MUDDY CREEK/ATLANTIC RIM WORKING GROUP

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Muddy Creek Uplands Monitoring Plan

Introduction

The Environmental Impact Statement (EIS) and Record of Decision (ROD) for the Atlantic Rim Natural Gas Field Development project were approved in March 2007. As a result of this decision, operators are authorized to develop up to 1800 coal bed methane (CBM) wells and 200 conventional deep gas wells southwest of Rawlins, Wyoming. Performance-based goals were outlined in the ROD to describe the conditions that the Bureau of Land Management (BLM) and operators will attempt to achieve within the Atlantic Rim Project Area (ARPA). Operators and the BLM will work cooperatively towards demonstrating successful achievement of these performance goals.

A Muddy Creek Monitoring Group has been established to work towards implementing the performance based goal of maintaining adequate water quality, water quantity, species distribution, and aquatic habitat components for Muddy Creek sensitive fish. Participants of this monitoring group include the BLM, the Wyoming Game and Fish Department (WGFD), the Wyoming Department of Environmental Quality (WDEQ), the Little Snake River Conservation District (LSRCD), and the United States Geological Survey (USGS). In order to meet the performance goal specific to Muddy Creek, monitoring plans for individual sections of Muddy Creek have been developed and are being included in the overall monitoring plan. This document describes how the upland portions of the Muddy Creek watershed are be monitored.

Monitoring Area

The ARPA covers approximately 270,080 acres and is situated between the Colorado River and the Great Divide Basins. An estimated 69% of the ARPA drains into the Muddy Creek watershed, with smaller portions draining into the Great Divide Basin to the north and the Little Snake River to the south (Figure 1). As the performance goal that this monitoring plan addresses is specific to Muddy Creek habitat and fish distribution, the monitoring area only incorporates portions of the Muddy Creek watershed that are within the Atlantic Rim EIS area.

Muddy Creek drains into the Little Snake River and exhibits similar seasonal hydrograph fluctuations and sediment transport mechanisms (Goertler 1992). Streamflow is dominated by runoff originating from snowmelt in the spring followed by periods of low flow and intermittency during the summer months, sustained by thunderstorms and baseflow. Total annual precipitation within the ARPA ranges from 11 to 25 inches per year, with the most precipitation generally occurring along the eastern edge of the ARPA (Figure 2). Muddy Creek and its tributaries can exhibit disconnected aquatic habitat such as isolated pools during the low flow

periods. Precipitation events throughout the summer and into the fall, however, frequently result in short duration, high intensity stream flows that may reconnect aquatic habitat. These events are typically of short duration in the summer, but can last longer during the fall months and depending on precipitation can extend through the winter months.

Vegetative cover within the ARPA is predominantly sagebrush, with smaller areas of aspen forests, desert shrubs, greasewood flats, and juniper woodlands (Figure 3). Riparian vegetation consists mostly of grasses and sedges with some willow. Although it is estimated that only 1.5% of the ARPA is comprised of shrub-dominated riparian vegetation, this vegetative component is crucial for stabilizing streambanks and providing fish and wildlife habitat.

Water erosion potential is determined by a number of factors, including soil texture, slope, chemistry, and composition, and varies in severity throughout the ARPA. Soil types have been ranked by Natural Resource Conservation Service (NRCS) protocols according to their erosion potential. Disturbance in areas with elevated erosion potential rankings (moderate-severe or severe) are of particular concern because these soils have a higher potential to become mobilized and be transported to Muddy Creek.

The Muddy Creek watershed provides important habitat for four BLM-sensitive fish species, including the flannelmouth sucker, bluehead sucker, roundtail chub, and Colorado River cutthroat trout. Colorado River cutthroat trout occupy portions of Muddy Creek upstream of active oil and gas development and are therefore unlikely to be impacted by current development. The remaining three species utilize extensive warmwater habitat in lower Muddy Creek in areas that have been and are likely to be further developed for oil and gas. Accelerated erosion and sediment delivery into drainages as a result of oil and gas development can increase embeddedness of fine gravels, thereby reducing the spawning rate. In addition, increased sediment in waterways can change instream habitat characteristics and reduce the dissolved oxygen content by increasing stream temperatures, thereby impacting habitat and food sources of fish and other aquatic life. The Atlantic Rim EIS identifies oil and gas development as potentially having significant detrimental impacts to fish and other aquatic life.

