

Mancos Shale Literature Review on the Colorado Plateau

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Background

A literature review entitled “Mancos Shale Literature Review on the Colorado Plateau” was prepared by Utah State University (Logan) for the Bureau of Land Management (BLM) under provisions of the Colorado Plateau Cooperative Ecosystem Study Unit program. It is provided as a printed report with an accompanying CD-ROM.

The main focus of the literature review project was to identify available information directly related to research of the Mancos Shale on the Colorado Plateau. The literature review was further focused on salinity and disturbance effects on the Mancos formation, in an effort to provide relevant, current information to regional land managers and staff specialists dealing with an array of management and planning issues on Mancos landscapes.

Most citations deal with salinity and geochemistry and, to a lesser degree, with erosion and sedimentation. Because the primary objectives of the project were to identify research related to disturbance associated with the Mancos formation, and our review identified only minimal references for direct research on the Mancos, additional citations were included that deal with disturbance in other arid western United States areas—principally in the Mojave Desert.

Discussion

Printed Reference Document

There are six reference categories in the printed report:

- Salinity–selenium–geochemistry
- Soils–erosion–sedimentation
- Disturbance
- Dust
- Reclamation–restoration
- Vegetation–soil crust–invasive species

Salinity, selenium, and geochemistry papers focus primarily on issues of water quality, salt transport mechanisms, speciation and dissolution paths, salt quantities and sources, effects on soils and other biota, geomorphic influences, surface runoff and erosional relationships to salt mechanics, and case examples of impact assessments.

The soils, erosion, and sedimentation citations overlap with other groups—principally disturbance; however the focal point of this section considers the natural dynamics of these features as they apply to the Mancos or Mancos-like

formations. These papers primarily discuss water infiltration and runoff rates, sediment yield, mass movement, vegetation cover, geomorphic features and effects on erosion and sedimentation, and fluvial mechanics.

The facets of disturbance research presented include damage to natural soil stabilizers, soil displacement, damage to vegetation, increased mechanical erosion, soil compaction (increased bulk density), reduced soil moisture, increased soil temperature, increased runoff, and increased sediment loading and effects on mammals and fish. There are multiple citations of direct measurements from various forms of disturbance on arid desert soils in the Mancos formation and in other areas of the southwestern United States.

Dust research presented focuses primarily on characteristics of dust sources and the mechanisms of movement, influence of biotic and physical crusts in dust suppression, relations of dust to disturbance, particle sizes, distribution and wind



Photo by Lynn Jackson

Figure. A researcher studies dust derived from Mancos Shale along highway I-70 near Moab, Utah.

velocities required to move dust, nutrient input and losses to soil biota from dust, and geomorphic effects.

Reclamation and restoration citations presented in the printed reference primarily consider reclamation of saline soils, treatment effects on soil biota, soil amendments and effects on runoff and sediment yield, natural revegetation patterns, and the role of mycorrhizae in revegetation in arid areas.

Vegetation, soil or microbiotic crust, and invasive species consider new plant species on the Mancos formation, the role of competition in arid environments, plant community relations, soil characteristics and nutrient effects related to invasive species, and the new concept of state and transition modeling of ecological sites and potential applications for management.

CD-ROM

The CD-ROM contains, in addition to the references available in the printed report, an extended literature review with more than 700 references in EndNote bibliographic management software format, copies of more than 260 papers in PDF format, and a document in Microsoft Word of the printed report.

With EndNote software, specific keyword searches may be performed on the complete data set in the CD-ROM. The software will also link to PDF files so the full manuscript can be read by placing the folder with the PDF files on the C drive. If you wish to access the PDF folder from a different location in your computer, you can do so by changing the URL address in the EndNote file.

Conclusions

With the scope of the bibliographic analysis, it is difficult to provide a quick summary. However, it seems some general conclusions can be drawn. The first conclusion is that there has not been an abundance of direct research conducted on the Mancos Shale regarding the effects of disturbance, particularly related to the rangelands managed by the BLM. There is much research, however, on the effects of irrigated lands on the Mancos formation, which have limited applicability to BLM's management concerns.

Fortunately, this situation is being addressed by research being carried out primarily by the U.S. Geological Survey near Montrose and Grand Junction, Colorado, and near Moab and Caineville, Utah. Within the next 2 or 3 years we should have additional quantified information on how soils, vegetation, and salinity on the Mancos formation react to disturbance and reclamation measures.

A third conclusion that could be drawn from the literature is that the present anecdotal "wisdom" in some arenas that our disturbance activities "can't hurt this formation" seems false. The research literature rather conclusively indicates that disturbance on saline, fine-grained soils in arid environments increases salinity loads, sedimentation, compaction, dust generation, loss of vegetation and soil crusts, and appreciably affects water retention and infiltration capacities and subsequent vegetative growth.

Although these landscapes may seem inhospitable and relatively devoid of vegetation, we need to be extremely careful when implementing management or planning actions associated with them.

See below for further information or to obtain a copy of this report and CD-ROM. The report is available from the Moab Field Office, or is available for loan from the BLM library.

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