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Best Management Practices (BMPs): What?  
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### SLIDES: BMPs for Reclamation: Do We Know What Is Effective?

Peter Stahl

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# BMPs FOR RECLAMATION: DO WE KNOW WHAT IS EFFECTIVE ?



Pete Stahl

Wyoming Reclamation and Restoration Center  
Department of Renewable Resources  
College of Agriculture and Natural Resources  
University of Wyoming



# **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<sup>B-1202</sup>

<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

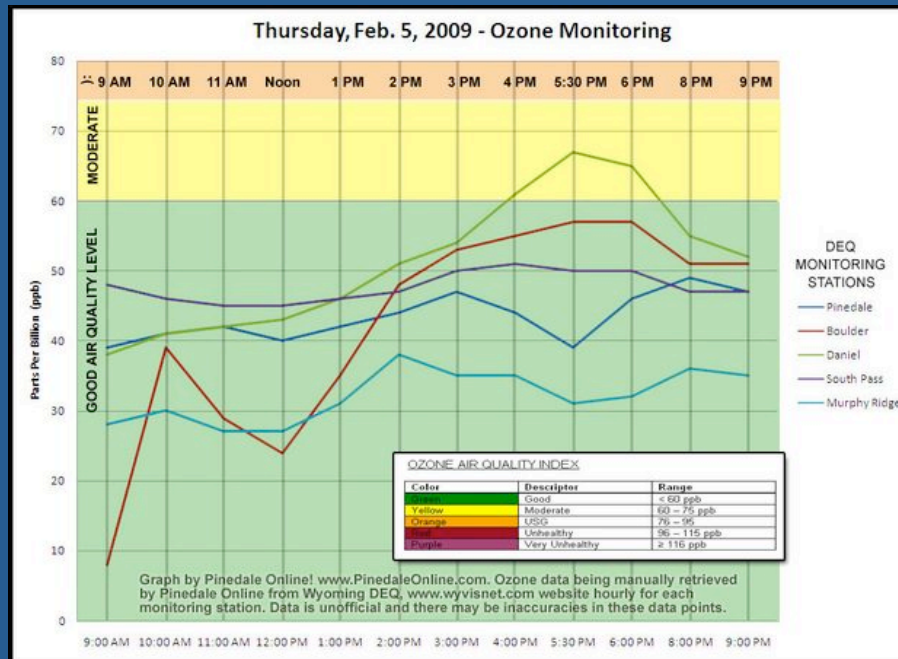
<http://ces.uwyo.edu/PUBS/B1204.pdf>



# OZONE

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