a braided stream.

Pipeline crossings that are buried rather than suspended above all major flow events should address all of the components of degradation, scour, and channel-lowering due to bedforms described above. In addition, once a determination is made on how deep to bury the pipeline at the stream crossing, the elevation of the pipe should be held constant across the floodplain. If the line is placed at shallower depths beneath the floodplain, channel migration may expose the line where it is not designed to pass beneath the channel (Figure 10).



Figure 10. Lateral migration of this stream channel during high water excavated a section of pipeline under the floodplain that was several feet shallower than at the original stream crossing.

In complex situations or where consequences of pipeline failure are significant, consideration should be given to modeling the mobile-bed hydraulics with a numerical model such as HEC-6 (U.S. Army Corps of Engineers 1993) or BRI-STARS (Molinas 1990). The Federal Interagency Stream Restoration Working Group (1998) summarizes the capabilities of these and other models and provides references for model operation and user guides where available.

## CONCLUSION

Pipelines that cross perennial, intermittent, and ephemeral stream channels should be constructed to withstand floods of extreme magnitude to prevent rupture and accidental contamination of runoff during high flow events. Pipelines crossing at the surface must be constructed high enough to remain above the highest possible floodflows at each crossing, and pipelines crossing below the surface must be buried deep enough to remain undisturbed by scour and fill processes typically associated with passage of peak flows. A hydraulic analysis should be completed during the pipeline design phase to avoid repeated maintenance of such crossings and eliminate costly repairs and potential environmental degradation associated with pipeline breaks at stream crossings.

## LITERATURE CITED

- Arcement, G.J., Jr. and V.R. Schneider. 1989. Guide for selecting Manning's roughness coefficients for natural channels and flood plains. U.S. Geological Survey Water-Supply Paper 2339. 38 pp.
- Barnes, H.H., Jr. 1967. Roughness characteristics of natural channels. U.S. Geological Survey Water-Supply Paper 1849. 213 pp.
- Biedenharn, D.S., C.M. Elliott, and C.C. Watson. 1997. The WES stream investigation and streambank stabilization handbook. Prepared for the U.S. Environmental Protection Agency by the U.S. Army Corps of Engineers Waterways Experiment Station. Vicksburg, MS.
- Burkam, D.E. 1977. A technique for determining depths for T-year discharges in rigid boundary channels. U.S. Geological Survey Water-Resources Investigations 77-83. 38 pp.
- Burkham, D.E. 1988. Methods for delineating flood-prone areas in the Great Basin of Nevada and adjacent states. U.S. Geological Survey Water-Supply Paper 2316. 20 pp.
- Chow, V.T. 1959. Open-channel hydraulics. McGraw Hill, New York. 680 pp.
- Federal Interagency Stream Restoration Working Group. 1998. Stream corridor restoration: Principles, processes, and practices. National Technical Information Service, Order No. PB98-158348INQ, Washington, DC.
- Lagasse, P.F., J.D. Schall, and E.V. Richardson. 2001. Stream stability at highway structures. Hydraulic Engineering Circular No. 20, Third Edition, FHWA NHI 01-002. Federal Highway Administration, Washington, DC.
- Leopold, L.B. and W.B. Langbein. 1962. The concept of entropy in landscape evolution. U.S. Geological Survey Professional Paper 500-A. 20 pp.
- Leopold, L.B. and T. Maddock, Jr. 1953. The hydraulic geometry of stream channels and some physiographic implications. U.S. Geological Survey Professional Paper 252. 57 pp.
- Molinas, A. 1990. Bridge stream tube model for alluvial river simulation (BRI-STARS), user's manual. National Cooperative Highway Research Program, Project No. HR 15-11. Transportation Research Board, Washington, DC.
- Park, C.C. 1977. World-wide variations in hydraulic geometry exponents of stream channels: An analysis and some observations. *Journal of Hydrology* 33:133-146.
- Richardson, E.V. and S.R. Davis. 2001. Evaluating scour at bridges. Hydraulic Engineering Circular No. 18, Fourth Edition, FHWA NHI 01-001. Federal Highway Administration, Washington, DC.

- Richardson, E.V., D.B. Simons, and P.F. Lagasse. 2001. Highways in the river environment. Report FHWA NHI 01-004, Hydraulic Design Series No. 6. Federal Highway Administration, Washington, DC.
- Ries, K.G., III and M.Y. Crouse. 2002. The National Flood Frequency Program, version 3: A computer program for estimating magnitude and frequency of floods for ungaged sites. U.S. Geological Survey Water-Resources Investigations Report 02-4168. 42 pp.
- Simon, A. 1989. A model of channel response in distributed alluvial channels. *Earth Surface Processes and Landforms* 14(1): 11-26.
- Simon, A. 1992. Energy, time and channel evolution in catastrophically disturbed fluvial systems. In Phillips, J.D. and W.H. Renwick (eds.). *Geomorphic systems: geomorphology*. Vol. 5. pp. 345-372.
- Simons, Li, and Associates. 1982. Engineering analysis of fluvial systems. Fort Collins, CO.
- Thomas, B.E. and K.L. Lindskov. 1983. Methods for estimating peak discharge and flood boundaries of stream in Utah. U.S. Geological Survey Water-Resources Investigations Report 83-4129. 77 pp.
- Thomas, B.E., H.W. Hjalmarson, and S.D. Waltemeyer. 1997. Methods for estimating magnitude and frequency of floods in the southwestern United States. U.S. Geological Survey Water-Supply Paper 2433. 195 pp.
- U.S. Army Corps of Engineers. 1993. HEC-6 scour and deposition in rivers and reservoirs: Users manual. Hydrologic Engineering Center, Davis, CA.

The mention of company names, trade names, or commercial products does not constitute endorsement or recommendation for use by the Federal Government.

## APPENDIX 17—UTAH PUBLIC LANDS STUDY: KEY SOCIAL SURVEY FINDINGS FOR GARFIELD, PIUTE, SANPETE, SEVIER, AND WAYNE COUNTIES

---

Utah State University conducted a statewide social survey in 2007 to assess the ways in which Utah residents use and value public land resources, and their views about public land management. Random samples of residential households were selected in each of the state's 29 counties. Sampled households were contacted by mail, and a randomly selected adult from the household was asked to participate in the survey. The university distributed self-completion questionnaires to potential survey participants using a multiple-wave survey administration procedure. The discussion that follows is focused on key survey results obtained for Garfield County (n=125 survey responses), Piute County (n=28), Sanpete County (n=133), Sevier County (n=139) and Wayne County (n= 41).<sup>1</sup>

The State of Utah Public Lands Policy Coordination Office has asked that BLM refer readers to its website at <http://governor.utah.gov/publiclands> where it posts updated State of Utah socioeconomic information from time to time. The BLM does not participate in collecting or compiling this information. For purposes of this PRMP/FEIS, BLM has only relied on information specifically cited in the PRMP/FEIS text and included in this Appendix.

### ECONOMIC LINKAGES TO PUBLIC LANDS

One major focus of the survey questionnaire involved assessing the various ways in which Utah residents engage in economic activities that are linked directly or indirectly to public land resources in the state.

#### Permit-Based Economic Activities

As indicated in Table A17-1, a minority of survey respondents in each of the five counties considered in this summary reported that a portion of their household income is directly linked to activities that involve permitted uses of lands or resources administered by the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), other federal agencies, or the State of Utah. The percentage of respondents indicating that some portion of their household income is derived from such permit-based activities was higher for each of the agency categories in Garfield, Piute, and Wayne counties than was the case in either Sevier County or Sanpete County. In Garfield and Piute counties, approximately one-fourth of the respondents indicated that a portion of their household income is linked to permitted activities that occur on lands administered by USFS. In Garfield, Piute, and Wayne counties, approximately one-fifth of respondents reported that household income is linked to activities that occur on BLM lands.

---

<sup>1</sup> The numbers of respondents for Piute and Wayne counties are small in part because the commercial firm that provided random samples of residential mailing addresses for the statewide survey was able to identify only 92 potentially valid residential addresses in Piute County and 145 in Wayne County. In addition, 30 of the questionnaire packets that were mailed to addresses included in the Piute County sample and 62 of those mailed to addresses in Wayne County were returned as undeliverable. As a result of these unexpectedly small sample sizes, results for Piute and Wayne counties should be interpreted cautiously.



Table A17-1. Percentage of survey respondents reporting that a portion of household income is directly linked to permitted use of public lands or resources.

Agency	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
USFS	22.4%	25.9%	7.5%	14.5%	17.1%
BLM	20.0%	18.5%	4.5%	11.6%	19.5%
Other federal agency	9.6%	7.4%	3.0%	1.5%	7.3%
State of Utah	11.2%	16.0%	4.5%	7.3%	12.5%

The figures reported in Table A17-2 represent the percentages of respondents reporting these types of permit-based economic linkages to public lands who indicated that 25 percent or more of their total household income is derived from those activities. In each of the five counties, substantial proportions of the respondents who reported involvement in permitted activities indicated that a quarter or more of their household incomes is linked to activities permitted by one or more federal or state land management agencies. Such levels of economic dependence on permitted activities were highest for Garfield County respondents, who reported permitted activities on lands administered by “other federal agencies” and USFS; among Piute County respondents who reported use of state lands; among Sanpete County respondents who reported use of BLM, other federal agency, and state lands; among Sevier County respondents who use USFS, state, or other federal agency lands; and among Wayne County respondents who engage in permitted uses of USFS, other federal agency, or state lands.

Table A17-2. Percentage of survey respondents reporting permit-based economic activities on public lands, who indicated that 25 percent or more of their household income is derived from those activities.

Agency	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
USFS	42.9%	14.3%	40.0%	68.4%	85.7%
BLM	32.0%	20.0%	50.0%	43.7%	37.5%
Other federal agency	66.7%	0.0%	50.0%	50.0%	75.0%
State of Utah	21.4%	50.0%	50.0%	60.0%	60.0%

## Household Participation in Selected Commercial Activities

The next series of questions asked respondents to indicate whether they or members of their households participate in any of a number of commercial activities that are commonly associated with public land use, but can involve the use of either public or private lands. Results summarized in Table A17-3 indicate that only a minority of survey respondents in each of the five counties reported participation in any of these activities. Among Garfield County respondents, the activities reported most frequently were livestock grazing and related work (23.4% of respondents) and commercial firewood cutting (19.4%). In Piute County, participation was reported most frequently for livestock grazing and related work (29.6%) and commercial firewood cutting (25.0%). In Sanpete County, the activity reported most frequently was livestock grazing and related work (11.3%). In Sevier County, respondents most frequently reported

participation in mining coal, uranium, or other minerals (14.6%). In Wayne County, the activities reported most frequently were livestock grazing and related work (12.2%) and other miscellaneous commercial activities (19.4%).

Table A17-3. Percentage of survey respondents reporting that they or members of their households participate in selected resource-based commercial activities, on either public or private lands.

<b>Economic Activity</b>	<b>Garfield County</b>	<b>Piute County</b>	<b>Sanpete County</b>	<b>Sevier County</b>	<b>Wayne County</b>
Livestock grazing and related work	23.4%	29.6%	11.3%	8.8%	12.2%
Commercial firewood cutting	19.4%	25.0%	8.3%	8.0%	4.9%
Logging, post and pole cutting, or other timber-related work	8.9%	10.7%	2.3%	7.3%	7.3%
Mining coal, uranium, or other solid minerals	0.8%	7.1%	2.3%	14.6%	0.0%
Mining sand, gravel, or other construction materials	2.4%	3.6%	2.3%	5.8%	4.9%
Oil and gas exploration and development	2.4%	0.0%	4.5%	4.4%	0.0%
Operating an outfitting or guiding business	5.7%	0.0%	0.0%	2.2%	0.0%
Film making/commercial photography	0.8%	0.0%	2.3%	2.2%	0.0%
Other commercial activities	5.2%	4.8%	5.5%	2.4%	19.4%

## Household Involvement in Businesses Linked to Recreation/Tourism

Survey respondents were also asked whether they or any member of their household operate or work in a business linked to recreation or tourism activity that is influenced by the presence of public lands and resources. The percentages of respondents who said “yes” to this question were highest in Wayne County (51.3%), in Garfield County (40.3%), and in Piute County (33.3%). Substantially lower percentages of respondents from Sevier (8.1%) and Sanpete (5.3%) counties indicated this type of economic linkage for their households. Respondents were also asked to assess how important activities and uses linked to public lands are to the success of this business. Among respondents who reported household involvement in such businesses, the proportions who said that the influence of public lands is “extremely important” to that business were 64.0% in Garfield County, 66.7% in Piute County, 44.4% in Sanpete County, 36.4% in Sevier County, and 75.0% in Wayne County.

