Vegetation Monitoring – Scoping Meeting
Vital Signs Monitoring Program
Southwest Alaska Network
16 April, 2003

Purpose

Provide a forum for National Park Service resource managers and scientists to discuss ideas and options for building an ecologically-based, issues-relevant, and affordable vegetation component of its integrated long-term monitoring program in the Southwest Alaska Network (SWAN).

Meeting Objectives

1) Discuss and identify candidate parameters for vegetation monitoring at the landscape scale; and

2) Discuss and identify approaches and options for sampling vegetation

Background Material Contained in this Document

1. Rationale For Long-term Monitoring In Southwest Alaska National Park Units And The Role Of This Scoping Meeting

2. Mandates Underlying the Need for Long-term Monitoring and Goals for Vegetation Monitoring

3. Conceptual Foundation for Monitoring

4. Physical Environment Overview of Network Parks

5. Vegetation Overview of Network Parks

6. List of Invited Workshop Participants

1. Rationale For Long-term Monitoring In Southwest Alaska National Park Units And The Role Of This Meeting

National Park Service Inventory and Monitoring Program- After completing a review of the natural resources management program of the National Park Service (NPS) in 1992, the National Academy of Sciences stated that if the NPS is to meet the scientific and resource management challenges of the twenty-first century, a fundamental metamorphosis must occur within its core. That metamorphosis materialized when NPS implemented a strategy to standardize natural resource inventory and monitoring on a programmatic basis throughout the agency. The effort was undertaken to ensure that the approximately 270 park units with significant natural resources possess the resource information needed for effective, science-based managerial decision-making and resource protection. The national strategy consists of a framework having three major components:

(1) completion of basic natural resource inventories in support of future monitoring efforts;
(2) creation of experimental Prototype Monitoring Programs to evaluate alternative monitoring designs and strategies; and
(3) implementation of operational monitoring of selected parameters (i.e. "vital signs") in all natural resource parks.

Knowing the condition of natural resources in national parks is fundamental to the Service's ability to protect and manage parks. National Park managers across the country are confronted with increasingly complex and challenging issues, and managers are increasingly being asked to provide scientifically credible data to defend management actions. Many of the threats to park resources, such as invasive species and air and water pollution, come from outside of the park boundaries, requiring an ecosystem approach to understand and manage the park's natural resources.

A long-term ecosystem monitoring program is necessary to make better informed management decisions, to provide early warning of abnormal conditions in time to develop effective mitigation measures, to convince other agencies and individuals to make decisions benefiting parks, to satisfy certain legal mandates, and to provide reference data for relatively pristine sites for comparison with data collected outside of parks by other agencies. The overall purpose of monitoring is to develop broadly based, scientifically sound information on the current status and long term trends in the composition, structure, and function of the park ecosystem. Use of monitoring information will increase confidence in manager's decisions and improve their ability to manage park resources.

National Park Service policy and recent legislation (National Parks Omnibus Management Act of 1998) requires that park managers know the condition of natural resources under their stewardship and monitor long-term trends in those resources in order to fulfill the NPS mission of conserving parks unimpaired. The following laws and management policies provide the mandate for inventorying and monitoring in national parks:

The mission of the National Park Service is:
"*...to promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purposes of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations*" (National Park Service Organic Act, 1916).

"*The Secretary shall undertake a program of inventory and monitoring of National Park System resources to establish baseline information and to provide information on the long-term trends in the condition of National Park System resources. The monitoring program shall be developed in cooperation with other Federal monitoring and information collection efforts to ensure a cost-effective approach*" (National Parks Omnibus Management Act of 1998)