Bower (2005) found positive associations between habitat features in Muddy Creek, such as pools, coarse substrates, and the sensitive fish populations mentioned above. A reduction in these habitat components due to accelerated erosion and sediment delivery to drainages as a result of surface disturbing activities would further jeopardize these species' populations. Currently, Upper Muddy Creek is being monitored for in-channel changes due to concerns with possible impacts as a result of oil and gas development. These monitoring programs include cross sections, longitudinal profiles, erosion pins, pool depths, embeddedness, and pebble and particle counts. In addition, photographs are taken at each location and water quality is monitored by USGS gage. Each monitoring site is visited yearly, and monitoring has taken place for the past five years. Initially, monitoring of Upper Muddy Creek was undertaken by industry. However, this area is no longer planned for development, and as a result, industry is currently not responsible for monitoring this area. Because of the value of consistent, repeated baseline data, the BLM has undertaken this responsibility and will continue to monitor the same locations on Upper Muddy Creek on a yearly basis. In the future, should oil and gas development again be proposed for the area, monitoring will again become the responsibility of industry.

Although in-stream monitoring is sufficient and effective in evaluating the magnitude and impacts of sediment delivery and accelerated erosion, once sediment has reached the stream such monitoring cannot identify sources of sediment. The upland monitoring discussed in this monitoring plan would identify and distinguish sources of sediment in areas where active oil and gas development is occurring, and would assist managers in selecting more effective and appropriate sediment retention methods, BMPs, and other infrastructure. The information collected as a result of this monitoring plan will be used to help ensure that the performance goal of maintaining adequate water quality, water quantity, species distribution, and aquatic habitat components is being attained.

Very little information has been collected on upland portions of the Muddy Creek watershed. In 2007, the Muddy Creek Working Group identified upland disturbance in areas such as wellpads, roads, and stockpile areas as potentially significant contributors of sediment to Muddy Creek and recommended the need for additional information on how runoff and erosion, as a result of upland development, is controlled. Numerous meetings and field trips have been held to discuss this monitoring need and to define how the monitoring should be implemented. The goal of this monitoring plan is to address erosion issues in the uplands before impacts reach Muddy Creek. Triggers that will initiate the adaptive management process for the performance goal for Muddy Creek sensitive fish include:

- changes in channel geomorphology, bank stability, and residual pool depths;
- changes in fish species distribution or population size;
- exceedence of Wyoming Water Quality Standards.

Best Management Practices

When implemented effectively and maintained on a consistent basis, BMPs can be extremely effective in controlling sediment movement. Initial stabilization of soil through the use of BMPs can reduce sediment runoff and prevent sediment delivery to drainages, and can accelerate re-vegetation of a site. In the ARPA, typical BMPs include wattles, check dams, sediment fences, and erosion control blankets. Culvert outlets are often armored with rip-rap to disperse the velocity of water. Sediment basins and other settling methods are sometimes used to reduce the amount of sediment traveling in runoff. For more information on appropriate BMPs, please see the WDEQ Water Quality Division's website at http://deq.state.wy.us/wqd/.

Monitoring Protocol

Submission of data from industry inspections of erosion control BMPs would be required. These data will include location, BMP type, condition, and maintenance needed (if any). These data should be submitted to the Rawlins Field Office twice yearly, at a minimum. Data should be collected once in the spring, following spring runoff, and once in the fall, prior to winter weather conditions. Additional monitoring is recommended following a precipitation event of greater than ½ inch in one hour as measured by the nearest weather monitoring station. The BLM will maintain collections of these records in order to incorporate all of the information that the companies have submitted, and compile the information into a database. The Working Group