## Household Involvement in Businesses Linked to Commodity Production

A similar question asked about the involvement of survey participants and members of their households in businesses that provide services and supplies to farming or ranching operations, logging firms, or other commercial enterprises that use or process natural resources located on public lands. The percentage of

respondents reporting participation by a household member in such businesses was relatively low in each of the five counties: 13.8% in Garfield County, 22.2% in Piute County, 11.4% in Sanpete County, 7.3% in Sevier County, and 23.1% in Wayne County.

## Ownership of Property or Assets With Values Influenced by Nearby Public Lands

When asked whether they own land, buildings, or other assets that they believe have a monetary value that is significantly influenced by the presence and condition of nearby public lands, 54.9% of respondents in Garfield County, 74.1% in Piute County, 22.7% in Sanpete County, 28.7% in Sevier County, and 61.5% in Wayne County said “yes.” Those who did perceive the existence of such a relationship were then asked to identify specific types of assets that they own and that they believe have a value influenced by the close proximity of public lands. Respondents in all five of these counties most frequently cited the value of their permanent, year-round residential property (38.4% in Garfield County, 50.0% in Piute County, 15.8% in Sanpete County, 15.8% in Sevier County, and 48.8% in Wayne County) as being influenced by the presence and condition of nearby public lands.

## PERCEIVED IMPORTANCE OF PUBLIC LANDS FOR OVERALL QUALITY OF LIFE

Survey participants were also asked to report how important they think 15 different types of public land resources and resource uses are for the overall quality of life experienced by people living in their communities. Table A17-4 summarizes response patterns to this series of questions for Garfield, Piute, Sanpete, Sevier, and Wayne counties, with a focus on the percentage of respondents from each county who indicated that they consider a particular type of resource use to be “very important” for local quality of life.

Table A17-4. Percentage of survey respondents indicating that selected public land resource uses are “very important” to the overall quality of life in their community.

Resource Use	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
Grazing of livestock on public lands	86.3%	80.8%	71.5%	67.2%	79.5%
Water resources used to irrigate crops and pastures	96.8%	92.6%	95.4%	92.6%	100.0%
Water resources used to supply homes and businesses	94.4%	77.8%	96.9%	91.9%	89.7%
Water resources that provide important fish/wildlife habitat	70.2%	84.6%	74.4%	79.1%	79.5%
Energy resources such as oil, gas, coal, or uranium	46.6%	47.4%	40.3%	68.2%	33.3%
Sand, gravel, or other minerals used in building and construction industries	40.5%	25.0%	25.2%	43.8%	41.7%

Resource Use	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
Forested areas that provide timber used by logging operations and lumber mills	71.8%	26.9%	47.6%	37.9%	55.3%
Areas in which trees or other vegetation provide important wildlife habitat	59.7%	63.0%	71.2%	73.5%	71.7%
Areas that attract tourism and recreational activity	75.4%	64.3%	48.1%	57.5%	76.9%
Opportunities to enjoy off-road vehicles, snowmobiling, or other motorized recreation	51.2%	78.6%	55.8%	59.6%	56.8%
Opportunities to enjoy hiking, backpacking, cross-country skiing, horseback riding, or other types of non-motorized recreation	64.5%	66.7%	55.4%	51.1%	74.4%
Opportunities to hunt for wild game	76.6%	75.0%	60.9%	69.9%	56.4%
Opportunities to fish in area lakes, streams, and rivers	77.4%	85.7%	65.9%	73.3%	64.1%
Undeveloped landscapes in which motorized access and resource development are restricted	26.7%	34.6%	34.7%	35.5%	33.3%
Areas managed to maintain biodiversity and protect habitat for sensitive or important plants or wildlife	32.2%	37.5%	41.9%	36.7%	34.2%

In Garfield County, 4 of the 15 types of public land resource use presented in this question were considered “very important” by fewer than one-half of respondents (energy resource development, sand/gravel or other construction-related mineral development, undeveloped landscapes in which motorized access and resource development are restricted, and areas managed to maintain biodiversity and protect habitat). At the same time, more than three-fourths of Garfield County respondents considered grazing of livestock on public lands; water resources used to irrigate crops and pastures; water resources used to supply homes and businesses; areas that attract tourism and recreation activity; opportunities to hunt for wild game; and opportunities to fish in area lakes, rivers, and streams to be “very important” to the local quality of life.

In Piute County, six of these resource uses were considered “very important” by fewer than one-half of the respondents (energy resources; sand, gravel, or other minerals; forested areas that provide timber for logging and lumber mills; areas that attract tourism and recreation; undeveloped landscapes in which motorized access and resource development are restricted; and areas managed to maintain biodiversity and to protect habitat). Conversely, three resource uses—water resources used to irrigate crops and pastures; water resources used to supply homes and businesses; and water resources that provide important fish or wildlife habitat—were considered “very important” to the local quality of life by more than three-fourths of Piute County respondents.

Six of these resource uses were considered “very important” by fewer than one-half of Sanpete County respondents: energy resources; sand, gravel, or other construction minerals; forested areas providing timber for logging and mill operations; areas that attract tourism and recreation; undeveloped landscapes in which motorized access and resource development are restricted; and areas managed to maintain biodiversity and protect habitat. At the same time, three-fourths or more of the respondents from Sanpete County considered water used for irrigation, water used to supply homes and business, and water providing important fish or wildlife habitat to be very important to the local quality of life.

In Sevier County, four resource uses were considered to be “very important” by fewer than one-half of respondents: sand, gravel, or other minerals; forested areas that provide timber for logging and lumber mills; undeveloped landscapes in which motorized access and resource development are restricted; and areas managed to maintain biodiversity and protect habitat. As was true in all of the counties, the three water resource categories (water used for irrigation, water used to supply homes and business, and water providing important fish or wildlife habitat) were considered very important to the local quality of life by 75 percent or more of Sevier County respondents.

Four of the resource use categories were considered to be very important to local quality of life by fewer than one-half of Wayne County respondents: energy resources; sand, gravel, or other construction minerals; undeveloped landscapes in which motorized access and resource development are restricted; and areas managed to maintain biodiversity and protect habitat. Five of the resource uses were considered very important by three-fourths or more of the respondents: grazing of livestock on public lands, water used for irrigation, water used to supply homes and business, water providing important fish or wildlife habitat, and areas that attract tourism and recreation activity.

## RECREATIONAL USES OF PUBLIC LANDS

Survey participants were also asked to report whether they had participated in any of a broad range of outdoor recreation activities and other non-commodity use activities on Utah public lands during the previous 12 months. Results from this series of questions are reported in Table A17-5 and Table A17-6. These findings clearly indicate that there is widespread participation in many of these public land activities among residents of each of the five counties considered in this summary report.

Table A17-5 reports the extent of reported participation in 30 different outdoor recreation activities. Among survey participants living in Garfield County, one-half or more reported participation during the preceding 12 months in camping, picnicking, day hiking, wildlife viewing, hunting, fishing, visiting historical sites, all-terrain vehicle (ATV) riding, and driving for pleasure/sightseeing on public lands. In Piute County, one-half or more of the limited number of survey respondents reported that they had participated in camping, picnicking, day hiking, wildlife viewing, nature photography, motor boating, hunting, fishing, visiting historical sites, ATV riding, four-wheel driving, and driving for pleasure/sightseeing. Half or more of Sanpete County respondents reported participation in camping, picnicking, day hiking, wildlife viewing, fishing, visiting historical sites, ATV riding, and driving for pleasure/sightseeing. In Sevier County the activities reported by 50 percent or more of respondents included camping, picnicking, fishing, visiting historical sites, ATV riding, and driving for pleasure/sightseeing. Finally, one-half or more of Wayne County respondents reported that during the past 12 months, they has participated in camping, picnicking, day hiking, wildlife viewing, nature photography, hunting, fishing, rock hounding, visiting historical sites, ATV riding, four-wheel driving, and driving for pleasure/sightseeing.

Responses to a question focusing on participation in a variety of non-commodity use activities on public lands are summarized in Table A17-6. Among this list of activities, Garfield County respondents were

most likely to report that they participate in collecting firewood for home use, cutting Christmas trees, gathering pinyon nuts, and collecting rocks for home landscaping. In Piute County, respondents most frequently reported that they collect firewood for home use, cut Christmas trees, collect rocks for home landscaping, and gather pinyon nuts. Sanpete County respondents most frequently reported that they collect firewood for home use. Sevier County respondents most frequently reported that they cut Christmas trees. In Wayne County, respondents were most likely to report that they collect firewood for home use, cut Christmas trees, collect rocks for home landscaping, and gather pinyon nuts. On balance, reliance on public lands for these types of non-commodity activities appears to be higher in Garfield, Piute, and Wayne counties than is the case in Sanpete County or Sevier County.

Respondents were also asked to identify from the lists presented in these questions the one or two activities that they participate in most often, and to provide detail on where they engage in those activities. Response data for these questions are currently being processed for Sanpete and Wayne counties, and as a result are not yet available for inclusion in this summary report. Among Garfield County respondents, the first of these activities listed by respondents most often involved hunting (16.4%) or fishing (14.5%). In Piute County, the first listed activity most often involved either ATV riding (37.5%) or hunting (20.8%). In Sevier County, the first-listed activities most often involved camping (26.3%) or ATV riding (16.9%). When asked to indicate where they participate in the first-listed of their “most frequently pursued” activities, 84.7% of Garfield County respondents, 83.3% of Piute County respondents, and 80.2% of Sevier County residents identified a location within the county where they live.

Table A17-5. Percentage of survey respondents reporting participation in selected recreation activities on Utah public lands during the past 12 months.

Activity	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
Camping	64.7%	76.9%	69.5%	69.3%	73.2%
Picnicking	72.9%	84.6%	77.1%	74.3%	80.5%
Backpacking	22.6%	29.6%	21.6%	18.1%	39.5%
Day hiking	59.1%	50.0%	52.0%	46.9%	80.0%
Bird watching	33.9%	34.6%	30.2%	20.6%	39.5%
Wildlife viewing	75.0%	85.2%	65.1%	73.1%	80.0%
Nature photography	35.1%	50.0%	33.3%	39.1%	56.4%
Canoeing/kayaking	3.8%	19.2%	2.4%	3.2%	8.3%
River rafting	3.8%	11.5%	4.0%	8.7%	2.9%
Motor boating	20.4%	51.9%	24.2%	36.2%	32.4%
Jet skiing	5.8%	14.8%	9.7%	6.3%	5.4%
Swimming	30.8%	29.6%	35.5%	23.4%	24.3%
Rock climbing	13.2%	3.8%	12.1%	7.3%	25.7%
Mountain climbing	11.4%	7.4%	20.2%	22.2%	22.2%
Hang gliding	0.0%	3.8%	0.0%	0.0%	0.0%
Mountain bike riding	13.2%	7.7%	16.9%	13.5%	11.1%
Hunting	56.4%	81.5%	46.5%	47.0%	56.4%
Fishing	67.5%	81.5%	63.6%	63.8%	65.9%



Activity	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
Horseback riding	40.5%	37.0%	24.6%	22.1%	22.2%
Orienteering/geo-caching	7.8%	16.0%	9.6%	11.3%	11.1%
Rock hounding	24.3%	16.0%	22.4%	21.0%	50.0%
Visiting historical sites	60.7%	57.7%	65.4%	60.8%	66.7%
Resort skiing/snowboarding	14.2%	7.7%	15.3%	6.3%	13.5%
Backcountry skiing/snowboarding	3.8%	7.7%	11.3%	1.6%	8.1%
Snowshoeing	4.8%	7.7%	4.8%	4.0%	13.5%
Snowmobiling	9.5%	15.4%	16.0%	10.4%	16.2%
ATV riding	58.1%	92.9%	53.5%	58.6%	61.5%
Dirt bike riding	10.7%	19.2%	9.7%	12.7%	13.9%
Four-wheel driving/jeeping	40.0%	66.7%	45.3%	43.6%	59.5%
Sightseeing/pleasure driving	80.0%	88.9%	82.3%	86.7%	87.8%

Table A17-6. Percentage of survey respondents reporting participation in selected non-commodity use activities on Utah public lands during the past 12 months.