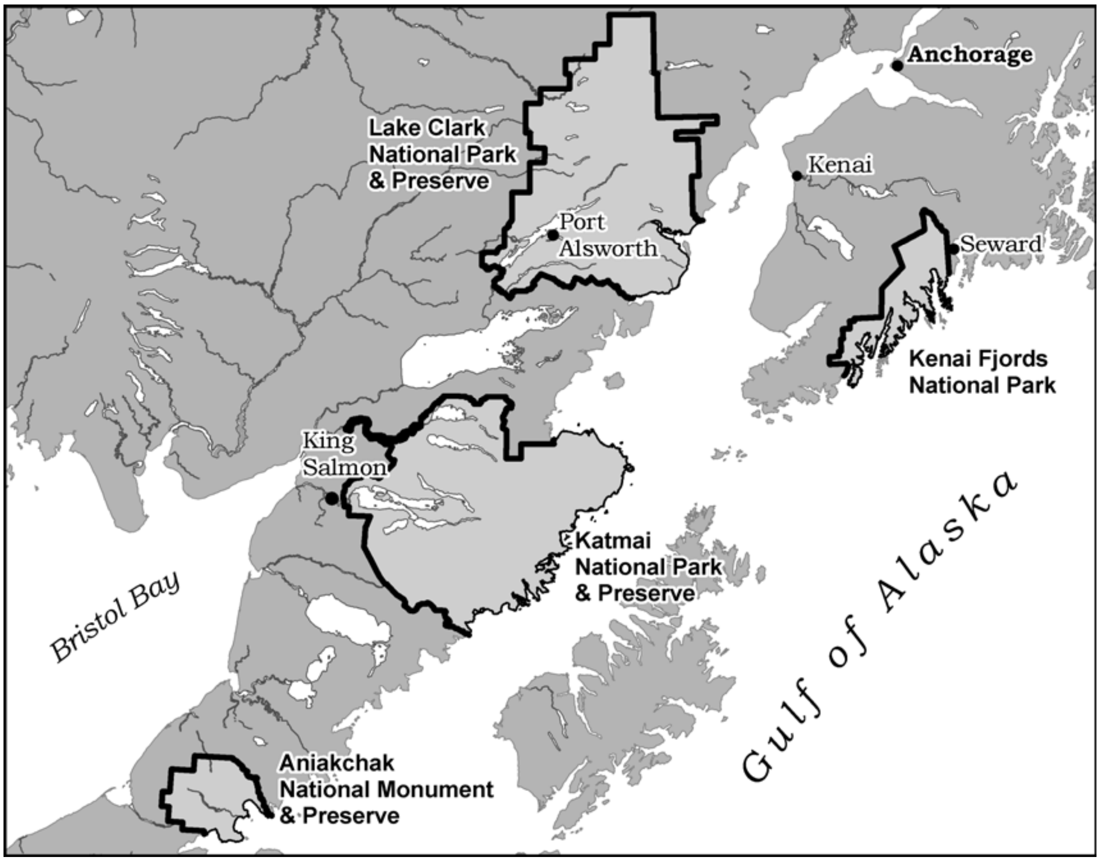
"*Natural systems in the national park system, and the human influences upon them, will be monitored to detect change. The Service will use the results of monitoring and research to understand the detected change and to develop appropriate management actions*" (2001 NPS Management Policies).

Southwest Alaska Network- In Alaska, national park units have been assigned to 4 inventory and monitoring networks. The networks were based on ecological similarity and physical proximity. The southwest Alaska network consists of 5 units:

(1) Alagnak Wild River (ALAG),
(2) Aniakchak National Monument and Preserve (ANIA),
(3) Kenai Fjords National Park (KEFJ),
(4) Katmai National Park and Preserve (KATM), and
(5) Lake Clark National Park and Preserve (LACL).

The timeline for designing the Southwest Alaska Network monitoring program and writing a monitoring plan is approximately 3 years. Natural resources staff from each of the parks and staff from the NPS Alaska Support Office jointly form a core planning team, known as the *Technical Committee* (TC). This committee is chaired by the Network Coordinator and reports to the Park Superintendents and Regional I&M Coordinator.

The Southwest Alaska Network began operations in 2000 with the planning of biological inventories for vascular plants, freshwater fish, and small mammals. The target objective of biological inventories is to document the occurrence of 90% of the expected species in network parks. Baseline knowledge is weak for SWAN parks, and these inventories represent the first systematic efforts to document species occurrence for these taxa in these parks. Biological inventories will occur over four years with data analysis and final reports scheduled for 2005.



