Sitka Sound Landscape Assessment

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Forest Service
Tongass National Forest
Sitka Ranger District
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Chapter 1 - Introduction

Management Direction for Landscape Assessments

Comprehensive assessments over large geographic areas (such as landscapes) are one tool of ecosystem management. A landscape assessment should describe physical, biological, and social conditions over broad areas and time and recommend opportunities to implement desired future conditions of Forest Plans.

Landscape assessments emphasize the following:

- assessing the function and condition of watersheds,
- incorporating watershed condition factors into agency planning and programs,
- restoring watersheds, and
- expanding collaboration among agencies and stakeholders.

Fiscal year program direction for the Forest Service, states that landscape assessments should be conducted at landscape scales equivalent to the 5th level Hydrologic Units (approximately 200,000 acres) and carried out according to the guidelines set forth in *Ecosystem Analysis at the Watershed Scale* (USDA FS 1995). Core topics to be assessed include: erosion processes, hydrology, stream channel conditions, vegetation condition, water quality, riparian and aquatic species and habitats, and human uses. In addition, Appendix J of the *Tongass Land and Resource Management Plan* (Forest Plan) (USDA FS 1997), provides direction for the content of landscape assessments. Appendix J of the Forest plan also specifies that landscape assessments should be designed to help set the stage for project planning and strengthen project-level National Environmental Policy Act (NEPA) analysis. Interdisciplinary discussion about key geographic resources, habitat relationships and management issues should be the focus of assessments.

The Purpose of the Sitka Sound Landscape Assessment

The purpose of the Sitka Sound Landscape Assessment is three-fold. First, the assessment is intended to provide a description of the existing condition of the Sitka Sound Landscape Assessment Area (Assessment Area). This description will be used in the Affected Environment section of future NEPA documents. *The assessment is a precursor to NEPA analysis, **not** a decision document itself, and should be considered a working document*. When new information is obtained, it will be incorporated. A benefit of this landscape assessment is the compilation of information for future reference. Second, the assessment will increase our knowledge and understanding of the ecological systems and past and present human use within the Assessment Area. Finally, the

assessment will include recommendations for achieving the desired future condition for the area.

This assessment utilizes an interdisciplinary approach for gathering information and evaluating the condition of key ecosystems and functions. The assessment can identify management concerns. Subsequent future analyses and project planning will strengthen our understanding of the Assessment Area watersheds and our ability to apply ecosystem management to the Tongass National Forest.

The Assessment Area

The Assessment Area, which includes the City and Borough of Sitka, encompasses nearly 273,800 acres (Figure 1-1) and is one of 83 5th level Hydrologic Unit Code (HUC) watershed associations on the Tongass. In addition, the Sitka Sound watershed is one of 25 Watersheds Associations of Concerns identified by a Forest Service Regional Interdisciplinary Team in October 2000. Key factors in determining these Watersheds Associations of Concern or Priority Watersheds was disturbance indices (harvest on steep slopes, riparian harvest level, road and stream crossing density) along with aquatic value ratings (high fish habitat capability, water and hydro power supplies, recreation uses) (USDA FS 2000).

Included in this assessment are the drainages that flow into Fish Bay, St. John the Baptist Bay, Nakwasina Sound, Katlian Bay, Sitka Sound, Silver Bay, and Deep Inlet on Baranof Island. Table 1-1 lists the 18 Value Comparison Units (VCUs) located within the Assessment Area. VCUs are parcels of land that generally encompass a drainage basin or watershed containing one or more large stream systems. VCU boundaries usually follow easily recognizable watershed divides. These units delineate areas for resource inventory and interpretation. For analytical purposes, the Assessment Area boundaries correspond to VCU boundaries. VCUs in the Assessment Area are delineated in Figure 1-2.

Table 1-1. VCUs within the Assessment Area

VCU Number	VCU Name	VCU Number	VCU Name
2870	Fish Bay	3130	Katlian River
2880	Range Creek	3180	Blue Lake
2990	Annahootz Mountain	3190	Sugarloaf Mountain
3000	Nakwasina Passage	3200	Aleutkina Bay
3010	Nakwasina Sound	3210	Redoubt Bay
3020	Neva Strait	3220	Deep Inlet
3100	Gavanski Island	3230	Salmon Lake
3110	Sitka	3240	Green Lake
3120	Katlian Bay	3250	Bear Cove

Sitka Sound Landscape Assessment Area –Vicinity Map.

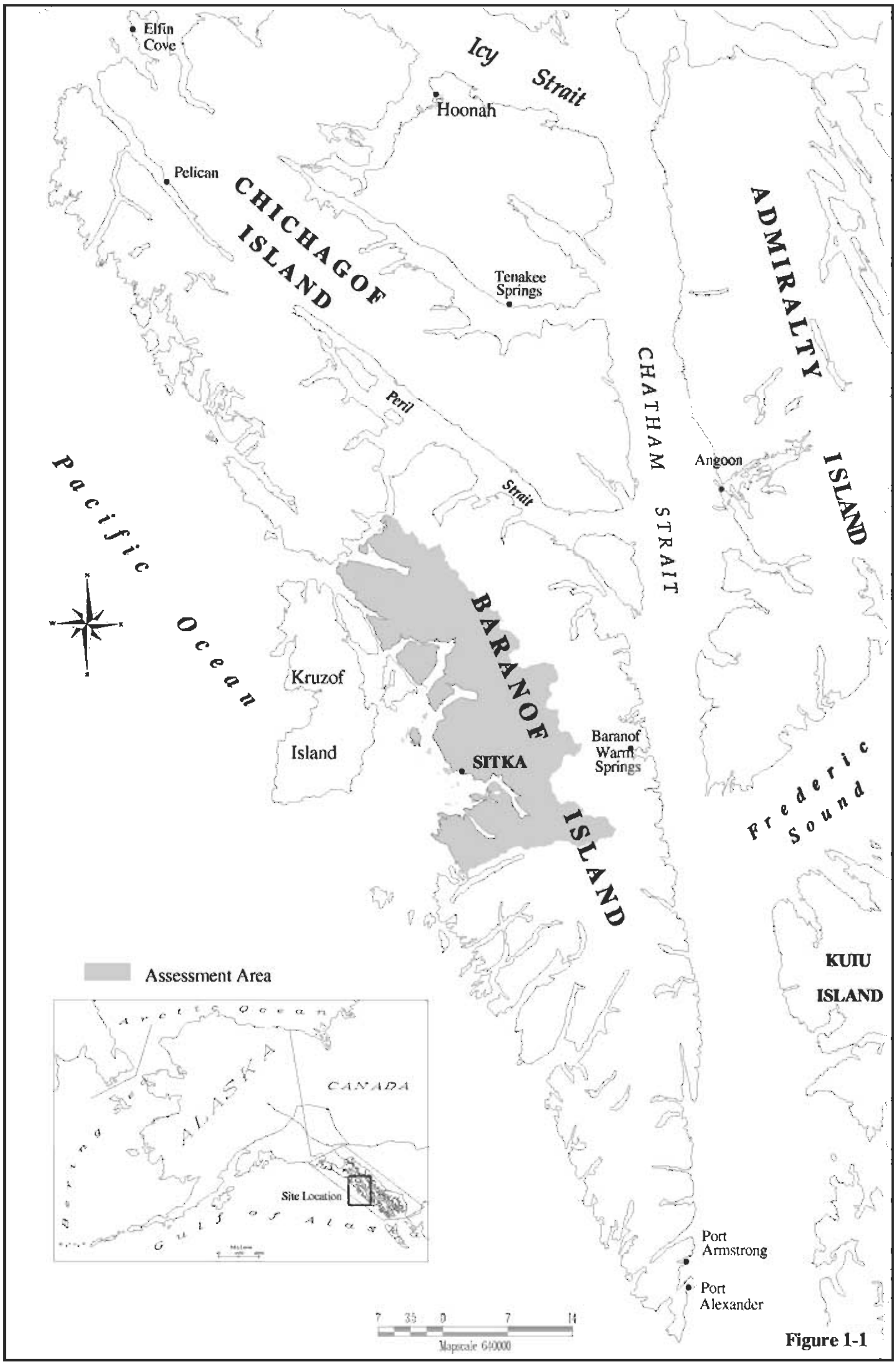


Figure 1-1

Sitka Sound Landscape Assessment Area

Value Comparison Units (VCU's)
and
Land Use Designations (LUD's).

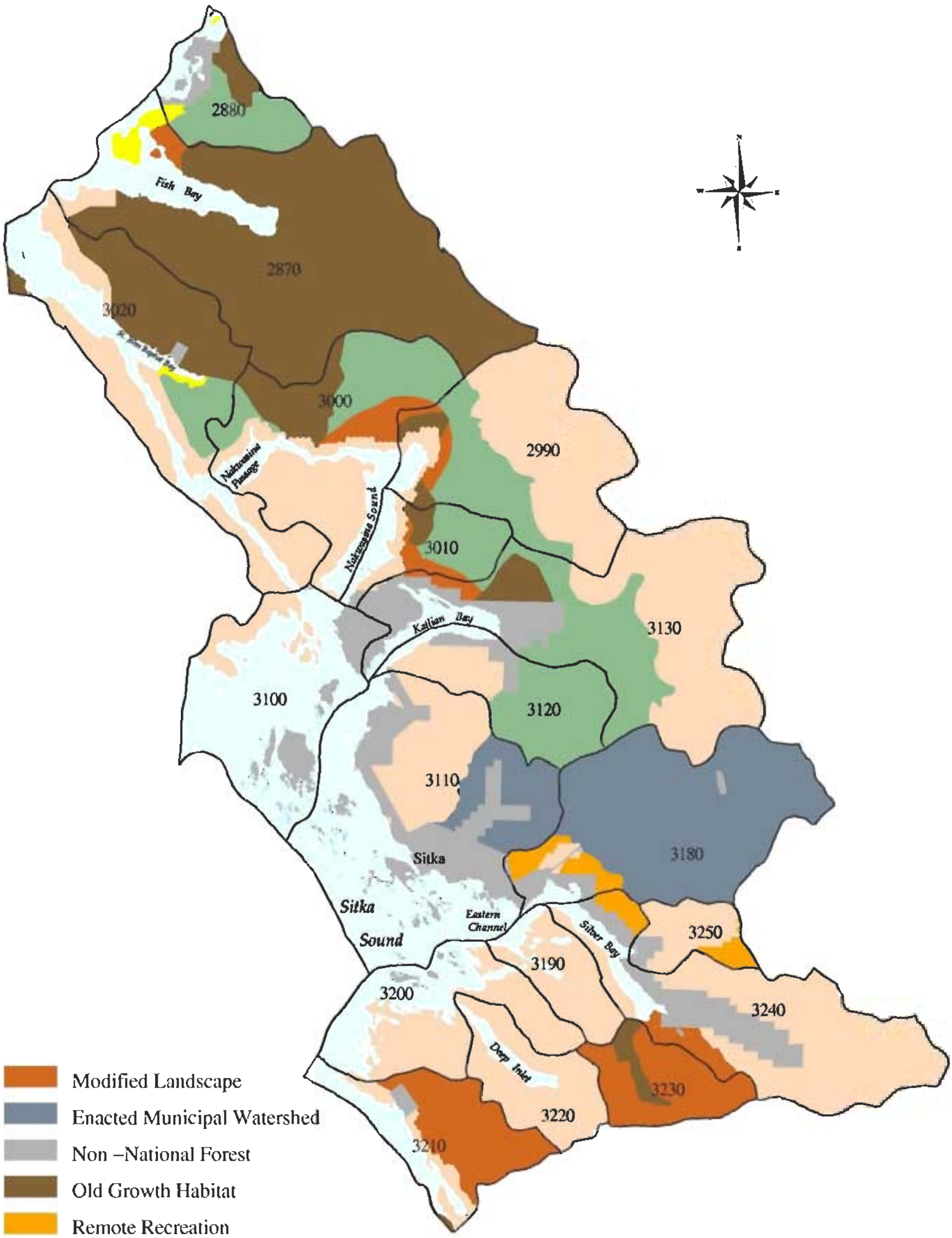


Figure 1-2

Land ownership within the Assessment Area is varied, but not complex (Table 1-2). Most of the land (approximately 248,900 acres) is in federal ownership and managed by the USDA Forest Service. The United States Geologic Survey and the USDI National Park Service manage the remainder of federally owned land in the Assessment Area (approximately 255 acres). The State of Alaska, the City and Borough of Sitka, the Shee Atiká Corporation, and private landowners own approximately 24,876 acres.

Table 1-2. Land Ownership for the Assessment Area

Ownership Status	Acres	
Federally Owned	**248,900**	
Forest Service Managed	248,645	
Lands with Use Restrictions[1]		4,763
Encumbered Lands[2]		1,395
United States Geologic Survey Managed	178	
National Park Service Managed	77	
Non-Federally Owned	**24,876**	
State of Alaska	8,806	
City and Borough of Sitka	6,490	
Privately Held (Unknown Ownership)	6,374	
Native Corporation (Shee Atiká)	3,206	
Sitka Sound Landscape Assessment Area	**273,776**	

[1]Use Restricted lands managed by the Forest Service include lands in the Enacted Municipal Watershed and Semi-Remote Recreation LUDs according to the Forest Plan.
[2]Encumbered lands managed by the Forest Service may be conveyed as entitlements to the State of Alaska, the Shee Atiká Corporation, or native allotments.

Relationship to the Forest Plan

The Forest Plan guides the management of National Forest System (NFS) lands within Assessment Area. National forest planning takes place at several levels: national, regional, forest, and project levels. The Sitka Sound Landscape Assessment is an ecosystem analysis conducted at the landscape scale and does not attempt to address decisions made at higher levels. However, it does identify opportunities to implement direction provided at those higher levels.

The Forest Plan embodies the provisions of the National Forest Management Act (NFMA), its implementing regulations, and other guiding documents. It sets forth in detail the direction for managing the land and resources of the Tongass National Forest and is the result of extensive analysis, which is presented in the Forest Plan FEIS (USDA FS 1997).

A Forest Plan Record of Decision (ROD) was signed in 1997 (USDA FS 1997). Where appropriate, the Sitka Sound Landscape Assessment tiers to the 1997 Forest Plan, as encouraged by 40 CFR 1502.20.

The Forest Plan assigns one or several of 19 specific Land Use Designations (LUDs) to each VCU. LUDs are used to guide management of the NFS lands within the Tongass National Forest. Each designation provides for a unique combination of activities, practices, and uses. The seven LUDs that are found within the Assessment Area are listed in Table 1-3 (see also Figure 1-2).

Table 1-3. Land Use Designations for the Assessment Area

LUD	Development Status	Acres	Percent of Assessment Area[1]
Semi-remote Recreation	Mostly Natural	99,602	36
Old-growth Habitat Reserve	Mostly Natural	57,117	21
Timber Production	Intensive Development	38,876	14
Enacted Municipal Watershed	Mostly Natural	28,627	11
Modified Landscape	Moderate Development	19,143	7
Remote Recreation	Mostly Natural	3,996	1
Scenic Viewshed	Moderate Development	1,284	<1

Source: Forest Plan and Forest Plan ROD (USDA FS 1997)
[1]Roughly 9 percent of the Assessment Area is Non-National Forest land.

Land Use Designations are categorized into two broad categories: development and non-development LUDs. Development LUDs are those that "permit commercial timber harvest (Timber Production, Modified Landscape, and Scenic Viewshed) and convert some of the old-growth forest to early-to-mid –successional, regulated forests" (USDA FS 1997, p. 7-9). Non-development LUDs are "land use designations that do not permit commercial timber harvest and generally maintain the integrity of the existing old-growth ecosystem" (USDA FS 1997, p. 7-25). The Assessment Area contains land allocated to each of the three development LUDs and land allocated to four of the non-development LUDs (i.e., Semi-remote Recreation, Old-growth Habitat Reserve, Enacted Municipal Watershed, and Remote Recreation).

The goals of each of the LUDs present in the Assessment Area are included below. Chapter 3 of the Forest Plan contains a detailed description of each land use designation (USDA FS 1997).

Semi-remote Recreation
The goals of this designation are: 1) to provide predominantly natural or natural-appearing settings for semi-primitive types of recreation and tourism; and 2) to provide opportunities for a moderate degree of independence, closeness to nature, and self-reliance in environments requiring challenging motorized or non-motorized forms of transportation.

Old-growth Habitat Reserve
The goals of this designation are: 1) to maintain areas of old-growth forests and their associated natural ecological processes to provide habitats for old-growth associated resources; and 2) to manage early seral conifer stands to achieve old-growth forest characteristic structure and composition based upon site capability.

Timber Production
The goals of this designation are: 1) to maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs; 2) to manage these lands for sustained long-term timber yields; and 3) to seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this land use designation.

Enacted Municipal Watershed
The goal of this designation is to maintain these watersheds as municipal water supply reserves in a manner that meets State of Alaska Drinking Water Regulations and Water Quality Standards for water supply.

Modified Landscape
The goals of this designation repeat goals 1) and 3) listed under Timber Production and include two others: 1) to provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground distance zone; and 2) to recognize the scenic values of suitable timber lands viewed from identified popular roads, trails, marine travel routes, recreation sites, bays, and anchorages, and …to modify timber harvest practices accordingly.

Remote Recreation
The goals of this designation are: 1) to provide extensive, unmodified natural settings for primitive types of recreation and tourism; and 2) to provide opportunities for independence, closeness to nature, and self reliance in environments offering a high degree of challenge and risk; and 3) to minimize the effects of human uses, including subsistence use, so that there is not permanent or long-lasting evidence.

Scenic Viewshed
The goals of this LUD are: 1) to seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this land use designation; 2) to provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments as seen from visual priority travel routes and use area; and 3) to recognize the scenic values of suitable timber lands viewed from selected popular roads, trails, marine travel routes, recreation sites, bays, and anchorages, and to modify timber harvest practices accordingly.

Chapter 2 - Issues and Key Questions

This chapter includes a list of issues and key questions the Sitka Sound Landscape Assessment is intended to address. These issues and questions were developed by an Interdisciplinary Team (IDT) of resource specialists working on the Sitka Ranger District and guided the analysis.

The list consists of issues and questions about the Assessment Area identified by resource specialists. Public comments received on the project during the open comment period have also been incorporated into this list. This landscape assessment is not a decision document, and some comments were outside the scope of the assessment. Some of the issues, questions, and comments are addressed in this chapter. However, most of them are addressed in chapters 3 and 4 of this assessment. Some of the comments received provided valuable information that was used by the resource specialists as they analyzed the data. Appendix A includes all of the comments received on this project.

Regarding the Physical Characteristics of the Assessment Area

Forest Vegetation

ISSUE: ***Provide timber resources to meet market demand, and provide for traditional and special uses of forest products.***

KEY QUESTIONS:

1) What are the timber/silviculture land management and resource objectives for the Sitka Sound area?
2) What future forest conditions can be anticipated based upon management activities?
3) Does the Assessment Area contain areas of second growth available for thinning or pre-commercial thinning?
4) What opportunities exist for enhancing fisheries resources, watersheds, and wildlife resources through the use of silvicultural prescriptions?
5) What are the traditional and special uses of forest products in the Sitka Sound area? Can silvicultural prescriptions enhance these?

Regarding the Biological Characteristics of the Assessment Area

I. Fisheries

***ISSUE*: Human use of Salmon and other aquatic species associated with freshwater is one of the primary uses of the Sitka Sound area. Salmonids and other aquatic species depend on healthy watersheds and high water quality for their life cycle. Land management activities have affected and may continue to affect water quality.**

KEY QUESTIONS:

1) What is the condition of important fish streams in the area?
2) Where are important recreation/subsistence/commercial fish streams? What and where are the water related subsistence uses (plants, fish, wildlife)?
3) What amount of timber harvest and road construction has occurred in riparian areas?
4) What types of water-related recreation activities are accessible by roads? What types of water-related recreation activities are accessible via saltwater?
5) What restoration opportunities exist in the riparian areas and important fish streams in the Assessment Area?
6) What kinds of fish/wildlife restoration/enhancement work have taken place in the Assessment Area (including everything from stream restoration activities and fish pass construction to the establishment of large-scale hatcheries)? Where have these activities taken place?
7) What beneficial water uses currently exist within the Assessment Area (e.g., hydropower, non-profit hatcheries, commercial, domestic water sources, recreation, and consumptive vs. non-consumptive uses)?

COMMENT RECEIVED:

1) "Protect Blue Lake water quality."

   Response: The State of Alaska Department of Environmental Conservation (ADEC) has primary responsibility for water quality regulation. The Forest Service works with ADEC to insure that management activities are in compliance with applicable laws and regulations. More information on water quality standards can be found in chapters 3 and 4. In addition, the Blue Lake watershed is in a Municipal Watershed land use designation (LUD), which protects municipal drinking water sources (USDA FS 1997 [Forest Plan]).

II. Biological Diversity

<u>ISSUE</u>: Old-growth forests are important for maintaining biological diversity across the landscape. They provide structural and biological environments that are important for wildlife habitat and subsistence.

KEY QUESTIONS:

1) How has management activity been distributed across the landscape? What are the potential impacts to biodiversity from future land management activities?
2) What is the extent of old-growth forest within the Assessment Area? Does it maintain connectivity?

COMMENTS RECEIVED:

1) "No complete analysis of this degradation [harvest in riparian zones of Starrigavan valley and Katlian Bay] in corridor capability has been made."

   Response: This comment is outside the scope of this assessment, however watershed rehabilitation projects in the form of riparian thinning and instream Large Woody Debris placement have been implemented or are planned within these and other previously managed watersheds to address this issue.

2) "In the SSLA please provide fine-scale information on the structure classes within the old growth forest and their value for habitat."

   Response: Information on old-growth forests and their value for habitat is provided in the Vegetation and Biodiversity sections of chapters 3 and 4.

3) "Maintain corridors for wildlife along riparian areas and beach fringe give increasing recreational use."

   Response: This comment is addressed in the Forest Plan and is outside the scope of this assessment.

Regarding the Human Dimensions of the Assessment Area

I. Roads

***ISSUE*: Forest Service System and Non-system roads in the Analysis Area are mostly associated with timber harvests that occurred between 1960 and 1980. As per their Road Maintenance Objectives (RMO), the remote National Forest System roads in this area have received little or no maintenance. Roads are still used for land management activities and recreation and may be contributing to water resource degradation.**

KEY QUESTIONS:

1) How can roads be managed to reduce long-term impacts on aquatic habitat and water quality while maintaining recreation and land management use?
2) What are the general patterns or trends of land management activities (such as future timber harvest and roading) in the area?
3) Where/what is the current recreation/subsistence use associated with roads?
4) What is the current condition of the roads? Where are the key resource problems/concerns?

COMMENTS RECEIVED:

1) "I think trails connecting old logging roads would be awesome for four wheeling and camping would be a wonderful option for the island bound citizens."
2) "…I respectfully request that no roads be decommissioned within the SSLA."

Response to 1 and 2: The majority of the comments received by the IDT were related to recreation and roads. Chapter 5 includes recommendations by the IDT about the need for additional road condition surveys (see Chapter 3) as well as roads that could be used for recreational purposes.