Activity	Garfield County	Piute County	Sanpete County	Sevier County	Wayne County
Collecting firewood for home use	56.1%	50.0%	33.6%	26.2%	53.8%
Cutting Christmas trees	46.2%	46.4%	23.6%	35.1%	51.3%
Collecting material for craft projects	24.5%	22.2%	16.7%	20.2%	28.2%
Collecting rocks for home landscaping	30.4%	34.6%	19.8%	28.5%	48.8%
Collecting plants for home landscaping	17.3%	7.7%	9.6%	8.7%	15.8%
Gathering wild mushrooms	1.9%	3.8%	0.0%	2.3%	5.3%
Gathering pinyon nuts	38.6%	38.5%	9.6%	15.6%	41.0%
Gathering berries, herbs, or wild foods	19.1%	22.2%	10.4%	9.4%	13.2%
Collecting fossils, rocks, or minerals	23.4%	29.6%	18.1%	22.7%	35.9%

## ATTITUDES AND PREFERENCES REGARDING PUBLIC LAND MANAGEMENT

Two similar sets of survey questions focused on respondents' attitudes and preferences regarding the extent to which various natural resource use activities or management practices should be reduced or increased by those responsible for managing public lands in Utah. Response patterns to these questions are summarized in Table A17-7 and Table A17-8.

The data presented in Table A17-7 indicate that Garfield County respondents were considerably more likely to prefer an increase rather than a decrease in mineral exploration and extraction, timber harvest, exploration for and development of oil and gas resources, protection of fish and wildlife habitat, thinning of forested areas to reduce wildfire risk, livestock grazing, and development of water storage and delivery systems on Utah public lands. They were also more likely to prefer a reduction in the designation of wilderness areas and in protection of endangered species. As indicated in Table A17-8, Garfield County respondents were also more likely to prefer an increase rather than a reduction in provision of road access to recreation areas, provision of hunting opportunities, development of trails for off-highway motorized recreation, development of trails for non-motorized recreation, regulations that restrict motorized vehicles to designated trails, and development of visitor facilities to increase tourism.

As indicated in Table A17-7, Piute County respondents were considerably more likely to prefer an increase rather than a decrease in mineral exploration/extraction, timber harvest, oil and gas development, protection of fish and wildlife habitat, use of controlled burns to improve ecological conditions, thinning of forested areas to reduce wildfire risk, and development of water storage and delivery systems. They were also likely to express a preference for a reduction in the designation of wilderness areas, and a reduction in protection of endangered species. Table A17-8 reveals that Piute County respondents also were much more likely to prefer an increase rather than a decrease in the provision of road access to recreation areas, provision of hunting opportunities, development of trails for off-highway motorized recreation, and regulations to limit the noise and emissions from snowmobiles and ATVs.

Table A17-7 reveals that Sanpete County respondents were much more likely to express a preference for increased rather than decreased emphasis on mineral exploration/extraction, timber harvest, oil and gas development, protection of fish and wildlife habitat, use of controlled burns to improve ecological conditions, thinning of forested areas to reduce wildfire risk, and development of water storage and delivery systems. Interestingly, they were also somewhat more likely to prefer an increase rather than a decrease in protection of endangered species and in livestock grazing. As indicated in Table A17-8, respondents from Sanpete County were also considerably more likely to prefer an increase rather than a decrease in road access to recreation areas, hunting opportunities, development of trails for non-motorized recreation, regulations that would require motorized vehicles to stay on designated trails, regulations that would limit noise and emissions from snowmobiles and ATVs, and development of visitor facilities to increase tourism.

Sevier County respondents were considerably more likely to prefer an increase rather than a decrease in mineral exploration/extraction, timber harvest, oil and gas development, protection of fish and wildlife habitat, use of controlled burns to improve ecological conditions, thinning of forested areas to reduce wildfire risk, livestock grazing, and development of water storage and delivery systems (see Table A17-7). They were also much more likely to prefer an increase rather than a decrease in road access to recreation areas, hunting opportunities, trails for off-highway motorized recreation, trails for non-motorized recreation, regulations that require motorized vehicles to stay on designated trails, and visitor facilities to increase tourism (Table A17-8).

Finally, the data reported in Table A17-7 reveal that Wayne County respondents were substantially more likely to express a preference for increased emphasis on mineral exploration/extraction, timber harvest, oil and gas development, protection of fish and wildlife habitat, thinning of forested areas to reduce wildfire risk, livestock grazing, and development of water storage and delivery systems. They were also considerably more likely to prefer a decrease as opposed to an increase in designation of wilderness areas. In addition, as indicated in Table A17-8, Wayne County respondents were much more likely to prefer an increase rather than a decrease in road access to recreation areas, hunting opportunities, trails for non-motorized recreation, regulations that would require motorized vehicles to stay on designated trails, regulations to limit noise and emissions from snowmobiles and ATVs, and visitor facilities for tourists.

Table A17-7. Survey respondents' attitudes regarding the extent to which various activities occurring on Utah public land should be reduced or increased.<sup>a</sup>

Type of use/activity	Garfield County		Piute County		Sanpete County		Sevier County		Wayne County	
	Reduce	Increase	Reduce	Increase	Reduce	Increase	Reduce	Increase	Reduce	Increase
Mineral exploration/extraction	11.9%	63.5%	4.8%	38.1%	15.0%	35.0%	12.6%	39.5%	19.4%	44.4%
Timber harvest	5.8%	73.6%	0.0%	46.1%	11.2%	62.4%	11.8%	48.8%	21.1%	50.0%
Designation of wilderness areas	66.7%	14.2%	46.2%	7.7%	33.1%	26.8%	46.4%	15.2%	50.0%	22.5%
Exploration for/development of oil and gas resources	9.2%	70.6%	8.0%	56.0%	17.7%	46.0%	13.6%	48.8%	24.3%	40.5%
Protection of important fish and wildlife habitat	13.1%	36.9%	18.5%	37.0%	7.1%	47.7%	4.7%	47.6%	15.0%	50.0%
Protection of endangered species	50.4%	20.5%	42.3%	26.9%	22.2%	39.7%	31.2%	24.8%	33.3%	30.7%
Use of controlled burns to improve ecological conditions	42.9%	25.2%	20.0%	48.0%	19.5%	37.3%	14.9%	31.4%	28.9%	39.5%
Thinning of forested areas to reduce wildfire risk	8.3%	70.0%	0.0%	76.0%	8.8%	67.2%	4.8%	66.9%	5.4%	67.5%
Livestock grazing	7.4%	52.1%	18.5%	18.5%	14.3%	27.0%	14.5%	29.9%	7.5%	40.0%
Designation of wild and scenic rivers	38.8%	20.7%	34.8%	13.0%	24.1%	24.2%	20.7%	22.3%	31.6%	31.6%
Developing water storage and delivery systems to meet needs of nearby communities	3.3%	84.3%	3.8%	57.7%	2.3%	78.5%	2.3%	72.7%	2.6%	76.9%

a. Original response categories were "major reduction" and "moderate reduction" (combined to create "reduce") and "major increase" and "minor increase" (combined to create "increase"). "Stay about the same" responses are not reported here.

Table A17-8. Survey Respondents' Attitudes Regarding the Extent to Which the Emphasis Placed on Various Activities Occurring on Utah Public Land Should be Reduced or Increased by Public Land Managers. <sup>a</sup>

Type of use/activity	Garfield County		Piute County		Sanpete County		Sevier County		Wayne County	
	Reduce	Increase	Reduce	Increase	Reduce	Increase	Reduce	Increase	Reduce	Increase
Permitting of commercial guiding or outfitter services	14.8%	22.6%	19.2%	11.5%	19.7%	12.0%	25.4%	10.2%	5.3%	21.1%
Providing road access to recreation areas	7.4%	66.1%	10.7%	67.8%	12.8%	49.6%	8.3%	54.9%	12.5%	37.5%
Providing hunting opportunities	7.4%	52.9%	14.8%	44.4%	10.5%	40.3%	11.5%	50.0%	5.1%	46.1%
Developing trails for off-highway motorized recreation	21.5%	53.7%	17.9%	35.8%	28.3%	42.5%	20.9%	48.9%	30.8%	35.9%
Developing trails for hiking, biking, and other non-motorized recreation	11.7%	50.0%	11.1%	22.2%	12.1%	53.2%	17.6%	53.5%	5.0%	42.5%
Regulations that require motorized vehicles to stay on designated trails	21.3%	48.4%	18.5%	33.3%	12.5%	56.2%	13.0%	52.7%	20.0%	55.0%
Regulations that limit levels of noise and emissions from snowmobiles and ATVs	24.4%	36.1%	10.7%	39.3%	17.9%	45.5%	20.6%	37.3%	12.8%	51.2%
Developing visitor facilities to increase tourism	12.5%	51.7%	22.2%	33.3%	18.9%	36.0%	18.5%	38.5%	15.8%	42.1%

a. Original response categories were "major reduction" and "moderate reduction" (combined to create "reduce") and "major increase" and "minor increase" (combined to create "increase"). "Stay about the same" responses are not reported here.

## APPENDIX 18—FACTORY BUTTE SRMA RMZs AND MANAGEMENT PRESCRIPTIONS

---

### INTRODUCTION

The Approved Resource Management Plan creates a special recreation management area (SRMA) in the Factory Butte Area, with three recreation management zones (RMZ) described in greater detail below. The three zones are: (1) Off-highway Vehicle (OHV) Play Areas RMZ, (2) Motorized Touring RMZ, and (3) Landmarks RMZ. For the entire SRMA, the market and market strategy are as follows:

**Market Strategy:** Destination Recreation—Tourism. The SRMA is isolated from major population centers; therefore, visitors to this general area usually include this particular area on their itinerary.

**Market:** International, national, regional, and local OHV user groups and families (including commercial groups) seeking an extreme OHV riding experience. Also includes photographers (commercial and non-commercial) and sight-seers along scenic Highway 24, who view the badlands topography, the Factory Butte landmark, and the desert vegetation.

**SRMA Management Objectives:** A SRMA plan to manage for visitors' activities and experiences would be completed within 5 years from the signing of the Richfield Field Office (RFO) RMP Record of Decision (ROD). Management prescriptions for kiosks and monitoring would apply to all the RMZs.

### KIOSKS

Kiosks would be designed and placed to provide information and interpretation to SRMA users in a non-intrusive format. Kiosks and other facilities would be developed as generally shown on the Proposed Factory Butte SRMA map. Kiosks would be placed at either end of the Swing Arm City to Factory Butte Corridor, one at the gap in the fence toward the Swing Arm City Open Area side and one at the south boundary line of the Factory Butte Open Area. A kiosk would be placed where the fence begins next to Factory Butte Road. Two other kiosks would be strategically placed along the portion of Factory Butte Road that bounds the eastern and northeastern side of the open area around the Factory Butte. A kiosk would be placed in Swing Arm City Open Area and the Caineville Cove Inn Open Area. Suggested features of these kiosks are as follows:

- The kiosks should be developed, built, and put up in coordination and cooperation with local rider groups, and adoption or sponsorship by such groups should be encouraged. This will encourage their respect for the kiosks and decrease the likelihood of vandalism.
- Informational kiosks should educate riders about the importance of responsible ridership and of confining their cross-country riding to open areas.
- Informational kiosks should encourage riders to be aware of illegal cactus collecting and report any suspicious activity to law enforcement officials.
- Informational kiosks should encourage riders to be on the lookout for other riders who are not obeying the boundary signs and report them to law enforcement officials.
- Informational kiosks should educate riders about the importance of balanced use and respecting the boundary signs, as a way of preserving the opportunity for open cross-country riding in the Factory Butte area.
- Information in the Swing Arm City Open Area and the Factory Butte Open Area kiosks should clearly illustrate how riders may legally ride to and from each open area using the corridor.



