

ESSENTIAL HYDROLOGIC FUNCTIONS OF PLAYAS IN THE POWDER RIVER BASIN OF NORTHEASTERN WYOMING¹

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Abstract: The Surface Mining Control and Reclamation Act of 1977 (SMCRA) requires that surface coal mine operations return areas to a land use equal to or higher than that which existed prior to mining. In order to address the issues raised by the disturbance and later reclamation of playas located within active mining areas, the Wyoming Department of Environmental Quality, Land Quality Division (WDEQ/LQD) has been in the process of developing a guideline on depressions (playas) for coal mining operators. The draft guideline states:

"...depressions may only be allowed as a replacement feature, it is important that a premining survey be conducted to establish the characteristics and function. The hydrologic function of any depression is the critical concern in evaluating its suitability or success as a post mining feature." (emphasis authors)

This research has as its primary purpose to characterize the unique hydrologic functions of playas within the Powder River Basin of northeastern Wyoming by defining the interrelationships which exist between soils, vegetation and water and how these interrelationships will be important in the restoration of playa areas once they are drastically disturbed by mining activities.

A reconnaissance level survey will be conducted on sixty randomly selected playas during the summers of 1994 and 1995. Transition zones between different vegetation communities will be surveyed. A minimum of one soil sample will be collected from each upland area and each vegetation community within the playa. The soil samples will be analyzed to determine the soil type, soil color, and clay, silt and sand content. Measurement of the playa's length, width, and depth will be made in order to derive a relationship between the playa size and configuration and the water quantity which could potentially be stored within the playa throughout the year.

Detailed surveys will be performed on six playas during the summer of 1995. Ten 1m x 1m quadrants will be sampled in each visibly distinct upland and playa vegetation communities. Production data will be estimated using the Robel Pole method. Soil samples will be taken using a Giddings soil auger. Samples will be collected at one-foot intervals to a maximum depth of 6 feet at each vegetation quadrat. Field analysis will consist of: determination of horizons present, thickness, color, electrical conductivity, pH, reduced iron with alpha-alpha-dipyridyl, surface horizon textural class, dominant subsoil textural class, and depth to water table. Laboratory analysis will be performed on one soil profile per playa and will include determination of organic matter content, soluble salts, particle size distribution, and mineralogy.

At least one 4" diameter monitoring well and 2-2" diameter piezometers will be installed in each playa included in the detailed survey. A minimum of two sets of suction cup lysimeters will be installed in each playa for collection of soil water samples. Water quality samples will be collected monthly.

Each playa will be instrumented with a pressure transducer and data logger for continuous recording of surface water levels. Other instrumentation includes a rain gauge, a staff gauge and a Class A evaporation pan. Information gathered from this instrumentation will be used to estimate a surface water budget. Soil moisture readings will be

taken with a neutron probe to qualitatively estimate the subsurface hydrologic budget. The data will be used to estimate the effects of recharge (if any) from the playas on maintaining shallow aquifers.

Additional Key Words: Depression, hydrology, mined land, soils, vegetation.

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