II. Recreation Facilities and Use

***ISSUE*: Recreational experiences should be managed according to Forest Plan Standards and Guidelines.**

KEY QUESTIONS:

1) Is the area being managed to accommodate the recreation experience level prescribed in the Forest Plan (inventoried as compared to Forest Plan direction)?
2) How has recreation resource planning (interagency, integrated agency and tourism) affected the area?
3) What types of recreation use are occurring in this area (commercial/non-commercial special uses, developed, interpretative programs, construction/rehabilitation and data collection)?
4) What is likely to affect the recreation experience in this area in the future?

COMMENTS RECEIVED:

1) "I would like to see a trail at least 10 feet wide be put in from Sitka to Rodman Bay connecting logging roads. By doing this it would be easier to access recreational areas and would increase the amount of tourists thru Sitka."
2) " I would like to see a multiuse trail put in from the end of the Sitka road system (north end) that goes up through the logged areas and allows the use of these logging road systems for recreational use."

   Response to 1 and 2: The Sitka District Recreation Staff has identified the need to write a comprehensive Off Highway Vehicle (OHV) plan for the District. This plan would only consider areas that have already been roaded. In the future, roads constructed in conjunction with timber harvests may become available for recreation use, but there are no plans at this time to build OHV roads.

3) "Improve the trail from Salmon Lake to Redoubt Lake."

   Response: This trail is scheduled to be reconstructed in the next five years.

4) "We believe it imperative that enforcement money be ample to catch those using the roads only as a starting point for creating new trails."

   Response: When the Sitka Ranger District OHV plan is developed, it will include an enforcement strategy based on Forest Plan direction and standards and guidelines.

III. Subsistence

<u>ISSUE</u>: Subsistence use is important to the people living in and visiting the Sitka Sound Area.

KEY QUESTIONS:

1) What are the subsistence, sport, and non-consumptive wildlife uses in the area?
2) What habitat improvement projects would benefit wildlife and fisheries habitat and populations and meet the objectives of the Assessment Area?
3) What silvicultural practices could be used to accomplish wildlife habitat objectives?
4) Do pre-commercial thinning (PCT) opportunities for enhancing forage for Sitka black-tail deer exist?

General Comments

1) "When is the FS going to clean up the campsite they used 10-15 years ago in Fish Bay?"

   Response: This comment is outside the scope of the assessment. However, the campsite was visited during the road assessment in Fish Bay. It appears that the public has been using the site as temporary shelter. The Forest Service plans to remove this campsite.

2) "…the assessment is related to describing current conditions with a negative aspect rather than defining and describing opportunities of a positive nature."

   Response: Not all key questions are negative.

3) (Summarized) "...May be difficult to reach out to the public in ways that inform them of the value of participation in this project, and encourages their involvement and local knowledge…Involve the public, review site-specific testimony, meet with local groups."

   Response: We agree. In February the Team held a public meeting where an open forum approach was used. Compared to past meetings, public turnout and comment was good. The Forest Service also inquired responses from the Sitka Tribe of Alaska and sent letters to local groups inviting them to comment on the assessment project. Letters seeking public comment were also sent to persons expressing an interest in the assessment and persons who had commented on previous projects in the area. Finally, a web site that included an e-mail address for comments on the assessment was created.

4) "I believe conservationist and people recreating can live and work together; one need not dictate and control the others. I appreciate that this group is interested in public concerns."

   Response: Thank you.

Chapter 3 - Assessment Area Description

Physical Characteristics

Geographic Location

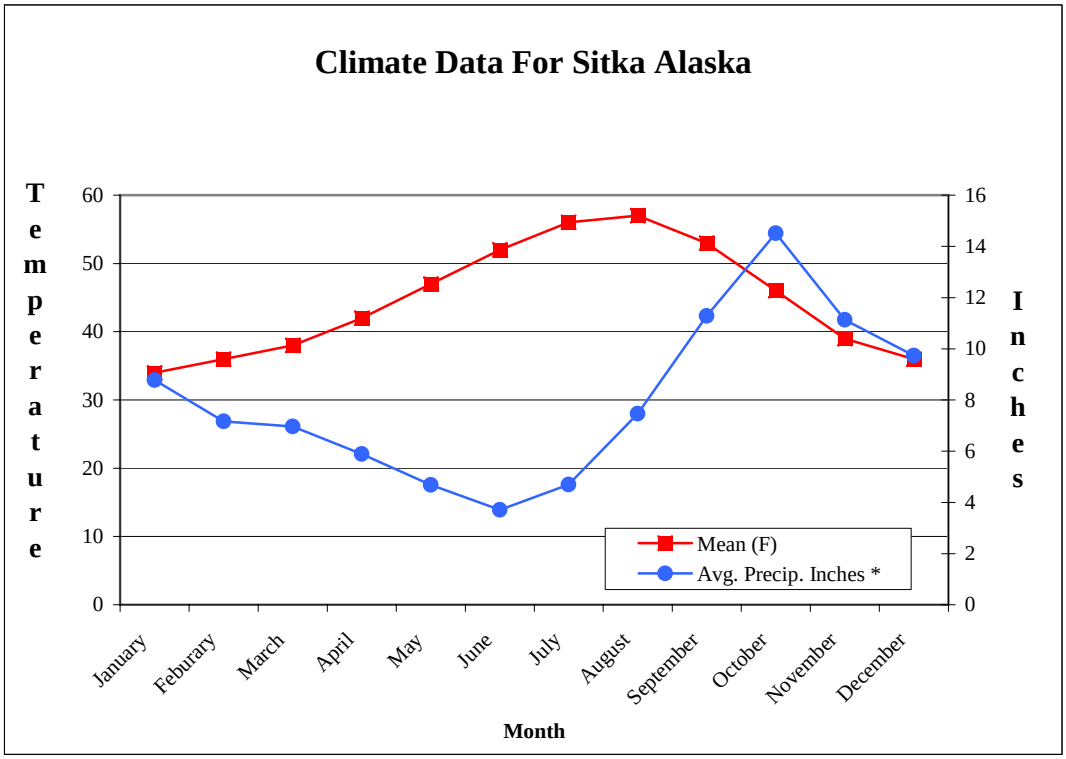
The Assessment Area consists of nearly 273,800 acres and is located in Southeast Alaska on the western side of Baranof Island. It encompasses, and its boundaries are defined by, Sergius Narrows to the north, the high peaks of central Baranof Island to the east, Sitka Sound to the west, and Redoubt Bay to the south.

Figure 3-1. Sisters Mountains: Indian River Valley near Sitka, AK

Climate

The Assessment Area has a maritime climate that has affected the physical and biological characteristics and the human uses of the area. Temperatures are moderated by the Alaska Current, which circulates counterclockwise up the coast (Johnson and Hartman 1969). Data from the nearest climatic station in Sitka indicate there is only 22.6ºF difference between the mean average temperatures of the warmest (August, 56.7ºF) and coldest (January, 34.1ºF) months (Figure 3-2). The climate is predominantly cloudy, cool, and wet throughout the year. This station also indicates that the average yearly precipitation at Sitka is 96 inches. Precipitation occurs throughout the year, with June being the driest month (3.71 inches) and October the wettest (14.51 inches). This station in Sitka is located near saltwater, at less than 50 feet in elevation, on Japonski Island. The actual climate data within the various Assessment Area watersheds is likely to be much colder and wetter at higher elevations and further from saltwater.

Figure 3-2. Climate Data for Sitka, AK



Source: www.weather.com
* Source: Sitka Airport Records 1842-1996

Landscape Processes

A complete characterization of a landscape or landform must contain three components: a description of the feature, the processes involved in its formation, and its development through time (Chorley and others 1984). There are five primary processes that influence landscapes: tectonism (geological plate movement), glaciation, hill slope processes (landslides and surface erosion), fluvial processes (stream flow and sediment transfer), and wind. Tectonic and glacial processes operate on a geologic time scale. Landforms within the Assessment Area are generally less than 12,000 years old. Hill slope and fluvial processes have the greatest potential to affect resource conditions on a time scale of years to decades. The Interdisciplinary Team has attempted to treat the Assessment Area holistically, discussing the development of the landscape, soils, and vegetative types in relation to the major disturbance factors in these watersheds.

Tectonic Processes

Tectonic activity affects the Assessment Area on different temporal and spatial scales. On the geologic time scale, the movement of large terranes has resulted in the many different assemblages of bedrock in Southeast Alaska (Brew 1990). A geologic fault runs along Silver Bay, through Sitka Sound, and up along Partofshikof Island and the outer coast of Chichagof Island. On a time scale of thousands of years, some movement has probably occurred along this fault.

Glacial Processes

Glaciation has exerted the most profound effect on the soils and plants of the Assessment Area. The Wisconsin glaciation, which ended 12,000 to 13,000 years ago (Miller 1973), along with earlier glaciations, has resulted in U-shaped valleys and higher elevation cirque basins. The glaciers scoured some areas down to the bedrock and deposited basal till and ablation till elsewhere. The Wisconsin deglaciation resulted in a sea level that was much higher than it is today. This accounts for the presence of marine silts and sands in many of the low-lying valleys of northern Southeast Alaska. Miller (1973) mapped extensive deposits of the Gastineau Channel Formation in the Juneau area. It is likely that these marine silts and sands now underlie many wetlands in the low-lying areas of the watersheds in the Assessment Area.

The Little Ice Age was a period of worldwide cooling and glacial advance from the middle of the 13th through the late 19th century (Porter 1986). During this period, glaciers completely covered Glacier Bay. Deep winter snow pack and severe avalanching likely influenced Baranof Island's upper tree line and forest composition.

Hill Slope Processes

Erosion has had a large effect on local topography since the Wisconsin glaciation. Many colluvial and alluvial fans (i.e., landforms partially formed by debris torrents) were deposited on the valley floors during this time. Recent landslides suggest that this process is continuing within the Assessment Area. Initiation of landslides in an undisturbed environment is linked to temporary water table development during high-intensity storms (Swanston 1969). Landslides in timber harvest areas are generally on

gentler slopes and are significantly smaller than those in undisturbed environments (Swanston and Marion 1991). Though one does not yet exist for Assessment Area, the Forest Service is in the process of completing a forest-wide landslide inventory for the Tongass National Forest.

Fluvial Processes

Fluvial processes, or moving water processes, created the flood plains and alluvial fans in the Assessment Area. Fluvial processes have varying effects depending on water and sediment volumes; however, materials carried by the water are always sorted and deposited according to size and weight. Today, with the possible exception of the Nakwasina and Katlian Rivers, the streams in the Assessment Area are not overloaded with material. Most area streams generally have one channel with fluvial deposits such as point bars (on the inside of meanders) and levees (fine sands on the upper stream banks) (Davis 1983).

Wind Processes

Southeast Alaska's temperate rainforests are susceptible to wind damage because of the combination of shallow root systems, poorly drained soils, and high winds, which often occur during peak rain events (Alaback 1990). Most commonly, single trees or small groups of trees are blown down (Harris 1989); however, entire tree stands sometimes blow down. Currently no inventories of stands that have regenerated after a large blowdown event exist for the Assessment Area.

Geology / Soils

Plate tectonics and bedrock geology have shaped this region of the State. Southeast Alaska is composed of several bands of rock called terranes, which originated far from North America in the Pacific Ocean (Brew 1990). Each band is composed of different materials and measures hundreds of kilometers in length and tens of kilometers in width. The two primary terranes of the Assessment Area are the Chugach (which comprises most of Baranof Island and the west coast of Chichagof Island) and the Wrangellia (which comprises Northwest Baranof Island and a thin piece of Chichagof Island inland along the west coast) (Brew 1990).

These terranes, which are separated by faults, have moved both vertically and horizontally, adding geologic complexity to the region (Brew 1990). The topography of the Assessment Area has been shaped by the folding and faulting of thick sequences of sediments and the upwelling of magma, which formed granite when it cooled.

Soils on mountain and hill slopes are formed primarily of decomposed bedrock and colluvial material (deposited by gravity). Soils formed over bedrock are generally shallow, while colluvial soils are deeper and better drained. In addition, soils formed of volcanic ash occur in areas east of Kruzof Island. Glacial till soils occur in patches plastered along mountain and hill slopes to elevations of about 1,000 feet, while ash deposit layers can be found at varying elevations and thicknesses. In the valley bottoms, soils have formed of river deposits, colluvial material, and marine sediments.

The cool, wet climate characteristic of the area causes organic matter to decompose slowly, creating soils characterized by thick organic surface layers. Peatlands composed of very deep organic matter are common in areas where drainage is restricted by topography or where an impermeable layer such as bedrock or glacial till exists. In coarse alluvium (gravels and cobbles) the soils are well drained and support forests. Where the alluvium is finer and restricts drainage, nonforested vegetation communities such as fens and bogs form. Tree root depth is shallow, primarily limited to the nutrient-rich organic layers and the first few inches of the mineral layers. This root zone consists typically of moist, acidic organic horizons, and contains most of the nutrients available for plant growth (Heilman and Gass 1972).

Soil Types

Soils are the foundation of terrestrial ecosystems. Soil absorbs nutrient-rich water and releases it to microorganisms and plants, which become food and habitat for larger animals and people. Soils are a non-renewable resource because of the time it takes for them to form. There are many types of soils, and their specific properties determine the type of ecosystem they support and their resiliency to land management (USDA FS 2002).

Soils in the Assessment Area have developed from a variety of unconsolidated and weathered mineral or organic parent materials. Mineral soils develop from weathered rock, and organic soils develop from decomposed plant materials. Topography, climate, and vegetation play important roles in soil development.

Mineral soil originates from bedrock that either weathered in place or was transported and deposited away from its place of origin. Mineral soils are typically covered with an organic layer that ranges from a few inches to several feet in thickness. Several classes of mineral soils exist in the Assessment Area, including glacial till and alluvial, colluvial, and residual soils.

Because of the high amount of precipitation and low temperatures in the Assessment Area, organic materials accumulate more quickly than they decompose, resulting in the creation of thick organic layers. Organic deposits range from about an inch to more than 40 feet in depth. Organic soil development is greatest on level terrain but is also found on rolling hills and moderately steep to steep slopes. Organic soils are often found covering glacial deposits on relatively flat valley bottoms. Most areas with organic soils in the Assessment Area are classified as wetlands (USDA FS 2002).

Soil Productivity

Soil productivity is the inherent capacity of a soil to support the growth of specific plants or plant communities. It is critical to the forest because it affects the productivity of most other forest resources. Soil productivity is dependent on soil quality and can be affected by on-site disturbances such as natural erosion; landslides; to human-related disturbances; timber harvest activities; and use of roads, boat ramps, recreation trails, and picnic areas. Tree growth, wildlife and fish habitat, and recreation opportunities are all influenced by soil quality.

Soil productivity varies between soil types. In mineral soils, most nutrients are produced and stored in the upper organic layers. Soil productivity is determined by soil drainage, texture, depth, and site characteristics (including elevation, slope, and aspect). The most productive soils, which generally support coniferous forest stands, range from well drained to moderately well drained and are moderately deep. They are found on floodplain terraces, moderately stable alluvial fans, hill slopes, mountain slopes, and uplifted beaches.

Most organic soils are found in non-forested and forested wetlands that support low-volume forest, scrub-shrub, peatlands, and alpine meadow plant communities. Organic soils are not considered highly productive in terms of timber stand volume, but they are productive in terms of species richness and biomass. Organic soils that drain poorly support a wide variety of plant communities with high biomass and species diversity, and they are home to many species of fish and wildlife (USDA FS 2002).

Soil Stability

Swanston (1969) counted more than 3,800 landslides, which occurred in the last 150 years in Southeast Alaska. Most slides occur on steep slopes and when heavy rainfall has saturated the soil. In addition, wind associated with these storms can blow down trees,

which may help trigger slope failure. Vegetation masks older slides on aerial photos making them difficult to identify; however, they can be discerned from soil profiles and shallow linear depressions on slopes.

Landslides typically begin on open slopes and are a mixture of rock, soil, and vegetation. Swanston and Marion (1991), in their study of landslides within Southeast Alaska, observed that only about 3 percent of all landslides reached fish streams. In most of these cases, only a relatively small amount of fine sediment reaches the stream. However, if this mixture reaches a headwater channel where enough water has concentrated, it can become a fast-moving debris torrent, which can scour the channel and move a large amount of sediment and woody debris. If this debris torrent reaches a main stream channel, it can create local accumulations of sediment and large woody debris and can cause the bedload to shift.

Soil type also influences landslide occurrence. The soils in the Assessment Area are mapped and described in the Chatham Area Integrated Resource Inventory (USDA 1986). In order to describe their relative instability, soils are grouped into mass movement hazard categories: MMHAZ 1 (low hazard), MMHAZ 2 (moderate hazard), MMHAZ 3 (high hazard), and MMHAZ 4 (extreme hazard). These categories are based on a number of factors that influence landslides, including slope, landform, parent material, and drainage. Fifty-five percent of the Assessment Area is rated as either MMHAZ 3 or 4.

Figure 3-3 shows the distribution of MMHAZ 3 and 4 soils throughout the Assessment Area. Table 3-1 lists selected watersheds with MMHAZ 3 and 4 soils and the extent of management activities that has occurred in them. The Nakwasina, South Katlian, Katlian, and Starrigavan watersheds have the highest percentages of high hazard soils, which suggest that relatively large portions of these watersheds have the potential to produce and transport sediment to streams.

Table 3-1. Distribution of High Hazard Soils (MMHAZ 3 and 4) in the Assessment Area and the Extent of Management Activities on Such Soils by Watershed

Watershed Number	Name	Acres of MMHAZ 3 & 4	Acres RMA[1] in MM-HAZ 3 & 4 by LUD			Acres Harvested in MMHAZ 3 & 4	Miles of Road in MMHAZ 3 & 4	Stream Miles in MMHAZ 3 & 4
			Development LUDs[2]	Non-Development LUDs[2]	Total			
8	**Fish Bay**	**10,940**	**3**	**674**	**677**	**224**	**0**	**38**
29	**Nakwasina**	**17,006**	**181**	**447**	**628**	**256**	**1**	**33**
48	**Katlian**	**17,053**	**183**	**409**	**592**	**330**	**0**	**43**
21	**South Fish Bay**	**1306**	**0**	**187**	**187**	**116**	**0**	**6**
61	**South Katlian**	**5918**	**115**	**10**	**125**	**220**	**1**	**9**
28	**Noxon**	**3389**	**115**	**7**	**122**	**110**	**0**	**9**
62	**Starrigavan**	**2713**	**0**	**111**	**111**	**283**	**1**	**10**
74	**Camp Coogan**	**2209**	**2**	**116**	**118**	**162**	**1**	**6**
59	Katlian Bay (South)	1942	0	93	93	175	0	6
46	**Lisa Creek**	**3070**	**100**	**7**	**107**	**168**	**1**	**6**
67	Verstovia	3457	0	46	46	154	2	8
90	**Kizhuchia**	3399	88	0	88	242	0	6
49	Coxe	2313	21	55	76	121	0	4
34	Nakwasina Lake	860	4	39	43	68	0	2
24	St John (North)	1633	0	35	35	257	2	2
41	North Halleck	950	0	34	34	109	0	3
51	Lisianski	1635	0	0	33	368	1	1
39	Nakwasina Sound (East)	1085	6	25	31	233	0	3
27	St John Baptist	656	5	24	29	262	2	3
33	Nakwasina Passage (West)	603	0	24	24	279	1	1
32	Neva Strait (East)	1054	16	6	22	1	0	2
92	Kidney Cove	1181	12	9	21	19	0	2
37	Nakwasina Passage (North)	426	15	5	20	1	0	2
58	Sunta Héen	428	12	0	12	11	0	1
36	Limit	207	4	7	11	47	0	1
89	Caution	89	9	1	10	20	0	1
Total		**85,529**	**891**	**2371**	**3295**	**4243**	**13**	**215**

Note: This table only includes watersheds with a significant number of acres (>50) of MMHAZ 3 or 4 soils. **Bold** type indicates watersheds that have been assigned a High Watershed Concern ranking and High/Medium Fish Capability ranking (for more information on these rankings, refer to the Fisheries section in Chapter 4).

[1] RMA refers to a Riparian Management Area.

[2] Refer to Chapter 1 for a description of development and non-development Land Use Designations.

Sitka Sound Landscape Assessment Area

Hazard Soils.

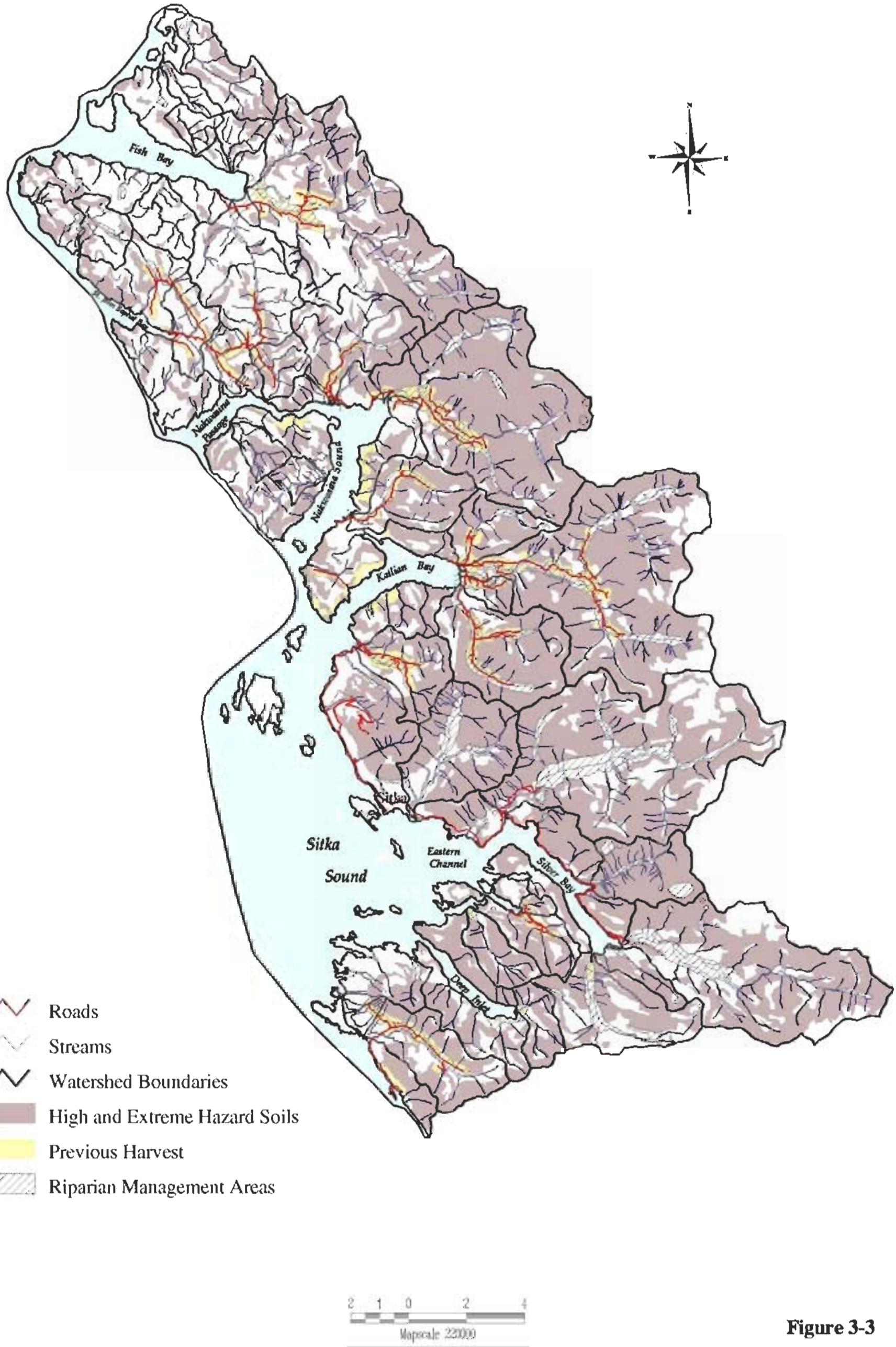


Figure 3-3

Ecological Classification

The Assessment Area is comprised of three ecological subsections according to Nowacki and others (2001) (Figure 3-4). These ecological subsections, which help to define the ecosystems of Southeast Alaska, are based upon physiography, lithology, and surficial geology due to their interactions in processing water.