## MONITORING/MITIGATION

Regular monitoring is imperative to ensure the resources are able to be used in a renewable manner. Monitoring would occur for visual, soil, special status species, and recreational experiences.

Inventory and monitoring of the threatened and endangered (T&E) cactus species in the area has been occurring and that effort would continue. It is imperative that the Bureau of Land Management (BLM) continues to gain knowledge about these species, where populations are located, and what, if any, continued impacts are occurring to these populations. OHV area designations or routes may be revised in the future based on the findings from monitoring resource conditions and trends in the area. The effect of OHVs on soils in the Factory Butte area has been monitored through the use of collection pits and photo plots for several years and would continue.

Compliance with the new OHV designations for the Factory Butte area would mainly be accomplished by law enforcement Rangers. The improvements outlined below are instrumental in identifying boundaries, making compliance and enforcement more effective and efficient. Assistance from other agencies may be requested, especially during high-use periods (holiday weekends). Additional presence on the ground would be most beneficial during the first several years of the new designations, when visitors to the area are learning about the new designations and the areas that would best accommodate the recreational opportunity they seek. When the authorized officer determines through monitoring that OHVs are causing considerable adverse impacts to certain areas, the authorized officer shall close or restrict such areas and notify the public. BLM could impose limitations on the types of vehicles allowed on specific designated routes if monitoring indicates that a particular type of vehicle is causing disturbance to the soil, visual, special status species, or vegetative resources, by off-road travel.

Mitigation measures have been incorporated into the proposed action such as considering placement of structures on the landscape, use of previously disturbed areas and ensuring continued access for permitted uses. Potential negative impacts have been minimized to the extent practicable. For example, visual contrasts to the landscape have been addressed and would be consistent with management objectives. In addition, surveys and clearances would be conducted before specific trails and recreation facilities (e.g., fences, kiosks, bathrooms) would be developed.

### ZONE 1. OHV PLAY AREAS RMZ

**Recreation Niche:** OHV users seeking the technical riding opportunities provided by the badland topography.

**Recreation Management Objectives:** By the year 2015, manage this zone to provide opportunities for site users to engage in sustainable, easy-to-access day-use and multi-day motorized recreation, providing no less than 75 percent of visitors and affected community residents at least a “moderate” realization of these benefits (i.e., 3.0 on a probability scale, where 1=not at all; 2=somewhat; 3=moderate; and 4=total realization).

**Primary Activities:** Driving among badlands, motorized hill climbing, camping along badland fringes, photography, spending time with friends and family.

**Experiences:** Savoring the sensory experience of an outdoor setting, relishing group togetherness, enjoying risk-taking adventures, appreciating nature, escaping everyday stress and boredom, and enjoying easy and convenient access to natural resources.

**Benefits:**

- Personal—Improved OHV skills, bonding with family and friends, stress relief, enhanced awareness and appreciation of natural resources, greater self-reliance, and renewed human spirit.
- Community—Stronger sense of community dependency on public lands and greater family/group bonding.
- Economic—Enhance local economy via purchases (gas, groceries, lodging, OHV/outdoor equipment).
- Environmental—Increased awareness and protection of natural landscapes.

**Setting Characteristics:**

- Physical—Mostly front country and middle country with regard to naturalness and facilities.
- Social—front country around dispersed campsites and staging areas; front country and middle country among badlands.
- Administrative—dispersed campsites and staging areas; informational kiosks, fencing and carsonite signage along the edges of the RMZ.

**Specific Management Prescriptions:**

The following areas would be designed as OHV open areas:

- Swing Arm City Open Area (2,600 acres)
- Swing Arm City to Factory Butte Corridor
- Factory Butte Open Area (5,300 acres)
- Caineville Cove Inn Open Area (100 acres).

**Swing Arm City Open Area (2,600 acres)**

The Swing Arm City Open Area boundary would be as shown on the Proposed Factory Butte SRMA map. Carsonite signs should be placed along this entire boundary, spaced close enough so that at least two signs are visible to riders at all times depending on type of terrain. The signs should advise riders which areas are and are not open to cross-country travel.

One formal entrance would be constructed into the Swing Arm City OHV Open Area from Highway 24. An Encroachment Permit would be obtained from the Utah Department of Transportation (UDOT) for this single entrance. A standard area sign would be located adjacent to this main entrance road identifying the area as the “Swing Arm City OHV Open Area.” The access road would be upgraded for approximately three-fourths mile into the OHV area. Road base, proper drainage and a 24-inch x 20-inch culvert would be required to allow access during all weather conditions. For safety reasons, all other entrances from Highway 24 would be closed. At the north end of the access road, two or three OHV loading/unloading ramps would be constructed for the safety of visitors to the open riding area. Many accidents occur in conjunction with loading and unloading motorcycles and four-wheel vehicles from truck beds. The loading/unloading ramps would be wedge-shaped platforms that would enable a vehicle to back up to the ramp and load/unload on a level surface, thereby providing a safer option to visitors using the OHV open area.

A fence would be placed along the flat land situated above and to the northeast of Swing Arm City, in a direction roughly parallel to the northeast rim of Swing Arm City. The distance between the northeast rim of Swing Arm City and the fence itself should be approximately 500 feet. The approximate course of the fence would be as follows in Township 28 South, Range 9 East: Beginning at a point along the Factory

Butte Road near the southeast quarter of Section 11, the fence would run in a northwesterly direction through the southeast quarter of Section 11, the northwest quarter of Section 11, the northeast quarter of Section 10, and the southwest quarter of Section 3 until it reaches the benches of North Caineville Mesa that are too steep for riders to pass. There would be a gap in the fence somewhere in the northwest quarter of Section 11 or the northeast quarter of Section 10. This gap in the fence would mark the beginning of the corridor through which riders would travel between the Swing Arm City Open Area and the Factory Butte Open Area.

Other improvements would be added to enhance visitor services and for the protection of health and safety. These improvements would include upgraded access into the open OHV area, improved parking areas at kiosk or trailhead locations if necessary, loading/unloading ramp(s), and a restroom. The upgraded access would consist of engineering proper drainage, installing culverts, and adding surface material (road base and gravel) to enable access during wet weather conditions. Parking areas would be improved only if necessary for the health and safety of visitors and would include leveling of the minimum area necessary and/or adding gravel. Initially, a double CXT vault toilet would be placed on Factory Bench Road near Highway 24. One toilet building would be located at the existing disturbed location on the east side of Factory Bench Road. The existing pull-out would be upgraded and used for the parking area. This would be a concrete building that is pre-cast and delivered ready to place at the site. The building would measure 12 feet x 17 feet. The surface disturbance and footprint on the ground would be the same. The ground disturbance during construction would be somewhat larger to facilitate excavation of the vaults and accommodate the use of heavy equipment to set the vaults and building. Vault toilets may be added for visitor convenience or if sanitation issues arise at other locations. The color and texture of the outside walls and roof of the buildings would be chosen to match the surrounding area. Parking barriers or two-rail post and pole fences would be placed around these structures to protect them from damage by vehicles. The barriers or fencing would be kept to the minimum necessary to protect the improvements.

### **Swing Arm City to Factory Butte Corridor**

Riders passing through a narrow corridor would be more likely to cause rutting. A wider corridor means less likelihood of rutting from vehicle trails. Thus, the corridor between Swing Arm City and the open area around Factory Butte should be 30 feet wide. The corridor would commence at the gap in the fence, and run in a northerly direction until it reaches the above-described south boundary of the open area around Factory Butte. The course of the corridor would be as shown on the Proposed Factory Butte SRMA map, only the corridor should pass through the southeast quarter of Section 34, Township 27 South, Range 9 East when it crosses Neilson Wash. Carsonite signs would be placed along both sides of this corridor, spaced close enough so that at least two signs would be visible to riders at all times depending on type of terrain. The signs will advise riders which areas are and are not open to cross-country travel.

### **Factory Butte Open Area (5,300 acres)**

The Factory Butte Open Area boundary would be as shown on the Proposed Factory Butte SRMA map. The proposed boundary starts at a point on the Factory Butte Road nearest the southeast corner of Township 27 South, Range 9 East Section 25 and runs northerly along Factory Butte Road until that road reaches a point approximately in the center of the southwest quarter of Section 11; thence it departs from Factory Butte Road and runs southwesterly along the edge of the bluegate shale through the southwest quarter of Section 11, the southeast quarter of Section 10, the northwest quarter of Section 15, and the southeast quarter of Section 16; thence it runs south-southwesterly through the western half of Section 21, the northwestern quarter of Section 28, and the southeastern quarter of Section 29 until it reaches the south boundary line of Section 29; thence it runs east along the south boundary line of Sections 29, 28, 27, 26, and 25 until it reaches Factory Butte Road at the point of beginning. Carsonite signs should be

placed along this entire boundary, spaced close enough so that at least two signs are visible to riders at all times depending on type of terrain. The signs should advise riders which areas are and are not open to cross-country travel. Approximately 1 mile of fencing would be constructed along the south boundary of the State Section 32 in Township 27 South, Range 9 East. This fence would provide additional protection and a controlled monitoring area between the North Caineville Mesa and North Caineville Reef.

### **Caineville Cove Inn Open Area (100 acres)**

The Caineville Cove Inn Open Area boundary would be as shown on the Proposed Factory Butte SRMA map. This would entail portions of Sections 25, 26, and 27 in Township 28 South, Range 8 East. Many tourists who come to the general area stay at the motel, and they would be able to step outside their motel and recreate in the immediate vicinity. The north boundary of the Caineville Cove Inn Open Area would be fenced to limit use to the open area.

## **ZONE 2. MOTORIZED TOURING RMZ**

**Recreation Niche:** Scenic and extensive auto-touring and OHV route network accessing badland scenery, badland landmarks, and desert flora and fauna.

**Recreation Management Objectives:** By the year 2015, manage this zone to provide opportunities for community residents and regional visitors to engage in sustainable, easy-to-access, primarily day-use motorized recreation, providing no less than 75 percent of visitors and affected community residents at least a “moderate” realization of these benefits (i.e., 3.0 on a probability scale, where 1=not at all; 2=somewhat; 3=moderate; and 4=total realization).

**Primary Activities:** Driving OHVs or auto-touring, viewing scenery and wildlife, photography, spending time with friends and family, participating in organized tours, and walking or hiking.

**Experiences:** Savoring the sensory experience of an outdoor setting, relishing group togetherness, enjoying moderate risk-taking adventures, appreciating nature, and escaping everyday stress and boredom.

### **Benefits:**

- Personal—Improved OHV and driving skills, bonding with family and friends, stress relief, enhanced awareness and appreciation of natural resources, greater self-reliance, and renewed human spirit.
- Community—Stronger sense of community dependency on public lands and greater family/group bonding.
- Economic—Enhanced local economy via purchases (gas, groceries, lodging, OHV/outdoor equipment).
- Environmental—Increased awareness and protection of natural landscapes.

### **Setting Characteristics:**

- Physical—Mostly middle country along routes, but backcountry away from routes with regard to naturalness and facilities.
- Social—Mostly middle country along routes with regard to group sizes and contacts, but generally backcountry away from routes.
- Administrative—Front country along routes and staging areas; middle and backcountry away from routes.

**Specific Management Prescriptions:**

All motorized use (OHV or auto-touring) would be limited to designated routes (Proposed Factory Butte SRMA map).

**ZONE 3. LANDMARKS RMZ**

**Recreation Niche:** Scenic use of these areas from a distance by OHV and auto-touring users, offering outstanding landmarks, views, and exceptionally scenic setting. Also includes non-motorized use of the North Caineville Mesa Area of Critical Environmental Concern (ACEC) and the Factory Butte, including hiking, scrambling, and climbing.

