Soil Mapping in Southwest Alaska

Stephanie Schmit and Tony DeMarco

USDA-Natural Resources Conservation Service; Homer, Alaska

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

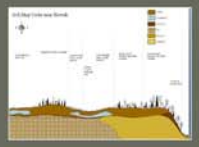
Introduction

An understanding of the soil resource is critical to land managers and scientists. Soil mapping inventories soil properties and describes their extent across the landscape. Surveys in southwest Alaska currently underway include the Nushagak-Mulchatna watershed and the Togiak National Wildlife Refuge.

Figure 1. A well drained floodplain soil formed in stratified silty and sandy alluvium along the Nushagak River corridor.

Methods

A soil survey is a resource inventory where field scientists walk the landscape observing differences in soil types, vegetation, landform, and hydrology.



At representative sites, soil properties and plant communities are documented. A model is constructed relating soil, vegetation, and landform properties.

Maps relating the model are digitized in a GIS.

The maps are linked to tabular databases that contain the properties of the soils, their potential uses, and their limitations.

Soil mapping is done at different scales based on potential for development and resource management concerns. Below are examples of these.

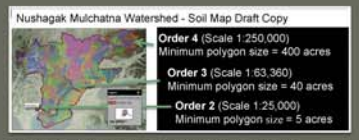


Figure 2. Soil map of the Nushagak-Mulchatna Watershed with three orders or scales of soil mapping.

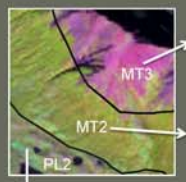
Togiak National Wildlife Refuge

An order 3 (1:63,360) soil survey will be completed in 2012 for selected watersheds, outlined in black below, mainly associated with the headwaters of the Togiak, Goodnews, and Kenektok rivers.

Figure 3. Soil survey area for the Togiak NWR in the Ahklun Mountains Major Land Resource Area.

Figure 4. A typical mountain slope catena in Togiak NWR.

Soil components are grouped into map units that will provide useful interpretations for Togiak NWR.



Upper mountain slopes support dwarf shrub vegetation, including many berry species, which are an important bear food source.

Mountain backslopes support alder, a nitrogen (N) fixer; functioning as a N source in the ecosystem.

Rolling till plains produce ponds and lakes which are important fish habitat and waterfowl breeding ground.

Nushagak-Mulchatna Watershed

This soil survey covers 8.3 million acres and spans across the Bristol Bay Lowlands, the Ahklun mountains, and the Yukon Kuskokwim highlands. Soils across these regions differ due to their unique landscape and climate.

Figure 5. Soil survey area for the Nushagak-Mulchatna watershed with Major Land Resource Area boundaries.

The Bristol Bay Lowlands landscape consists of relatively wet, gently sloping to rolling plains of glacial drift covered with loamy and silty eolian deposits up to several meters thick.

Figure 6. A typical eolian plain map unit and associated soil components.

Soil Properties of the Bristol Bay Lowlands

Typic Dystrocryepts form on higher positions on the landscape that are drier and less insulated by organic material. Wind blows snow off these convex positions, adding to the lack of moisture and soil development. A thin snowpack and organic layer result in a soil profile that responds quickly to air temperature.

In contrast, Histic Cryaquept soils are lower down on the slope in concave and linear positions where water and snow collect and organic matter accumulates. This insulates the soil, resulting in a lower mean annual soil temperature and a longer lag time relative to changes in air temperature. Below are soil temperature graphs from two soil profiles.

Soil and air temperature changes over a 2 year period

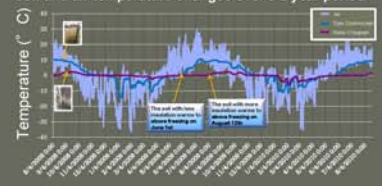


Figure 7. Soil temperature at 50 cm below the soil surface and air temperature from August 2008 to August 2010.

Permafrost

Permafrost in the Bristol Bay Lowlands is common but sporadic and is often associated with peat mound formation. Peat mounds are a type of microtopography that forms when the ground is pushed up as permafrost expands below it. There are many factors that contribute to the existence of permafrost in an area with an average annual temperature above freezing. The thick organic layer that insulates the frozen soil plays a large role.

Figure 8. Permafrost peat mounds

Conclusions

Climate, topography, parent material, and organisms all play a role in soil formation. This is the reason the distribution of soil types is so closely related to landscape patterns and vegetation communities. Soil scientists and ecologists use these relationships to delineate map unit boundaries and determine soil types.

Soil mapping in southwest Alaska provides baseline data throughout remote regions. This data is intended to assist in land use management and enhance the understanding of the landscape.

For further information

Please contact *stephanie.schmit@ak.usda.gov*. More information on this and related projects can be obtained at *http://www.ak.nrcs.usda.gov/soils/index.html*.