The largest ecological subsection in the Assessment Area is the Central Baranof Metasediments. This area is described as:

> …a place of extreme topography, weather and beauty. When visible through the clouds, the rugged terrain has stunning scenery and the tallest peaks of any island in Southeast Alaska, including the spectacular peaks of Mount Ada and Annahootz. The bedrock is a mixture of sedimentary, metasedimentary, and granitic rocks. It also has notable ultramafic intrusions, by which Red Bluff Bay derives its name. This subsection has the highest topographic roughness in all of Southeast Alaska. Abundant year-round precipitation is the result of orographic lift that strips clouds of moisture as they pass. Heavy, high elevation snowfall feeds the most extensive collection of glaciers, icefields and snowfields of any subsection outside the mainland. Alpine glacial activity has carved large U-shaped valleys with precipitous valley walls and hanging valleys. Many sediment-laden streams form floodplains and alluvial fans at the bottom of the larger U-shaped valleys. Almost 50 percent of the subsection is alpine, and only about 10 percent is hemlock-spruce forest. The steepness of the terrain limits wetland to less than 10 percent of this subsection. The alpine habitats fringed by coastal forests support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole (Nowacki and others 2001, p. 88).

The second subsection in the Assessment Area is defined by the past activities of Mt. Edgecumbe. Nowacki and others (2001) describe it as:

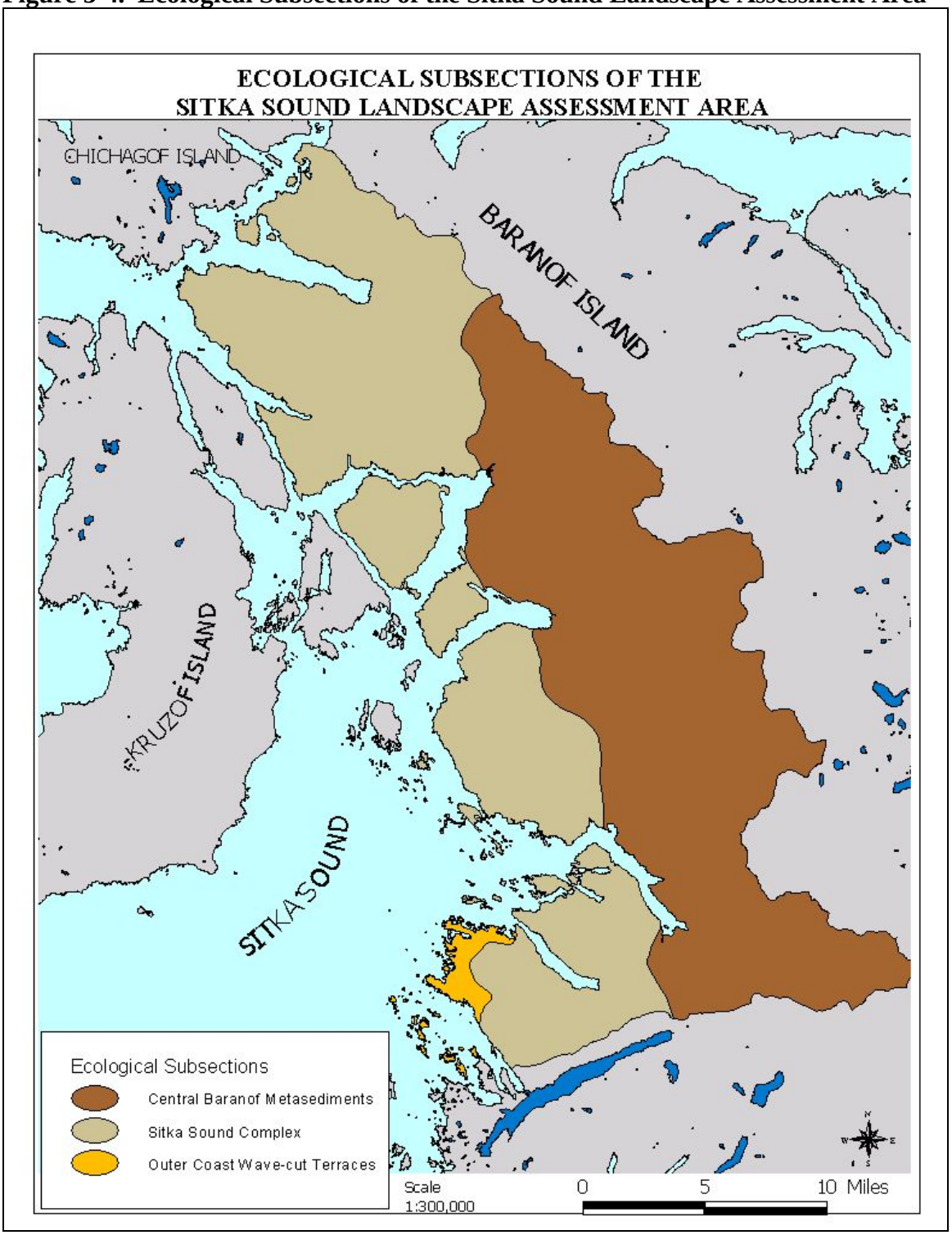
> … highlands encircling Sitka Sound include the mountains on northwest Baranof Island, Halleck, Krestof, and Partofshikof Island, and the northern third of Kruzof Island. This area was blanketed by 2 to 6 feet of ash about 9-12,000 years ago (Riehle et al. 1992). Over time, portions of these volcanic deposits have washed downslope exposing the underlying Sitka graywake, granite, and low-grade metamorphic rocks such as phyllites. Much of this area is considerably lower in elevation than surrounding subsections, particulary Halleck, Krestof, and Partofshikof Island. This subsection has no glaciers, although it does contain a few permanent snowfields. Volcanic ash and cinders are the principal parent materials, covering over 50 percent of the subsection. Landslides are common on the ash-coated surfaces, particularly in areas roaded during the 1960-70s. Hemlock-spruce and hemlock forest dominate shorelines and low elevations. Forested wetlands of lodgepole pine and mixed conifers are relatively abundant compared to bordering subsections to the east. The alpine and coastal forest

> habitats support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole (p. 106).

The third subsection in the Assessment Area is where the glaciated bedrock benchlands meet the Pacific Ocean. This subsection is labeled as Outer Coast Wave-cut Terraces and is described as:

> A narrow band of coastline with thousands of islands lines the western edge of Chichagof and Baranof Islands. This coastal area represents a former wave-cut terrace (strandflat) up to 200 ft above current sea level. It formed during a marine transgression when the weight of the late Wisconsin glaciers still depressed this area (Mann 1986). It is a striking series of seamounts and shelves that currently rise above sea level. Moderate and high gradient streams are controlled largely by bedrock. Soils are primarily derived from bedrock, since most of the till and other materials were washed off by ocean waves. Vegetation is varied. Sitka Spruce-reedgrass is a common plant community along salt-sprayed rocky coastlines. Here, shrubs are uncommon and mature spruce trees are somewhat stunted, reaching maximum heights under 100 feet (short by Sitka spruce standards!). Mixtures of forested and nonforested wetlands often reside in zones immediately behind these beachfront forests. Numerous shallow lakes dot the landscape. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, mink, river otter, common shrew, Keen's mouse, and tundra vole (Nowacki and others 2001, p. 252).

Figure 3-4. Ecological Subsections of the Sitka Sound Landscape Assessment Area



Hydrology

The Sitka Sound area can be divided into a number of watersheds (Figure 3-5). Watershed delineations enable land managers to evaluate the effects of various management activities on fish habitat and an aquatic system's capability to produce fish. One of the key questions developed for this assessment was: What is the condition of important fish streams in the area? The following section provides information on hydrologic functions, watershed conditions and vulnerability, and aquatic species and their habitat to help answer this question.

In all, there are 97 HUC 6 watersheds in the Assessment Area (Figure 3-5 and Table 3-2). Some of these represent islands in Sitka Sound; others are small areas containing small streams that discharge directly to the ocean. Most watersheds in the northern part of the area have well-developed flood plains that support or, prior to complete valley bottom timber harvest activities, supported stands of large Sitka Spruce. Watersheds in the southern portion of the Assessment Area, south of the city of Sitka, are generally steeper than those in the north and have relatively small floodplains. Three watersheds in the Assessment Area, the Indian River, Blue Lake, and Green Lake Watersheds, are in an Enacted Municipal Watershed Land Use Designation (LUD).

Stream Flow

Steep slopes along with well-drained, shallow soils and high drainage densities characterize watersheds in the Assessment Area. Most watersheds in the area respond rapidly to rainstorms, which can cause large daily fluctuations in stream flow. Stream flow is highly variable during the year (see detailed gage data on the following pages). River discharge generally peaks in September or October and gradually declines throughout winter and early spring. Snowmelt at high elevations results in moderate flow increases in May and June.

Gage Data

The United States Geologic Survey operates or has operated eight stream gauging stations in the Assessment Area. Table 3-2 details general information for these gages.

Sitka Sound Landscape Assessment Area

Key Watersheds
and
Stream Classes.

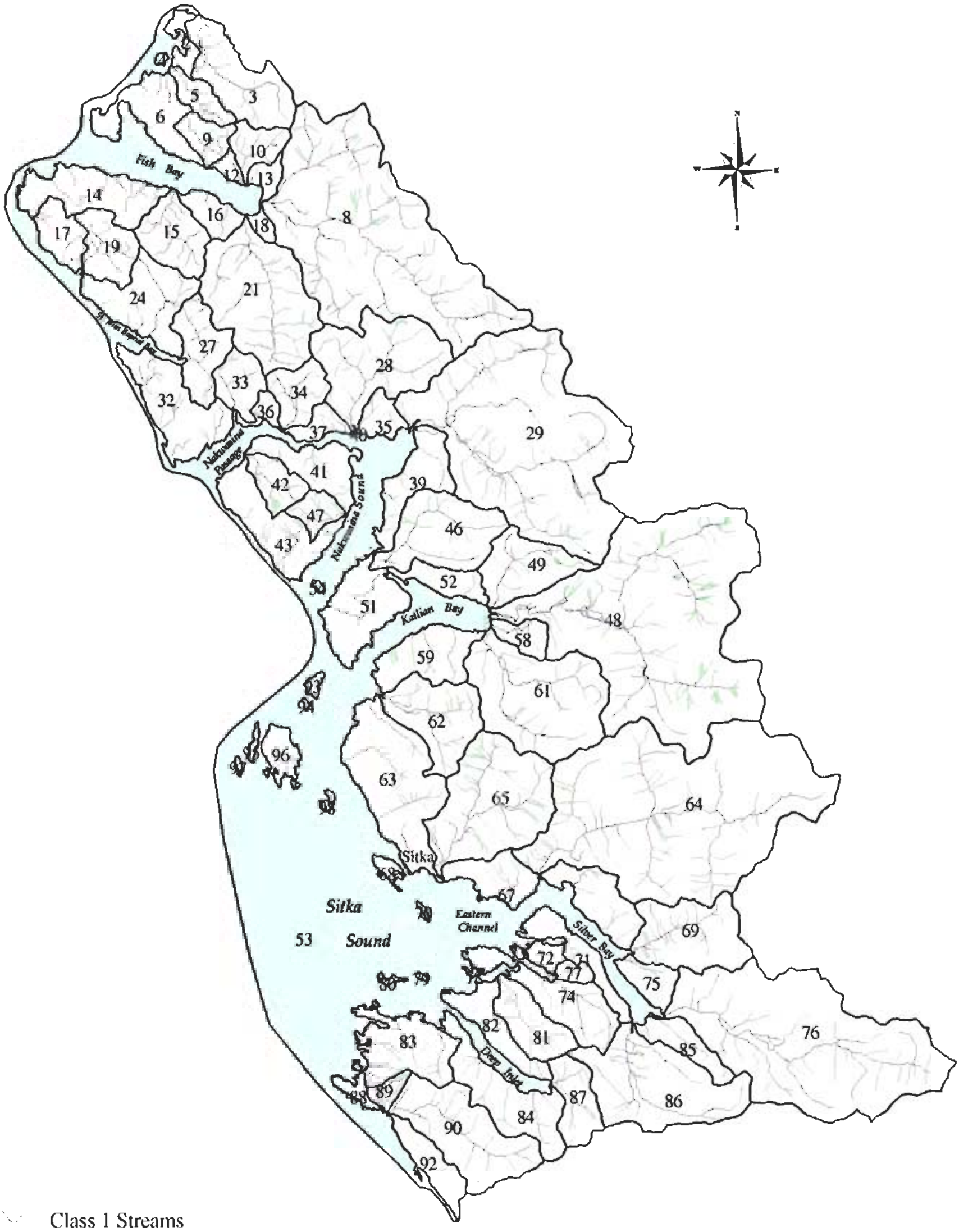


Figure 3-5

Table 3-2. Gage Station Data for the Sitka Sound Landscape Assessment Area

Site Number	Site Name	Gage Datum	Drainage Area (square miles)	Date of Record	Mean Annual Flow (cfs[1])	Peak Flow (cfs)
15087610	Nakwasina River near Sitka	20 ft. above sea level	31.9	1976-1982	287 (1981)	6,300 (10/9/79)
15087690	Indian River near Sitka	125 ft. above sea level	10.1	1980-2000	106 (a 13 year average)	6,460 (11/19/93)
15087700	Indian River near Sitka	30 ft. above sea level	12.0	1998-2000	112 (1999)	Not available
15088000	Sawmill Creek near Sitka	4 ft. above sea level	39.00	1920-1957	472.08 (a 24 year average)	11,100 (1993) 7,100 (1948)
15088200	Silver Bay TR[2] at Bear Cove near Sitka	110 ft. above sea level	0.38	1999-2000	Not available	Not available
15090000	Green Lake near Sitka	Not available	28.8	1915-1925	294.8 (a 9 year average)	3,300 (1918)

Source: USGS web site http://water.usgs.gov/nwis/

[1] cfs is cubic feet per second.

[2] TR means tributary stream.

Table 3-3. Assessment Area Watersheds by Number and Name (Key to Figure 3-5)

2	Baby Bear Cove		58	Sunta Héen
3	Range Creek		59	Katlian Bay (South)
4	Bear Bay Island		61	South Katlian River
5	Bear Bay Creek		62	Starrigavan River
6	Schulze Cove		63	Sitka (North)
8	Fish Bay River		64	Blue Lake
9	Fish Bay (North 1)		65	Indian River
10	Fish Bay (North 3)		66	Herring Cove
12	Fish Bay (North 2)		67	Verstovia
13	Fish Bay (North 4)		68	Japonski Island
14	Louis Cove		69	Medvejie
15	Fish Bay (South 1)		70	Galankin Island
16	Fish Bay (South 2)		71	Silver Bay (West)
17	South Icy Queen		72	Birdnest Bay
18	Fish Bay (South 3)		73	Minor Island
19	North Neva Straits		74	Camp Coogan Creek
21	South Fish Bay River		75	Silver Bay (East)
24	St John (North)		76	Green Lake
27	St John Baptist Creek		77	Camp Coogan (East)
28	Noxon Creek		78	Aleutkina Bay (North)
29	Nakwasina River		79	Emgeten Island
32	Neva Strait (East)		80	Long Island
33	Nakwasina Passage (West)		81	Leesoffskaia
34	Nakwasina Lake		82	Deep Inlet (East)
35	Nakwasina Sound (North)		83	Cape Burunof
36	Limit		84	Deep Inlet (West)
37	Nakwasina Passage (North)		85	Silver Bay (South)
39	Nakwasina Sound (East)		86	Salmon Lake
41	North Halleck		87	Deep Inlet Creek
42	Northwest Halleck		88	Povorotni
43	South Halleck		89	Caution
46	Lisa Creek		90	Kizhuchia Creek
47	Southeast Halleck		92	Kidney Cove
48	Katlian River		93	Big Gavinski
49	Coxe Creek		94	Little Gavinski
51	Lisianski		95	Crow Island
52	Katlian Bay (North)		96	Middle Island
53	Sitka Sound		97	Gagarin Island
54	Crosswise Island		98	Kasiana Island

The following pages detail the major watersheds in the area and give USGS statistics for gage data where available.

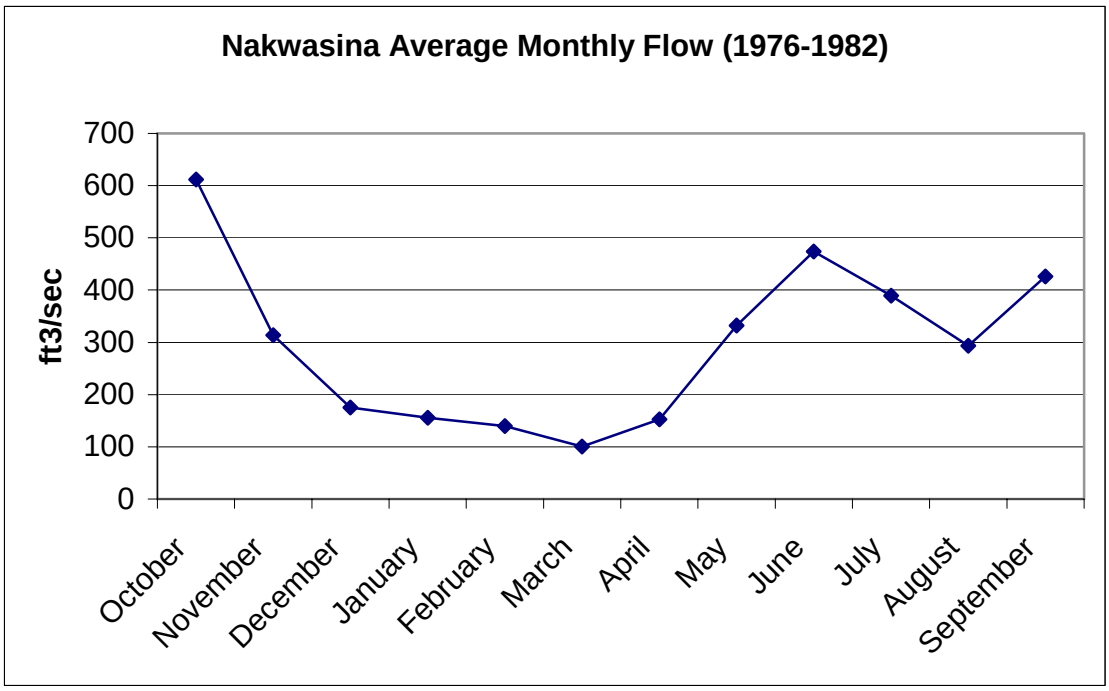
Nakwasina River near Sitka

Watershed Statistics

Watershed Size:	21,067 acres
Stream Miles:	
Class I	10.20 miles
Class II	23.97 miles
Class III	30.84 miles
Class IV	N/A miles
Road Miles:	8.50 miles
Harvest:	1,365.29 acres

USGS Gage Data

Peak Flow	6,300 cfs (10/9/79)
Mean Annual Flow	287 cfs



Indian River Near Sitka

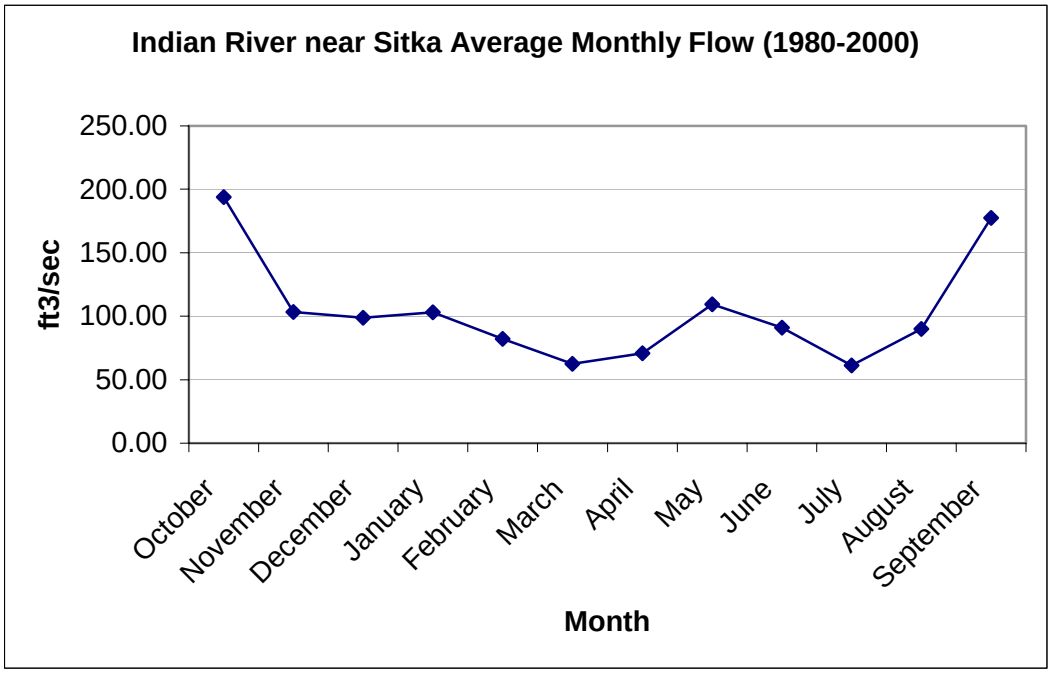
Watershed Statistics

Watershed Size:	7,828.2 acres
Stream Miles:	
Class I	12.3 miles
Class II	3.4 miles
Class III	18.4 miles
Class IV	N/A miles
Road Miles:	0 miles (USDA Land)
Harvest:	0 acres (USDA Land)

USGS Gage Data

Peak Flow	6,460 cfs (11/19/93)
Mean Annual Flow	106 cfs

Note: A percentage of Indian River Watershed is private property.