**Recreation Management Objectives:** By the year 2015, manage this zone to provide opportunities for community residents and regional visitors to engage in sustainable, primarily day-use non-motorized recreation, providing no less than 75 percent of visitors and affected community residents at least a “moderate” realization of these benefits (i.e., 3.0 on a probability scale, where 1=not at all; 2=somewhat; 3=moderate; and 4=total realization).

**Primary Activities:** Viewing scenery and wildlife, photography, spending time with friends and family, participating in and/or viewing organized tours, hiking, rock scrambling, and climbing.

**Experiences:** Savoring the sensory experience of an outdoor setting, relishing group togetherness, enjoying risk-taking adventures, appreciating nature, escaping everyday stress and boredom.

**Benefits:**

- Personal—Bonding with family and friends, stress relief, enhanced awareness and appreciation of natural resources, greater self-reliance, and renewed human spirit.
- Community—Stronger sense of community dependency on public lands and greater family/group bonding.
- Economic—Enhanced local economy via purchases (gas, groceries, lodging, outdoor equipment).
- Environmental—Increased awareness and protection of natural landscapes.

**Setting Characteristics:**

- Physical—Backcountry in the RMZ, but middle and front country and rural when viewing from routes.
- Social—Backcountry in the RMZ, but middle and front country and rural when viewing from routes.
- Administrative—Backcountry in the RMZ, but middle and front country and rural when viewing from routes.

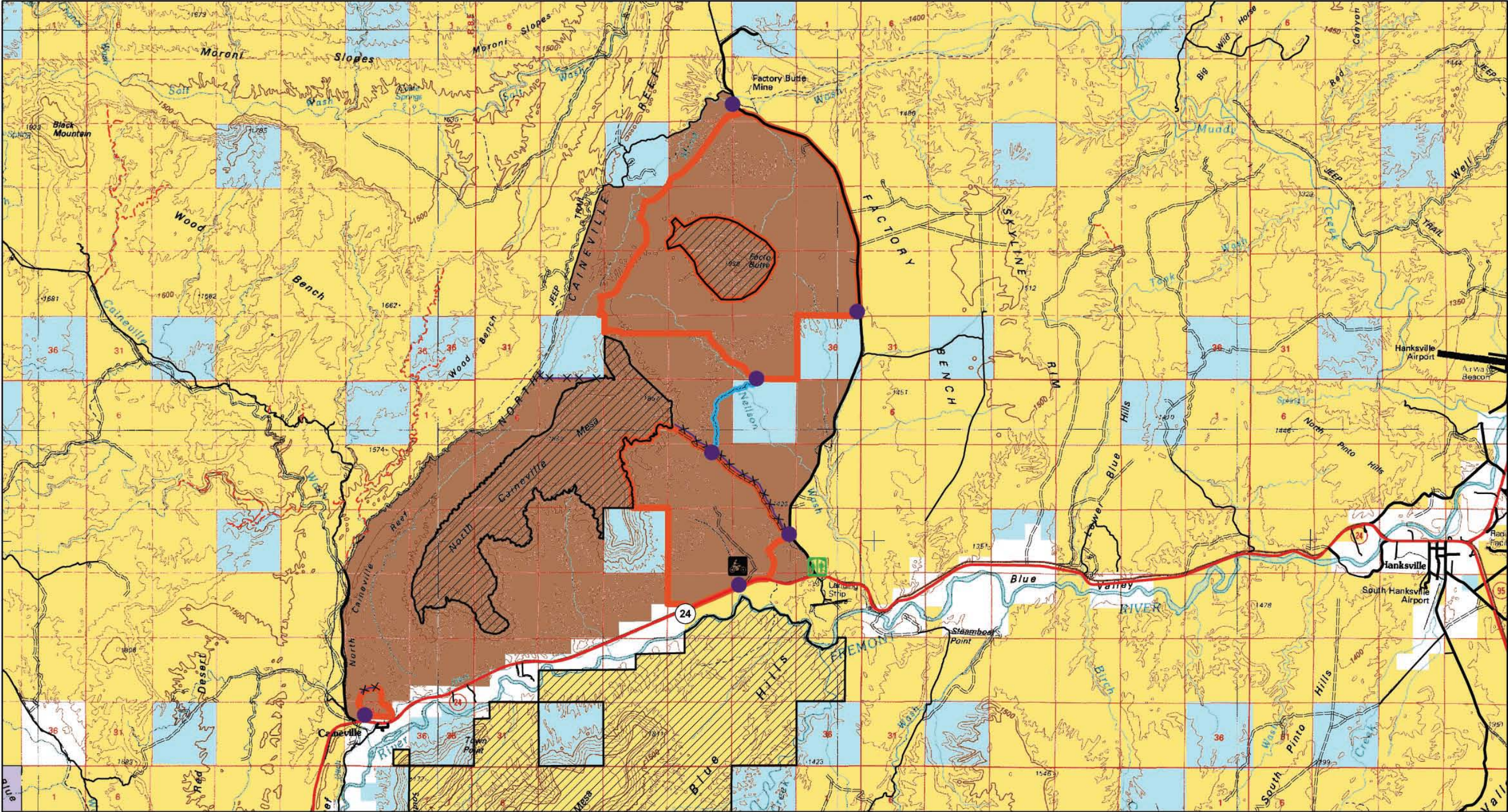
**Specific Management Prescriptions:**

Close the North Caineville Mesa ACEC to OHV and other motorized travel.



Factory Butte OHV and Special Recreation Management Areas

BLM



Public Land   State Land   National Forest   Private Land   National Park

Proposed Factory Butte SRMA

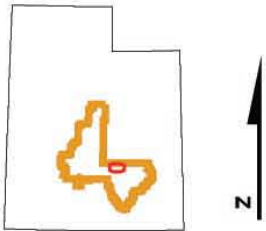
Kiosk Sites   Restroom   Loading Ramp

Proposed Open to cross-country travel

OHV Boundary Fences

Closed to OHV Use

Fenced Corridor to Open areas



0 1.25 2.5 5 Miles

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of this data for individual use or aggregate use with other data.





THIS PAGE INTENTIONALLY LEFT BLANK.

## APPENDIX 19—WILDLAND FIRE RESOURCE PROTECTION MEASURES AND REASONABLE AND PRUDENT MEASURES, TERMS AND CONDITIONS, AND REPORTING REQUIREMENTS IDENTIFIED THROUGH SECTION 7 CONSULTATION

The existing land use plans that comprise Alternative N (no action alternative) were amended September 26, 2005, with the *Finding of No Significant Impact and Decision Record (UT-USO-04-01) Utah Land Use Plan Amendment for Fire and Fuels Management*. The decisions from that document have been brought forward in their entirety. A majority of the decisions are located in the Management Common to All Alternatives section of the Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) Chapter 2 under the Wildland Fire Ecology heading. This appendix contains the remainder of the decisions, in the form of resource protection measures and terms and conditions identified through Section 7 consultation, that were too long to be easily integrated into Chapter 2 of the PRMP/FEIS.

### RESOURCE PROTECTION MEASURES IDENTIFIED IN THE UTAH LAND USE PLAN AMENDMENT FOR FIRE AND FUELS MANAGEMENT

Applicable Fire Management Practices:		
SUP: Wildfire Suppression WFU: Wildland Fire Use for Resource Benefit	RX: Prescribed Fire NF: Non-Fire Fuel Treatments	ESR: Emergency Stabilization and Rehabilitation
<b>Air</b>		
A-1 Evaluate weather conditions, including wind speed and atmospheric stability, to predict impacts from smoke from prescribed fires and wildland fire use. Coordinate with Utah Department of Environmental Quality for prescribed fires and wildland fire use. (RX, WFU)		
A-2 When using chemical fuels reduction methods, follow all label requirements for herbicide application. (NF)		
<b>Soil and Water</b>		
SW-1 Avoid heavy equipment use on highly erosive soils (soils with low soil loss tolerance), wet or boggy soils and slopes greater than 30%, unless otherwise analyzed and allowed under appropriate National Environmental Policy Act (NEPA) evaluation with implementation of additional erosion control and other soil protection mitigation measures. (SUP, WFU, RX, NF, ESR)		
SW-2 There may be situations where high intensity fire will occur on sensitive and erosive soil types during wildland fire, wildland fire use or prescribed fire. If significant areas of soil show evidence of high severity fire, evaluate the area for soil erosion potential and downstream values at risk and implement appropriate or necessary soil stabilization actions such as mulching or seeding to avoid excessive wind and water erosion. (SUP, WFU, RX)		
SW-3 Complete necessary rehabilitation on firelines or other areas of direct soil disturbance, including but not limited to waterbarring firelines, covering and mulching firelines with slash, tilling and/or subsoiling compacted areas, scarification of vehicle tracks, off-highway vehicles (OHV) closures, seeding and/or mulching for erosion protection. (SUP, WFU, RX)		
SW-4 When using mechanical fuels reduction treatments, limit tractor and heavy equipment use to periods of low soil moisture to reduce the risk of soil compaction. If this is not practical, evaluate sites, post treatment and if necessary, implement appropriate remediation, such as subsoiling, as part of the operation. (NF)		
SW-5 Treatments such as chaining, plowing, and roller chopping shall be conducted as much as practical on the contour to reduce soil erosion (BLM ROD 13 Western States Vegetation Treatment EIS 1991). (NF, ESR)		

<b>Applicable Fire Management Practices:</b>		
SUP: Wildfire Suppression	RX: Prescribed Fire	ESR: Emergency Stabilization and Rehabilitation
WFU: Wildland Fire Use for Resource Benefit	NF: Non-Fire Fuel Treatments	
SW-6 When using chemical fuel reduction treatments follow all label directions, additional mitigations identified in project NEPA evaluation and the Approved Pesticide Use Proposal. At a minimum, provide a 100-foot-wide riparian buffer strip for aerial application, 25 feet for vehicle application and 10 feet for hand application. Any deviations must be in accordance with the label. Herbicides would be applied to individual plants within 10 feet of water where application is critical (BLM ROD 13 Western States Vegetation Treatment EIS 1991). (NF)		
SW-7 Avoid heavy equipment in riparian or wetland areas. During fire suppression or wildland fire use, consult a resource advisor before using heavy equipment in riparian or wetland areas. (SUP, WFU, RX, NF, ESR)		
SW-8 Limit ignition within native riparian or wetland areas. Allow low-intensity fire to burn into riparian areas. (RX)		
SW-9 Suppress wildfires consistently with compliance strategies for restoring or maintaining the restoration of water quality impaired [303(d) listed] water bodies. Do not use retardant within 300 feet of water bodies. (SUP, WFU)		
SW-10 Plan and implement projects consistent with compliance strategies for restoring or maintaining the restoration of water quality impaired [303(d) listed] water bodies. Planned activities shall take into account the potential impacts on water quality, including increased water yields that can threaten fisheries and aquatic habitat; improvements at channel crossings; channel stability; and downstream values. Of special concern are small headwaters of moderate to steep watersheds; erosive or saline soils; multiple channel crossings; at-risk fisheries; and downstream residents. (RX, NF, ESR)		
<b>Vegetation</b>		
V-1 When restoring or rehabilitating disturbed rangelands, non-intrusive, nonnative plant species are appropriate for use when native species: (1) are not available; (2) are not economically feasible; (3) cannot achieve ecological objectives as well as nonnative species; and/or (4) cannot compete with already established native species (Noxious Weeds Executive Order 13112 2/3/1999; BLM Manual 9015; BLM ROD 13 Western States Vegetation Treatment EIS 1991). (RX, NF, ESR)		
V-2 In areas known to have weed infestations, aggressive action will be taken in rehabilitating firelines, seeding and follow-up monitoring and treatment to reduce the spread of noxious weeds. Monitor burned areas and treat as necessary. All seed used will be tested for purity and for noxious weeds. Seed with noxious weeds will be rejected (ROD 13 Western States Vegetation Treatment EIS 1991). (SUP, WFU, RX, NF, ESR)		
<b>Special Status Species</b>		
SSS-1 Initiate emergency Section 7 consultation with United States Fish and Wildlife Service (USFWS) upon the determination that wildfire suppression may pose a potential threat to any listed threatened or endangered species or adverse modification of designated critical habitat. (SUP)		
SSS-3 Prior to planned fire management actions, survey for listed threatened and endangered and non-listed sensitive species. Initiate Section 7 consultation with USFWS as necessary if proposed project may affect any listed species. Review appropriate management, conservation and recovery plans and include recovery plan direction into project proposals. For non-listed special status plant and animal species, follow the direction contained in the BLM 6840 Manual. Ensure that any proposed project conserves non-listed sensitive species and their habitats and ensure that any action authorized, funded or carried out by the Bureau of Land Management (BLM) does not contribute to the need for any species to become listed. (RX, NF, ESR)		
SSS-4 Follow terms and conditions identified in the Biological Opinion (see section below). (SUP, WFU, RX, NF, ESR)		
<b>Fish and Wildlife</b>		
FW-1 Avoid treatments during nesting, fawning, spawning, or other critical periods for wildlife or fish. (RX, NF, ESR)		
FW-2 Avoid if possible or limit the size of, wildland fires in important wildlife habitats such as, mule deer winter range, riparian and occupied Greater sage-grouse habitat. Use resource advisors to help prioritize resources and develop Wildland Fire Situation Analyses and Wildland Fire Implementation Plans when important habitats may be impacted. (SUP, WFU)		

