FEDERAL AID
FINAL PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
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Project Duration: 1 July 2012 – 30 June 2013

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Report Due to HQ: December 5, 2013

I. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY

Project Objectives:

OBJECTIVE 3: JOB/ACTIVITY 1B: Develop, implement and maintain searchable on-line system for species of concern data.

Accomplishments: We worked with Axiom Consulting and Design to complete the new AKNHP webpage and a web-based searchable spatial database for rare species. The results are accessible at http://aknhp.uaa.alaska.edu/ and click on **Animal Data Portal**. The primary goal of the zoology program data portal is to assimilate and synthesize information concerning rare and invasive species for use in land management and species conservation applications in Alaska.

OBJECTIVE 4: Develop habitat maps and descriptions of the habitats and ecological processes that support the G1-G3 and Category 1 and 2 nongame species
JOB/ACTIVITY 4B: The next step is to develop descriptions of the habitats and ecological processes that support the Category 1 and 2 and G1-G3 species.

Accomplishments: We had planned to use the LANDFIRE ecological systems map (landcover map) for our base map. But it had a poor accuracy and we were not able to use it to complete OBJECTIVE 4: JOB/ACTIVITY 4B. To remedy the lack of a statewide landcover map, we mosaicked together all available maps into two maps that, together, cover all of Alaska: 1) Vegetation map and classification northern, western and interior Alaska (Figure 1), and 2) Vegetation Map and Classification: Southern Alaska and Aleutian Islands (Figure 2).

