

BMPs FOR RECLAMATION: DO WE KNOW WHAT IS EFFECTIVE ?



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WRRC MISSION:

to develop, collect, and disseminate impartial scientifically based information related to the reclamation, restoration and remediation of disturbed lands in Wyoming and the western United States.

and

train students and practitioners in land reclamation and restoration ecology, offering an undergraduate minor in Land Reclamation and certification for graduate students.

EDUCATION, OUTREACH, RESEARCH



Outline of Talk

What do we know about reclamation practices effective in Remediation of Oil and Gas well pads?

How is effectiveness measured?

What are the difficulties/problems in measuring effectiveness of reclamation practices?

What is the value of monitoring/measuring?

WHAT DO WE KNOW ?

Reestablishment of native vegetation under particularly stressful environmental conditions.

Seed of native plants

Problematic soils

Invasive species

Habitat restoration

HANDBOOK
OF
WESTERN RECLAMATION
TECHNIQUES

Second Edition
2006

[http://
www.techtransfer.osmre.gov/
http://cbmcc.org/intro06.pdf](http://www.techtransfer.osmre.gov/)



Successful restoration of severely disturbed lands: Overview of Critical Components^{B-1202}

<http://www.wyomingextension.org/agpubs/pubs/B1202.pdf>

Publication #: B-1202

Publication Type: Bulletin

Date Published: Tuesday, December 01, 2009

**College of Agriculture and Natural Resources
Cooperative Extension Service**



HOW IS EFFECTIVENESS MEASURED ?

Revegetation

Soil Stability

Wildlife Habitat

ECOSYSTEM FUNCTION and RESILIENCE



DOCUMENTATION and MONITORING!!

Energy Companies, Regulatory Agencies, Reclamation Contractors

DIFFICULTIES/PROBLEMS IN MEASURING EFFECTIVENESS OF RECLAMATION PRACTICES ?

Costs/Time

Standardized analytical methods

**Site to Site Variability/Year to Year Variability
(lack of controlled, replicated experiments)**

Database establishment, maintenance, QA/QC, accessibility

WHAT IS THE VALUE OF QUANTITATIVE MONITORING ?

PRICELESS!



WRRC's APPROACH TO DEVELOPMENT OF RECLAMATION BMPs

Informed Basic Research

**Monitoring and Evaluation of
Documented Practices**

**Database Examination and
Field Monitoring**

CURRENT RECLAMATION RELATED RESEARCH AT THE UNIVERSITY WYOMING

- Quantifying sagebrush structure on ecological sites in the Upper Green River Basin. Ginger Paige, Matt Holloran, Ann Hild, Pls. Funded by T. Thorne Sage Grouse Cons Fund.**
- Reclaiming Halogeton Invasions of Salt-Desert Shrublands in the Wyoming Basin, Ann Hild, PI. Funded (in part) by the Wyoming Reclamation and Restoration Center**
- Identification of Elk Disturbance Risk and Driving Mechanisms in a Natural Gas Development Field, Jeff Beck, PI. Conducted in the Fortification Creek area. Funded by Wyoming Reclamation and Restoration Center.**
- Coalbed Natural Gas Co-produced Water Impacts on Soils, George Vance, PI.**
- Innovative Remediation Strategies for Radium Ponds, Pete Stahl and Lisa Cox, Pls. Funded by the Wyoming Mining Association and UW School of Energy Resources.**

CURRENT RECLAMATION RELATED RESEARCH AT THE UNIVERSITY OF WYOMING

- Economics of Native Seed Production for Reclamation and Restoration Activities, Roger Coupal, Kristiana Hansen and Kristina Hufford, Pls. Funded by Wyoming Reclamation and Restoration Center.**
- Impacts of Soil Salvage and Stockpiling on Soil Fertility, Jay Norton, PI. Conducted in the Jonah Field, Pinedale Anticline and Wamsutter. Funded by BP, QEP, and Encana.**
- Improving Reclamation Methods in Southern Wyoming, Pete Stahl and Steve Williams, Pls. Funded by the Bureau of Land Management.**
- Improving Sagebrush Reclamation Technologies in Bentonite Minelands of the Bighorn Basin, Pete Stahl and Lyle King, Pls. Funded by the Bureau of Land Management.**

INDUSTRY SUGGESTIONS FOR RESEARCH

- 1. Document successful reclamation in steep topographic areas and areas considered to have low reclamation potential.**
- 2. Definition of areas of No Reclamation Potential.**
- 3. Clear definition of Low Reclamation Potential sites (LRP criteria and the practices and measures that can be implemented to successfully reclaim these areas.**
- 4. Establish a variety of monitoring protocols acceptable to both regulatory agencies and industry operators.**
- 5. Reestablishment of native grasses; methods for control of cheatgrass.**