Scoping Workshops- Planning for long-term "vital signs" monitoring began in January 2002. The planning process is built around a series of mini-scoping workshops and meetings where the Technical Committee and scientists from other agencies collaborate in reviewing our current state of knowledge, identifying factors affecting park ecosystems, and identifying candidate attributes to monitor. This scoping meeting is the third in a series of such meetings and workshops to be held between August 2002 and May 2003.

Scoping meetings for coastal and freshwater resources were held in August and November 2002. The meeting formats proved highly successful in generating useful discussion about Southwest Alaska Network park ecosystems and monitoring strategies. A summary document is compiled for each workshop and circulated for review among the participants. These summaries provide a record of discussion and will be used by the Technical Committee to make decisions concerning the selection of “vital signs” or sampling design for monitoring. We hope to build on that process with this vegetation session and successive workshops.

In planning for long-term monitoring, it is useful to have some idea of the financial and logistic constraints. The ambitious nature of the NPS monitoring program and its relatively limited budget make careful design of the program critical. Effort must be strategically directed toward areas that give the most return of useful information for time and money invested.

Beginning in 2004, the total projected annual operating budget for the SWAN monitoring program will be 1.4 million dollars. All program costs including administration and salaries, data management, and operational monitoring must be supported by this budget. Core permanent employees of each network may include the Coordinator, Biometrician, and Data Manager. Hence, it is reasonable to assume that the operating budget for this network will be roughly 1.0 million dollars.

2. Mandates Underlying the Need for Long-term Monitoring and Goals for Vegetation Monitoring

NPS Mandate:- " . .to preserve for the benefit, use, and inspiration of present and future generations . . ". .

SWAN Park and Preserve Mandates

<u>Katmai National Park and Preserve</u>- "for the protection of the ecological and other scientific values of Naknek lake and the existing monument….." "To protect habitats for, and populations of, fish and wildlife, including, but not limited to, high concentrations of brown/grizzly bears and their denning areas; to maintain unimpaired the water habitat for significant salmon populations; and to protect scenic, geological, cultural, and recreational features."

<u>Alagnak National Wild River</u>- "To protect and enhance the values which caused it to be included in said system…." These values are the river's outstandingly remarkable scenic, fish and wildlife, and recreation attributes. (ANILCA)

<u>Aniakchak National Monument and Preserve</u>- "To maintain the caldera and its associated volcanic features and landscape, including the Aniakchak River and other lakes and streams, in their natural state; To protect habitat for, and populations of, fish and wildlife, including, but not limited to, brown/grizzly bears, moose, caribou, sea lions, seals, and other marine mammals, geese, swans, and other waterfowl….." (ANILCA):

<u>Lake Clark National Park and Preserve</u>- "To protect the watershed necessary for the perpetuation of the red salmon fishery in Bristol Bay; To maintain unimpaired the scenic beauty and quality of portions of the Alaska Range and the Aleutian Range, including volcanoes, glaciers, wild rivers, lakes, waterfalls, and alpine meadows in their natural state; To protect habitats for and populations of fish and wildlife, including, but not limited to caribou, Dall sheep, brown/grizzly bears, bald eagles, and peregrine falcons." (ANILCA:

<u>Kenai Fjords National Park</u>- "To maintain unimpaired the scenic and environmental integrity of the Harding Icefield, its outflowing glaciers, and coastal fjords and islands in their natural state; and to protect seals, sea lions, other marine mammals, and marine and other birds and to maintain their hauling and breeding areas in their natural state, free of human activity which is disruptive to their natural processes." (ANILCA)

Protect and Manage Natural Resources

Maintain landscape features, ecosystems, communities, populations, trophic structure, and productivity within the historic bounds of natural variability

Understand Natural Resources and Ecosystem Dynamics

Conduct Resource Inventories

Conduct Long-term Monitoring

NPS Service-wide Vital Signs Monitoring Goals

1. Determine status and trends in selected indicators of the condition of park ecosystems to allow managers to make better-informed decisions and to work more effectively with other agencies and individuals for the benefit of park resources.

2. Provide early warning of abnormal conditions of selected resources to help develop effective mitigation measures and reduce costs of management.

3. Provide data to better understand the dynamic nature and condition of park ecosystems and to provide reference points for comparisons with other, altered environments.