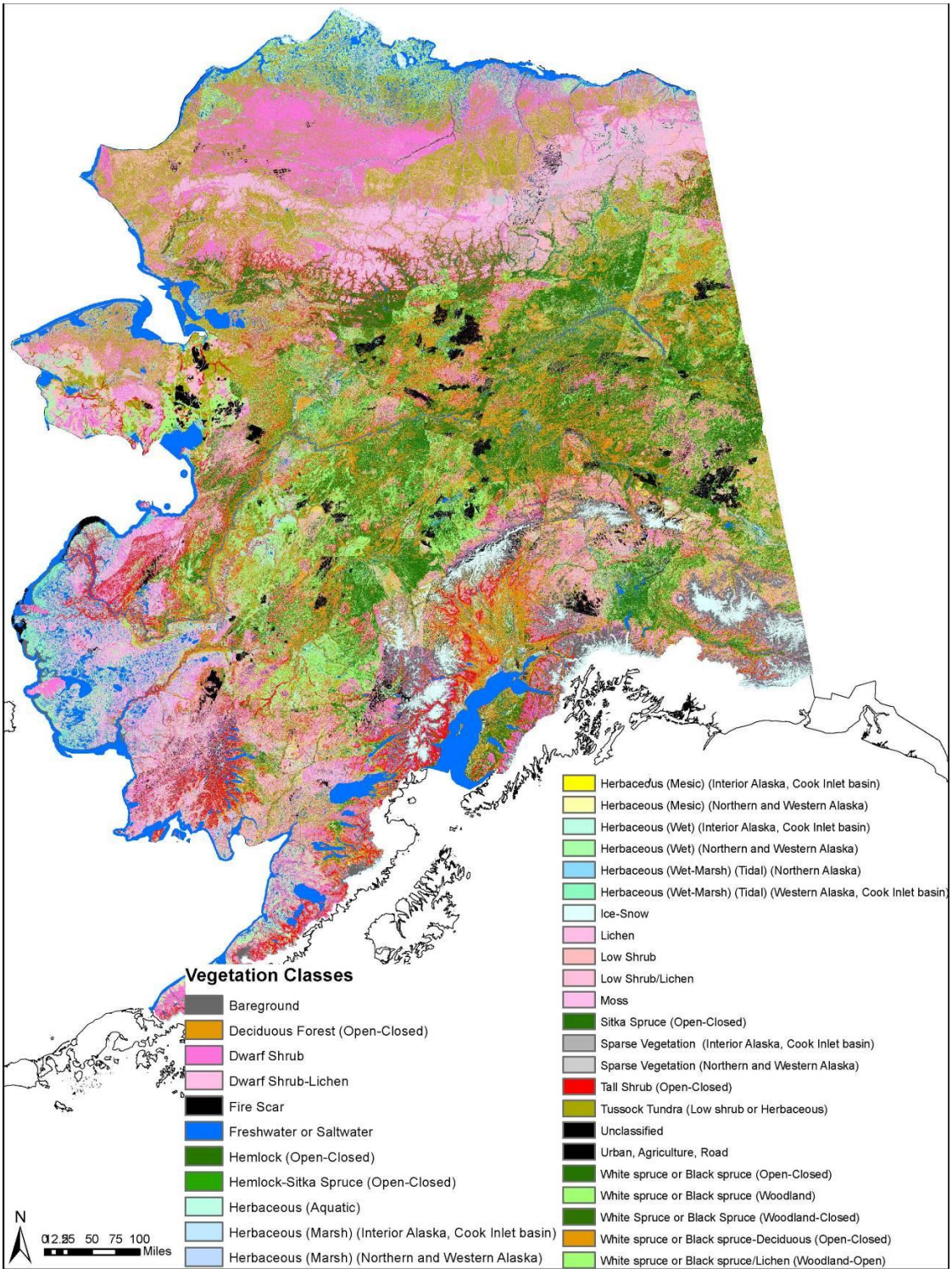


Figure 1. Vegetation map and classes for Northern, Western and Interior Alaska.