Sawmill Creek (Blue Lake) Near Sitka

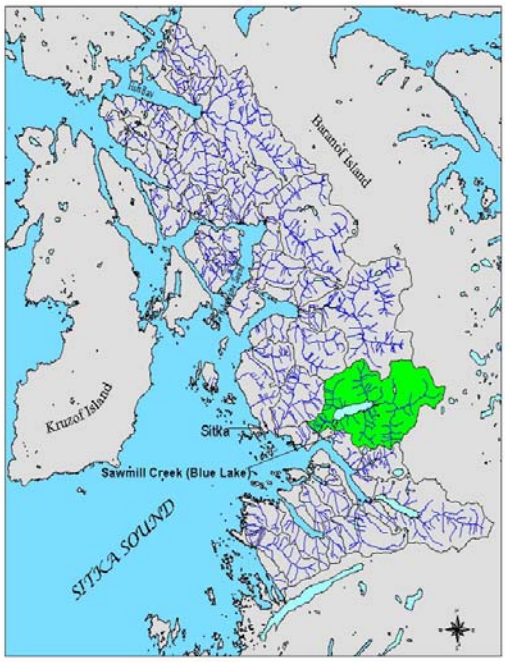
Watershed Statistics

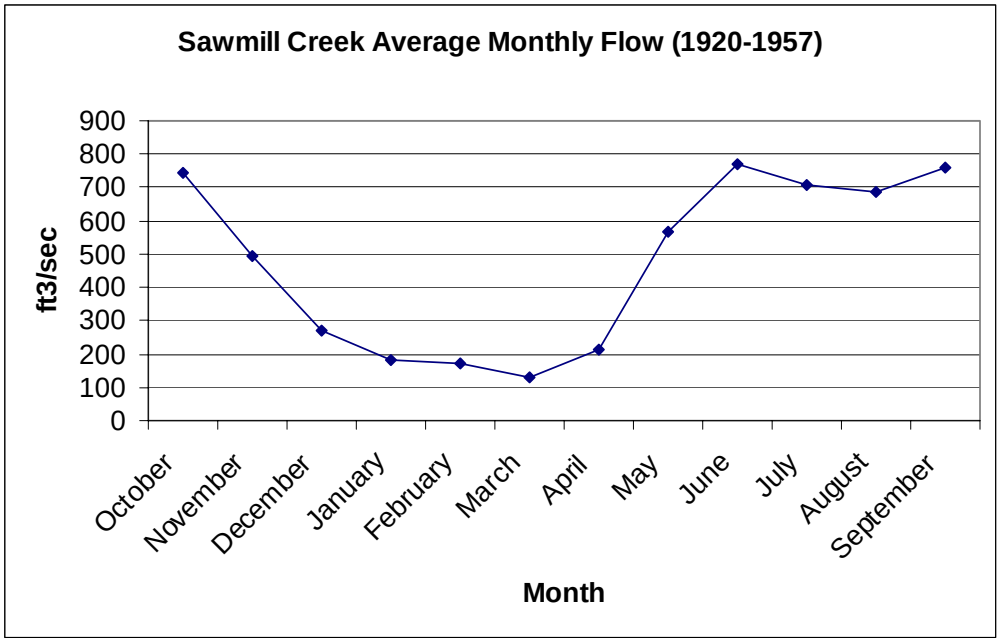
Watershed Size:	25,016 acres
Stream Miles:	
Class I	7.2 miles
Class II	18.9 miles
Class III	31.0 miles
Class IV	N/A miles
Road Miles:	0 miles (USDA Land)
Harvest:	0 acres (USDA Land)

USGS Gage Data

Peak Flow	11,100 cfs (1993)
Mean Annual Flow	472 cfs

Note: Blue Lake is dammed and used for a municipal drinking water source and hydropower. A percentage of this watershed is private property.



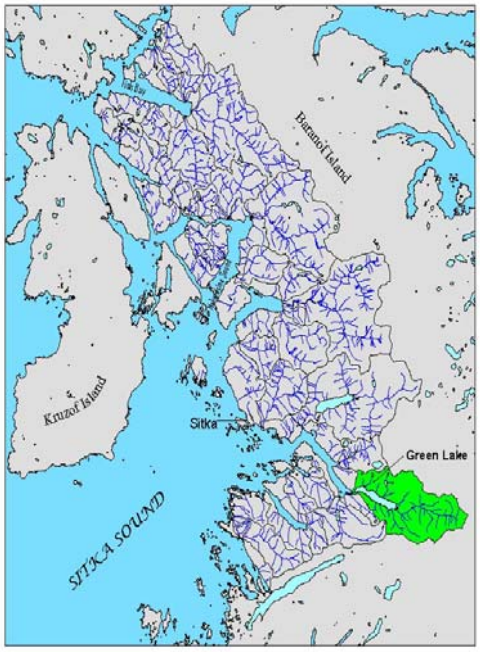


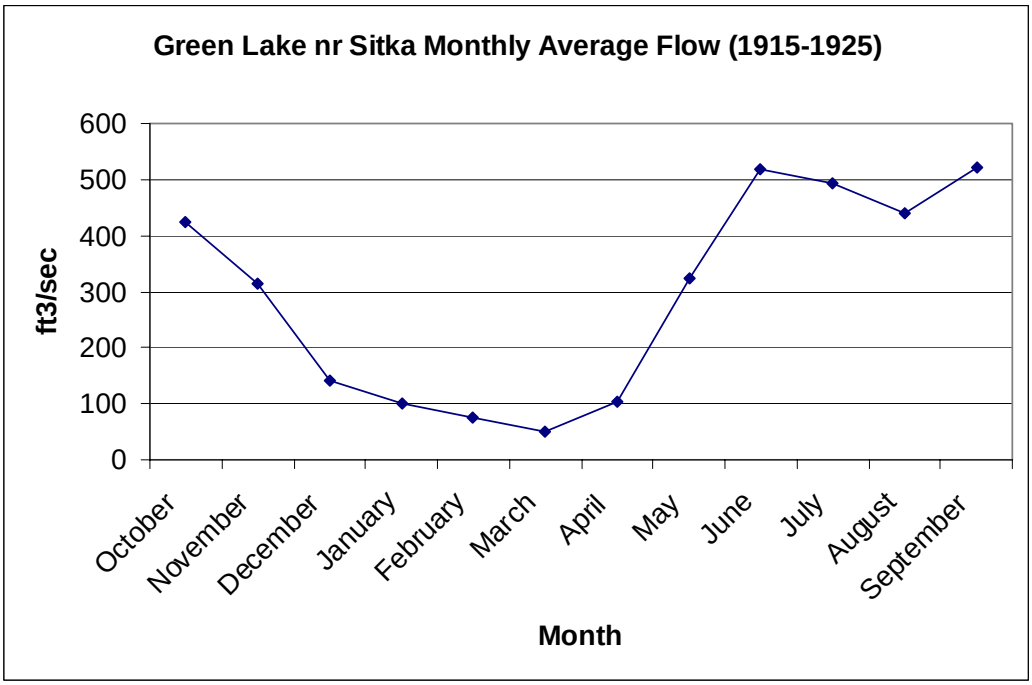
Green Lake Near Sitka

Watershed Statistics

Watershed Size:	18,009 acres
Stream Miles:	
Class I	4.1 miles
Class II	13.2 miles
Class III	19.1 miles
Class IV	N/A miles
Road Miles:	0 miles
Harvest:	0 acres
USGS Gage Data	
Peak Flow	3,300 cfs (1918)
Mean Annual Flow	294 cfs

Note: Flow data is from early last century. Green Lake is now dammed and has a regulated flow.





Assessment Area Streams

All significant stream segments in the Assessment Area were mapped and classified using the Alaska Region Channel Type Classification System (USDA FS 1992). The area contains 786 miles of significant streams. For this assessment, stream class (a measure of fish habitat) and channel type (a measure of sediment transport) were analyzed. Table 3-4 displays stream miles by class and process group and includes the drainage density of streams in key watersheds within the Assessment Area.

Stream Channel Types

Stream channel types are determined by their size, location in the watershed, adjacent landforms, gradient, hydraulic control, and riparian vegetation. Channel type and stream class are influenced by geology, landform, climate, and vegetation.

Stream channels are classified into three main types: transport, transitional, and depositional channels. Transport channels have low sediment retention and include high gradient contained (HC), moderate-gradient contained (MC), and low gradient contained (LC) channels. HC channels are located on steep headwater slopes and are the primary sediment conduit to the low-gradient valley bottom and footslope streams. Transitional channels, in contrast, have moderate sediment retention and include moderate-gradient mixed control (MM), estuarine (ES3), glacial (GO5), and some alluvial fan (AF2) channels. Finally, depositional channels have high sediment retention and include the valley bottom flood plain (FP), palustrine (PA), estuarine (ES2 and ES4), and some alluvial fan (AF1) channels. As mentioned above, the Assessment Area contains 786 miles of mapped streams: 574 miles (73 percent) are transport channels, 94 miles (12 percent) are transitional channels, and 118 miles (15 percent) are depositional channels.

Valley bottom flood plain and palustrine streams generally have the most anadromous (Class I) fish spawning and rearing habitat. Generally, larger U-shaped watersheds contain a higher percentage of depositional valley bottom channels. This holds true for the large U-shaped watersheds of Nakwasina and Katlian. Between 19 and 27 percent of the stream miles in these watersheds are classified as depositional channels.

Stream Classes

Four stream designations are used on the Tongass National Forest to classify stream channels (Forest Plan 1997).

- Class I streams and lakes have anadromous or adfluvial (resident migration) fish habitat.
- Class II streams and lakes have only resident fish populations.
- Class III streams do not have fish populations but have the potential to influence the water quality of downstream aquatic habitat.
- Class IV streams are small, intermittent and/or perennial channels with insufficient flow or transport capabilities to have an immediate influence on the water quality of downstream fish habitat.

Class IV streams have not been analyzed for this assessment because of a lack of data. However, Class IV streams are analyzed during project-level planning and implementation. The watersheds in the Assessment Area contain a total of 190.6 miles of Class I streams (24 percent of all stream miles), 225.3 miles of Class II streams (29

percent of all stream miles), and 370.6 miles of Class III streams (47 percent of all stream miles) (Figure 3-5).

Drainage Density

Steam density, also referred to as drainage density, is a measure of stream length per square mile of watershed. This measurement is useful in determining a stream's potential for runoff and sediment transport. The same factors that influence channel type, geology, landform, climate, and vegetation also influence drainage density. Drainage density within the Assessment Area averages 2.0 miles per square mile (mi/mi2) and ranges from 1.7 mi/mi2 to 2.4 mi/mi2.

Table 3-4. Stream Miles by Class and Process Group and Drainage Densities for Key Watersheds[1] in Assessment Area

			Stream Miles By Class			Stream Miles by Process Group		
Watershed	**Area (mi2)**	**Drainage Density (mi/mi2)**	**Class I**	**Class II**	**Class III**	**Transport**	**Transitional**	**Depositional**
Fish Bay	33.4	2.3	17	27	32	56	8	12
Starrigavan	6.4	2.4	5	3	8	11	2	3
Noxon	10.1	2.0	4	5	11	16	3	2
Nakwasina	32.9	2.0	10	24	31	40	13	12
Katlian	38.4	2.2	28	9	47	53	8	23
South Katlian	13.1	1.9	10	5	11	15	4	7
Nakwasina Passage (West)	2.6	1.9	3	1	2	3	1	2
Lisa Creek	7.6	1.9	5	4	6	10	3	2
Coxe Creek	5.2	2.0	2	3	6	7	3	1
Camp Coogan	5.5	1.7	2	3	4	7	1	1
Salmon Lake	11.5	1.7	6	7	7	13	3	4
Kizhuchia	9	1.9	7	3	7	11	2	4

[1] Key watersheds are those that have been assigned a High Watershed Concern ranking and High/Medium Fish Capability ranking (for more information on these rankings, refer to the Fisheries section in Chapter 4).

Water Quality and Sedimentation

The regulation of water quality in the Assessment Area is the responsibility of the State of Alaska's Department of Environmental Conservation (DEC). DEC can set specific water quality standards for a waterbody if it determines that there is a specific water quality issue associated with the waterbody. DEC has not set specific water quality standards for the streams and lakes in the Assessment Area; the most stringent general water quality standard (i.e., Water Supply) is typically applied to these water bodies. Currently, three watersheds in the Assessment Area, Sitka (North) [Granite Creek], Katlian and Nakwasina, are on the State of Alaska's 303(d) impaired water bodies list. See Appendix B for the water quality criteria regulated by the State of Alaska.

Total Maximum Daily Load

Total Maximum Daily Loads (TMDLs) are specified by the Clean Water Act and are used when suspected pollution sources impacting waterbodies come from non-point sources. TMDLs, which are pollution load limits**,** describe the amount of a particular pollutant a waterway can receive and still comply with water quality standards. TMDLs take into account the pollution from all sources, including discharges from industry and sewage treatment facilities; runoff from farms, forests, and urban areas; and discharges from natural sources such as decaying organic matter or nutrients in soil. TMDLs include a safety margin for uncertainty and growth that allows for future discharges to a river or stream without exceeding water quality standards and that fully supports the designated uses of the waterbody.

A non-point source is any form of pollution that does not come from a point such as a discharge pipe from a factory. Non-point sources on National Forests are usually the result of runoff from land management activities. The State of Alaska has begun the TMDL process for water bodies in two Assessment Area watersheds (Nakwasina and Katlian) and has approved a TMDL for the Granite Creek (see Appendix B). The water bodies of Katlian and Nakwasina are listed by the State of Alaska as "Tier 1" waters. As such, they require assessments and verification that pollution exists and/or the pollution controls currently in place are needed. When assessments are completed, such as the case with Granite Creek, waters are reclassified as "Tier 2," and TMDLs are established.

Biological Characteristics

Fisheries

Southeast Alaska is famous for its salmon runs. Most of the streams in the area are used for spawning and rearing by a variety of anadromous and resident fish. Some of the species in the Assessment Area are listed in Table 3-5.

Table 3-5. Most Common Fish Species in the Assessment Area

Common Name	Scientific Name
coho salmon	*Oncorhynchus kisutch*
pink salmon	*Oncorhynchus gorbuscha*
chum salmon	*Oncorhynchus keta*
sockeye salmon	*Oncorhynchus nerka*
steelhead	*Oncorhynchus mykiss*
coastal cutthroat trout	*Oncorhynchus clarki*
Dolly Varden char	*Salvelinus malma*

In 2002, commercial fishers harvested over 56 million fish valued at 38 million dollars from Southeast Alaska waters. Sport fishing in the Assessment Area is also big business. According to the Alaska Department of Fish & Game (ADF&G) web site, there are 138 saltwater fishing guides registered in the Sitka area (ADF&G, 2002). In 2000, there were over 22,000 salmon harvested by recreational fishers in the saltwater surrounding the Assessment Area (ADF&G, 2002).

Aquatic Species and Habitat

The estuary (ES4), flood plain (FP3, FP4, FP5), and low gradient contained channels (LC1 and LC2) comprise most of the critical stream habitat for pink, chum, and coho salmon, steelhead trout, Dolly Varden char, and sculpin. Where accessible, these low gradient channels provide much of the available spawning habitat for all fish species present. These channels, along with associated secondary channels and smaller flood-plain channels, provide abundant rearing habitat for juvenile coho salmon, steelhead and cutthroat trout, and Dolly Varden char.

Very low gradient, palustrine channels (PA0, PA1, and PA2) and sloughs and associated beaver ponds occur within some of the Assessment Area watersheds. Primarily associated with fens, PA channels and beaver pond areas are characterized by organic sediments, abundant deep pool and glide areas with cover, and spring-fed tributaries. The PA channels and beaver ponds provide high quality rearing and limited spawning habitat for coho salmon, Dolly Varden char, and cutthroat trout.

The highly productive estuary channels (ES) provide high quality spawning habitat for pink and chum salmon and provide important rearing habitat for many salmonids during at least part of their life cycle. In addition, all fish species use the accessible habitat in the moderate gradient channels (MM1, MM2, MC1, MC2, AF1, and AF2). These

channels contain low to moderate amounts of spawning and rearing habitat. The stronger swimming coho salmon, cutthroat trout, and char make most use of the habitat in these channels.

For more detail on stream classes, refer to the Forest Service Aquatic Habitat Management Hand-book (USDA FS 1986). Channel types are extensively defined in the Region 10 Channel Type User Guide (USDA FS 1992).

Salmon Life Histories and Characteristics within the Assessment Area

Indigenous fish species known to utilize the rivers, creeks and lakes within the Assessment Area include coho salmon *(Oncorhynchus kisutc*h), pink salmon (*Oncorhynchus gorbuscha*), chum salmon *(Oncorhynchus keta*), sockeye salmon *(Oncorhynchus nerk*a), Dolly Varden Char *(Salvelinus malm*a), rainbow trout (*Oncorhynus mykiss*), coastal cutthroat trout *(Oncorhynchus clarki*) and steelhead trout (*Oncorhynchus mykiss*), certain sculpin species *(Cottus* sp*p*.) and three-spine stickleback *(Gasterosteus aculeatu*s). Chinook salmon *(Oncorhynchus tshawytsch*a) have also been observed straying from two local hatcheries into adjacent streams, but are not known to be naturally reproducing. Sustaining populations of Brook trout (*Salvelinus fontinalis*) [Green Lake] and Arctic Grayling (*Thymallus arcticus (Pallus*)) [Beaver Lake] have also been introduced within the Assessment Area. No fish species within the Assessment Area are federally listed as threatened or endangered.

Although different populations of the same fish species can vary slightly within their respective systems in terms of run timings and run characteristics in the Assessment Area, we assume that the area salmon follow similar patterns to other salmon runs in the Southeast Alaska. A general description of these life history characteristics and timings for the more abundant species follows:

<u>Coho (Silver)</u>
Coho salmon typically spend 2 to 3 years at sea before returning to spawn. Coho typically spend 1 or 2 full years rearing in streams and rivers before beginning their migration to sea. Because of their larger size when entering salt water, coho are generally considered less dependent on estuarine rearing than are pink or chum salmon (Simenstad et al. 1982). Coho tend to move through estuaries more rapidly, using deeper waters along shorelines. Feeding is primarily on planktonic or small nektonic organisms, including decapod larvae, larval and juvenile fish, and euphausiids (Miller et al. 1976, Simenstad et al. 1982). Coho also eat drift insects and epibenthic gammarid amphipods, especially in turbid estuaries (Sandercock 1991). Coho are one of the more numerous species in area streams that support them.

Coho salmon usually enter streams in late August, and spawning runs can continue until at least well into December. Fry emerge typically in May and feed on macroinvertebrates, salmon eggs, and other fry. They generally reside in the river system for one to two years before outmigrating to the ocean. Most will smolt in May and June after reaching a size of 3 to 4 inches in length and begin their seaward migration.

Pink (Humpback or Humpy)
Pink salmon spend only 2 years in the ocean before returning to their natal streams to spawn. Pink salmon are less likely to migrate great distances once in fresh water and are more likely to start mating behavior lower in a drainage than the other salmon species. Often the upstream limit for spawning is a waterfall or rapids that other Pacific salmon can surmount (Heard 1991). Some Pinks will even spawn in the estuary. After a 5 to 8 month incubation the emergent fry migrate within days to sea, often not feeding while in fresh water. Feeding is primarily on planktonic or small nektonic organisms, including chironomid pupae, dipateral larvae, and drift insects (Heard 1991). Pink salmon are the most numerous species inhabiting area streams.

Chum (Dog)
Chum salmon spend 2 to 5 years in the ocean before returning to their natal streams to spawn. Like pink salmon, chum salmon are less likely to migrate great distances once in fresh water and are more likely to start mating behavior lower in a drainage than the other salmon species. Often the upstream limit for spawning is a waterfall or rapids that other Pacific salmon can surmount (Salo 1991). After a 5 to 8 month incubation the emergent fry migrate within 30 days to sea. Feeding is primarily on planktonic or small nektonic organisms, including chironomid larvae, dipateral larvae, and drift insects (Salo 1991). Chum salmon are less numerous than pink salmon in area streams.

Sockeye (Red)
Sockeye salmon usually do not enter into spawning areas until they were ready to spawn, with fish gathering or near the mouth of their natal system or staging in lakes before moving upstream. Sockeye salmon spawning migrations in the Assessment Area (Salmon Lake and Redoubt Lakes) begin in mid-May and continue through September. Spawning usually occurs in rivers, streams, and upwelling areas along lake margins. Eggs hatch during the winter, and the young sac-fry, or alevins, remain in the gravel, until the spring. At this time they emerge from the gravel as fry and move into lake habitats to rear and feed on zooplankton. Juveniles usually spend one to three years in fresh water before migrating to the ocean in the spring as smolts. Once in the ocean, sockeye grow quickly, usually reaching a size of 4 to 8 pounds after one to four years (ADF&G 1994).

Chinooks (Kings)
There are no wild Chinook salmon runs within the Assessment Area. Northern Southeast Regional Aquaculture Association (NSRAA) operates a hatchery at the mouth of Medvejie Creek in Silver Bay south of Sitka. Chinook fry from this hatchery are reared in pens both at the Medvejie facility and at Green Lake. Fish returning to the hatchery begin returning in late May and early June. A cost recovery seine fishery is conducted in conjunction with the returning fish. There is no spawning access for the fish imprinted to Medvejie Creek and Green Lake and excess fish are known to stray into the larger streams flowing into Silver Bay (Sawmill Creek and Salmon Lake Creek). Green Lake contains a resident population of Chinook that escaped from a broken pen. No natural reproduction of Chinook is known to occur in these streams or within Green Lake. Sport fishing at the hatchery, within Silver Bay and in the two adjacent streams is also popular among local residents and visitors.

Sheldon Jackson College also operates a hatchery that produces Chinook salmon on their campus. Water used for hatchery operations is diverted from Indian River. Fish returning to this hatchery also begin returning in late May and early June. There is no spawning access for fish at the hatchery and excess fish are known to stray into the lower reaches of Indian River. No natural reproduction of Chinook is known to occur in this stream. Sport fishing at the hatchery and within the adjacent Crescent Harbor breakwater is popular among local residents and visitors.

Life Histories and Characteristics of Trout and Char within the Assessment Area

Rainbow

Rainbow trout may exist above impassible barriers. Rainbow trout spawn in early spring and exhibit similar spawning behavior as other salmon, although not all rainbow trout die after spawning. After a 2-month incubation, the fry emerge. Rainbow trout primarily feed on food associated with the substrate such as diptera, mayflies, stoneflies, amphipods, and aquatic worms and eggs. No information is known about the overall population status of rainbow trout in the Assessment Area watersheds. A fish habitat and population study is currently being conducted on Blue Lake, a thriving stocked rainbow fishery, as part of the Blue Lake dam relicensing process.

Rainbows have both resident populations and immigrating spawning populations from other river systems. Resident rainbows likely remain stunted in growth due to the limited food supply and habitat. Non-spawning rainbows may also follow spawning salmon into streams later in the summer to prey on salmon eggs.

Steelhead

The steelhead trout is a rainbow trout that has spent part of its life in the sea. There are no major physical differences between rainbow and steelhead trout; however, the nature of their differing lifestyles has resulted in subtle differences in color, shape and general appearance, with steelhead trout being considerably larger than rainbow trout.

Within a one-, two-, or sometimes three-year period, Alaska steelhead will have moved hundreds of miles from their parent stream. Some populations return to the home stream as early in the year as July and are known as “summer steelhead”, which are relatively rare in Alaska and found in only a few select Southeast Alaska streams. “Fall” run steelhead are much more common in northern Southeast Alaska. These fish enter the freshwater systems as adults in August, September, October, and into the winter. Many of the Southeast Alaska systems have “spring” run steelhead. These fish end their ocean journeys in mid April, May and June. The Assessment Area contains small populations of both fall and spring run steelhead (ADF&G 1994).