4. Provide data to meet certain legal and congressional mandates related to natural resource protection and visitor enjoyment.

5. Provide a means of measuring progress towards performance goals

SWAN
***Overall Network Goals*:**

I. Establish baseline reference conditions representing the current status of park and preserve ecosystems; and

II. Detect changes over time, particularly, any changes that are outside the natural variation in these baselines.

Vegetation Monitoring Goals:

I. Observe structure and composition of plant communities and their spatial distribution on the landscape.

II. Document rates and types of change in vegetation in response to environmental factors and human effects across spatial (landscape) and temporal scales.

III. Monitor plant communities that are ecological keystones or highly valued by stakeholders

IV. Understand how vegetation patterns and animal distribution are related to each other, and predict how changes in vegetation affect animals.

3. Conceptual Foundation for Monitoring

Clearly, the Southwest Alaska Network embodies a vast, diverse, and complex landscape. Monitoring at large geographic scales requires an understanding of relationships between components and processes of interacting ecosystems and the human activities that affect them. The network has defined a draft conceptual foundation to serve as a guide for monitoring.

> *"The Southwest Alaska Network and its surrounding landmass, freshwater systems, and coastlines are an interconnected set of ecosystems that must be monitored as an integrated whole. Within this interconnected whole, at time-scales of years to decades, we assert that climate, natural disturbance, biotic interactions, and human activities are the most important driving forces in determining ecosystem structure and function. Consequently, our monitoring program must address the interplay of multiple forces, which occur at a variety of spatial and temporal scales, in order to understand the landscape and changes in structure and function."*

This conceptual foundation is basis for a program that will be:

- **Ecologically-based** and **issues-oriented** with emphasis on assessing long-term and cumulative effects rather than short-term and isolated effects

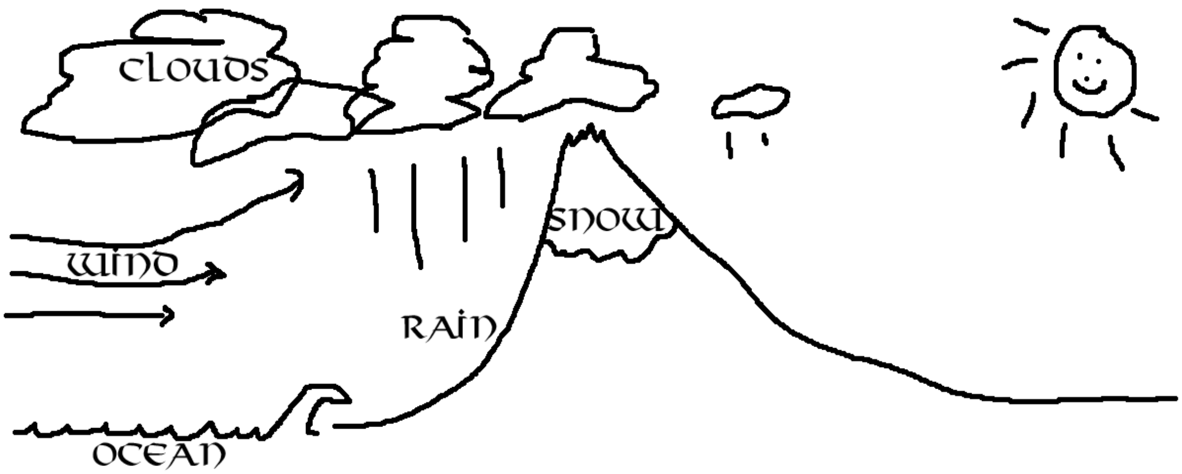
- **Interdisciplinary** and incorporates disciplines of biology, hydrology, geomorphology, and landscape ecology and at multiple scales (e.g., coarser-grained network-scale, and finer-grained park-scale).