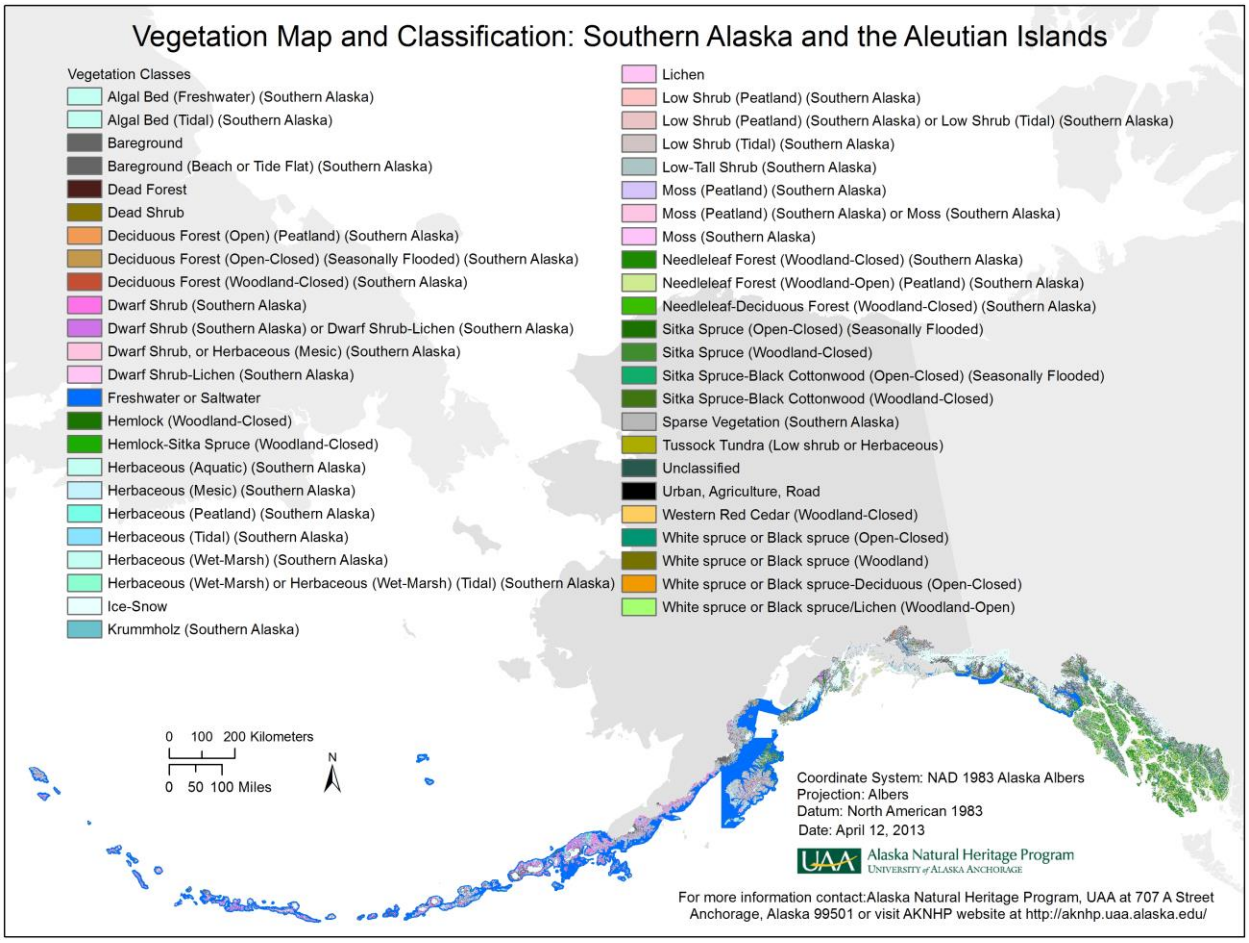


Figure 2. Vegetation map and classes for Southern Alaska and the Aleutian Islands.

We developed the following products for each map:

- Coarse-scale vegetation map (accessed through the AKNHP website: http://aknhp.uaa.alaska.edu/)
- Key to coarse-scale vegetation classes
- Coarse-scale class descriptions
- Fine-scale vegetation map (accessed through the AKNHP website: http://aknhp.uaa.alaska.edu/)
- Fine-scale legend

All the products can be downloaded at http://aknhp.uaa.alaska.edu/ecology/landcover-maps/

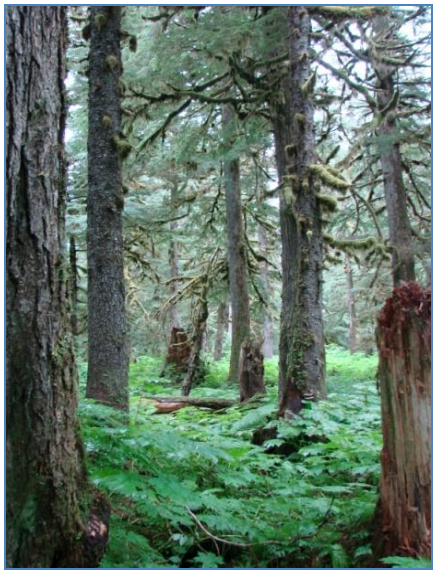
Once the landcover maps were completed we were able to complete OBJECTIVE 4: JOB/ACTIVITY 4B to develop descriptions of the habitats and ecological processes that support the Category 1 and 2 and G1-G3 species. The results are in the report: Alaska Biophysical Settings and Plant Associations of Conservation Concern by Keith Boggs, Brian Heitz, and Lindsey Flagstad. They will be downloadable on the web page Ecosystems and Plant Associations of Conservation Concern http://aknhp.uaa.alaska.edu/ecology/landscapes-and-plant-associations-of-conservation-concern/ in the near future. The results are in final review by various ecologists in ADF&G, USDA Forest Service, USDI BLM, USDI NPS, and USDI FWS.

The following is an example of one description.

Floodplain Old Growth Sitka Spruce Forest Plant Association

Conservation Status Rank: G3 S3

Introduction
Old growth Sitka spruce forests on floodplains and outwash plains are characterized by high canopy cover of mature Sitka spruce, an abundance of snags and downed wood, and a diverse shrub and forb layer (Old-Growth Definition Task Group 1991). The floodplains of southeast Alaska may contain the highest densities of the largest old growth Sitka spruce trees in North America. These forests are recognized as reservoirs of biodiversity, (Franklin 1989) contain relatively high levels of endemism and species richness, provide important winter refugia for birds and mammals, and support unequalled anadramous fish runs (Samson et al 1989, DellaSalla et al. 1994, 1996).



Figures 1 and 2: Old-growth Sitka spruce floodplain forests along the Stikine River, Alaska.