<b>Applicable Fire Management Practices:</b>		
SUP: Wildfire Suppression	RX: Prescribed Fire	ESR: Emergency Stabilization and Rehabilitation
WFU: Wildland Fire Use for Resource Benefit	NF: Non-Fire Fuel Treatments	
FW-3 Minimize wildfire size and frequency in sagebrush communities where sage-grouse habitat objectives will not be met if a fire occurs. Prioritize wildfire suppression in sagebrush habitat with an understory of invasive, annual species. Retain unburned islands and patches of sagebrush unless there are compelling safety, private property and resource protection or control objectives at risk. Minimize burn-out operations (to minimize burned acres) in occupied sage-grouse habitats when there are no threats to human life and/or important resources. (SUP)		
FW-4 Establish fuel treatment projects at strategic locations to minimize size of wildfires and to limit further loss of sagebrush. Fuel treatments may include greenstripping to help reduce the spread of wildfires into sagebrush communities. (RX, NF)		
FW-5 Use wildland fire to meet wildlife objectives. Evaluate impacts to sage-grouse habitat in areas where wildland fire use for resource benefit may be implemented. (WFU, RX)		
FW-6 Create small openings in continuous or dense sagebrush (>30% canopy cover) to create a mosaic of multiple-age classes and associated understory diversity across the landscape to benefit sagebrush-dependent species. (WFU, RX, NF)		
FW-7 On sites that are currently occupied by forests or woodlands, but historically supported sagebrush communities, implement treatments (fire, cutting, chaining, seeding etc.) to re-establish sagebrush communities. (RX, NF)		
FW-8 Evaluate and monitor burned areas and continue management restrictions until the recovering and/or seeded plant community reflect the desired condition. (SUP, WFU, RX, ESR)		
FW-9 Utilize the Emergency Stabilization and Rehabilitation (ESR) program to apply appropriate post-fire treatments within crucial wildlife habitats, including sage-grouse habitats. Minimize seeding with non-native species that may create a continuous perennial grass cover and restrict establishment of native vegetation. Seed mixtures shall be designed to re-establish important seasonal habitat components for sage-grouse. Leks shall not be re-seeded with plants that change the vegetation height previously found on the lek. Forbs shall be stressed in early and late brood-rearing habitats. In situations of limited funds for ESR actions, prioritize rehabilitation of sage grouse habitats. (ESR)		
<b>Wild Horses and Burros</b>		
WHB-1 Avoid fencing that would restrict access to water. (RX, NF, ESR)"		
<b>Cultural Resources</b>		
CR-1 Cultural resource advisors shall be contacted when fires occur in areas containing sensitive cultural resources. (SUP)		
CR-2 Wildland fire use is discouraged in areas containing sensitive cultural resources. A programmatic agreement is being prepared to cover the finding of adverse effects to cultural resources associated with wildland fire use. (WFU)		
CR-3 Potential impacts of proposed treatment shall be evaluated for compliance with the National Historic Preservation Act (NHPA) and the Utah Statewide Protocol. This shall be conducted prior to the proposed treatment. (RX, NF, ESR)		
<b>Paleontology</b>		
P-1 Planned projects shall be consistent with BLM Manual and Handbook H-8270-1, Chapter III (A) and III (B) to avoid areas where significant fossils are known or predicted to occur or to provide for other mitigation of possible adverse effects.(RX, NF, ESR)		
P-2 In the event that paleontological resources are discovered in the course of surface fire management activities, including fires suppression, efforts shall be made to protect these resources. (SUP, WFU, RX, NF, ESR)		
<b>Forestry</b>		
F-1 Planned projects shall be consistent with Healthy Forest Restoration Act Section 102(e) (2) to maintain or contribute to the restoration of old-growth stands to a pre-fire suppression condition and to retain large trees contributing to old growth structure. (SUP, WFU, RX, NF)		

<b>Applicable Fire Management Practices:</b>		
SUP: Wildfire Suppression	RX: Prescribed Fire	ESR: Emergency Stabilization and Rehabilitation
WFU: Wildland Fire Use for Resource Benefit	NF: Non-Fire Fuel Treatments	
F-2 During planning, evaluate opportunities to utilize forest and woodland products prior to implementing prescribed fire activities. Include opportunities to use forest and woodland product sales to accomplish non-fire fuel treatments. In forest and woodland stands, consider developing silvicultural prescriptions concurrently with fuel treatments prescriptions. (RX, NF)		
<b>Livestock Grazing</b>		
LG-1 Coordinate with permittees regarding the requirements for non-use or rest of treated areas. (SUP, WFU, RX, NF, ESR)		
LG-2 Rangelands that have been burned, by wildfire, prescribed fire or wildland fire use, will be ungrazed for a minimum of one complete growing season following the burn. (SUP, WFU, RX)		
LG-3 Rangelands that have been re-seeded or otherwise treated to alter vegetative composition, chemically or mechanically, will be ungrazed for a minimum of two complete growing seasons. (RX, NF, ESR)		
<b>Recreation and Visitor Services</b>		
Rec-1 Wildland fire suppression efforts will preferentially protect Special Recreation Management Areas and recreation site infrastructure in line with fire management goals and objectives. (SUP)		
Rec-2 Vehicle tracks created off established routes will be obliterated after fire management actions in order to reduce unauthorized OHV travel. (SUP, WFU, RX, NF, ESR)		
<b>Lands and Realty</b>		
LR-1 Fire management practices will be designed to avoid or otherwise ensure the protection of authorized rights-of-way and other facilities located on the public lands, including coordination with holders of major rights-of-way systems within rights-of-way corridors and communication sites. (WFU, RX, NF, ESR)		
LR-2 Fire management actions must not destroy, deface, change or remove to another place any monument or witness tree of the Public Land Survey System. (SUP, WFU, RX, NF, ESR)		
<b>Hazardous Waste</b>		
HW-1 Recognize hazardous wastes and move fire personnel to a safe distance from dumped chemicals, unexploded ordnance, drug labs, wire burn sites or any other hazardous wastes. Immediately notify BLM Field Office hazmat coordinator or state hazmat coordinator upon discovery of any hazardous materials, following the BLM hazardous materials contingency plan. (SUP, WFU, RX, NF, ESR)		
<b>Mineral Resources</b>		
M-1 A safety buffer shall be maintained between fire management activities and at-risk facilities. (SUP, WFU, RX)		
<b>Wilderness and Wilderness Study Areas</b>		
Wild-1 The use of earth-moving equipment must be authorized by the field office manager. (SUP, WFU, RX, ESR)		
Wild-2 Fire management actions will rely on the most effective methods of suppression that are least damaging to wilderness values, other resources and the environment, while requiring the least expenditure of public funds. (SUP, WFU)		
Wild-3 A resource advisor shall be consulted when fire occurs in Wilderness Areas and Wilderness Study Areas (WSA). (SUP, WFU)		

## U. S. FISH AND WILDLIFE SERVICE INCIDENTAL TAKE STATEMENT, INCLUDING REASONABLE AND PRUDENT MEASURES, TERMS AND CONDITIONS, AND REPORTING REQUIREMENTS FOR ESA SPECIES OF THE BIOLOGICAL OPINION

The USFWS has completed a biological opinion on the Proposed Action alternative and terms and conditions have been identified as part of that opinion. Together, the resource protection measures and the terms and conditions were incorporated into the Proposed Action to reduce resource conflicts. Species that were addressed in the complete statement contained in the *Finding of No Significant Impact and Decision Record (UT-USO-04-01) Utah Land Use Plan Amendment for Fire and Fuels Management* that do not occur within the decision area or are not affected by management in the EIS alternatives are not include in the Incidental Take Statement below.

### Incidental Take Statement

Section 9 of the Act, as amended, prohibits take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. “Harm” is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 173). “Harass” is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3).

No exemption from Section 9 of the Act is granted in this biological opinion. The Bureau of Land Management’s (BLM) implementation of the Land Use Plan Amendment and Five Fire Management Plans is likely to adversely affect listed species. The likelihood of incidental take, and the identification of reasonable and prudent measures and terms and conditions to minimize such take, will be addressed in project-level, and possibly programmatic-level consultations. Any incidental take and measures to reduce such take cannot be effectively identified at the level of proposed action because of the uncertainty of wildland fire, broad geographic scope, and the lack of site-specific information. Rather, incidental take and reasonable and prudent measures may be identified adequately through subsequent actions subject to Section 7 consultations at the project and/or programmatic scale.

Even though actual take levels are unquantifiable, take will occur through harm and harassment. Therefore, we are providing the following Reasonable and Prudent Measures (RPMs) and terms and conditions to minimize overall take. Implementation of these RPMs and terms and conditions during project planning will also expedite site-specific Section 7 consultation.

### Reasonable and Prudent Measures

The USFWS believes that the following RPMs are necessary and appropriate to minimize impacts of incidental take of Utah prairie dog, southwestern willow flycatcher, California condor, bald eagle, Mexican spotted owl, and Siler pincushion cactus:

1. The BLM shall implement measures to minimize mortality or injury of federally listed species due to proposed project activities without placing firefighter personnel at risk. The species that were determined to be “**likely to adversely affected**” by project activities included: Utah prairie dog, southwestern willow flycatcher, California condor, bald eagle, Mexican spotted owl, and Siler pincushion cactus.
2. The BLM shall implement measures to minimize harm to federally listed species through destruction of their suitable or designated critical habitats, without placing firefighter personnel at



risk. The species' habitats that were determined to be "**likely to adversely affected**" by project activities included: Utah prairie dog, southwestern willow flycatcher, California condor, bald eagle, Mexican spotted owl, and Siler pincushion cactus.

## Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, the BLM must comply with the following terms and conditions, which implement the RPMs described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. The following terms and conditions apply to all species covered under this biological opinion, and are to be implemented in addition to the Applicant Committed Measures described in the Proposed Action:

### General Terms and Condition

1. To implement Reasonable and Prudent Measure 1:
  - a. Before the beginning of each fire season, a threatened and endangered species education program will be presented to all personnel anticipated to be within federally listed species habitats during suppression activities. This program will contain information concerning the biology and distribution of listed species throughout the Fire Management Plan Planning Area, their legal status, fire suppression goals and restrictions within suitable and critical habitat. Following training, each individual will sign a completion sheet to be placed on file at the local BLM office.
  - b. All project employees (including fire fighting personnel) shall be informed as to the definition of "take", the potential penalties (up to \$200,000 in fines and one year in prison) for taking a species listed under the Endangered Species Act, and the terms and conditions provided in this biological opinion.
  - c. A qualified resource advisor will be assigned to each wildfire that occurs in or threatens listed species habitat. The resource advisor's role is help define goals and objectives for fire suppression efforts and informs the Incident Commander (IC) of any restrictions, but does not get involved in specific suppression tactics. Resource advisors shall oversee fire suppression and suppression rehabilitation activities; to ensure protective measures endorsed by the Incident Commander are implemented.
  - d. For pre-planned projects, the Authorized Officer shall designate an individual as a contact representative who will be responsible for overseeing compliance with the Applicant Committed Measures and terms and conditions contained in this biological opinion, and providing coordination with the USFWS. The representative will have the authority to halt activities which may be in violation of these conditions, unless human health and safety or structures are at risk.
  - e. Project-related personnel shall not be permitted to have pets accompany them to the project site.
  - f. If available, maps shall be provided to local dispatch centers showing general locations of listed species. Local BLM or Utah Division of Wildlife Resources (UDWR) biologists shall be consulted for specific locations if fires occur within or near the general locations delineated on the map.
  - g. In occupied habitat, pre- and post-monitoring of federally listed species' responses to the pre-planned treatments will be conducted.
2. To implement Reasonable and Prudent Measure 2:
  - a. Fingers or patches of unburned vegetation within burned areas shall not be burned out as a fire suppression measure unless required for safety concerns or due to high reburn potential.