Regardless of when they enter the stream, spawning commences about mid-April and usually occurs throughout May and early June. Unlike salmon, steelhead commonly spawn more than once, and fish over 28 inches are almost always repeat spawners. A

male may spawn with several females, and more males than females die during the spawning period. The ragged and spent spawners move slowly downstream to the sea, where lost fats are restored and adults again visit the feeding regions of the ocean. On rare occasions a fish will return to the stream within a few months, but most repeat spawners spend at least on winter in the sea between spawning migrations (ADF&G 1994).

By mid summer fry emerge from the gravel and seek refuge along stream margins and in protected areas. Generally, the juvenile steelhead will remain in the parent stream for about three years before outmigrating to salt water (ADF&G 1994).

Cutthroat

Cutthroats have several life history forms including stream resident, stream spawning/lake resident, and anadromous populations. Within the Assessment Area watersheds, cutthroat trout are typically landlocked by impassible barriers within lakes. Some anadromous runs may be present, however there is little information on their populations and distribution. Buck Lake and Lake 436 in the northern portion of the Assessment Area are known to have healthy populations of cutthroat trout. Cutthroat, like rainbows, are spring spawners, when stream water temperatures reach about 5^{o} C (41^{o}F), utilizing the upper reaches of low gradient tributary streams with gravel bottoms (Stolz and Schnell 1991).

Resident and sea-run coastal cutthroat trout have similar early life histories. Adults spawn in small, isolated headwater streams from late April to early June, and young cutthroat emerge from the gravel in June. Selection of isolated spawning areas is thought to reduce interaction of young cutthroat with more aggressive juvenile steelhead and coho salmon. Later, the young occupy beaver ponds, sloughs, or lakes. Sea-run cutthroat rear for three to four years in fresh water and migrate to sea during May when they are about 8 inches long. Time at sea varies form few days to over a hundred days before they return to their natal stream. During their migration, they follow the shoreline and seldom venture farther than 30 to 45 miles from their home stream. In the fall they return to their home stream where they mature during the winter months. Fish mature at 5 to 7 years and live to be 9 to 10 years old (ADF&G 1994).

Dolly Varden Char (Dollies)

Dolly Varden have several life history forms including stream resident, stream spawning/lake resident, and anadromous populations. Within the Assessment Area watersheds, Dolly Varden are typically anadromous unless landlocked by impassible barriers. Dolly Varden, like other char, are fall spawners, utilizing streams with gravel bottoms. After an approximately 4-month incubation, the fry emerge usually in April or May. Dolly Varden are opportunistic feeders, eating larval and adult aquatic insects, snails, leaches, and small fish.

Anadromous populations generally spend 3 to 4 years in fresh water before their first migration to sea in the spring. Dolly Varden spend only a few weeks to several months at sea before returning to fresh water for spawning and/or overwintering (Wydoski and Whitney 1979). Dolly Varden are becoming important to anglers when salmon are not

available. The sport fishery for Dolly Varden appears to be increasing popular over recent years. Some of the larger systems within the Assessment Area, such as Fish Bay, Nakwasina and Katlian are thought to have very healthy populations.

Dolly Varden have both resident and immigrating spawning populations. Resident Dollies likely remained stunted in growth due to the limited food supply and habitat in area streams. Anadromous Dolly Varden spawners enter streams from mid-August to early October, and then outmigrate mostly in October. Immigrating anadromous Dolly spawners are typically large and are an obvious target for sport anglers. Non-spawning Dollies also are known to follow spawning salmon into streams later in the summer to prey on salmon eggs, as well as prey upon outmigrating salmon fry at river mouths.

Wetlands and Deepwater Habitats

The high precipitation level and glacial terrain of Southeast Alaska have combined to form extensive wetlands and deepwater habitats in the Assessment Area. Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40 CFR 230.41(a)(1)). Wetlands are sites that generally have both saturated soils for at least a portion of the year and vegetation that is adapted to saturated conditions.

Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep so that water, rather than air, is the principal medium within which the dominant organisms live. Wetlands and deepwater habitats are defined separately because traditionally the term wetland has not included deep permanent water; however, both must be considered in an ecological approach (Cowardin and others 1979).

Wetlands and deepwater habitats are valued for their physical, chemical, and biological functions. They moderate flooding, reduce runoff and sedimentation, provide wildlife and plant habitat, and may help sustain stream flow during dry periods. Physical functions may include flood conveyance, surface and ground water regulation, sediment retention, and temperature moderation. Chemical functions may include nutrient storage, pH moderation, and carbon storage. Biological functions include habitat for terrestrial, aquatic, and marine plants and animals.

Vegetation

The following section describes existing forest vegetation and timber resources, as well as past harvest within the Assessment Area. Assessment Area boundaries follow watershed boundaries and therefore include entire VCUs as well as portions of VCUs. However, in carrying out the analysis of Assessment Area vegetation, whole VCUs were analyzed. This area will be referred to as the Vegetation Analysis Area in the discussion that follows. Table 3-6 displays forested acres by VCU for all Forest Service administered lands within the Vegetation Analysis Area. Forested acres, as displayed in Table 3-6, include all forest types and both productive and non-productive lands. Productive forests are those that currently contain or are capable of producing at least 20 cubic feet of wood fiber per acre per year, or those having greater than 8,000 board feet per acre. Productive forests include both old-growth and young-growth forests.

Table 3-6. Acres of National Forest System (NFS) Lands and Forested Acres by VCU in the Vegetation Analysis Area

Value Comparison Unit	Acres of NFS Lands	Forested Acres
2870	41,776	31,477
2880	6,116	4,919
2990	23,458	7,503
3000	19,670	17,129
3010	5,648	4,233
3020	21,464	20,323
3100	2,328	2,300
3110	12,866	8,841
3120	9,762	4,367
3130	27,823	7,948
3180	25,486	5,271
3190	5,017	4,736
3200	7,719	7,301
3210	8,815	8,105
3220	7,498	6,641
3230	7,645	6,342
3240	18,621	6,073
3250	4,131	524
Total	**255,843**	**154,033**

Forest Vegetation

The Assessment Area is a diverse and dynamic landscape with considerable topographic relief. It contains a mosaic of young and old forests, muskegs, forested muskegs, and alpine areas. Forest vegetation structure, composition, and distribution are largely determined by site productivity and soil drainage, as well as natural and human-caused disturbance. The dominant tree species in the Assessment Area is western hemlock. Varying amounts of Sitka spruce and Alaska yellow cedar are also found within the area. The most productive forests are associated with deep, well-drained soils, many of which are found in the alluvial fan and flood plain landforms located in places such as Fish Bay, Nakwasina Sound, and Katlian Bay. Sitka spruce favors these more nutrient-rich and well-drained sites. Western hemlock dominates the less productive sites with Mountain

hemlock at higher elevations. Yellow cedar is often absent on the more productive sites, but does occur in scattered pockets. Cedar can be relatively common on many open and less productive sites or forested muskeg stands and occasionally dominates these areas. Mixed conifer stands dominated by small to medium-sized mountain and western hemlock and yellow cedar are typical of wet, sparsely forested muskeg areas and low productivity sites. Much of the upland area surrounding Fish Bay is comprised of this forest type. Shore pine, a variety of lodgepole pine, is also common in these mixed conifer stands and open muskeg areas. Alder tends to grow on exposed and disturbed soil sites such as old roads.

The distribution and abundance of understory plants is highly variable and dependent on soil drainage, the distribution of large organic debris as a rooting substrate, the amount of light reaching the forest floor, and the type and amount of natural or human-caused disturbance. Vaccinium (blueberry, huckleberry) tends to be the most prevalent understory shrub. It is typically found with Menziesia, copperbush, and devil's club. Salmonberry is common on disturbed sites, and skunk cabbage occurs throughout the area on wet micro-sites. The dominant forbs are typically five-leaf bramble and bunchberry. Various species of ferns, lichens, and moss are also numerous. The dominant plant associations[1] are western hemlock/blueberry and western hemlock/blueberry/devil's club.

The plants in estuaries and along the beach fringe include red alder, Sitka alder, crabapple, and various sedges and grasses.

Muskeg vegetation is a mixture of sedges, deer cabbage, sphagnum mosses, and low growing herbs such as Labrador tea and bog laurel. Muskegs typically contain numerous small ponds. Stunted, slow-growing shore pines grow on the less saturated areas.

Forest Vegetation Structure

Forest stand structures in the Assessment Area vary from single-storied, even-aged forests to complex, multi-layered, uneven-aged forests.

Even-Aged Forest

Stand replacing disturbances such as clearcut timber harvest and/or windthrow are responsible for most of the even-aged stands within the Assessment Area. These stands are generally classified as young-growth. The Vegetation Analysis Area contains 11,004 acres of young-growth forest. Ninety-six percent of the young-growth acres in the area has been generated by previous harvests and is classified as productive forest.

These stands follow a clearly defined pattern of development beginning with rapid establishment of conifer seedlings, shrubs, and herbaceous plants (i.e., stand initiation) and followed by canopy closure after about 25 to 35 years. These developing young forests are extremely dense, containing thousands of trees per acre. They are also characterized by relatively uniform tree height and diameter distributions that result in

[1] Plant association refers to the climax forest plant community type representing the end point of succession.

intense competition preventing new tree regeneration (i.e., stem exclusion). During the stem exclusion stage, light is unable to reach the forest floor. The absence of light prevents the growth of understory shrubs and herbs. The stem exclusion stage can persist for 50 to 100 years before understory vegetation is reestablished and new tree cohorts emerge (i.e., understory reinitiation). Understory reinitiation occurs as wind disturbance, insects, and diseases create gaps in the forest canopy (Deal 2001, p. 2).

Intermediate silvicultural treatments such as thinning can potentially reduce the duration of the stem exclusion stage, encourage more rapid growth among a smaller number of trees, and maintain or enhance understory vegetation. The majority of harvest generated young-growth in the Assessment Area is currently in the late stage of stand initiation or in the early stage of stem exclusion. Precommercial thinning activities favoring the growth of Sitka spruce are responsible for the dominance of this species in young-growth stands. The majority of young-growth forest in the Assessment Area is located in the Fish Bay, St John the Baptist Bay, Nakwasina Sound, Katlian Bay, and Kizhuchia Creek drainages.

Uneven-aged Forest

Uneven-aged stands are characterized by a patchy, multi-layer canopy; trees that represent many age classes; larger trees that dominate the overstory; large standing dead trees (snags) or decadent trees; and higher accumulations of large down woody material (USDA 1997 [Forest Plan], p. 7-31). These multi-aged stands, which produce at least 20 cubic feet of wood fiber per acre per year or have greater than 8,000 board feet per acre, are classified as productive old-growth forest (POG). The amount and distribution of productive old-growth habitat is assessed using volume strata classification from the timber type data GIS layer (TIMTYPE) and the common land unit data layer (CLU). Volume strata are derived from timber volume, soil, and slope information, and are an indicator of productive forest habitat. POG is divided into low, medium, high, and very high volume strata. National Forest System (NFS) lands in the Vegetation Analysis Area contain 74,926 acres of POG. POG accounts for 31 percent of the land in development LUDs and 30 percent of the land in non-development LUDs.[2]

The remaining forested acres of NFS Lands in the Vegetation Analysis Area (68,102 acres) are characterized by non-productive forest. Non-productive forest is associated with muskeg land types including lowlands, fens, riparian areas, broken mountain slopes, plateaus, glacial outwash zones, and other unproductive land types (e.g., steep, narrow canyons associated with areas other than muskegs). Non-productive forest is characterized by very low timber volume, mixed species, and old, defective, and stunted trees. Table 3-7 provides a summary of both productive and non-productive forested acres within the Vegetation Analysis Area.

[2] Development and non-development LUDs are described in Chapter 1.

Table 3-7. Acres by Volume Strata, Stand Structure, and Forest Productivity on NFS Land within the Vegetation Analysis Area

Volume Strata	Acres	Vegetative Structure	Acres
Very High Strata	11,828	**PRODUCTIVE FOREST**	
High Strata	8,569	Productive Old-Growth	74,926
Medium Strata	48,440	Young-Growth Harvest Generated	10,521
Low Strata	6,089	Young-Growth Wind Generated	483
Young-High Strata	79	**Total Productive Forest**	**85,930**
Young-Medium Strata	1,196	**Total Forested Non-Productive**	**68,102**
Young-Low Strata	54		
Poles	9,388	**Total Forested**	**154,032**
Saplings	287	**Total Non-forested**	**102,203**
Total	**85,930**	**Total Vegetation Analysis Area**	**256,235**

Source: Heuer 2003 - Tongass GIS

Yellow Cedar Decline

Many yellow cedars are in a state of decline and experiencing high rates of mortality in the Assessment Area and across the Tongass National Forest. The cause of this decline is not entirely understood. Ongoing research suggests that mortality is naturally occurring and is caused by some form of environmental stress such as soil toxins or freezing. The decay resistant properties of yellow cedar make salvage desirable; the strength of the wood does not deteriorate, and the trees retain their value for decades after they die. Yellow cedar currently has the highest commercial value of any tree species on the Tongass National Forest.

Harvest History and Regeneration

Approximately 10,524 acres have been harvested from NFS lands within the Vegetation Analysis Area. This represents an estimated 4 percent of the total NFS land area and 7 percent of the forested land area. The clearcut regeneration harvest method has been the primary means of harvesting timber within the area (approximately 91 percent of the harvested acres), and most harvest occurred after 1956. Approximately 1,121 acres were harvested using the selective harvest method prior to 1956. An estimated additional 2,259 acres in the Vegetation Analysis Area have been harvested from privately owned land or land in other ownership. Table 3-8 provides a harvest summary for the Vegetation Analysis Area. See also Figure 3-6.

Table 3-8. Harvest History within the Vegetation Analysis Area

Harvest Year	Acres of NFS Land Harvested	Acres of Non- NFS Land Harvested	Harvest Summary	Acres	% NFS Land	% Non-NFS Land	% All Ownerships
1901	7		**NFS Lands**				
1910	90		Prior to 1956				
1918	27		(Selective Harvest)	1,121	<1		
1927	5		After 1956	9,429	4		
1940	48		**Total**	**10,550**	**4**		
1942	51						
1947	176		**Non-NFS Lands**				
1951	639		Prior to 1956	0		0	
1953	78		After 1956	2,259		9	
1957	6		**Total**	**2,259**		**9**	
1959	146	42					
1960	765	699	**All Ownerships**				
1961	1,257	381	Prior to 1956	1,121			<1
1962	1,314	221	After 1956	11,688			4
1963	707	43	**Total**	**12,809**			**5**
1964	652	255					
1965	322						
1966	118						
1967	765	107					
1968	1,136						
1969	173	73					
1970	361						
1974	478	249					
1975	409						
1978	41						
1979	767						
1985	12						
Unknown	0	189					
Total	**10,550**	**2,259**					

Source: Heuer 2003 - Tongass GIS

Since 1985, no timber harvest has occurred on NFS lands within the Vegetation Analysis Area. In 1996 a Record of Decision for the Northwest Baranof Timber Sale Environmental Impact Statement was signed. This decision approved three timber sales within the Assessment Area totaling approximately 22.5 million board feet (MMBF) of timber: the Lisa Creek, Schultz Cove, and St. John timber sales. Though these sales were advertised one or more times, they did not sell due to unfavorable market conditions at the time of offer.

Sitka Sound Landscape Assessment Area

Riparian Management Areas
and
Previous Harvest by Decade.

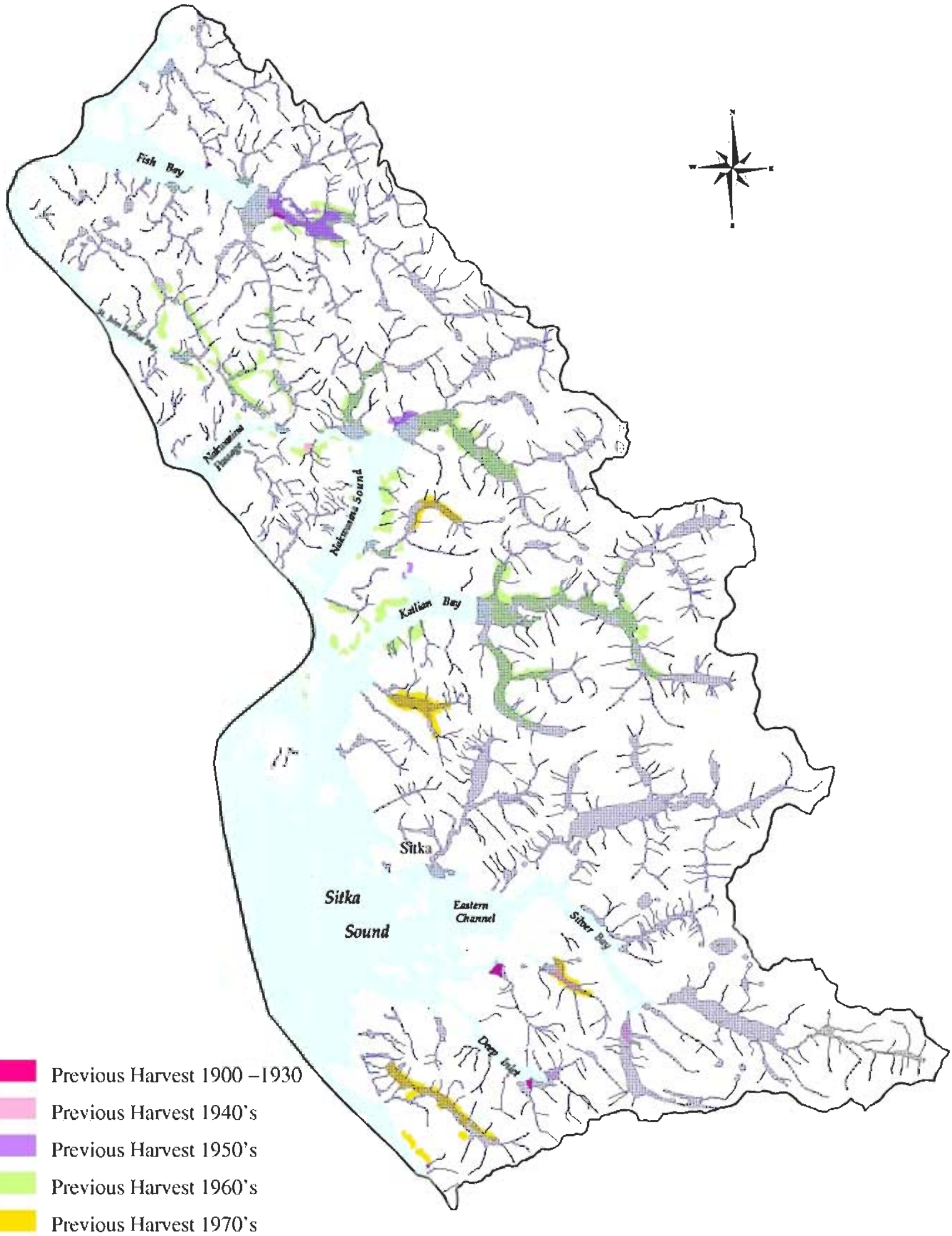


Figure 3-6

Some selective harvest occurred on private land in Katlian Bay during 2002; however, no data are available for other harvest activities on Non-NFS lands since 1985.

Historic Logging

The Assessment Area contains what may be the oldest industrial clearcut in Alaska. Approximately 189 acres of timber at the base of Mount Verstovia were harvested sometime during the 1860s to make charcoal and firewood for the Russian foundries and stoves in Sitka. The tree stand begins at sea level and reaches approximately 1,000 feet in elevation. Today, this young Verstovia forest illustrates the structure and dynamics of a maturing 140 year-old even-aged forest. The forest is currently in transition from an even-aged structure to a more complex stand structure. In April 2003, the Sitka Ranger District acquired 1,034 acres of land at the base of Mount Verstovia, including this young stand. This newly acquired parcel of land will be part of a non-development LUD; however, the specific management emphasis to be applied to this parcel has yet to be determined.

Most other historic logging activities that took place prior to 1956 made use of selective harvest methods and were located either along the shoreline within several hundred feet of salt water or in alluvial fan areas at the heads of bays. These selective harvests targeted a particular size and species of tree, primarily large Sitka spruce. The stand structures of these areas are generally more variable than in the areas that have been clearcut. Removal of trees often improved conditions for residual trees in the vicinity and resulted in more variable and dense understory vegetation due to canopy gaps created through harvest. In contrast, little understory vegetation typically exists in the dense shoreline areas that have not been logged.

Much of this historic harvest was accomplished using A-frames[3] to drag the logs into the saltwater. Little suspension is possible with this method; therefore, evidence of skid paths created by the A-frames still remains in some areas such as Fish Bay and Camp Coogan Bay. Conifer regeneration in these areas is often less abundant, and red alder may be predominant. In some cases, skid paths also changed drainage patterns and rerouted small streams.

Regeneration

National Forest Management Act (NFMA) regulations state that "when trees are cut to achieve timber production objectives, the cuttings shall be made in a way as to assure that the technology and knowledge exists to adequately restock the lands within five years after final harvest" [(36 CFR 219.27c (3)]. Regeneration of harvested acres on NFS lands within the Assessment Area has been successful; all previously harvested areas have been certified as regenerated.

[3] An A-Frame is a steel, A-shaped frame or boom that is rigged with a cable and winch and used to provide lift for loading and yarding logs.

Young-Growth Management

The management of young-growth stands is a responsibility that comes with timber harvest and is an important element of timber and land management. Many of the harvest generated young-growth stands within the Assessment Area have been precommercially thinned to improve the growth and yield of timber, to change the species mix to favor more profitable species, or to improve wood quality. In addition, multiple emphasis thinning has been implemented to improve fish and wildlife habitat. These multiple emphasis prescriptions are designed to maintain, enhance, or restore understory vegetation by delaying canopy closure; maintaining greater species diversity; and restoring riparian structure and/or instream fish habitat by decreasing the time needed to grow large trees that will eventually serve as large woody debris. Approximately 57 percent (6,038 acres) of the harvest generated young forest within the Vegetation Analysis Area has been thinned. Of these acres, approximately 29 percent were thinned to achieve wildlife, riparian, and fisheries objectives.

Timber Management

For the purpose of managing timber, forested land is categorized into productive and non-productive land. As mentioned previously, productive forests are those that currently contain or are capable of producing at least 20 cubic feet of wood fiber per acre per year, or those having greater than 8,000 board feet per acre. Land that does not meet these criteria is considered unsuitable and unavailable for timber production (i.e., non-productive forest land).

Within the Vegetation Analysis Area there are 85,930 acres of productive forest land; 11,937 acres of these are classified as suitable and available for harvest.[4] For a detailed description of how land is classified as suitable and available for timber production refer to Appendix A of the Forest Plan. Table 3-9 shows the acres of land suitable and available for timber harvest by VCU and volume strata.[5]

[4] The figure for acres classified as suitable and available for timber harvest excludes acres of suitable land that is currently young-growth or is otherwise not available (i.e., land falling within no-harvest buffers identified by the Tongass Timber Reform Act and Forest Plan).
[5] Refer to pp. 3-18 to 3-19 of the Forest Plan for details on volume stratification.