- **Integrative** and blends "top-down" approach for characterizing ecological systems, with "bottom-up" understanding of ecosystem processes and functions

4. Overview of the Physical Environment of Network Parks

In December 2002, several SWAN Technical Committee members and others met to discuss the major drivers of landscape pattern and change in SWAN. Understanding the influence and magnitude of different drivers of change, the collective influence of multiple drivers, the ecological consequences of the changes, and the feedbacks between ecosystems and their physical environments are all critical to developing strategies for long-term monitoring. This section contains background material compiled for this meeting and highlights the major observations made by participants.

There are two major forces acting at the landscape scale in network parks: weather and tectonics. These forces are laid on mountains rising from the ocean. The south and east faces of these parks are steep mountains rising abruptly from the ocean. Western slopes tend to be gentler depositional slopes in the lee of major storm patterns. The steep mountains catch storms curling ashore from the Gulf of Alaska, and cool the rising air masses. Consequently, large volumes of moisture fall on the upwind slopes of these parks, as rain in the lower elevations and as snow at higher elevations. Maritime air masses are relatively warm and have a low flux in annual temperature range.



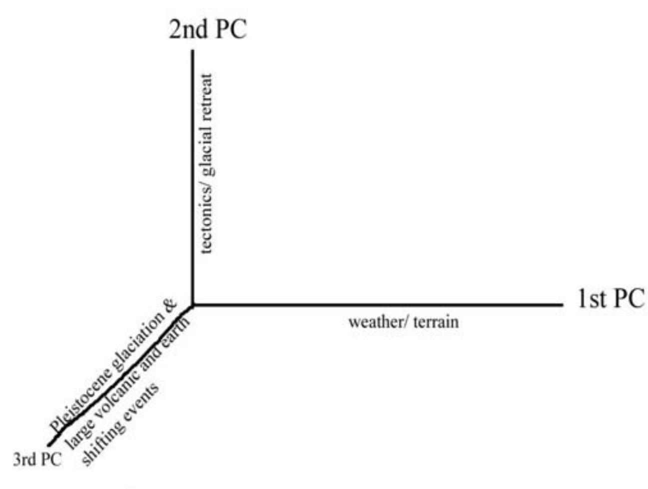
The steep mountains of this region are built by the Pacific Plate subducting under the North American Plate along the edge of the Gulf of Alaska. This is a very active tectonic zone, with NW movement of the Pacific Plate at 2-3 inches annually. The diving action of the Pacific plate results in numerous earthquakes and contributes to many active volcanoes. The narrow band of coastal lands is constantly dropping from tectonic activity, and then gradually rebounding. (Note—this is different than movements in the interior such as along the Denali fault, where land is moving side to side, but not up and down) Volcanic eruptions dump ash on surrounding terrain to various depths, and occasionally melt glaciers, causing flooding. A rough count in the vicinity of SWAN parks reveals over 100 earthquakes of magnitude 6.0 and greater in the past century, and 15 active volcanoes, several of them erupting multiple times in the past 100 years.

Most of this region was covered with extensive ice sheets several times during the Pleistocene, and the remnant glaciers and vegetation patterns are still adjusting to Holocene warming and retreat of the icesheets. Large-scale volcanic eruptions within the past 10,000 years have also left vast expanses of tephra.

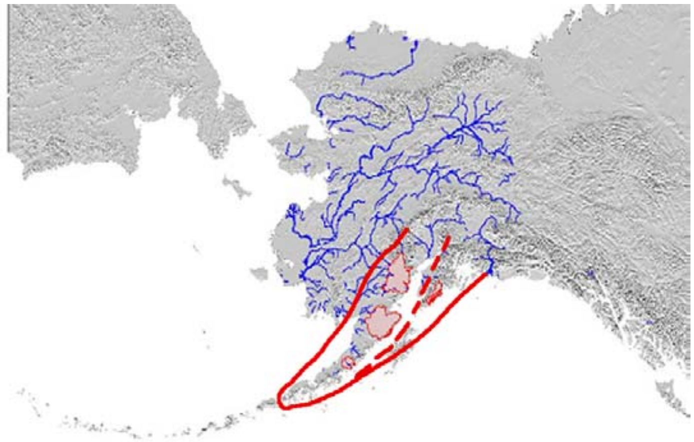
Vegetation communities are distributed in the SWAN country in response to at least three temporal patterns. The first principle component (thinking in ordination space) would be the distribution of vegetation types on the terrain, in response to the weather patterns. This pattern is annual to decades long. In general terms, this means forested types along the coastal margin, alder thickets above that, and a narrow alpine tundra zone, which grades into rock and ice around 3000'. The gentler slopes of the lee side support mixed spruce/hardwood forests, low shrubs and dwarf shrub tundra and scattered wetlands.