- b. Emergency stabilization and rehabilitation efforts must focus on areas where there is a potential of non-native species to spread, particularly within suitable habitat for federally listed species.
- c. The specific seed mix and areas to be seeded within suitable habitat for federally listed and sensitive species will be determined through coordination and Section 7 consultation with the USFWS.
- d. In occupied habitat burned by wildland fire, the recovery of vegetation shall be monitored, including establishment and monitoring of paired plots, inside and outside of the burned area unless the BLM and the USFWS concur that monitoring is not required.
- e. Site-specific projects under the Land Use Plan Amendment and Fire Management Plans will maintain, protect, or enhance the primary constituent elements of designated critical habitat in all implementation activities.
- f. The effectiveness of suppression activities and threatened and endangered species conservation measures shall be evaluated after a fire in coordination with the USFWS. Procedures shall be revised as needed.
- g. In occupied habitat, pre- and post-monitoring of federally listed species' habitat responses to the pre-planned treatments will be conducted.
- h. Temporarily close burned areas to off highway vehicles (OHV) within occupied habitat after a wildland fire event until vegetation and soils recover. Consultation with the USFWS may determine that an area may remain open if there is no threat to the species or habitat.
- i. Consult with the USFWS to determine the need to obscure decommissioned trails and roads and illegal OHV trails within occupied habitat after a wildland fire event to prevent the trails and roads from re-opening.

### Utah Prairie Dog

The following terms and conditions are in addition to the general terms and conditions listed above and apply to the Utah prairie dog:

1. To implement Reasonable and Prudent Measures 1 and 2:
  - a. Wildfires will be suppressed before they reach a prairie dog colony ("prairie dog colony" refers to any occupied Utah prairie dog colony) or after they exit a colony. Active suppression efforts will not occur within a colony unless human health and safety or structures are at risk.
  - b. Only hand lines will be authorized within colonies.
  - c. Normally, only water shall be used on fires that occur within prairie dog colonies. If the fire Incident Commander decides that the situation requires use of chemical retardants in order to protect life and property, they may be used. The chemical composition will be supplied to the USFWS during emergency consultation.
  - d. All vehicles shall stay on existing roads within colonies, except as stated in (e). Storage of equipment and materials shall not occur within 0.25 mile of colonies. Vehicle maintenance shall not occur within these areas.
  - e. The resource advisor, biologist, or biological monitor (someone who is either qualified with a biological background or has been trained by the resource advisor) ensures that prairie dogs and their burrows are protected or avoided by walking in front of engines, tracked vehicles, or other firefighting-related vehicles within occupied prairie dog colonies.
  - f. Vehicles shall not exceed a speed of 10 miles per hour (cross country) in occupied Utah prairie dog colonies unless a higher speed is determined to be prudent for safety reasons.
  - g. Within colonies, precautions shall be taken to ensure that contamination of the site by fuels, motor oils, grease, etc. does not occur and that such materials are contained and properly disposed of off site. Inadvertent spills of petroleum-based or other toxic materials shall be

cleaned up and removed immediately, unless during an emergency event (wildfire suppression). In which case the spill shall be cleaned up as soon as practical after the emergency situation is controlled.

- h. Camps associated with fire suppression activities shall be situated outside occupied habitat.
- i. If a dead or injured Utah prairie dog is located, initial notification must be made to the USFWS Division of Law Enforcement, Cedar City, Utah at telephone 435-865-0861 or to the Cedar City office of the UDWR at telephone number 435-865-6100. Instruction for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state.

### **Southwestern Willow Flycatcher**

The following terms and conditions are in addition to the general terms and conditions listed above and apply to the southwestern willow flycatcher:

1. To implement the Reasonable and Prudent Measure 1:
  - a. Prior to planned project activities, potentially affected habitat will be surveyed according to USFWS protocol (*A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol; Technical Report NPS/NAUCPRS/NRTR-97/12*).
  - b. Except where fires are active in occupied habitat, minimize unnecessary low-level helicopter flights during the breeding season (April 1–September 30). If safety allows, approach bucket dip sites at a 90-degree direction to rivers to minimize flight time over the river corridor and occupied riparian habitats. Locate landing sites for helicopters at least 0.25 mile from occupied flycatcher habitat unless human safety or property dictates otherwise.
  - c. Minimize use of chainsaws or bulldozers to construct firelines through occupied or suitable habitat except where necessary to reduce the overall acreage of occupied habitat or other important habitat areas that would otherwise be burned.
  - d. Implement activities to reduce hazardous fuels or improve riparian habitats (prescribed burning or vegetation treatments) within occupied or unsurveyed suitable habitat for southwestern willow flycatchers only during the non-breeding season (October 1 to March 31).
2. To implement Reasonable and Prudent Measure 2:
  - a. Riparian fuel reduction actions shall be considered as experimental, and initially conducted only in unoccupied habitats until the success and ramifications are better understood. Efficacy of these actions as a fire management tool, and effects on bird habitat quality, shall be tested in a scientifically explicit, controlled fashion (Appendix L in U.S. Fish and Wildlife Service 2002).
  - b. In occupied or suitable flycatcher habitat, creation of firebreaks might render the habitat unsuitable (Appendix L in U.S. Fish and Wildlife Service 2002). As long as human safety and property allows, firebreaks shall be conducted in unoccupied sites, outside of proposed critical habitat, or within proposed critical habitat under the following situations:
    - i. The habitat does not meet the Primary Constituent Elements of the proposed critical habitat as listed in 69 FR 60706-60786, October 12, 2004;
    - ii. Minimal fireline necessary to prevent unacceptable losses of occupied habitat; and
    - iii. Between fuel concentrations and flycatcher breeding sites to prevent fires from spreading into breeding sites (Appendix L in U.S. Fish and Wildlife Service 2002).

- c. Prescribed fire shall be avoided in occupied habitat and considered only as experimental management techniques if dealing with suitable unoccupied habitat (Appendix L in U.S. Fish and Wildlife Service 2002).
- d. Fires in occupied habitat and adjacent buffer zones shall be rapidly suppressed if safety allows.

### **California Condor and Bald Eagle**

The following terms and conditions are in addition to the general terms and conditions listed above and apply to the California condor and bald eagle:

- 1. To implement the Reasonable and Prudent Measure 1:
  - a. If California condors or bald eagles are found inhabiting (nesting) within the action area of a pre-planned project, a buffer of 1 mile surrounding the nesting area will be designated as non-treatment zones (Romin and Muck 2002).
  - b. If California condors are observed within 0.25 mile of an open water source, such as an inflatable storage tank or “pumpkin,” the water storage tank will be covered when not in use.

### **Mexican Spotted Owl**

The following terms and conditions are in addition to the general terms and conditions listed above and apply to the Mexican spotted owl:

- 1. To implement Reasonable and Prudent Measure 1:
  - a. Pre-planned fuels reduction projects within Mexican spotted owl designated critical habitat shall be designed to enhance habitat requirements for the Mexican spotted owl as well as for the valuable prey species they rely upon.
- 2. To implement Reasonable and Prudent Measure 2:
  - a. Fire suppression shall be considered for wildfires in designated critical habitat.

### **Threatened or Endangered Plants**

The following terms and conditions are in addition to the general terms and conditions listed above and apply to the federally listed plants:

- 1. To implement Reasonable and Prudent Measure 1:
  - a. Do not allow wildland fire use within occupied habitat unless agreed to by the BLM and the USFWS.
  - b. When feasible (human life or property are not at risk) firebreaks shall be constructed down slope of plants and populations; if firebreaks must be sited upslope, buffers of 100 feet minimum between surface disturbances and plants and populations will be incorporated.
- 2. To implement Reasonable and Prudent Measure 2:
  - a. Do not allow wildland fire use within occupied habitat unless agreed to by the BLM and the USFWS.
  - b. For pre-planned projects within known or potential habitat, site inventories shall be conducted to determine habitat suitability prior to initiation of project activities, at a time when the plant can be detected.
  - c. For riparian/wetland-associated species, avoid loss or disturbance of riparian habitats.
  - d. Limit disturbances to and within suitable habitat by staying on designated routes where feasible.

- e. Limit new access routes created by the project.
- f. Following a wildland fire event, place signing to limit ATV travel in sensitive burned areas.

### **Siler Pincushion Cactus**

The following terms and conditions are in addition to the general terms and conditions listed above as well as the terms and conditions for threatened and endangered plant species. These terms and conditions apply specifically to the Siler pincushion cactus:

1. To implement Reasonable and Prudent Measures 1 and 2:
  - a. Follow and implement the restrictions to pesticide use within suitable Siler pincushion cactus habitat developed by the Environmental Protection Agency (EPA). These limitations were excerpted from the EPA's Pesticides: Endangered Species Protection Program (<http://www.epa.gov/oppfead1/endanger/arizona/cocon.htm#brady>):
    - i. If the active ingredient is 2,4-D (all forms), ATRAZINE, CLOPYRALID, DICAMBA (all forms), DICHLORPROP (2,4-DP), HEXAZINONE, MCPA (all forms), PARAQUAT, PICLORAM (all forms), or TEBUTHIURON, then do not apply this pesticide in the species habitat. For ground applications do not apply within 20 yards of the habitat, or within 100 yards for aerial applications.
    - ii. If the active ingredient is OXYFLUORFEN (granular or non-granular), then do not apply this pesticide in the species habitat. For ground applications do not apply within 100 yards of the habitat, or within ¼ mile for aerial applications.
    - iii. If the active ingredient is either METRIBUZIN or SULFOMETURON METHYL, then do not apply this pesticide on rights-of-way in the species habitat.

### **Closing**

The USFWS believes that an unquantifiable amount of incidental take will occur in the form of harm and harassment as a result of the proposed actions. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed actions. The BLM must immediately provide an explanation of the causes of the taking and review with the USFWS the need for possible modification of the reasonable and prudent measures.

### **Reporting Requirements**

Upon locating dead, injured, or sick listed species, immediate notification must be made to the USFWS Salt Lake City Field Office at (801) 975-3330 and the USFWS Division of Law Enforcement, Ogden, Utah, at (801) 625-5570. Pertinent information including the date, time, location, and possible cause of injury or mortality of each species shall be recorded and provided to the USFWS. Instructions for proper care, handling, transport, and disposition of such specimens will be issued by the USFWS Division of Law Enforcement. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state.

