



Study Examines the Impacts of Coalbed Methane Development on Soil and Vegetation Resources throughout the Powder River Basin of Montana and Wyoming.

Background:

Energy development is both an economic asset and environmental concern for many in the western U.S. The recent increase in coalbed methane development (CBM) in the Powder River Basin (PRB) region of Wyoming and Montana has placed particular focus on the impacts of development on soil, water, and wildlife resources in the area.

The addition of water (a by-product of CBM extraction) to the land surface combined with surface disturbance associated with CBM development provides ideal conditions for non-native plant species. Restoration efforts need to be guided by data from inventory and monitoring of pre- and post-disturbance sites.

The U.S. Bureau of Land Management (BLM) sought assistance in collecting and analyzing data to determine impacts of CBM produced water as outlined in the 2003 PRB Final Environmental Impact Statement. Impacts may include vegetation changes from dry-land plant communities to wetland/riparian, loss of native vegetation and/or encroachment of invasive species, channel stability (erosion/deposition), and general channel health and productivity.

To assess the impacts on vegetation from CBM product water, the BLM has partnered with the USGS Northern Rocky Mountain Science

Center (NOROCK) to compare vegetation changes before and after disturbance and over time. The study will also examine disturbance caused by surface water discharge from CBM wells on surface soils, as well as impacts of subsurface discharge on vegetation and soils.

Study Area:

The Powder River Basin runs through southeast Montana and northeast Wyoming. This study includes only BLM lands within Wyoming.



Figure 1. Map of the Powder River Basin in northeast Wyoming and southeast Montana.

Methods:

NOROCK will assess the impacts on vegetation from leaking, seeping, and piping reservoirs, from discharge of CBM-produced water to ephemeral stream channels, and in subsurface drip irrigation systems (SDI). Researchers will locate study sites to represent a cross section of the types of CBM reservoirs and irrigation systems in place. Where possible, controls will include sampling before water is discharged into the reservoir or irrigation system.

Vegetation composition and cover, by species, will be measured during the natural peak growing season and, if necessary, during post peak season to capture the effects of supplemental water (from leaking reservoirs or irrigation). Vegetation will be sampled using multi-scale plots that have been used for other studies in this area and across the western U.S.

Near-surface soils will be sampled in conjunction with the vegetation sampling in relation to biological components. Near-surface soils will also be sampled for laboratory analyses of soil microbial groups based on molecular methods. If possible soil moisture probes will be used to track soil moisture changes at different rooting depths. Additional soil samples may be collected and analyzed for texture, salinity, pH, microbial characteristics, etc. in conjunction with other components of the project.

Deliverables:

Outputs from the project include:

- Quantitative data from the study.
- Written reports of interpretive findings and conclusions for each individual study.
- Presentations and informative materials for BLM land managers.

This interdisciplinary investigation and subsequent findings of land surface change and biologic, geologic and hydrologic effects of CBM development is providing resource managers, land owners, and developers with information to improve the management of land and water impacted by CBM development.



Mass wasting caused by reservoir leakage and subsurface downstream flow on a less permeable soil layer. Photo courtesy of Chong, 2008.

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The Northern Rocky Mountain Science Center is located in Bozeman, Montana and includes three field stations in Montana and one duty station in Wyoming. For more information on NOROCK's research, please visit <http://nrmsc.usgs.gov> or contact the Center Director: Jeff Kershner 406-994-5304 or jkershner@usgs.gov