Table 3-9. Acres of NFS Land within the Vegetation Analysis Area Suitable and Available for Timber Harvest by Volume Class and VCU

VCU	Total Suitable and Available Acres	High Volume Strata	Medium Volume Strata	Low Volume Strata
2870	234	79	122	33
2880	1037	143	679	215
2990	897	174	589	134
3000	2320	291	1827	202
3010	1242	474	666	102
3020	835	181	520	69
3100	0	0	0	0
3110	0	0	0	0
3120	120	47	72	1
3130	521	51	437	33
3180	0	0	0	0
3190	0	0	0	0
3200	0	0	0	0
3210	2,207	705	1350	170
3220	0	0	0	0
3230	2431	362	1859	209
3240	93	0	70	23
3250	0	0	0	0
Total	**11,937**	**2,558**	**8,218**	**1,413**

Biological Diversity

National Forest Management Act (NFMA) regulations define diversity as the distribution and abundance of different plant and animal communities and species (36 CFR 219). In managing forest ecosystems, biological diversity (or biodiversity) is defined as the variety of life forms and processes, including the complexity of species, communities, gene pools, and ecological functions, within an area covered by a land management plan (Bourgeron and others 1994). It is defined and understood in terms of the natural and historical numbers and distributions of plants and animals, habitats, and communities (USDA FS [Forest Plan FEIS] 1997). The underlying assumption is that biodiversity can be maintained through the maintenance of functioning ecosystems. By protecting large, interconnected blocks of habitat, the species associated with these ecosystems will be conserved. Furthermore, habitat must be well distributed over large geographical areas to allow interactions between individuals within and among populations and to provide the amounts, types, and needs of reproductive individuals. For these reasons, biodiversity is evaluated at the landscape scale.

Maintaining population viability is another important component in maintaining biodiversity. A fish or wildlife population is said to be viable if it is distributed in such a way and is comprised of the estimated number of reproductive individuals needed to insure its continued existence (36 CFR 219 and the Forest Plan). NFMA regulations require that fish and wildlife habitats in National Forests be managed to maintain viable populations of species.

The Forest Plan contains a comprehensive conservation strategy to maintain viable populations of native and desired non-native fish and wildlife species and subspecies that may be associated with old-growth forests (USDA FS 1997, p. 3-76). It does so by maintaining Old-growth Habitat Reserves (OGR) and riparian, beach, estuary, and other species-specific key habitats and by maintaining connectivity (i.e., connective corridors) between OGR and non-development LUDs.

The Forest Plan also identifies 13 management indicator species (MIS) that are closely associated with the old-growth forests of the Tongass National Forest (USDA FS 1997, p. 3-352). MIS are vertebrate or invertebrate species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements.

Old-growth Forests

Old-growth forests provide structural and biological environments that are important for maintaining biological diversity across the landscape. The Forest Plan defines old-growth forests as:

> Ecosystems distinguished by the later stages of forest stand development that differ significantly from younger forests in structure, ecological function, and species composition. Old-growth forest is characterized by a patchy, multi-layer canopy; trees that represent many age classes; large trees that dominate the

> overstory, large standing dead (snags) or decadent trees; and higher accumulations of large down woody material. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context (USDA FS 1997, p. 7-27).

In Southeast Alaska, old-growth forests are primarily comprised of western hemlock and Sitka spruce (Schoen, Kirchoff and Hughes 1988, p. 1) that are subjected to high frequency, low magnitude disturbances (usually wind) (Brady and Hanley 1984 from Deal 2001, p. 1). These natural disturbances result in gap-phase replacement (Alaback and Juday 1989; Lertzman and others 1996 from Deal 2001, p 1). Large trees that die and fall create openings or "gaps" in the forest that allow light to reach the forest floor and release understory vegetation that is used as forage. In addition, the dense canopy characteristic of old-growth forests is comprised of large limbs that provide thermal insulation and intercept enough snowfall to allow wildlife access to forage during the winter.

Old-growth forests are valuable as wildlife habitat and as a source of high quality timber. Large dead or defective trees provide nesting sites for martens, goshawks, and bald eagles, and feeding sites for woodpeckers, sapsuckers, brown creepers, and others. Woody debris provides habitat for wildlife and acts as a micro-site on which seedlings may grow. The habitat needs of the wildlife species in the Assessment Area, the majority of which are associated with old-growth forests, must be integrated with the management of other resources. Balancing these important but conflicting values is critical.

The Forest Plan includes a strategy for maintaining a Forest-wide system of OGR intended to preserve the integrity of the old-growth ecosystem and the species dependent on that ecosystem. In addition to OGR, lands designated as non-development LUDs in the Forest Plan (e.g., the Wilderness, National Monument, LUD II, Remote Recreation, Semi-remote Recreation, Wild River, and Enacted Municipal Watershed LUDs) also contribute to this strategy (USDA FS 1997, p. K-1). Forest Plan objectives for OGR include limiting roads, facilities, and permitted uses to those that are compatible with old-growth forest habitat management. While OGR and other non-development LUDs are classified as unsuitable for timber production, the salvage of dead or down trees is permitted along roadsides or if trees are considered a hazard (USDA FS 1997 [Forest Plan], p. 3-80).

A system of large, medium, and small OGR has been designated to maintain contiguous blocks of old-growth forest habitat to support viable and well-distributed populations of old-growth associated species and subspecies (USDA FS 1997 [Forest Plan], p. 3-81). OGR are required to contain productive old-growth habitat (POG), which is defined as having a timber volume of greater than 8,000 board feet per acre and classified as low, medium, high, or very high volume strata in the GIS database (USDA FS 1997 [Forest Plan], p. 7-31). The dense canopy that is characteristic of POG provides important cover and forage habitat for wildlife. The canopy reduces snow accumulations in the understory during the winter but is open enough to provide understory vegetation during the spring, summer, and fall. The Forest Plan also requires that a percentage of the POG in medium and large OGR consist of high volume POG (HPOG). HPOG includes the

largest volume of trees and is classified as high volume strata in the GIS database (USDA FS 1997 [Forest Plan], p. K-1).

The Assessment Area encompasses 18 Value Comparison Units (VCUs) as defined by the Forest Plan (USDA FS 1997) and five Wildlife Analysis Areas (WAA) as defined by the Alaska Department of Fish and Game (ADF&G) (Figure 3-7). WAA boundaries are used by ADF&G to assess specific geographic areas from which communities obtain deer for subsistence uses. VCU boundaries differ from the boundaries of the Assessment Area in that portions of Partofshikof and Krestof Islands are included in the VCU boundaries but not in the Assessment Area boundaries. The area used in this analysis to assess the status of biodiversity in the Sitka Sound area will be based on whole VCUs and will be referred to as the Biodiversity Analysis Area.

Sitka Sound Landscape Assessment Area

Wildlife Analysis Areas.

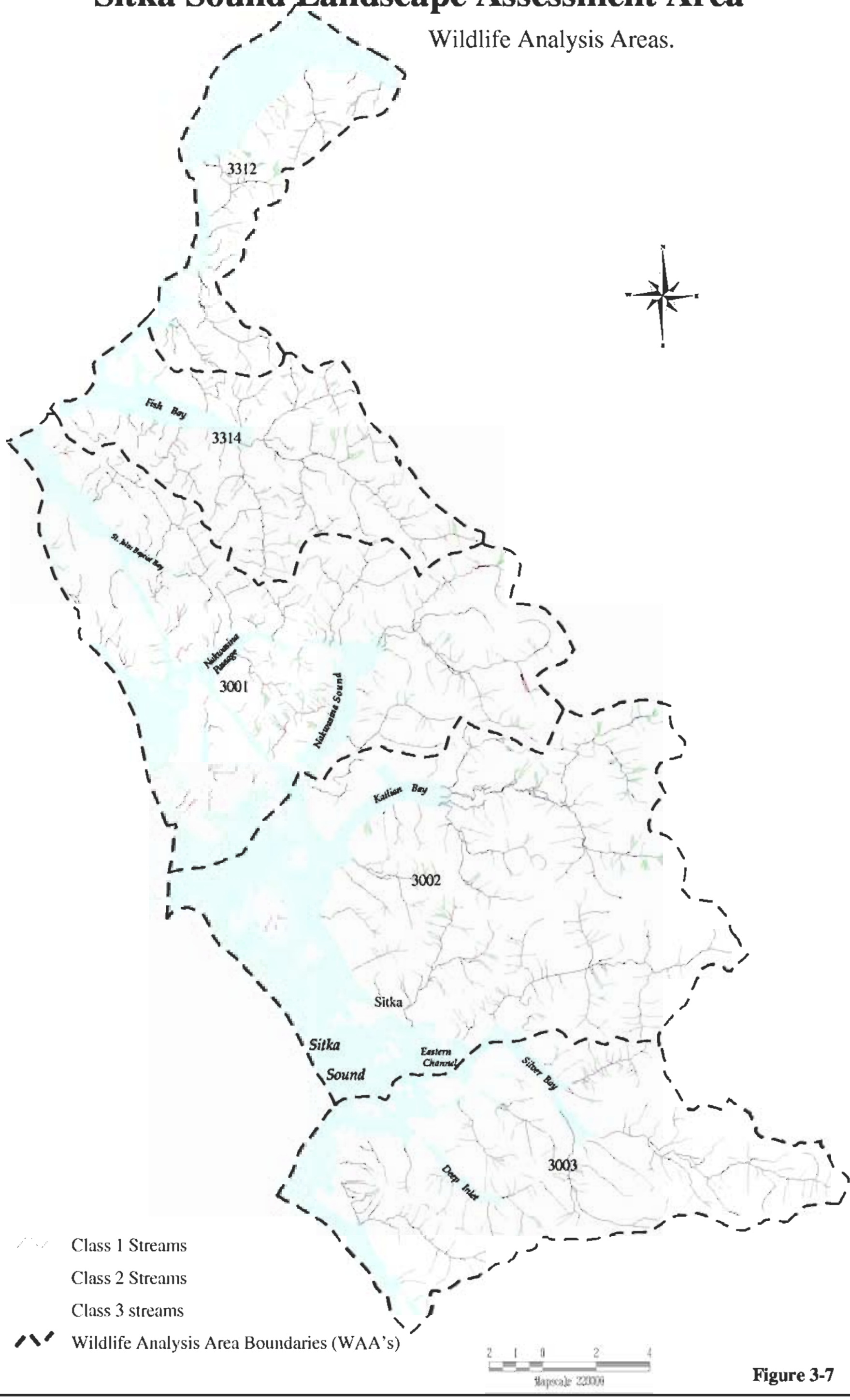


Figure 3-7

WAA and VCU boundaries used to assess biodiversity for this analysis encompass 281,093 acres, 255,843 acres of which are NFS lands. The majority of the NSF land within the Biodiversity Analysis Area (77 percent) is located in non-development LUDs and is considered unsuitable for timber production. Twenty-two percent (56,699 acres) of the NSF land in this area is considered productive old-growth (POG) habitat (Figure 3-8 and Table 3-10). An estimated 22 percent (57,160 acres) of the Biodiversity Analysis Area is designated as OGR, and 36 percent (20,549 acres) of the OGR is designated as POG.

Table 3-10. Amount of Productive Old-growth Habitat (POG) in Old-growth Habitat Reserves (OGR) and Other Non-Development LUDs on National Forest System (NFS) Land in the Biodiversity Analysis Area

VCU	NFS	Non-Development LUDs (excluding OGR)			OGR		
		Acres	%	POG	Acres	%	POG
2870	41,776	722	2	324	39,547	95	12,429
2880	6,116	2	0	0	1,262	21	506
2990	23,458	15,652	67	692	867	4	595
3000	19,670	7,752	39	3,692	3,622	18	1,764
3010	5,648	967	17	298	611	11	499
3020	21,464	10,215	48	5,559	8,511	40	3,455
3100	2,328	2,328	100	1,573	0	0	0
3110	12,866	12,866	100	5,076	0	0	0
3120	9,762	2,788	29	990	0	1	0
3130	27,823	17,101	61	566	1,606	6	560
3180	25,486	25,486	100	1,970	0	0	0
3190	5,017	5,017	100	2,775	0	0	0
3200	7,719	7,719	100	5,460	0	0	0
3210	8,815	1,730	19	1,211	95	1	63
3220	7,498	7,498	100	3,977	0	0	0
3230	7,645	0	0	0	1,039	14	678
3240	18,621	17,222	92	1,727	0	0	0
3250	4,131	4,131	100	198	0	0	0
Total	**255,843**	**139,196**	**54**	**36,088**	**57,160**	**22**	**20,549**

Source: Stangl 2003

[1] Non-development LUDs include LUDs designated as Enacted Municipal Watershed, Remote Recreation, Semi-remote Recreation, and Old-growth Habitat Reserves.

The Forest Plan requires that a small OGR be maintained in each VCU where larger reserves are not present and specifies habitat criteria to be followed in locating these reserves (USDA 1997, p. 4-120 and Appendix K). Small OGRs must equal at least 16 percent of the acres in the VCU and must be located either within the VCU or within adjacent watersheds or ecological boundaries. Furthermore, at least fifty percent of the acres in a small OGR must contain productive old-growth habitat (POG).

Five small OGRs have been designated in the Assessment Area (Table 3-11). The small OGRs in VCUs 2880 and 3010 exceed the minimum Forest Plan requirements for both total acres and acres of POG. VCU 3230 (south of Silver Bay) contains a small OGR that is linear in shape. Although reserves should be more circular rather than linear in shape to maximize the amount of interior forest habitat, this small OGR contains quality riparian and low elevation habitat. To meet Forest Plan standards, an additional 184 acres should be added to this small OGR.

The small OGR in VCU 2990 (head of Nakwasina Bay) does not contain the requisite number of acres; however, as Table 4-16 shows, that VCU contains an additional 15,652 acres of land in a non-development LUD. Therefore, over 16 percent of the VCU is in a non-development LUD. VCU 2990 does not contain the requisite number of acres of POG; an additional 590 acres of POG are required for this VCU to meet Forest Plan standards. VCU 2990 as a whole does not contain a large proportion of POG. Of the 23,458 acres of NFS land in this VCU, only 2,841 acres are classified as POG. Of this, 1,287 acres of POG are currently located within non-development LUDs. Forest Plan standards would be met if 66 percent of the POG within the VCU were classified as non-development LUD.

The small OGR in VCU 3130 (east of Katlian Bay) does not contain the requisite number of acres, but the VCU does contain an additional 17,101 acres of land in a non-development LUD. Therefore, over 16 percent of the VCU is in a non-development LUD. However, VCU 3130 requires the addition of 1,100 acres of POG to meet Forest Plan standards. VCU 3130 contains just 2,305 acres classified as POG (8 percent of the NSF land in the VCU). Of this, 1,126 acres of the POG are currently located within non-development LUDs. For VCU 3130 to meet Forest Plan standards, an additional 1,110 acres of POG should be allocated to a non-development LUD. Doing so would mean that 97 percent of the POG within the VCU would be located within a non-development LUD.

Sitka Sound Landscape Assessment Area

Non –Development LUD's
and
Productive Old Growth.

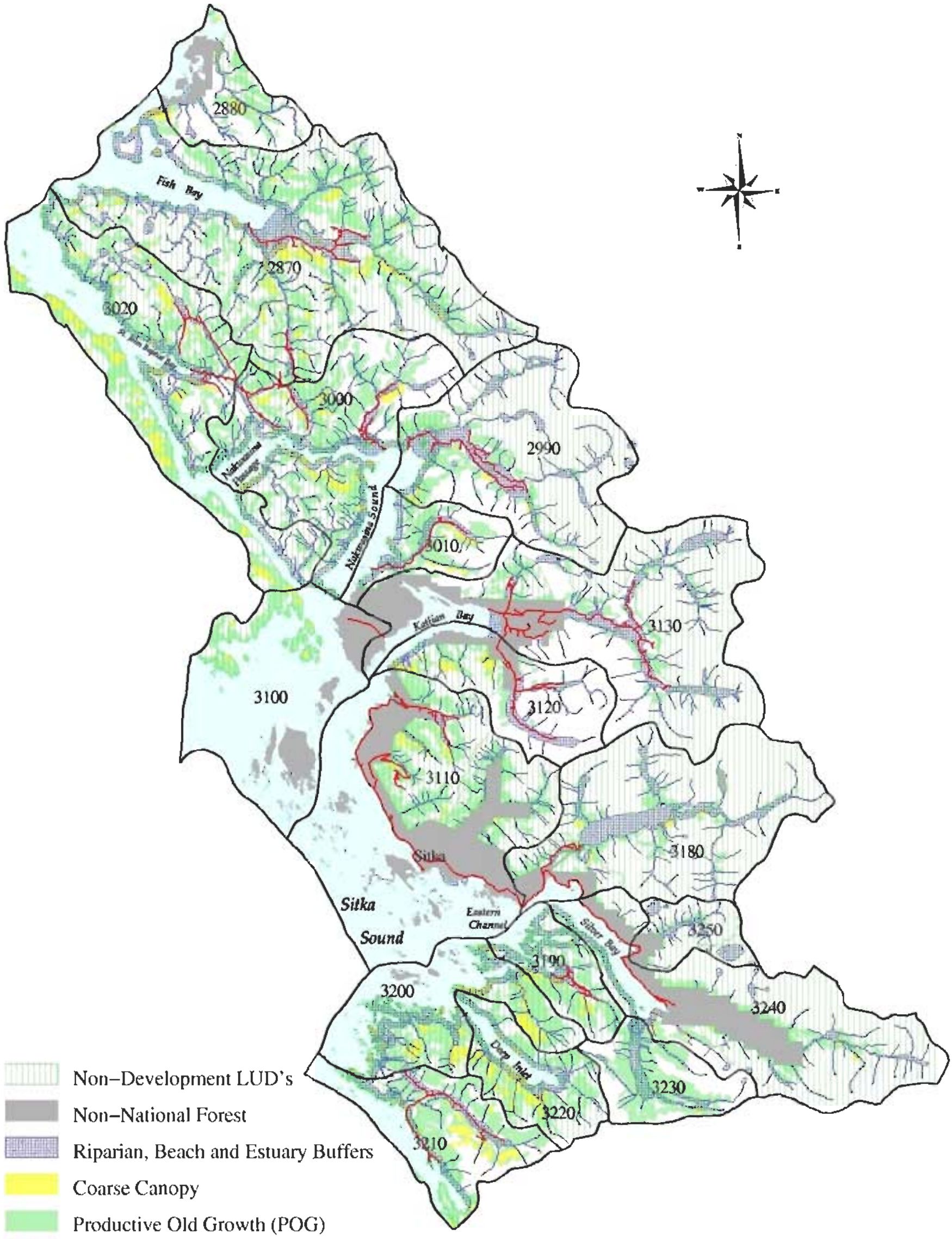


Figure 3-8

Table 3-11. Acres of National Forest Land (NFS), Small Old-growth Habitat Reserves (OGR), and Productive Old-growth Habitat (POG) in Value Comparison Units (VCU) in the Assessment Area

VCU	NFS	Minimum Acres Small OGR Required	Small OGR	Difference from required Small OGR	POG in the Small OGR	Minimum POG required	Difference from required POG
2880	6,116	979	1263	284	506	489	17
2990	23,458	3753	867	-2886	595	1877	-1282 [1]
3010	5,648	904	1579	675	797	452	345
3130	27,823	4452	1606	-2846 [1]	560	2226	-1,666 [1]
3230	7,645	1223	1039	-184	678	612	66

Source: Stangl 2003

[1] In VCU 2990, there is an additional 15,652 acres of non-development LUD including 692 acres of POG. In VCU 3130, there is an additional 17,101 acres of non-development LUD with 566 acres of POG.

Habitat Connectivity

The Forest Plan states that habitat connectivity should be addressed to assess whether blocks of contiguous old-growth forest habitat between large and medium OGR and other non-development LUDs are maintained. Maintenance of habitat corridors is important to minimize the isolation and decline of wildlife species associated with blocks of old-growth (Harris 1984). The connectivity, or corridors, between old-growth habitats in a landscape may be as important to maintaining diversity as the size of the old-growth habitat (Noss 1983).

The extent and distribution of productive old-growth forested habitat, or POG, are important factors to consider when assessing habitat connectivity. Using the division of old-growth timber volume derived from the interpreted timber type data GIS layer (TIMTYPE) as a predictor of large diameter trees, the availability and distribution of productive old-growth habitat can be assessed in two ways. First, volume strata, which are based on timber volume, soil, and slope information, may be used as an indicator of productive old-growth (POG) habitat and highly productive old-growth habitat (HPOG). Second, structure mapping, which considers volume class (VC) and stand density, may be used as an indicator of canopy texture. HPOG is defined as volume classes 5, 6, and 7 on non-hydric soils and on hydric soils with slopes of greater than 55 percent. Coarse canopy textured stands are associated with tall, large diameter trees on highly productive sites (e.g., alluvial fans) with low to moderate canopy closures. They are defined as volume class 5 on north facing slopes (VC 5N) and all volume class 6 and 7 (VC 6&7) stands (Caouette and others 2000).

The VCUs that encompass the Biodiversity Analysis Area total 281,093 acres. An estimated 30 percent of this area is POG (Table 3-12). Of the POG, an estimated 28 percent (23,306 acres) is classified as HPOG, and 13 percent (10,762) is classified as coarse canopy habitat.

Table 3-12. Proportion of Highly Productive Old-growth (HPOG) and Coarse Canopy Habitat (VC 5N and VC 6&7) within the Productive Old-growth (POG) in the Biodiversity Analysis Area

VCU	Acres of POG[1]	Percentage of HPOG[2] in the POG	Proportion of Coarse Canopy in the POG	
			% VC 5N[3]	% VC 6&7[4]
2870	13,471	28	12	1
2880	2,237	13	8	0
2990	2,841	27	5	1
3000	8,426	25	10	0
3010	2,425	37	10	0
3020	10,256	37	14	2
3100	2,363	19	8	1
3110	6,754	33	6	8
3120	1,854	40	26	3
3130	3,864	14	3	1
3180	2,298	36	6	0
3190	2,775	12	10	0
3200	5,460	32	19	5
3210	5,200	30	10	4
3220	3,977	30	15	3
3230	3,922	23	0	7
3240	4,938	23	10	0
3250	443	14	9	0
Total	**83,504**	**28**	**11**	**2**

Source: Stangl 2003

[1] POG is equivalent to low, medium, high, and very high volume strata.

[2] HPOG is equivalent to high and very high volume strata.

[4] VC 5N stands contain medium to large diameter trees and are characterized by coarse and fine canopy textures.

[5] VC 6&7 stands contain tall, large diameter trees on highly productive sites (e.g., alluvial fans) and have a low to moderate canopy closures and a coarse canopy texture.

Of the 255,843 acres of NFS Lands in the Biodiversity Analysis Area, 29 percent (74,926 acres) is classified as POG. An estimated 27 percent (20,398 acres) of the POG is the higher volume HPOG and 12 percent (9,302 acres) is coarse canopy habitat. Of the 56,699 acres of POG in non-development LUDs, 29 percent (16,357 acres) is classified as HPOG and 13 percent (7,615 acres) is coarse canopy habitat. Of the 18,225 acres of POG in the development LUDs, 22 percent (4,040 acres) is HPOG and 9 percent (1,685 acres) is coarse canopy habitat (Table 3-13).

