USDA United States Department of Agriculture

Soil and Plant Science Division

Technical Soil Services Report

Southwest Soil Survey Region

Klamath Falls, OR MLRA Soil Survey Office

Fen Investigations in Klamath County, Oregon

Purpose

The Klamath Falls MLRA Soil Survey Office is providing assistance to the US Forest Service (USFS) on an effort to inventory and monitor fens (peat-accumulating wetlands fed by mineral-enriched groundwater) in northern Klamath County, within the Fremont-Winema National Forest. The Forest Service is developing a protocol that can be used to measure fen attributes and assess changes over time, with the objective of better understanding fen resiliency and response to management practices. The area of interest includes approximately 2,364 acres of wetlands and riparian areas, some of which include fens. A user guide for assessing functioning condition of fens in the Sierra Nevada and Southern Cascade Ranges in California (Weixelman and Cooper, 2009) provides background for the inventory and monitoring effort in northern Klamath County. Fens occur worldwide, with peat accumulation driven primarily by high ground-water tables that create anoxic conditions and slow the decomposition of organic matter (ibid, 2009). Like all wetlands, fens occupy a small proportion of the landscape, yet they are disproportionately important in the ecosystem services they provide, such as forage for wildlife, nutrient cycling, flood attenuation, and regional biodiversity enhancement; they are also a major sink for atmospheric carbon (Gorham, 1991; Mitsch and Gosselink, 1993). The relationship between hydrologic regimes and peat accumulation creates and maintains fens. For the purposes of this inventory, one of the criteria for identifying a fen is 40 cm of organic soil material within 80 cm of the soil surface.

The Soil Survey Office provided draft soil survey spatial and tabular data from an ongoing initial soil survey project (OR683). Chris Gebauer (MLRA Soil Survey Leader) and Brooke Hogan (Soil Scientist) spent a day in the field on August 24th working with Forest Service scientists to evaluate soil properties in the study area. This also provided an opportunity to evaluate soil survey project mapping and map unit design, in the context of client needs and management concerns.

Key Outcomes/Products

USFS staff used the preliminary soil survey data from the OR683 Soil Survey Area, in addition to remotely sensed imagery, to identify areas of interest/probability for fens. The areas of high probability for fens corresponded very well with initial soil survey mapping. Additionally, on-site field work by Forest Service ecologists is confirming that fen locations are closely associated with the Stirfry soil series. In the initial soil survey mapping, the areas identified by ecologists as fens are mapped as a complex of Cosbie and Stirfry soils, with Cosbie soils occurring in drainageways and open depressions and Stirfry soils occurring on fens in drainageways.

By conducting field visits with Forest Service ecologists, MLRA soil survey office staff were able to confirm that, at least so far, the field criteria involving soil properties (e.g., organic and mineral soil material textures and soil color) used for fen identification and the protocols developed to measure fen attributes are being applied consistently and correctly.

Future Goals/Conclusions

By assisting with this Fen Inventory and Monitoring project, the Klamath Falls MLRA Soil Survey Office will continue to have opportunities to evaluate soil survey project mapping, map unit design, soil properties, and soil-site correlations. MLRA Soil Survey Office staff will also be available to review and provide input as needed on future technical documents and project proposals related to fens in the area. There may also be opportunities to conduct Dynamic Soil Properties studies, especially if/when long-term fen monitoring sites are selected. Finally, this work is highlighting the need to continue work on Ecological Sites (e.g., there is no existing Ecological Site in MLRA 6 that correlates well to the Stirfry soil). The types of questions being asked about fen ecosystem dynamics and changes due to management practices are well-suited to the types of information that would be provided in an Ecological Site Description (ESD) with a state-and-transition model. The types of data currently being collected in this fen inventory and monitoring project may be of use in the future as we develop and revise ESDs.

References:

Gorham, E. 1991. Northern peatlands: role in the carbon cycle and probable responses to climatic warming. Ecological Applications 1:182–195.

Mitsch, W.J., and J.G. Gosselink. 1993. Wetlands. Second edition. John Wiley, New York, NY.

Weixelman, D.A., and D.J. Cooper. 2009. Assessing proper functioning condition for Fen areas in the Sierra Nevada and Southern Cascade Ranges in California: a user guide. Page Gen. Tech. Rep. R5-TP-028. Vallejo, CA.

A slice of soil (upper 60 cm) from a fen shows the slightly decomposed organic material from moss in the upper part.

The stark contrast between fen and upland at this location is not always so clear in the project area, and hydrophytic vegetation is not always correlated to the presence of a fen.

There are numerous species of moss in the fens.

This meadow is mapped as a complex of Cosbie and Stirfry soils. The team here is discussing soil properties as they relate to fen identification.