The BLM shall submit a report to the USFWS on or before (December 1) of each year in which fire management activities occurred within occupied habitat. For the listed and candidate species covered under this consultation, the report shall include: 1) the amount of potential and/or occupied habitat affected by wildfire (i.e. stream miles burned, percentage of drainage burned, fire severity map); 2) to the extent possible, the number of individuals killed from direct and indirect effects of wildfire; 3) any habitat and/or population monitoring efforts from past wildfire events; 4) a copy of the burned area emergency stabilization and rehabilitation plan; 5) implementation and effectiveness monitoring of burned area

emergency stabilization and rehabilitation treatments; 6) implementation and effectiveness monitoring of the standard operating procedures; 7) recommendations for enhancing the effectiveness of the standard operating procedures; and 8) any recommendations for additional standard operating procedures. The first report shall be due to the USFWS on (December 1, 2005). The address for the Utah Fish and Wildlife Office is:

Field Supervisor, U.S. Fish and Wildlife Service  
2369 West Orton Circle, Suite 50  
West Valley City, Utah 84119  
Telephone: (801) 975-3330

## **ADDITIONAL RESOURCE PROTECTION MEASURES DEVELOPED BY THE BLM AND THE U. S. FISH AND WILDLIFE SERVICE**

In addition to the resource protection measures listed in the land use plan amendment, the following conservation measures were developed through the Section 7 consultation process. These resource protection measures were identified in the U.S. Fish and Wildlife Service's Biological Opinion (p. 42). That document states that "the BLM has incorporated these measures...by reference to their [Biological Assessment]." Species that were addressed in these measures that do not occur within the decision area or are not affected by management in the EIS alternatives are not included. Additional resource protection measures are as follows:

- Manage natural and prescribed fire regimes to protect or improve Utah prairie dog habitat.
- Within Utah prairie dog habitat, reseedling would be implemented according to the Utah Prairie Dog Recovery Plan.
- Manage prescribed fire and wildland fire use within Mexican spotted owl Protected Activity Centers (PAC) to ensure protection of nesting, roosting, and foraging habitats.
- Wildland fire suppression would be prioritized for use in Mexican spotted owl PACs. When feasible, fire camps associated with suppression efforts would be built outside of the PACs and nest protection areas.
- For treatments within suitable habitat for listed species, pre- and post-monitoring would take place as determined on a case-by-case basis.
- Incorporate the standards and guidelines recommended by the Inland Native Fish Strategy (USFS 1995).
- As per the decision of the resource advisor, avoid construction of firelines using mechanized equipment across the stream channel. If used, the mechanized equipment would terminate at, and not cross, the stream channel.
- Avoid transferring water from one watershed into another for the purpose of water drops, as this could aid in the spread of water-borne diseases such as whirling disease.
- Avoid retardant use in any riparian wetland communities.
- Restricted use of mechanical treatments and hand tools.
- Per-burn acreage limitations of 5-100 acres, as long as human life or property are not threatened.
- Prior to planned fire management actions, survey for listed threatened and endangered and non-listed sensitive species. Review appropriate management, conservation, and recovery plans and include recovery plan direction into project proposals, if listed. Ensure that any proposed project conserves non-listed sensitive species and their habitats and ensure that any action authorized, funded, or carried out by the BLM does not contribute to the need for any species to become listed.

In addition to the Resource Protection Measures listed under the LUP, the Richfield Support Center had instituted the following measures into their FMP.



Measures designed to protect threatened, endangered, or candidate species (plant and animals) include:

- END-4 A Resource Advisor must coordinated with the plant specialist in the Fillmore field office in order to authorize any dozer use. (SUP, WFU0)
- END-5 Contact the Resource Advisor for all fire management activities that may affect the Utah Prairie Dog (SUP, WFU, RX, NF, ESR)
- END-6 Contact the Resource Advisor for all fire management activities that may affect the southwestern willow flycatcher. Manage fires according to the conservation plan. (SUP, WFU, RX, NF, ESR)
- END-7 Protect Mexican spotted owl habitat. Manage fires according to the Mexican spotted owl recovery plan and "Suggestions for the Management of Mexican Spotted Owls." Contact the Resource Advisor for all fire management activities.
- END-8 Suppress all wildland fires in critical sage grouse, prairie dog, or pygmy rabbit habitat. (SUP)
- END-9 Contact the Resource Advisor for fire management activities in Bonneville cutthroat trout or Boreal toad habitat. (SUP, WFU, RX, NF, ESR)

## APPENDIX 20—UTAH STANDARDS FOR RANGELAND HEALTH AND GUIDELINES FOR GRAZING MANAGEMENT

---

The BLM has developed the following Fundamentals of Rangeland Health and their companion rules-Standards for Rangeland Health and Guidelines for Grazing Management for BLM in Utah ([BLM-UT-GI-97-001-4000] U.S. Department of Interior, Bureau of Land Management, Utah State Office 1997).

### D.1. FUNDAMENTALS OF RANGELAND HEALTH

As provided by regulations, developed by the Secretary of the Interior on February 22, 1995, the following conditions must exist on BLM lands:

1. Watersheds are in, or making significant progress toward, properly functioning physical condition, including their upland, riparian –wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, and timing and duration of flow.
2. Ecological processes, including the hydrologic cycle nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.
3. Water quality complies with State water quality standards and achieves, or is making significant progress towards achieving established BLM management objectives such as meeting wildlife needs.
4. Habitats; are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered Species, Federal proposed, Category 1 and 2 Federal candidate and other special status Species.

In 1997, the BLM in Utah developed rules to carry out the Fundamentals of Rangeland health. These are called Standards for Rangeland health and Guidelines for grazing management.

**Standards** spell out conditions to be achieved on BLM Lands in Utah, and **Guidelines** describe practices that will be applied in order to achieve the Standards.d.2. Standards for Rangeland Health

#### **STANDARD 1. UPLAND SOILS EXHIBIT PERMEABILITY AND INFILTRATION RATES THAT SUSTAIN OR IMPROVE SITE PRODUCTIVITY, CONSIDERING THE SOIL TYPE, CLIMATE, AND LANDFORM.**

*As indicated by:*

1. Sufficient cover and litter to protect the soil surface from excessive water and
2. wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.
3. The absence of indicators of excessive erosion such as rills, soil pedestals. and actively eroding gullies.

4. The appropriate amount, type, and distribution Of vegetation reflecting the presence of (1) the Desired Plant Community IDPCI, where identified in a land use plan, or (2) where the PVC is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

**STANDARD 2. RIPARIAN AND WETLAND AREAS ARE IN PROPERLY FUNCTIONING CONDITION.  
STREAM CHANNEL MORPHOLOGY AND FUNCTIONS ARE APPROPRIATE TO SOIL TYPE,  
CLIMATE AND LANDFORM.**

*As indicated by:*

1. Stream bank vegetation consisting of or showing a trend toward species with root masses capable of withstanding high stream flow events. Vegetative cover adequate to protect stream banks and dissipate stream flow energy associated with high-water flows. protect against accelerated erosion. capture sediment. and provide for groundwater recharge.
2. Vegetation reflecting: Desired Plant Community. maintenance of riparian and wetland soil moisture characteristics, diverse age structure and composition. high vigor. large woody debris when site potential allows. and providing food. cover and other habitat needs for dependent animal species.
3. Revegetating point bars: lateral stream movement associated with natural sinuosity: channel width. depth, pool frequency and roughness appropriate to landscape position.
4. Active floodplain.

**STANDARD 3. DESIRED SPECIES, INCLUDING NATIVE, THREATENED.**

*As indicated by:*

1. Frequency, diversity, density, age classes, and productivity of desired native species necessary to ensure reproductive capability and survival.
2. Habitats connected at a level to enhance species survival.
3. Native species reoccupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of nonnative species.
4. Appropriate amount, type, and distribution of vegetation reflecting the presence of (1) the Desired Plant Community DPC, where identified in a land use plan conforming to these Standards, or (2) where the DPC is identified a community that equally sustains the desired level of productivity and properly functioning ecologic processes.

**STANDARD 4. BLM WILL APPLY AND COMPLY WITH WATER QUALITY STANDARDS  
ESTABLISHED BY THE STATE OF UTAH (R.317-2) AND THE FEDERAL CLEAN WATER  
AND SAFE DRINKING WATER ACTS. ACTIVITIES ON BLM LANDS WILL FULLY SUPPORT  
THE DESIGNATED BENEFICIAL USES DESCRIBED IN THE UTAH WATER QUALITY  
STANDARDS {R.317-2} FOR SURFACE AND GROUNDWATER. 1**

*As indicated by:*

1. Measurement of nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and other water quality parameters.
2. Macro-invertebrate communities that indicate water quality meets aquatic objectives.

Because BLM Lands provide forage for grazing of wildlife, wild horses and burros, and domestic livestock, the following rules have been developed to assure that such grazing is consistent with the Standards listed here.

1. BLM will continue to coordinate monitoring water quality activities with other Federal, State and technical agencies.

### **D.3. GUIDELINES FOR GRAZING MANAGEMENT**

1. Grazing management practices will be implemented that:
  - a. Maintain sufficient residual vegetation and litter on both upland and riparian sites to protect the soil from wind and water erosion and support ecological functions;
  - b. Promote attainment or maintenance of proper functioning condition riparian/wetland areas, appropriate stream channel morphology, desired soil permeability and permeability and infiltration, and appropriate soil conditions and kinds and amounts of plants and animals to support the hydrologic cycle, nutrient cycle, and energy flow.
  - c. Meet the physiological requirements of desired plants and facilitate reproduction and maintenance of desired plants to the extent natural conditions allow;
  - d. Maintain viable and diverse populations of plants and animals appropriate for the site,
  - e. Provide or improve within the limits of site potentials, habitat for Threatened or Endangered Species;
  - f. Avoid grazing management conflicts with other species that have the potential of becoming protected or special status species;
  - g. Encourage innovation, experimentation and the ultimate development of alternatives to improve rangeland management practices;
  - h. Give priority to rangeland improvement projects and land treatments that offer the best opportunity for achieving the Standards.
2. Any spring or seep developments will be designed and constructed to protect ecological process and functions and improve livestock, wild horse and wildlife distribution.
3. New rangeland projects for grazing will be constructed in a manner consistent with the Standards. Considering economic circumstances and site limitations, existing rangeland projects and facilities that conflict with the achievement or maintenance of the Standards will be relocated and/or modified.
4. Livestock salt blocks and other nutritional supplements will be located away from riparian/wetland areas or other permanently located, or other natural water sources. It is recommended that the locations of these supplements be moved every year.
5. The use and perpetuation of native species will be emphasized. However, when restoring or rehabilitating disturbed or degraded rangelands nonintrusive, nonnative plant species are appropriate for use where native species (a) are not available, (b) are not economically feasible, (c) can not achieve ecological objectives as well as nonnative species, and/or (d) cannot compete with already established native species
6. When rangeland manipulations are necessary, the best management practices, including biological processes, fire and intensive grazing, will be utilized prior to the use of chemical or mechanical manipulations.

7. When establishing grazing practices and rangeland improvements, the quality of the outdoor recreation experience is to be considered. Aesthetic and scenic values, water, campsites and opportunities for solitude are among those considerations.
8. Feeding of hay and other harvested forage (which does not refer to miscellaneous salt, protein, and other supplements) for the purpose of substituting for inadequate natural forage will not be conducted on BLM lands other than in (a) emergency situations where no other resource exists and animal survival is in jeopardy, or (b) situations where the Authorized Officer determines such a practice will assist in meeting a Standard or attaining a management objective.
9. In order to eliminate, minimize, or limit the spread of noxious weeds, (a) only hay cubes, hay pellets, or certified weed-free hay will be fed on BLM lands, and (b) reasonable adjustments in grazing methods, methods of transport, and animal husbandry practices will be applied.
10. To avoid contamination of water sources and in advertent damage to non-target species, aerial application of pesticides will not be allowed within 100 feet of a riparian wetland area unless the product is registered for such use by the EPA.
11. On rangelands where a standard is not being met, and conditions are moving toward meeting the standard, grazing may be allowed to continue. On lands where a standard is not being met, conditions are not improving toward meeting the standard or other management objectives, and livestock grazing is deemed responsible, administrative action with regard to livestock will be taken by the Authorized Officer pursuant to CUR 4180.2(c).
12. Where it can be determined that more than one kind of grazing animal is responsible for failure to achieve a Standard, and adjustments in management are required, those adjustments will be made to each kind of animal, based on interagency cooperation as needed, in proportion to their degree of responsibility.
13. Rangelands that have been burned, reseeded or otherwise treated to alter vegetative composition will be closed to livestock grazing as follows: (1) burned rangelands, whether by wildfire or prescribed burning, will be ungrazed for a minimum of one complete growing season following the burn; and (2) rangelands that have been reseeded or otherwise chemically or mechanically treated will be ungrazed for a minimum of two complete growing seasons.
14. Conversions in kind of livestock (such as from sheep to cattle) will be analyzed in light of Rangeland Health Standards. Where such conversions are not adverse to achieving a Standard, or they are not in conflict with BLM land use plans, the conversion will be allowed.