Table 3-13. Percentage of Productive Old-growth (POG), of High POG (HPOG), and Coarse Canopy (VC 5N and VC 6&7) of POG within National Forest System Lands (NFS) designated as Development and Non-Development (old-growth reserves, municipal watershed, remote recreation and semi-remote recreation) Land Use Designations (LUDs) by the Forest Plan in the BD Analysis Area

VCU	Non-Development LUDs				Development LUDs			
	Acres of POG[1] on NSF	% HPOG[2]	% VC 5N[3]	% VC 6&7[4]	Acres of POG[1] on NSF	% HPOG[2]	% VC 5N[3]	% VC 6&7[4]
2870	12,752	27	12	1	718	45	27	0
2880	506	13	5	0	1,404	14	10	0
2990	1,288	28	6	2	1,553	27	5	1
3000	5,455	32	13	0	2,970	13	5	0
3010	797	27	2	0	1,558	42	14	11
3020	9,078	38	14	3	1,113	27	17	0
3100	1,573	21	7	0	0	0	0	0
3110	5,076	23	5	1	0	0	0	0
3120	990	51	40	1	385	14	0	0
3130	1,126	10	0	0	1,179	5	0	0
3180	1,970	32	7	0	0	0	0	0
3190	2,775	12	10	0	0	0	0	0
3200	5,460	32	19	5	0	0	0	0
3210	1,273	36	4	17	3,670	29	9	0
3220	3,977	30	15	3	0	0	0	0
3230	678	60	0	40	3,245	15	1	0
3240	1,727	6	3	0	430	19	18	0
3250	198	18	6	0	0	0	0	0
Total	**56,699**	**29**	**11**	**2**	**18,225**	**22**	**8**	**1**

Source: Stangl 2003

[1] POG is equivalent to low, medium, high and very high volume strata.

[2] HPOG is equivalent to high and very high volume strata.

[4] VC 5N are stands that contain medium to large diameter trees and are characterized by coarse and fine canopy textures.

[5] VC 6&7 are stands that contain tall, large diameter trees on highly productive sites (e.g., alluvial fans) and are characterized by low to moderate canopy closures and a coarse canopy texture.

Management Indicator and Other Old-growth Dependent Wildlife Species

The Assessment Area supports a wide variety of wildlife species, including Sitka black-tailed deer, brown bear, mountain goat, and marten. The wildlife of the area contributes significantly to the economic, recreational, and subsistence needs of both local residents and visitors to the area. Demand continues to grow for opportunities to both hunt and view wildlife.

The Forest Plan identifies 13 vertebrate and invertebrate species as management indicator species (MIS) (USDA FS 1997, p. 3-352). These species, whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements, are closely associated with the productive old-growth forests of the Tongass National Forest. Species listed as MIS include the brown bear, bald eagle, river otter, Vancouver Canada goose, red-breasted sapsucker, brown creeper, hairy woodpecker, mountain goat, red squirrel, Sitka black-tailed deer, American marten, black bear, and gray wolf. The black bear and gray wolf were not considered in this analysis because they do not occur in the Assessment Area. Although the northern goshawk is not listed as a MIS, it is addressed in this document because it is also closely associated with old-growth habitat.

Brown Bear

Baranof Island is one of several islands in Southeast Alaska classified by the Alaska Department of Fish and Game as Game Management Unit 4 (GMU 4). GMU 4 supports a large and stable population of brown bears *(Ursus arctos).* The high density of bears in this area is partially due to the presence of riparian areas that support salmon (Unit 4 Brown Bear Management Team 2000).

Brown bears occupy a variety of habitats ranging from sea level to alpine. Although they use a number of habitats, the habitats they occupy during late summer are, perhaps, the most important. Late summer has been identified as the most critical or limiting period for brown bear. During this time, bears are concentrated along low-elevation streams and estuaries to feed on salmon. Foraging on salmon provides a readily accessible and efficient way for bears to build fat reserves that sustain them throughout the winter. Research has demonstrated that bear use of salmon streams is concentrated within an estimated 500 feet of streams during the peak period of salmon runs (Unit 4 Brown bear Management Team 2000).

Potential bear foraging sites include class one anadromous fish streams within the moderate gradient, mixed control, and flood plain process groups. Important foraging sites may also include waterfalls and other stream structures at which fish congregate and are easily accessible to brown bears. The GIS streams database indicates that the Biodiversity Analysis Area contains an estimated 227 miles of class one streams. Of these, approximately 142 miles are located within the moderate gradient, mixed control, and floodplain process groups (Table 3-14).

Table 3-14. Miles of Class One Streams by Channel Type within the Biodiversity Analysis Area

VCU	Miles of Class One Streams	Channel Type		
		Moderate Gradient	Mixed Control	Flood Plain
2870	29.66	0.33	3.60	14.17
2880	6.46	1.46	1.88	0.74
2990	14.15	0.00	0.88	9.46
3000	16.14	5.17	2.97	3.36
3010	5.45	0.00	2.73	1.32
3020	16.63	7.43	0.32	1.96
3100	2.17	0.69	0.85	0.00
3110	23.03	0.71	7.12	9.75
3120	9.51	0.00	2.68	5.71
3130	37.65	1.61	6.30	17.9
3180	17.63	0.22	3.13	1.72
3190	2.97	0.00	0.84	1.04
3200	6.78	3.01	0.00	0.95
3210	10.24	3.64	1.17	3.21
3220	2.25	0.00	1.21	0.14
3230	6.67	0.00	1.04	3.22
3240	14.91	0.01	1.59	2.03
3250	4.27	0.00	2.44	0.00
Total	**226.57**	**24.28**	**40.75**	**76.68**

Source: Stangl 2003

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus)* represents a species that depends on beach fringe forest habitat. Southeast Alaska has the highest density of bald eagles in North America. The most recent population estimate (1992) suggested that there are over 13,000 adult birds and approximately 8,000 nest sites in Southeast Alaska. As of 1999, surveys documented 175 bald eagle nests in the Biodiversity Analysis Area.

Bald eagles nest near areas that provide the best opportunities to search for food, such as tide flats, open water, and rivers. They feed primarily on fish, but are known to feed on water birds, marine invertebrates, and carrion. Bald eagles nest primarily in old-growth trees along the coast and within riparian areas. Over 90 percent of known nests are located within 500 feet of a saltwater beach.

River Otter

River otters (*Lontra Canadensis)* are found throughout the Assessment Area and are associated with coastal and fresh water aquatic environments and the immediately adjacent (within 100-500 feet) upland habitats (USDA FS 1997 [Forest Plan FEIS], p. 3-353). Beach characteristics affect the availability of food and cover. Adjacent upland vegetation is also important in providing cover. Old-growth forests with canopy cover and large-diameter trees and snags provide habitat for burrows and den sites.

Vancouver Canada Goose

The Vancouver Canada goose (*Branta Canadensis fulva)* is a game species that makes use of old-growth and riparian habitats. Unlike other subspecies of Canada geese, the Vancouver Canada goose uses forested habitats for nesting, brood rearing, and molting. They use trees for nest sites and perches during incubation and rely primarily on forest understory plant species for food. They are primarily non-migratory (Armstrong 1995) and are found almost exclusively in Southeast Alaska. Although nest sites or high use areas have not been documented, Vancouver Canada geese have been observed in the Assessment Area.

Cavity Dependent MIS

Many species, including woodpeckers, owls, hawks, waterfowl, bats, squirrels, martens, and otters, nest or den in tree cavities in Southeast Alaska. Several of these species depend exclusively on cavities in the large-diameter snags that are commonly found in old-growth stands.

The hairy woodpecker *(Picoides villosus)*, brown creeper (*Certhia Americana)*, and red-breasted sapsucker (*Sphyrapicus rubber)* are MIS that rely on old-growth forest habitat for nesting and foraging. The hairy woodpecker and red-breasted sapsucker are primary cavity excavators that nest and forage in snags and partially dead trees. The availability of suitable winter habitat for roosting and foraging is an important constraint on the habitat suitability for these species. The brown creeper is associated with high-volume stands that include large-diameter, old trees and that provide abundant prey.

Red squirrels (*Tamiasciurus hudsonicus)* were transplanted to Baranof Island in 1930 and 1931 as a potential prey species for marten. This MIS requires forests with cone-producing trees and cavities in trees and snags. Spruce trees and mature to old-growth forest have the highest value for red squirrel habitat.

Habitat for cavity dependent MIS is best represented by snag and stand structure management that uses volume class as an indicator of coarse canopy forest and stands associated with highly productive sites (e.g., alluvial fans).

Mountain Goat

Mountain goats *(Oreamnos americanus)* were introduced to Baranof Island in 1923. They occupy steep mountain ranges where cliffs, alpine, and sub-alpine habitats prevail. Mountain goats normally summer in high alpine meadows where they graze on grasses, herbs, and low-growing shrubs. During the winter, goats may migrate from alpine and sub-alpine areas to forested habitats. Forested areas containing old-growth trees with large, dense crowns comprise the highest value mountain goat habitat because they contain understory forage plants and trees that intercept snow.

Sitka Black-tailed Deer

The Sitka black-tailed deer (*Odocoileus hemionus)* is an important game and subsistence species in Southeast Alaska. Although deer utilize a wide range of habitats (e.g., from shoreline to alpine), they are seasonally associated with old-growth forests. Research conducted in Southeast Alaska indicates that low-elevation, high volume productive old-

growth habitats are particularly important to deer, especially during severe winters (Schoen and others 1985; Hanley and Rose 1987; Yeo and Peek 1992). These mature old-growth stands intercept snow, provide thermal cover, and support the largest biomass of herb and shrub forage for deer (Alaback 1982, Schoen and others 1984).

Low-elevation, high-volume old-growth stands with southern aspects and in areas that receive little snow are assumed to provide the best quality deer winter habitat. Although areas above 1,500 feet in elevation provide summer habitat for deer, these areas are assumed to have no value as deer winter habitat. An estimated 33 percent of NFS land in the Biodiversity Analysis Area is below 800 feet in elevation. Of the land in non-development LUDs, approximately 31 percent is at or below 800 feet in elevation. An estimated 12 percent of the Biodiversity Analysis Area meets the criteria for deer winter habitat (Table 3-15). Winter deer habitat occurs primarily along the west portion of the Assessment Area in the beach fringe and adjacent to riparian areas in VCUs 3000, 3020, 3100, 3110, 3190, 3200, and 3210.

Table 3-15. Deer Winter Habitat as a Proportion of Productive Old-growth Habitat (POG) Below 800 Feet in Elevation in the Biodiversity Analysis Area

VCU	Acres of POG Below 800 feet in Elevation[1]	Deer Winter Habitat[2]	
		Acres	Percent
2870	7,308	0	0
2880	1,402	0	0
2990	1,510	0	0
3000	4,545	1,130	25
3010	922	231	25
3020	7,954	1,544	19
3100	2,232	641	29
3110	3,392	918	27
3120	878	0	0
3130	2,279	0	0
3180	1,348	0	0
3190	1,850	404	22
3200	3,542	363	10
3210	2,598	650	25
3220	1,714	0	0
3230	2,057	0	0
3240	2,951	0	0
3250	364	0	0
Total	**48,846**	**5,881**	**12**

[1] These figures include land in all ownerships.
[2] Deer winter habitat is equivalent to POG at elevations below 800 feet, in areas of low snow accumulation, and on southern aspects.

An interagency model (Suring and others 1992) based on WAAs has been developed to evaluate potential winter habitat capability for deer. WAAs 3001, 3002, 3003, 3312, and 3314 are included in the Biodiversity Analysis Area (Figure 3-7). The model is a tool used to assess the effects of timber harvest activities on the habitat suitability and capability of an area. The model calculates habitat suitability indices (HSIs) based on

timber volume strata, aspect, elevation, and typical snowfall. HSI values are used to calculate and compare habitat capability and to estimate changes in habitat capability. Habitat capability is the theoretical number of deer that particular habitat types can be expected to support. Although it does not reflect the actual number of deer in an area, the model can be used to estimate the percentage of habitat capability remaining after harvest. The average habitat capability of the five WAAs in the Assessment Area is 86 percent (USDA FS 1997 [Forest Plan], Part One, p. 3-371).

American Marten

The American marten (referred to as marten) (*Martes Americana)* was chosen as an MIS because it represents a species requiring old-growth habitat and because it is a harvested furbearer. Marten historically occurred on the mainland of Southeast Alaska and on some islands. However, this species was introduced to Baranof Island between 1930 and 1950 to provide a species for fur trapping.

Marten are generalist predators that vary their diet seasonally. On Chichagof Island, marten were recorded to utilize winter-killed deer carcasses during the spring; squirrels, birds, and berries during the summer; and salmon carcasses and small rodents during the fall (Ben-David and others 1997, pp. 288-289). Like deer, marten are dependent on high-quality winter habitat that includes low-elevation, high-volume productive old-growth forest especially in coastal and riparian areas. These habitats intercept snow, provide cover and denning sites, and provide habitat for prey species. Approximately 93 percent (69,224 acres) of the POG on NFS lands in the Biodiversity Analysis Area is below 1,500 feet in elevation, and approximately 26 percent of this is HPOG.

The Forest Plan identifies twenty-one ecological subdivisions in the Tongass National Forest. These biogeographic provinces are characterized by species composition, patterns in the distribution of organisms, naturally occurring historical events, and climatic conditions. The Biodiversity Analysis Area is in the East Baranof Island biogeographic province (USDA FS 1997 [Forest Plan FEIS], p. 3-14). The Forest Plan also identifies higher risk biogeographic provinces for marten, where a significant amount of past timber harvest has established a large component of forest stand structure in young conifer stands (i.e., stands harvested since 1956) with little or no residual forest structure within the stands. The Biodiversity Analysis Area is not classified as a high-risk biogeographic province (USDA FS 1997 [Forest Plan], p. 4-114).

Northern Goshawk

The northern goshawk *(Accipiter gentiles)* is a wide-ranging forest raptor that occupies old-growth forest habitat in Southeast Alaska. The Alaska Region identifies the northern goshawk as a sensitive species. Sensitive species are those wildlife, fish, and plant species identified by a Regional Forester for which population viability is a concern. In an effort to evaluate the status, population, and habitat ecology of the northern goshawk on the Tongass National Forest, the Alaska Department of Fish and Game and the Forest Service conducted a goshawk study from 1991 to 1999. A total of 65 nesting areas were documented in Southeast Alaska (Titus and others 2001, p. 2), and 16 nest sites occurred on the North Zone of the forest (i.e., the Hoonah, Juneau, Sitka, and Yakutat Ranger Districts) (Flatten and others 2001, p. 6).

Of 661 radio relocations of goshawks in Southeast Alaska, over 90 percent were in habitat classified as volume class 4 or greater, and 68 percent were in habitats classified as volume class 5 or greater (Titus and others 1994, p. 4). Suitable nest site habitat is commonly between 12 and 37 acres in size and consists of large trees with a dense canopy and a generally open understory (Flatten and others 2001). Of 18 nest trees, 83 percent were located in old-growth stands, and 17 percent were in second-growth trees greater than 90 years of age (Titus and others 1994, p. 4). Goshawk nest sites generally occur far from forest openings, in stands more than 600 feet wide, on slopes of less than 60 percent, and near the toe of a slope or on a bench. Nest trees average 423 feet in elevation and generally do not exceed 1,000 feet (USDA FS 1998, p. A-3 to A-4; Titus and others 1994, p. 5).

Foraging areas comprise the largest proportion of goshawk breeding season home range. Foraging habitat is characterized by a greater diversity of age classes and structural characteristics (e.g., snags, woody debris) than nesting areas (Reynolds and others 1992, p. 16). Breeding season home range size is strongly dependent upon the quality of foraging habitat and prey availability. In Southeast Alaska, prey remains identified in goshawk breeding areas included Steller's jays (*Cyanocetti stelleri*), grouse (*Dendragapus* spp.), varied thrush (*Izoreus naevius*), red squirrel (*Tamiasciurus hudsonicus*), and woodpeckers (*Picidae*) (Titus and others 1994, p. 6). The median size of the adult goshawk home range during the breeding season in Southeast Alaska is 9,469 acres for females and 11,425 acres for males (Iverson and others 1996, p. 30).

Potential goshawk nesting habitat is defined as stands with high volume strata (HPOG) that are below 1,000 feet in elevation, on slopes of less than 60 percent, and in contiguous habitat outside of beach fringe and riparian buffers (USDA FS 1998, p. A-3). An estimated 65 percent of the POG on the NFS land in the Biodiversity Analysis Area (48,447 acres) occurs at less than 1,000 feet in elevation and has a slope of 75 percent or less. Approximately 31 percent of this POG is HPOG (14,937 acres). Fifty-three percent of the POG (39,360 acres) has a slope of 30 percent or less, and 32 percent of this is HPOG (12,622 acres).

Goshawk broadcast call surveys have been completed for 6 of the 18 VCUs in the Biodiversity Analysis Area (Table 3-16). Between 1993 and 2000, an estimated 164 hours of surveys and 382 broadcast call stations were completed. No goshawks were detected. No goshawk nest sites have been documented in the Biodiversity Analysis Area. The nearest documented nest site lies approximately 9 miles northeast of the Biodiversity Analysis Area. Although no goshawk nesting sites have been confirmed, goshawks are difficult to locate. It is likely that the Biodiversity Analysis Area includes goshawk breeding territories.

Table 3-16. Number of Broadcast Goshawk Call Stations and Hours of Goshawk Surveys Completed in the Biodiversity Analysis Area

VCU	Hours of Observations	Number of Call Stations
2870	63	151
2880	9	21
2990	8	21
3000	56	127
3010	6	10
3020	22	52
Total	**164**	**382**

Source: Stangl 2003

Human Dimensions

Heritage Resources and Current Human Use

Through examining human history, our understanding of the current landscape is enhanced. Conversely, landscape studies can help us understand cultural developments and historic events. For example, the extent of glaciation, isostatic rebound rates, rising ocean levels, and salmon colonization have all affected the development of local cultural patterns.

Knowledge about human use of the region encompassing the Assessment Area is largely based on three types of information: 1) the archeological record of the distant past, 2) ethnographic information about the cultures in the region and their society, and 3) written records for the historic period (i.e., the period that begins with the availability of written records). These are discussed briefly below.

Archeological Information

Archeological investigations indicate that people have inhabited the Assessment Area for at least 3000 years and, based on evidence from the surrounding area, possibly much longer. It is unclear whether human habitation in the area has been continuous because archeological investigations are incomplete. Archeological investigations are commonly used to reconstruct basic prehistoric patterns. Site locations, artifact and faunal assemblages, and oral histories all indicate that occupation and subsistence in the area revolved around the marine resources of this biologically rich region (Moss 1995). Although maritime resources have been consistently important to the people of Southeast Alaska, major changes in lifestyle and subsistence have taken place over time. The cultural chronology displayed in the following table illustrates these changes.

Table 3-17. Archeological Chronology for Southeast Alaska

Period	Age (BP[1])	Characteristics
Early	10,000 to 5000	• flaked stone tools (microblades) • subsistence based on marine mammals
Middle	5000 to 1500	• ground stone tools • fish weirs • mass salmon harvest and shellfish
Late	1500 to 210	• subsistence consistent with Middle period • appearance of forts

Source: Moss 1995

[1] BP stands for "years before present." "Present" refers to 1950, the year during which radiocarbon dating was developed.

The Early period in this chronology is characterized by flaked stone technology and a subsistence strategy based on marine mammals rather than fish. In contrast, ground stone tools and fish harvest (especially salmon) characterize the Middle and Late periods. This shift in technology and subsistence may mark the beginning of a new culture pattern in

the Assessment Area. An increase in the number of sites (based on radiocarbon dating) suggests that about 1500 years before present the population began to grow. Further, an increase in the number of sites identified as forts suggests more inter-group conflict.

Most archeological investigations on the Tongass National Forest are conducted in compliance with the National Historic Preservation Act. This legislation mandates that federal agencies identify and avoid effects to sites. Fifty-two sites containing prehistoric components have been identified in the Assessment Area. These sites are primarily summer camps and small villages. More extensive archeological investigations could answer questions concerning changes in resource utilization strategies, population, and the distribution of people. Such investigations could contribute to our understanding of the landscape.

Ethnographic Information

North America contained several culture areas at the time of European contact. These culture areas are defined by similarities in culture, language, and subsistence strategies. One of these culture areas, the Northwest Coast, extends from the Gulf of Alaska to northern California and encompasses the Assessment Area. Common elements of this culture area include an economy based on marine resources, settled villages, stratified social structures, sophisticated wood working, and highly developed art (Suttles 1990). The Assessment Area is located near the northern limits of this culture area.

The Tlingit peoples occupied this region when European explorers arrived. The Tlingit have a common language, customs, traditions, and religious beliefs that distinguish them from their surrounding neighbors, the Eyak and Athabascan to the north and east, and the Haida and Tsimshean to the south. The large Tlingit nation was divided into territories, or "kwaan," each of which had defined geographic boundaries and contained one or more permanent winter villages. The Assessment Area is located within the traditional Sitka Kwaan (Goldschmidt and Haas 2000). No political structure or leadership existed at the kwaan level for common activities such as public works or warfare. Each territory was further subdivided into moieties, clans, and households. Common activities were performed at these levels.

Tlingit society is divided into two moieties: the Raven and Eagle. Each person is born into one or the other. Both moieties are matrilineal; lineages are traced through the female parent. The moieties are also exogamous; members are required to marry a member of the opposite moiety. Every Tlingit community contains members of both moieties.

Moieties are further subdivided into independent bodies called "clans." Each clan has a designated chief. Clans have been described as "the active principle of life, the law, and the religion of the Tlingit…[they take] precedence over every other organization" (Emmons 1991, p. 23). Further, de Laguna states that clans "held primary territorial rights" (1990, p. 204). The following table displays the moieties and clans identified for the Sitka Kwaan.

Table 3-18. Moieties and Clans within the Sitka Kwaan

Moiety	Clan
Eagle	Kar-qwan-ton
	Ko-kee-ton
	Kat-oh-qwot-tee
	Chu-con-na-tee
	Ki-yatse-hit-ton
Raven	Kake-sat-tee
	Thluke-nar-hut-tee
	Kut-kow-ee
	Kuse-ka-dee
	Tuck-tane-ton
	Arn-kark-hit-ton
	Qwash-qwa-ton

Source: Emmons 1991

Within each clan are households governed by a house chief whose influence is comparable to the clan chief. Land use was guided by this social structure. For example, waterways were free for all to use, but land was divided among clans and subdivided by household and family. Each household had rights to designated salmon streams and areas for fishing, hunting, and berry collection (Emmons 1991, p. 27).

Authors who write about Tlingit social structure disagree on the number of Tlingit clans and households and the correct spelling of them. The most commonly used reference is *Possessory Rights of the Natives of Southeast Alaska* (Goldschmidt and Haas 1946 and 2000). This work suggests that the Chookaneidi, Luknax.adi, Kaagwaantaan, and Kiks.adi clans have territories in the Assessment Area (2000, Chart 9). The Chookaneidi territory extends from Deadmans Reach south to Neva Point. Luknax.adi territory includes the southern half of Halleck Island. Kaagwaantaan territory begins at Neva Point, extends to Cedar Cove (in Katlian Bay), and includes the northern half of Halleck Island. Kiks.adi territory extends from Cedar Cove south past Redoubt Bay. It is important to note that any such analysis of Tlingit territories represents a moment in time and that territorial boundaries are not static.