Distribution
Sitka spruce frequently occurs in many forest types ranging from northern California through southeast and south central Alaska to Kodiak Island. In Washington and Oregon, the Sitka spruce zone is generally only a few kilometers wide and at elevations below 150 meters within the coastal fog drip zone (Franklin and Dyrness 1973, Hemstrom and Logan 1986). In Alaska, the Sitka spruce zone is wider and extends to higher elevations (up to 700 m), and includes well-drained alluvial fans, floodplains, outwash plains, coastal beach fringes, and steep erosional slopes. It achieves dominance in climax old-growth stands on only a small portion of the landscape (Martin 1989). Albert and Schoen (2006) estimate that there are 2,350 km² of productive old growth on valley floors in the Alexander Archipelago, much of which may include Sitka spruce forest on floodplains (Figure 3).

Figure 3. Distribution of floodplain old-growth Sitka spruce forests across Alaska. Note that the polygons in this map are exaggerated so the reader can see them.

Vegetation

Sitka spruce dominates the overstory and western hemlock may be common, usually providing less than 25% cover. When co-dominant, western hemlock canopies occupy the layer beneath the spruce (Martin 1989, Vierick 1992). Red alder and black cottonwood are occasional in the overstory.

Old growth Sitka spruce forests support several different plant communities associated with different disturbance regimes and moisture conditions (Martin 1989). An abundance of *Alnus* and predominance of undeveloped soils (*e.g.* entisols or inceptisol) are indicative of younger sites or sites with recent sediment deposition from flooding. *Oplopanax horridus* shrubs are common in the understory.

The presence of soil development (spodic soils) is indicative of low magnitude flooding rather than high magnitude events, and *Vaccinium* shrubs (along with *Oplopanax*) provide high cover. Other herbaceous plants include *Tiarella trifoliata, Rubus pedatus, Calamagrostis nutkaënsis, Streptopus* spp. and ferns *Gymnocarpium dryopteris, Dryopteris dilitata,* and *Athyrium felix-femina*. Bryophytes are usually abundant on the forest floor and within the canopies. *Lysichiton americanum* is often present on the forest floor in areas with poorly drained and seasonally wet soils. Floodplains and deltas on the outer Pacific coastal side of islands that are subject to salt spray, high winds, and storms, the shrub layer may be sparse or absent and the herb layer dominated by *Calamagrostis nutkaënsis.*

Environmental Characteristics

Mainland river systems are mostly glacial fed from large, nearly continuous glaciers of the Coast Range. Streams on the islands are generally very short (less than 25 km). Some of these streams are fed by high mountain glaciers, but most originate form high surface rainfall runoff. Soil and air moisture is high and fires are rare. When they do occur, fires rarely reach the spruce canopy, and burn out in the humid understory conditions below.

Soils: The underlying soils are mostly comprised of alluvial sand and gravel deposited during flooding events and are well drained. Flooded soils usually show little soil profile development and are often classified as Entisols or Inceptisols (Martin et al. 1995). Older sites may support spodisols.

Climate: Southern Alaska has a cool wet maritime climate (Gallant et al. 1995, Nowacki et al. 2001). The Coastal Rainforests mean annual precipitation ranges from 135 to 390 cm with 80 to 600 cm falling as snow. Average summer temperatures range from 7 to 18 °C; average winter temperatures range from -3 to 3°C. Consequently, these forests have developed under relatively short, cool, and extremely wet growing seasons. Rainfall and temperature show highly variable pattern dependent upon proximity to mainland ice-fields, the Pacific Ocean, topography, and regional weather patterns.

Succession

Old growth Sitka spruce forests form on both outwash plains and floodplains. Outwash plains are formed by glacial streams that spread sediment across wide areas as a massive plain. Two primary factors create and sustain outwash plains: (1) during summer, there are rapid and drastic changes in water discharge rates, and (2) a large sediment supply in the river that is deposited on the plain.