will review the information, and if the Working Group determines that the performance goal that this plan is designed to achieve is not being met, modifications to this plan will be implemented Collecting information on upland sediment sources is a critical component in identifying impacts from erosion to Muddy Creek. The operators are required by the BLM to install and maintain BMPs to control erosion. Any BMPs that need replacing or maintenance should be noted, and remedied within a short time frame. Notification that the non-functional BMPs have been repaired must be submitted to the BLM within two weeks. These inspection reports should include, at a minimum, an electronic map depicting locations of BMPs and electronic spreadsheets, in a BLM approved format, describing their status, and if necessary, when degraded or improperly functioning BMPs will be repaired/replaced. The BLM will review the inspection reports and maintain collections of these records in order to incorporate all of the information that the companies have submitted. Inspection reports will be organized by groups of wells in units, or PODs. Although the BLM and the Atlantic Rim ROD require BMPs be installed, maintained, and monitored, the inspection reports may be similar to or the same as those generated for other BMP monitoring purposes.

Finally, a yearly site visit will be conducted by the Muddy Creek Working Group. The group will tour the area, looking at the channel cross sections and problem areas. This preliminary visit will be followed by a visit with the Working Group and industry. The purpose of the yearly onsite visit is to assist industry and the Working Group to cooperatively identify potential areas of erosion and sediment loading and provide recommendations to manage the problem. Examples of project design modifications are: BMPs that will prevent the movement of sediment into nearby waterways; avoidance/minimization measures, such as larger road offsets from channels; implementation of measures to mimic existing surface water runoff patterns; site-specific engineering controls; and other options that may be identified as issues are discussed.

Triggers

In order to determine whether more monitoring is indicated, and whether the performance goals are being met or not, the following have been defined as thresholds to initiate more monitoring and/or implement changes to this monitoring plan:

- A 20% failure rate of BMPs or a 5% recurring failure rate.

A failure of a BMP is defined as one that is no longer effective in retaining sediment or serving the purpose that it was designed to achieve. For example, if a hay wattle that was placed in a ditch to control sediment is no longer controlling the movement of sediment, then the wattle has failed as a BMP and must be replaced. If a BMP is determined to have failed, it must be remedied at the earliest convenience of the operator.

Should this threshold be met and additional monitoring is deemed necessary, the operators will be required to establish a number of monitoring locations to collect information at watershed outlets. These may be located in ephemeral channels if necessary. This information will include cross sections, longitudinal profiles, erosion pins, and photographs. For perennial systems, additional information such as embeddedness and pebble counts may be requested. The BLM will work with the operators on establishing appropriate monitoring locations should this additional monitoring be required; these sites will be located at the bottom of watersheds,

downstream from development. The goal of these sites is to determine potential cumulative impacts downstream of development by monitoring changes in bank shape, size, composition, and erosional features should BMP failure rates meet or exceed 20%. The monitoring sites will be used to determine changes in the watershed, and may be correlated to the rate of BMP failure and replacement in upland locations. A 20% change in bankfull cross sectional area of monitored drainages from year to year will trigger additional requirements.

Please note that these triggers will take into account anomalous water years and extreme water events before taking action. The triggers will only identify to the Muddy Creek Working Group that something has changed, and more discussion will be held prior to taking action.

Also, the 20% change in bankfull cross sectional area is not an aggregate of all cross sections; rather, if one cross section changes in area by more than 20% year to year then this would trigger the Working Group to meet and examine potential causes of this change. This would not necessarily indicate that action would be required on the part of the operators.

Conclusion

With the implementation of this monitoring plan, a better understanding of BMP effectiveness and maintenance within the ARPA will be achieved, which will facilitate planning of future development and adaptive management. The collection of this information will enable the BLM to adjust management actions as necessary. The information provided in the inspection reports will help the BLM to determine if the performance goal of maintaining adequate water quality, water quantity, species distribution, and aquatic habitat components for Muddy Creek sensitive fish is being met. Finally, a better understanding of which BMPs are effective in controlling sediment runoff and erosion in the Muddy Creek watershed will be achieved.

References Cited

Bower, M.R. 2005. Distributions and habitat associations of bluehead suckers, flannelmouth suckers, and roundtail chubs in the Upper Muddy Creek watershed of southern Carbon County, Wyoming. Master’s Thesis. University of Wyoming, Laramie.