The second temporal component is succession and adaptation to small tectonic and volcanic events and glacial recession. This time frame is decades to centuries. These perturbations result in the coastal lagoon and salt marsh complexes and beach ridges, forest (primarily spruce) lines which drown or regrow with slight elevation changes, and vegetation responses to ash deposition which ranges from a sprinkling to deposits over a foot deep. Vegetation succession in areas of glacial retreat is the typical primary succession of *Sterocaulon* and mosses, fireweed and legumes, alder, scattered spruce, and finally a closed shrub or forest community. Other disturbances in this component are fire, where common, the recent spruce bark beetle infestation, and perhaps human induced global climate changes.

The third temporal component is long term dispersal and succession from large infrequent events like the Pleistocene ice sheets and large volcanic events like the Aniakchak eruption about 5000 YBP. The Katmai eruption of 1912 may also fit into this component. This time frame is centuries to millennia. It includes the slow invasion of Sitka Spruce southward on Kodiak, which also may be occurring on the Shelikof coast of the Alaska Peninsula. A fair amount of soil-building processes accompany this component. It may also include natural fluctuations in the climate regime.



Maritime influence is a key driver of landscape pattern in this network. Maritime patterns are more unstable, directly tied to the larger oceanic forces and change on a shorter temporal scale than continental climate patterns. Marine systems also seem to be cyclic, while the continental changes are more directional. When viewed as a funnel across the spatial landscape, the primary gradient is marine to continental weather, with precipitation and wind as primary factors, and temperature a secondary factor. These



weather patterns are substantially modified by terrain being built and shifted by the Aleutian megathrust fault, leading to microhabitats and changes in temperature regimes on meso to micro spatial scales. One way this is expressed is in the amount of Holocene glaciation, with little to no glaciers down in Aniakchak, mountain glaciers in Katmai, mountain and valley glaciers in Lake Clark, and an icefield in Kenai Fjords. The Alaska Range and the Chugach Mountains are positioned to catch the curl of the Aleutian lows out of the Gulf. Rain shadows develop in the lee of both mountain ranges, leading the Kenai Peninsula to be semi boreal, and the western slopes of the Alaska Range to be fully boreal at the Stony River, grading into subarctic down the Alaska Peninsula. This leaves Cook Inlet ("a strange body of water") to function largely as a huge semi-boreal lake with tides, but not as a major marine influence

5. Vegetation Overview of Park Units

Aniakchak- Aniakchak volcano: Large expanses of cinder and tephra plains surround the crater itself. This area is largely barren, with scattered willow and forb patches around the edges and in lower drainages. Inside the caldera, wet herb and sedge meadows are concentrated near Surprise Lake. Patches of willow, *Calmagrostis,* and *Empetrum* heath are scattered around the floor of the crater.

Coastal side: The Cinder river drainage to the north and east of the caldera has relatively lush willow stands and grass/forb meadows with patches of *Empetrum* heath or wetlands. Alder patches grow in the valleys above the cinder plains. The upper Meshik River valley appears to be dominated by wetlands, and probably *Empetrum* heath. The coastlands are probably dominated by *Calamagrostis* and forb meadows, alder patches and *Empetrum* heath.

Alagnak River and Katmai- Bristol Bay lowlands, moraines and lakes: Wetlands support communities dominated by sedges, mosses and dwarf shrubs. Wetland and pond complexes provide nesting and rearing habitat for many species of waterfowl and shorebirds. Slight ridges are better drained and support "subforests" of white spruce and Kenai birch, with alder thickets and patches of *Calmagrostis* grasslands. The southernmost extent of white spruce on the Alaska Peninsula is just south of King Salmon. Glacial moraines support spruce and birch/balsam poplar forests with low and dwarf shrub communities in the understory and openings. The unit around Lake Colville supports wetlands and fairly dense spruce forests on the higher ground and side slopes.

