

# 2007 University of Alaska Combined Research and Extension Plan of Work

## High Latitude Soils- AFES

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### V(B). Program Knowledge Area(s)

#### 1. Program Knowledge Areas and Percentage

- 102 20% Soil, Plant, Water, Nutrient Relationships
- 104 20% Protect Soil from Harmful Effects of Natural Elements
- 122 20% Management and Control of Forest and Range Fires
- 123 20% Management and Sustainability of Forest Resources
- 125 20% Agroforestry

### V(C). Planned Program (Situation and Scope)

#### 1. Situation and priorities

The Arctic and Subarctic zones are expected to sustain the greatest impact in the wake of global climate change. In view of the vast acreage in Alaska and the potentially high carbon storage capacity in the boreal forest, an understanding of black spruce-dominated sites is important for both ecological modeling and for land management. Global climate change may result in warmer and dryer conditions in boreal forest regions. In 2004, forest fires destroyed the largest expanse of forest in 50 years. The impact of recent and future fires on boreal forest soil carbon bioavailability will require studies that will describe and model soil respiration following these fires. Additionally Alaska is known for its vast deposits of petroleum and mineral products. Extraction of these products will continue to impact soil resources and the habitat those resources support. SNRAS/AFES soils research programs have provided new knowledge in each of these priority areas over the past 30 years with potential development of ANWR, the proposed Gas-Pipeline. And the Pebble Mine to name a few, additional soils research will be required to ensure sound management of Alaska's soil resources.

### V(D). Planned Program (Assumptions and Goals)

#### 1. Assumptions made for the Program

SNRAS/AFES will maintain programs in soil science that will be supported by these assumptions and will follow a number of basic assumptions:

Global climate will not remain constant and current models predict increases that will impact northern latitudes first and hardest. Warming climates will increase incidence and magnitude of forest fires in the boreal forest of interior Alaska.

Resource extraction of petroleum and mineral will continue and without proper management will impact Alaska's soil resources in a negative way.

While agriculture is not predicted to be a key economic force in Alaska farming, at some level will continue and will require new knowledge of soil resources and their role in providing nutrients, water, and structure for good production and environmental protection.

#### 2. Ultimate goal(s) of this Program

Soil Research at SNRAS/AFES will have as a long-term goal, the development of a knowledge base that will address global climate change, resource extraction impacts on soil resources, and interactions between global warming, wildland fire, and soil carbon bioavailability. The Agricultural and Forestry Experiment Station's work in the soils area will focus on the following topics: Soil properties as they relate to soil quality, ability to resist and recover from disturbance, and soil productivity.

Origin, formation, and classification of high-latitude soils.

Plant nutrition and soil fertility.

Permafrost soil characteristics, limitations, and potential uses.

Soil management, land reclamation, and remediation of contaminated soils.

Soil responses to climate change.

Soil biology and processes of boreal ecosystems in a management context.

Long-term soil data

### V(F). Planned Program (Activity)

#### 1. Activity for the Program

High latitude soil research over the next five years will center on the following research topics and activities:

Characterization of black spruce forest soils in boreal regions of Alaska in terms of the organic carbon pool and relationship with forest management practices. The Arctic and Subarctic zones are expected to sustain the greatest impact in the wake of global climate change. Because of the vast acreage in Alaska and the potentially high C storage capacity in the boreal forest zone, an understanding of black spruce dominated sites is important for both ecological modeling and for land management.

Study soil carbon balance and nitrogen dynamics following disturbance by wildfire and logging in Interior Alaska. Evaluate whether and how wildfire changes the quality of organic matter remaining at the soil surface.

Soil respiration following wildfire in lowland black spruce forests, in upland black spruce and mixed hardwood forests.

Evaluate relationship between local climate and soil carbon balance.

Evaluate effects of agronomic management practices (fertility, tillage, etc.) on soil carbon levels. Yield and quality of barley and bromegrass will be evaluated as affected by zero/minimum tillage, to determine optimal N fertilizer rate, and cutting practice, and to determine soil carbon quantity and quality affected by different land management and tillage, and to quantify the potential mineralizable N in agricultural land under different management practices.