Goertler, C.M. 1992. Sediment dynamics within channel and riparian zone types along a cold-desert Wyoming stream. Master’s Thesis. University of Wyoming, Laramie.

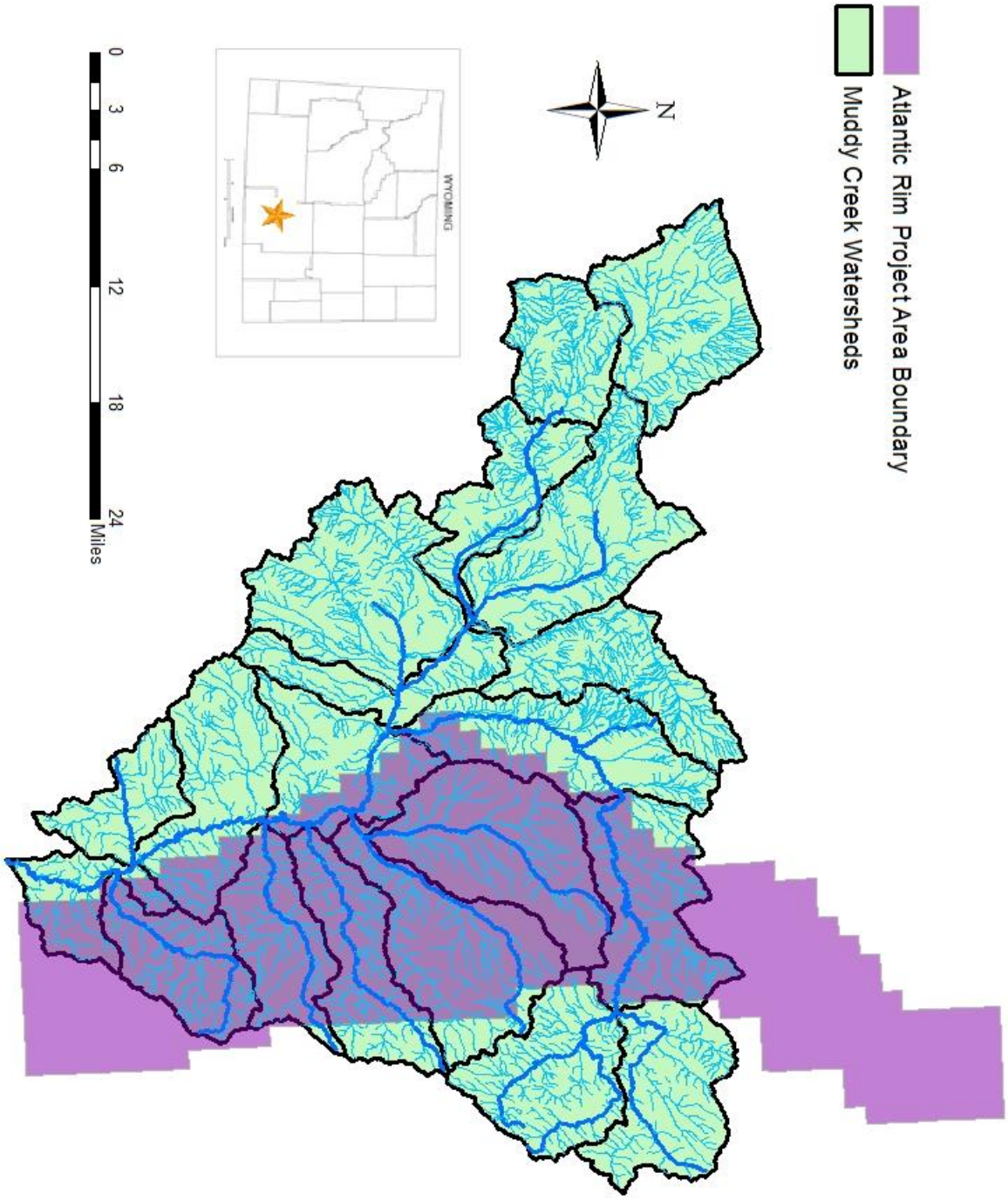

Figure 1. Muddy Creek watersheds, drainages, and the Atlantic Rim Project Area Boundary.