Lacustrine deposits and old lake terraces west of Brooks and Naknek Lakes are vegetated with sedge/low shrub tundra and open alder stands.

<u>Mountains:</u> The Kejulik and Cape Douglas Mountains are permanently glaciated, with valley glaciers nearly reaching the Shelikof coast. Below barren, exposed ridgetops and outcrops, patches of alpine tundra and low shrubs find footholds in sheltered niches and shallower patches of ash from the 1912 Katmai eruption. Lower slopes support dense alder stands, with a few Sitka spruce on the coastal headlands. Several valleys around Novarupta and Katmai, and slopes on the eastern side of the range, are still covered with deep ash deposits that remain unvegetated. The Walatka mountains and Kamishak highlands support dwarf shrub and alpine tundras at higher elevations, with dense alder on lower slopes and cottonwood stands along the streams in the lowest valleys. Beaver help shape floodplains of streams from sea level to the upper limits of alpine low willow. Portions of the large west-flowing river valleys are forested with white spruce, with balsam poplar along the floodplains.

<u>Coastlands:</u> are generally unstable, but adapted to repeated disturbances, and support early successional communities of sedges, aquatic forbs and grasses. Alder and elderberry patches provide nitrogen for the soils, and sheltered sites support stands of Sitka spruce.

Kenai Fjords- Gravel beaches grade into a supra-tidal community of beach ryegrass, beachpea and *Hockenyna* with scattered flowering forbs such as iris and jacob's ladder. Protected lagoons, like the backs of James and Beauty Bay have rich beds of goose tongue, a favorite spring food for bears. Exposed rocky cliffs have tufts of grasses and perennial forbs, some richly fertilized and aerated by puffin nests.

Alder stands and Sitka spruce/hemlock forests begin immediately above the storm tide zone. Alder is a rapid invader in disturbed zones, following avalanche tracks from the alpine down to tide line. Scattered grasses and forbs find a foothold under the shrubs. Alder provides nitrogen for recently de-glaciated soils, enriching the environment for spruce invasion. Sitka spruce appears to move into de-glaciated terrain within 20 years of ice retreat. Recently developed Sitka spruce stands have uniform aged trees with a thin moss ground cover, scattered grasses and shrubs such as salmon berry and *Menziesia*. Older stands, growing through the last glacial maximum, have spruce of varying ages, thick moss ground cover and on the tree limbs, with alder, salmonberry and Devil's club in openings. It appears that there were spruce forest refugia perched in high valleys above the ice limits that are now providing seed sources miles up-valley of the glacial terminus forests.

Alder thickets and open stands extend above the forested zone along the coast up to a narrow band of alpine tundra, which quickly grades into bare rock and ice. Glacial retreats have formed several wide valleys, which have broad braided floodplains. On the coast these floodplains are covered with stands of alder and willow, while cottonwood is an additional component at the Exit Creek floodplain.

Lake Clark- Coastal side: The Cook Inlet coastline is characterized by a narrow band of coastal salt marshes in Tuxedni and Chinitna Bays and scattered marshes and lagoons along the outer coast. Coastal zones without marshes have long gravel beaches or bedrock cliffs rising abruptly out of Cook Inlet. The salt marshes are a rich zone of sedges and some grasses with varying tolerance to salt water flooding, and form an early spring food source for bears grazing along the beaches. Much of the Lake Clark coast appears to be rising from tectonic movements and narrow bands of young spruce are establishing themselves into the *Elymus* grass community back of the beaches. The depositional flats and lower mountainsides behind the beaches are covered with spruce forests and alder thickets. Both white and Sitka spruce grow along the coast, with Sitka generally south of the Johnson river, and white spruce to the north. Conifer forests have multi-aged trees with thick moss understory, devil's club, salmonberry and scattered alder. Scattered stands of spruce rise out of a sea of alder, especially around the Tuxedni coast and above the dense spruce forest. Alder thickets grow above the spruce zone, thinning out into *Calamagrostis* meadows at the upper limits. The alpine tundra zone is very narrow on the coastal side of the mountains, dominated by *Luetka* and *Empetrum* and forbs. Tundra yields to bedrock and ice.