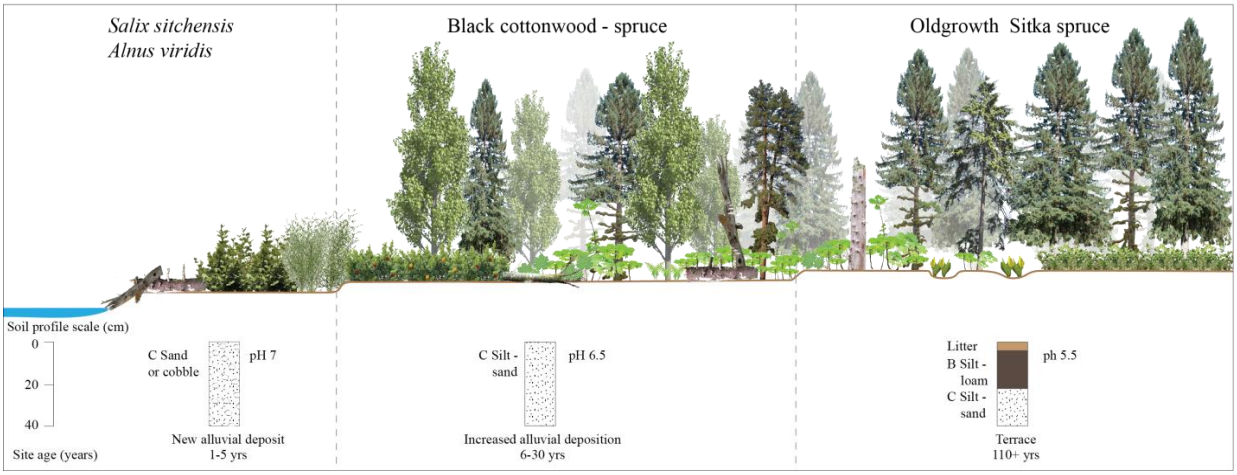


Figure 4. Idealized floodplain seral sequence.

In contrast, floodplains are mostly non-glacial consisting of meandering or straight active streams, abandoned channels, and alluvial terraces. The formation of new land in floodplain ecosystems is well documented (Leopold and others 1964). Along a meandering river, alluvium typically is deposited on convex curves in the river channel. The opposing concave bank is cut, providing sediment for deposition on convex curves downstream and creating a series of similar bands of alluvial deposits. The channel thus meanders laterally across the floodplain. Vegetation growing on new deposits near the river may be contrasted with that on older deposits inland to recognize and measure successional processes. Alluvium also is deposited on the soil surface

(flooding), groundwater, and precipitation and terraces become progressively drier as they are vertically and horizontally removed from the active channels.

On both outwash plains and floodplains, new alluvial bars or abandoned stream channels are colonized by tree, shrub, and herbaceous species including black cottonwood, Sitka spruce, alder and willow.The next successional stage includes black cottonwood and/or Sitka spruce forests with an alder or bryophyte understory. The tall shrub component of the early-successional stages diminishes rapidly, probably because of decreased light from the dense tree overstory. Black cottonwood does not regenerate and, consequently, dies out within 150 years, whereas Sitka spruce exhibits healthy regeneration and dominates the sites with a multilayered old-growth tree canopy. Western hemlock ultimately invades the sites, typically codominating with Sitka spruce.

Wind is an important factor causing change in the vegetation on floodplains. While individual treefall due to high wind speed is common throughout the forest, stand level disturbances are less common (Martin 1989) and are usually associated with fall and winter storms (Ott 1993). High rainfall and shallow root systems contribute to the susceptibility of Sitka spruce and western hemlock to windfall. Treefall results in canopy gaps and alteration of the microclimate of the understory plants below. Although seedlings of both spruce and hemlock are common, conditions generally favor spruce regeneration. Most regeneration of spruce and hemlock occurs on logs (Schrader 1998), which are nutrient rich habitats where seedlings are less susceptible to floods and avoid competition from forest floor mosses (Harmon 1986, Harmon and Franklin 1989).

Large spruce trees often develop heart-rot (*Neolentinus kauffmanii*), causing trunks to break (Boughton et al. 1992). As compared with other old growth conifer forests, old growth Sitka spruce forests have more large downed logs and fewer standing dead trees (snags).

Conservation Status

These forests are recognized as reservoirs of biodiversity, (Franklin 1989) contain relatively high levels of endemism and species richness, provide important winter refugia for birds and mammals, and support unequalled anadramous fish runs (Samson et al 1989, DellaSalla et al. 1994, 1996a). The capacity of these forests to sequester and store carbon and the role they play in regional and global climates are also of global significance (Waring and Franklin 1979, Alaback 1991).