INDUSTRY SUGGESTIONS FOR RESEARCH

- 6. Practices for reclaiming or enhancing Sage Grouse habitat.**
- 7. Reclamation strategies for produced water reservoirs.**
- 8. Ozone formation chemistry; driving forces in Upper Green River Basin vs. Powder River Basin**
- 9. Greenhouse gas recovery from produced water streams.**
- 10. Particulate Emissions; improved methods for reduction of dust associated with traffic on dirt roads.**

REESTABLISHMENT OF NATIVE GRASSES; CONTROL OF CHEATGRASS



**Successful restoration of severely disturbed lands:
Seeding essentials for reclaiming disturbed lands**

<http://ces.uwyo.edu/PUBS/B1204.pdf>

**Publication Author(s) : Calvin Strom, Jay Norton, Todd
Loubsky Hard Copy Price: 5.00**

HANDBOOK OF WESTERN RECLAMATION TECHNIQUES

<http://www.techtransfer.osmre.gov/nttmainsite/Library/hbmanual/westrecl/front-matter.pdf>

RECLAIMING/ENHANCING SAGE-GROUSE HABITAT

Energy development and wildlife habitat database organization. Pete Stahl and John Tanaka, Pls. Funded by Wyoming Department of Game and Fish.

Improving sagebrush reclamation in bentonite mining areas of the Bighorn Basin. Pete Stahl and Lyle King, Pls. Funded by the U.S. Bureau of Land Management.



REDUCING IMPACTS OF ENERGY DEVELOPMENT TO SAGEBRUSH WILDLIFE HABITATS IN WYOMING

Jeffrey Beck, Chad LeBeau, Amber Mason, and Kelsey Simpson

Publication # B-1209
Published: 10 October 2010

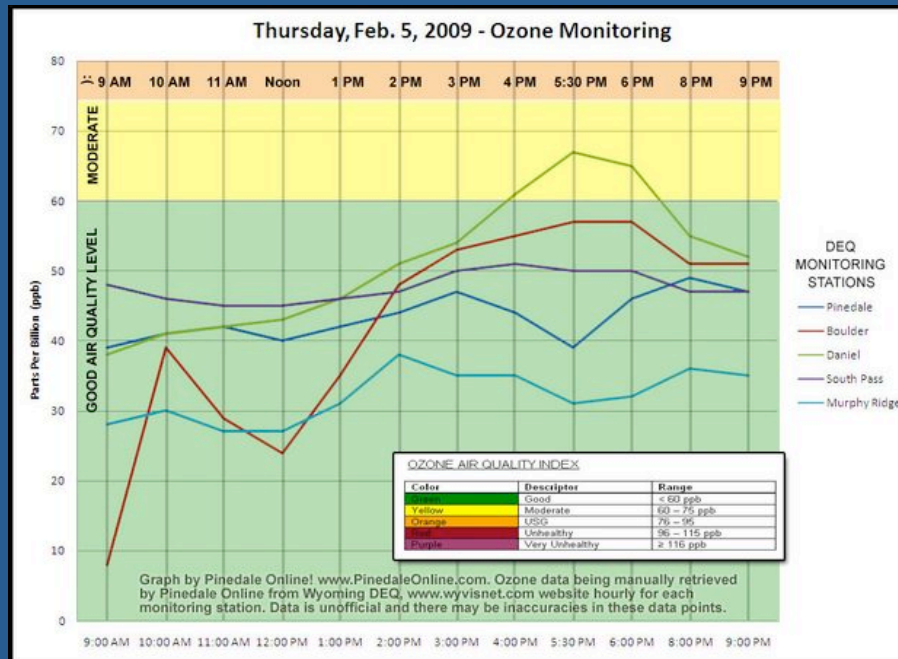
<http://ces.uwyo.edu/PUBS/B1204.pdf>



OZONE

Dr. Derek Montague, Associate Professor of Atmospheric Science
and
Dr. Robert Field, Lecturer, Environment and Natural Resources

Air Quality Studies in the Upper Green River Basin, Wyoming. Funded by
WYDEQ and the University of Wyoming School of Energy Resources.



ACKNOWLEDGEMENTS

**State of Wyoming
University of Wyoming Faculty
University of Wyoming Graduate Students
Bureau of Land Management
University of Wyoming School of Energy Resources
Wyoming Department of Game and Fish
Wyoming Mining Association
Anadarko Petroleum
BP
Encana
QEP
Horizon Wind Energy
Ucross foundation
Thomas Thorne Sage-Grouse Conservation Fund**