Lake side: The western side of the park is dominated by a series of large long lakes with their eastern extents in the Alaska Range, and pushing out to the terminal moraines from the most recent advances of large valley glaciers. Low ridges and subdued mountains lie between the lake systems. The northern part of the park, by the Stony river, is boreal in character, with black spruce, muskegs, aspen and birch, and wildfire. Further south, vegetation is a mosaic of spruce and mixed spruce/birch or cottonwood forests, paper birch, low shrubs dominated by dwarf birch, dwarf shrub tundra with ericaceous shrubs, scattered wetlands and alpine tundra. Vegetation patterns are arrayed in response to soil texture and drainage patterns from a complex glacial and alluvial history.

Mountainous spine: The center of the park is primarily glacial ice and bedrock or till. Most valley glaciers are in retreat, leaving large expanses of moraines and ground till, which is slowly revegetating with mosses and lichens, fireweed and Dryas, willow and alder. An ecosystem of note is the expansive shallow wetlands along the Neacola river, which runs into Chakachamna Lake. This valley provides rich habitat for beaver, moose, nesting waterfall and bear. The wetlands appear to be dominated by sedges and willows, and are maintained by flooding and beaver activity.

6. Invited Participants, Vegetation Monitoring - Scoping Workshop

Bennett, Alan
Coordinator
National Park Service
Southwest Alaska Network
2525 Gambell St.
Anchorage, AK 99501
907/257-2628
alan_bennett@nps.gov

Berg, Ed
Ecologist
Kenai National Wildlife Refuge
P.O. Box 2139
Soldotna, AK 99669
907/260-2812
Edward_Berg@fws.gov

DeVelice, Rob, Ecologist
USFS, Chugach National Forest
3301 C Street, Suite 301
Anchorage, AK 99503
907/271-2837
rdevelice@fs.fed.us

Hamon, Troy
Chief of Resources Mgmt and Fishery Biologist
Katmai National Park & Preserve (Aniakchak/Alagnak)
King Salmon, AK 99613
907/246-2121
troy_hamon@nps.gov

Knuckles, Penny
Chief of Resources Management
Lake Clark National Park & Preserve
Port Alsworth, AK 99653
907/781-2113
penny_knuckles@nps.gov

Martin, Eveline
Resource Management Specialist
Kenai Fjords National Park
PO Box 1727
Seward, AK 99664
907/224-2114
ian_martin@nps.gov

Martin, Ian
Wildlife Biologist
Kenai Fjords National Park
PO Box 1727
Seward, AK 99664
907/224-2146
ian_martin@nps.gov

Mortenson, Dorothy
Data Manager
National Park Service
Southwest Alaska Network
2525 Gambell St.
Anchorage, AK 99503
907/257-2626
dorothy_mortenson@nps.gov

Oakley, Karen
Consultant to NPS-Alaska Vital Signs Monitoring Program
Alaska Science Center
USGS-BRD
1011 East Tudor Rd.
Anchorage, AK 99503
907/786-3579
karen_oakley@usgs.gov

Putera, Judy
Wildlife Biologist
Lake Clark National Park and Preserve
Port Alsworth, AK 99653
907/781-2107
judy_putera@nps.gov

Roland, Carl
Botanist
Denali National Park & Preserve
201 1st Avenue
Fairbanks, AK USA 99707
907/455-0672
carl_roland@nps.gov

Spencer, Page
Ecologist
NPS-Alaska Support Office
2525 Gambel St
Anchorage, AK 99518
907/257-2625
page_spencer@nps.gov

Shephard, Michael
Ecologist
US Forest Service, State and Private
Forestry
907/743-0637
mshephard@fs.fed.us

Tande, Gerald
Vegetation Ecologist
Alaska Natural Heritage Program
707 A Street
Anchorage, Alaska 99501
907-257-2787
angft@uaa.alaska.edu

Wesser, Sara
Regional I&M Coordinator
National Park Service
2525 Gambel St
Anchorage, AK 99503
907/257-2557
sara_wesser@nps.gov