Rarity: In southern coastal Alaska, old growth forests growing on well drained alluvial and riparian soils are relatively rare (62,000 ha), and it is highly probable that the largest big tree stands of this forest types have already been eliminated from the region (Albert and Schoen 2006).

Trend: Past logging practices, including the broad-scale clearing of riparian forests has occurred disproportionately on low elevation old-growth Sitka spruce forest on floodplains and alluvial fans and at rates of 1.6 times their availability. It has been estimated that the percentage of big-tree old-growth forest logged in the southeast region likely lies between 28-50% (Albert and Schoen 2006).

Threat: Old growth Sitka spruce forests on floodplains are susceptible to damage from logging and human development. Logging in old-growth forests has a negative impact on several species including northern goshawk (*Accipiter gentilis laingi*), Alexander archipelago wolf (*Canis lupus lingoni*), martern (*Martes americana*), northern flying squirrel (*Glaucomys sabrinus*), brown bear (Suring et al. 1993), and some neotropical and resident birds (DellaSala et al. 1996).

Species of Conservation Concern

The species listed below are designated critically imperiled or vulnerable either globally (G1-G3)[1] or within Alaska (S1-S3) (Faber-Langendoen et al. 2009), and occur or potentially occur in this Plant association. For literature citations associated with each species please see the Alaska Natural Heritage Program, UAA's web page and select the individual species (http://aknhp.uaa.alaska.edu/).

Mammals and Birds

		Rank		
Species		**G**	**S**	**Description**
Alexander Archipelago Wolf	*Canis lupus ligoni*	G4T2T3	S3	Primarily found in rugged coastal spruce-hemlock forests supporting prey such as deer, small mammals, and spawning salmon.
Keen's Myotis	*Myotis keenii*	G2G3	S1S2	In SE Alaska, occur primarily in coniferous forests with females preferring old-growth forests and cedar trees in riparian areas for day roosts.
Prince Of Wales River Otter	*Lontra canadensis mira*	G5T3T4	S3	In SE Alaska, occur primarily in uneven aged old-growth dominated by hemlock/spruce and hemlock.
Prince of Wales Flying Squirrel	*Glaucomys sabrinus griseifrons*	G5T2?	S2	Old growth western hemlock-Sitka spruce forests, and peatland scrub-mixed-conifer forests. Dens in tree cavities and woodpecker holes.
Marbled Murrelet	*Brachyramphus marmoratus*	G3G4	S2S3	Nest in old-growth hemlock and Sitka spruce on moss-covered trunks, or on ground near sea-facing talus slopes or cliffs.
Queen Charlotte Goshawk	*Accipiter gentilis laingi*	G5T2	S2	Nest in either Sitka spruce or western hemlock. Typically hunt in continuous forests.

Plants

	Rank		
Species	**G**	**S**	**Description**
Polystichum setigerum	G3	S3	This fern is endemic to coastal northwest British Columbia and southeastern Alaska. Disjunct populations occur on Attu Island at the western tip of the Aleutian Archipelago. It grows on forest floors in lowland coastal forests, forest edges, and along run-off channels at elevations ranging from sea level to 250 meters.

[1] Conservation status ranks estimate extinction or elimination risk posed to a species or ecological community, respectively. Ranks range from 1 = critically imperiled to 5 = secure, and consider the rarity, trend and threats to a given species or ecological community. Ranks are collaboratively designated by the conservation group, NatureServe and their partner organizations on global (G) and statewide (S) levels. See http://www.natureserve.org/explorer/ranking.htm for further explanation.

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II. PUBLICATIONS

Boggs, K., T.V. Boucher, T.T. Kuo, D. Fehringer, and S. Guyer. 2012. Vegetation map and classification: Northern, Western and Interior Alaska. Alaska Natural Heritage Program, University of Alaska Anchorage, Anchorage, Alaska. 88 pgs

Boggs, K., G. Tande, T.V. Boucher, and T.T. Kuo. 2013. Vegetation map and classification: Southern Alaska and Aleutian Islands. Alaska Natural Heritage Program, University of Alaska Anchorage, Anchorage, Alaska

Boggs, K., B. Heitz, and L. Flagstad. 2013. Alaska biophysical settings and plant associations of conservation concern. Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A St., Anchorage, AK 99501

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