Historical Information

The history of Euro-American exploration and occupation of Southeast Alaska can be divided into four major periods (Arndt and others 1987):

- 1741-1799: exploration and the maritime fur trade
- 1799-1867: Russian-American Company management
- 1867-1884: American military rule
- 1884-1958: development of the modern landscape

Each period is summarized below. Forty-nine sites in the Assessment Area have historic components (Figure 3-9).

Exploration and the Maritime Fur Trade (1741-1799)
The historic period began when the Kamchatka Expedition reached Southeast Alaska in 1741. The voyage had profound consequences for Southeast Alaska. The impetus behind this Russian-led expedition was fur: the Chinese were willing to pay high prices for sea otter pelts, and stories of otter abundance in Southeast Alaska attracted the Russians. During this period Spain, Britain, France, and the United States also sent expeditions to the area for a variety of reasons including the following: to claim possession of land, to search for the Northwest Passage, and to assess the potential economic significance of the region.

Russian-American Company Management (1799-1867)
Continuing expansion eastward brought Russians to Alaska. Russia's primary interest was fur trade, and the principal facilitator of this trade was the Russian-American Company. This company was granted an Imperial monopoly over trade in Alaska and established several settlements for that reason. In 1799, the company established St. Archangel Michael near Starrigavan Creek; however, the Tlingit attacked the settlement in 1802, driving out the Russians and Aleuts. The Russians returned in 1804, and until 1867 Sitka served as the center of Russian trade and commerce in the Americas. However, declining profits from the fur trade, increased expenses of maintaining a presence in the Americas, and the expense of the Crimean War prompted Russia to sell Alaska to the United States.

American Military Rule (1867-1884)
After Alaska was purchased from Russia by the United States, the American Military ruled the territory. Nominally, the Army governed from 1867 to 1877, and the Navy ruled from 1879 to 1884. Sitka continued to serve as the center of government during this period. Several commercial endeavors that would later become important began during this period: fishing, mining, timber, and tourism.

Development of the Modern Landscape (1884-1955)
Southeast Alaska's economy expanded throughout this period. Fishing, mining, and the timber industry became the mainstays of the region. Small communities associated with these industries came and went, and the cultural landscape gradually took on its present character.

Of the four historic periods delineated by Arndt and others (1987), the most recent has had the greatest impact upon the landscape. Timber harvest, military development associated with World War II, mining, fur farming, commercial fishing, and homesteading activities have all left evidence on the land.

Sitka Sound Landscape Assessment Area

Documented Cultural Resources.

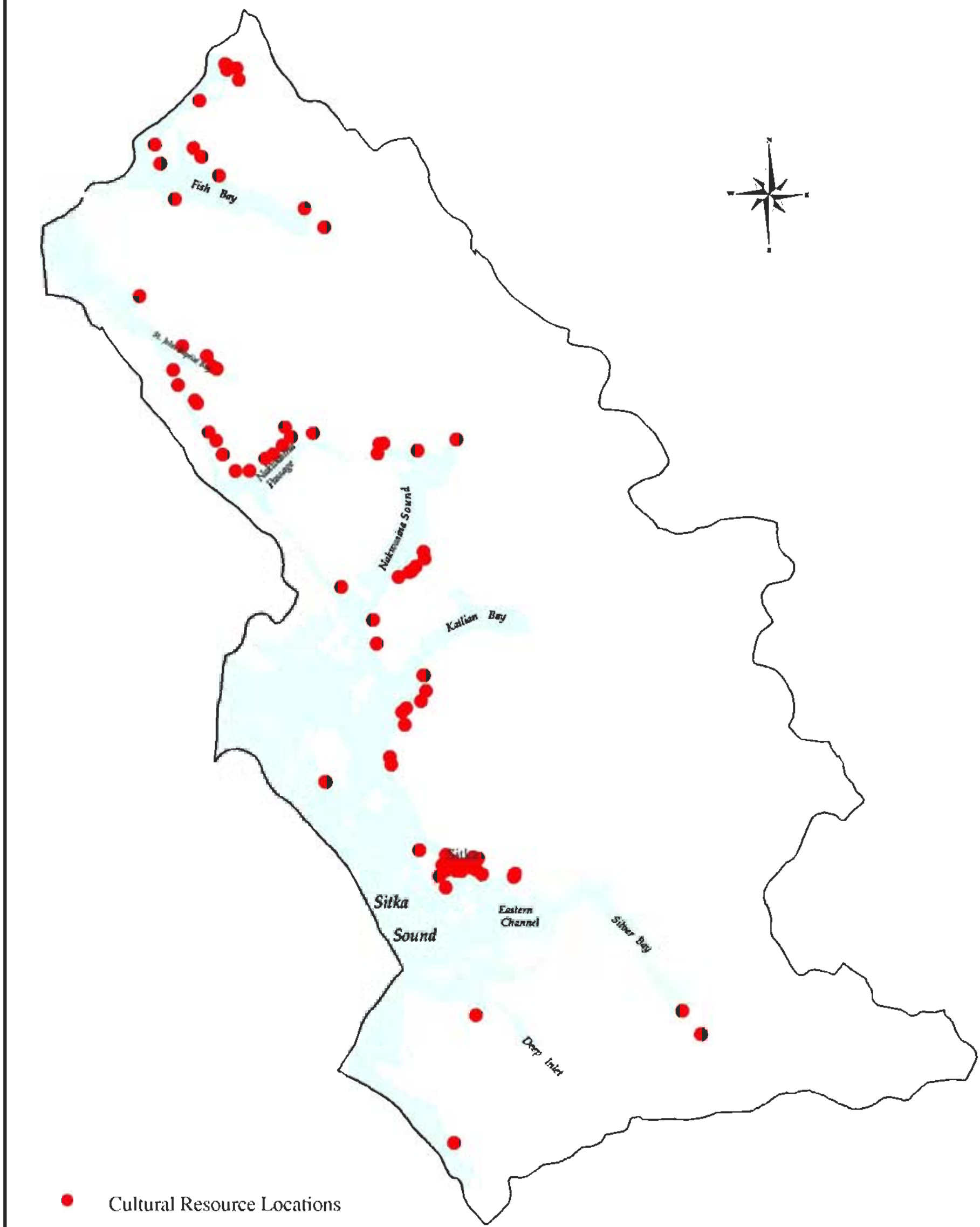


Figure 3-9

Known Heritage Sites

Investigations have identified 91 archeological and historic components in the Assessment Area. Table 3-19 illustrates the distribution of these components across larger waterways. In addition to these sites, there are over 30 documented historic sites within the City and Borough of Sitka that are representative of the various historic periods.

Table 3-19. Heritage Sites in the Analysis Area Across Large Waterways

Vicinity	Components Identified			Total
	Prehistoric	Historic	Multiple	
Peril Strait	6	1	0	7
Fish Bay	2	4	1	7
St. John the Baptist Bay	6	0	0	6
Neva Strait	4	3	0	7
Olga Strait	1	1	0	2
Nakwasina Passage	8	3	2	13
Nakwasina Sound	7	1	1	9
Katlian Bay	2	0	0	2
North Sitka Sound	3	25	4	32
Silver Bay	1	1	0	2
South Sitka Sound	2	0	2	4
Total	**42**	**39**	**10**	**91**

Recent and Current Human Use

The Assessment Area contains a number of sites that illustrate the importance of the timber industry in shaping the area. Evidence of logging camps remains at Fish Bay, St. John the Baptist Bay, and Katlian Bay. These settlements, along with the resources extracted from them, have shaped the Assessment Area and the people who live there. Timber harvest from the area provided jobs and helped support the economy of the region, and the lumber and pulpwood produced by the industry has been distributed throughout the world.

The anadromous fish streams in the area produce salmon that are important to the commercial, sport, and subsistence fisheries in Southeast Alaska. Commercial salmon fishing provides significant income for area residents. Important fisheries include the seine fisheries for chum and pink salmon and herring, and the troll fisheries for coho and Chinook salmon. Although Chinook salmon are not produced in any Assessment Area streams, local Chinook stocks are produced by the Northern Southeast Regional Aquaculture Association (NSRAA) Medvejie hatchery and the Sheldon Jackson College hatchery. The Assessment Area is extremely important to Sitka residents for subsistence hunting, fishing, and gathering. Important subsistence fishing species include coho, pink, chum, sockeye, and Chinook salmon; steelhead and cutthroat trout; Dolly Varden char; and herring. Sockeye salmon from Salmon Lake Creek is an especially important subsistence resource.

Water Supply

The City & Borough of Sitka derives its water supply from two sources: the Blue Lake Reservoir watershed (the primary water source) and Indian River (an emergency backup source). Blue Lake supplies between 4 and 8 million gallons of treated water per day (mgd) for domestic and industrial uses (CBS ED 2002). Typically, higher consumption rates occur during the summer with increased numbers of visitors and increased commercial use at local fish plants. A brief discussion of each water treatment facility follows.

Blue Lake Water Treatment Plant (BLWTP)

Located at stream mile (SM) 2.7 on Sawmill Creek, this concrete arch dam is 211 feet high with a base width of 25 feet and a crest width of 256 feet. The reservoir, which was created when the dam was constructed, raised the natural water surface of Blue Lake from 208 to 342 feet in elevation and increased the surface area from 490 to 1,225 acres. The reservoir has gross storage capacity of 145,200 acre-feet (af) and usable storage of 102,200 af at spill level (CBS ED 2002).

Indian River Water Treatment Plant (IRWTP)

Now a secondary source of water, Indian River was the primary source water for many years prior to the construction of the Blue Lake Water Treatment Plant in 1984. Water is diverted into a reservoir beside the IRWTP where it then infiltrates down through the gravel and sand bottom of the reservoir. This filtered water is then collected into one of a dozen infiltration pipes and transported into four wells, each with a pump. The water in these wells is then chlorinated before it is distributed to the community. IRWTP is operated on a monthly basis to insure plant readiness to produce safe drinking water in case of emergency (CBS ED 2003).

Power

The City & Borough of Sitka owns and operates two hydroelectric facilities: Blue Lake (FERC #2230) and Green Lake (FERC #2818). These facilities have a combined generating capacity of 27.2 megawatts of hydroelectricity (CBS ED 2003). A brief description of each of these facilities follows.

Blue Lake

The Blue Lake Hydroelectric Project was originally licensed in March 1958 with a fifty-year license term. Currently, the City of Sitka Electric Department is working on obtaining a new license for the facility. A tentative calendar of events leading up to the Federal Energy Regulatory Commission (FERC) issuance of an order of new license follows (CBS ED 2003):

- 2003 – 2005 conduct field studies as necessary
- March 2003 file notice of intent to apply for new license
- August 2003 prepare scoping document 2
- March 2006 submit environmental assessment and application for new license
- October 2007 FERC makes order issuing new license

Green Lake

The Green Lake hydroelectric facility is located at SM 0.4 on Green Lake Outlet Creek. A concrete arch dam located at the outlet of Green Lake forms the reservoir. The Green Lake Project was originally licensed in April 1979 with a fifty-year license term. Construction began in 1978 and was completed in 1982. Total capacity and usable capacity of the dam below the spillway crest elevation (395 feet) are 88,000 and 75,000 acre-feet, respectively. Water released from power generation flows directly into Silver Bay and is not returned to the stream (USGS 2003).

Transportation and Facilities

Roads in the Assessment Area

The Assessment Area covers approximately 425 square miles and contains 124 miles of road, excluding private, city, and state roads in Sitka. Of the 124 miles of road, 49 miles are unclassified road, and 15 miles are Non-National Forest System Roads and fall under another agency's jurisdiction. Currently there are approximately 60 miles of National Forest System Roads (Figure 3-10 and Appendix C) in the Assessment Area. Approximately 25 miles of these roads are open but only 10 miles are passable with either standard passenger vehicles or high clearance vehicles. For a definition of "unclassified road" and other road-related terminology, please refer to the Glossary. The City and Borough of Sitka, a community of nearly 9,000 people, is the only community within the area. It is situated in the southern half of the Assessment Area. Sitka is isolated, serviced only by air or water; no roads link the community to other communities or to the mainland.

The interior of the Assessment Area can be reached in a number of ways. First, a number of forest roads that have not been maintained allow access to the interior from multiple points along the shoreline. A small portion of the Assessment Area can also be accessed from the community of Sitka by way of Road 7576 (Harbor Mountain Road), Road 7577 (Blue Lake Road), and Road 7578 (Nelson Logging Road).

The landscape of the western portion of the Assessment Area has changed with the development of the community of Sitka, its road system, and resource extraction activities. Logging roads have provided access for timber harvest in the major watersheds of Fish Bay, St. John the Baptist Bay, Nakwasina Sound, Katlian Bay, Redoubt Bay, and Camp Coogan Bay. These remote road systems have not seen extensive public vehicle traffic. Most of the traffic on these roads has been related to logging activity, off highway vehicles (OHVs), and hikers.

A Roads Analysis Plan (RAPs) is scheduled for completion in 2004. This analysis will include the roads within the Sitka Sound Landscape Assessment Area.

Sitka Sound Landscape Assessment Area

National Forest System Roads

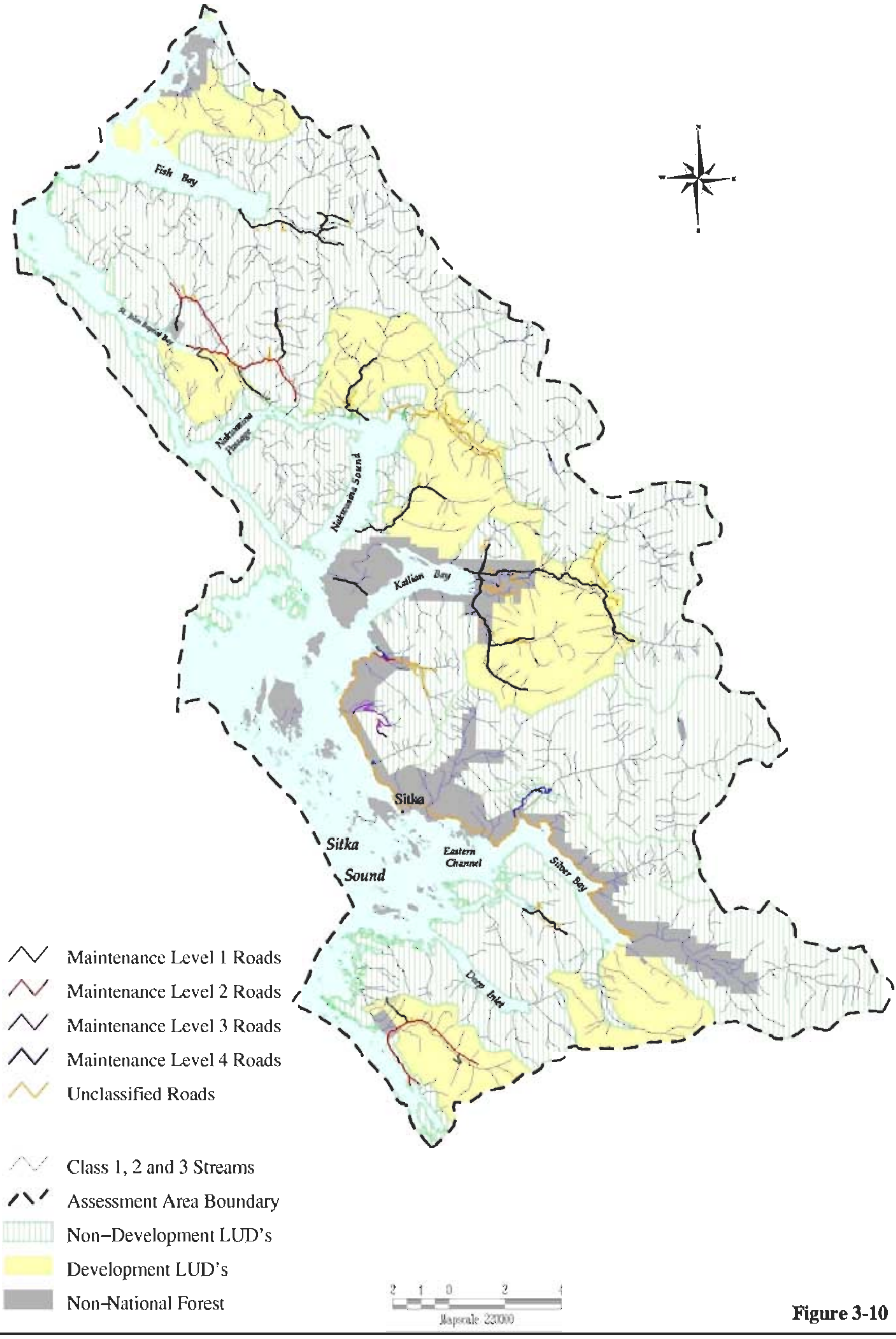


Figure 3-10

Table 3-20 below displays the miles of forest roads in each of the seven land use designations (LUDs) within the Assessment Area and on Non-National Forest land.

Table 3-20. Miles of Assessment Area Roads by Land Use Designation

Land Use Designation (LUD)	Acres	Miles of Road
Modified Landscape	19,143	9.6
Old-growth Habitat Reserves	57,117	24.9
Remote Recreation	3,996	0.0
Enacted Municipal Watershed	28,627	0.0
Semi-Remote Recreation	99,602	19.2
Timber Production	38,876	32.7
Scenic Viewshed	1,284	0.3
Non-National Forest Land	24,876	37.5
Total	**273,776**	**124.2**

Road Construction

Roads in Southeast Alaska are generally constructed by laying organic material (e.g., tree tops, limbs, stumps) on the leveled ground surface and then covering this organic mat with two to three feet of shot rock. Rock on classified roads is normally grid rolled to produce a smoother surface. Running surfaces on classified roads are generally 14 to 16 feet wide with turnouts, while temporary roads range from 12 to 14 feet wide. Culverts or bridges are placed at all natural channels. Cross drains, which are small culverts intended to transport runoff underneath the road, are commonly installed. Most cut banks and fill slopes are seeded upon construction to stabilized soil and reduce erosion and sedimentation.

Status and Maintenance Levels of Forest Roads

An objective maintenance level is assigned to each forest road. The objective maintenance level represents the level at which a road is to be managed. It is based on the maintenance level considering future road management objectives, including traffic needs, budget constraints, and environmental concerns. Roads also have an operational maintenance level, which is the actual current level of road maintenance. The operational maintenance level assigned to a road takes into consideration current needs, road conditions, budget constraints, and environmental considerations. Thus, roads may be currently maintained at one level but are planned for maintenance at a different level at some future date. The objective maintenance level may be the same as, higher than, or lower than the operational maintenance level.

Each of the road maintenance levels is described in the following paragraphs. Note that the description of each applies to both operational maintenance levels and objective maintenance levels. Maintenance levels referred to in this report will be the current assigned objective maintenance level.

Closed Roads

Forest Roads that are closed to vehicular traffic are managed according to Objective Maintenance Level 1 (OML). For a road to be assigned to this maintenance level, the period of its closure must exceed 1 year. Closed roads may provide intermittent service.

Such roads receive custodial maintenance to keep damage to adjacent resources at an acceptable level and to perpetuate the road to facilitate future management activities. Maintenance emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies include "prohibiting" and "eliminating" motorized traffic. OML 1 roads may be managed at any other maintenance level during the time they are open for traffic.

Though these roads are generally closed to vehicular traffic, they may be open for Off Highway Vehicle (OHV) use and for non-motorized uses. While OHV traffic is typically discouraged, foot traffic is welcome.

Closed roads in the Assessment Area have been physically closed with a barrier or have been overgrown with alder. Some closed roads contain log bridges that are unsafe for vehicles. The original drainage structures remain in place on some closed roads but have been removed on others. Table 3-21 displays the length and location of closed roads in the Assessment Area.

Table 3-21. Closed Roads in the Assessment Area

Road No.	Length (miles)	Remarks
7558	4.4	Lisa Creek
7574	2.9	Noxon Creek
7580	4.3	Fish Bay
7583	2.1	St. John the Baptist
7584	1.1	Bay Loop
7585	2.0	Limit Island
7594	2.0	Camp Coogan
75790	0.7	Coxe River
75791	3.0	South Katlian
75792	2.0	Mount Katlian
75797	4.9	Katlian River
75801	0.9	Fish Bay Spur 1
75802	1.0	Fish Bay Spur 2
75803	0.8	Fish Bay Spur 3
75821	1.3	Kizhuchia L Spur
75822	0.7	Kizhuchia M Spur
75831	1.2	St. John the Baptist Spur 1
75832	1.7	St. John the Baptist Road System
7599	1.4	Non system road
Total miles:	38.4	

Open Roads (Maintenance Levels 2 through 5)

Forest Roads that are open to vehicular traffic are managed according to one of four OMLs. Roads assigned to maintenance levels 2 through 5 are open and maintained to provide constant service to motorized vehicles. All open roads should receive periodic roadside brushing and annual drainage structure maintenance.

OML 2

OML 2 is assigned to roads open for use by high clearance vehicles such as 4-wheel drive pickup trucks. Passenger car traffic is not a consideration. Traffic on these roads is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Roads may be used for log haul. Appropriate traffic management strategies include discouraging or prohibiting passenger cars and accepting or discouraging high clearance vehicles.

Road surface conditions on these roads are in a self-maintained condition. Drivable waterbars, which are similar to speed bumps, may be added to the road to channel storm waters off the roadway. Existing drainage structures are to be left in place and supplemented with waterbars. Vehicle speed is expected to be slow in comparison to roads open to standard passenger vehicles. This is likely to slow the formation of potholes and minimize impacts to forest wildlife.

OML 3

OML 3 roads are open and maintained for standard passenger car use. User comfort and convenience are not considered priorities. These roads typically consist of a single lane with turnouts and spot surfacing; however, some roads may be fully surfaced with either native or processed material. They are intended for use at low speeds. Traffic management strategies include either encouraging or accepting traffic. However, use by certain classes of vehicles or users may be discouraged or prohibited depending on the volume of commercial use, ATV use, etc.

OML 4

OML 4 roads provide a moderate degree of user comfort and convenience at moderate travel speeds. At a minimum, these roads have one lane and a crushed aggregate surface. In addition, some roads may have two lanes, dust control, or may be paved. The most appropriate traffic management strategy is to encourage use. However, specific classes of vehicles or users may be prohibited at certain times.

Table 3-22 displays the miles of road in the Assessment Area that are maintained at OMLs 2, 3, and 4.

Table 3-22. Open Roads in the Assessment Area

OML 2 Roads		
Road No.	**Length (miles)**	**Remarks**
7582	5.9	Kizhuchia Creek
7583	3.9	Saint John the Baptist
75832	1.7	No Name Lake
7584	3.0	Bay Loop
75842	0.8	Bay Loop Spur 2
Total miles:	**15.3**	
OML 3 and 4 Roads		
Road No.	**Length (miles)**	**Remarks**
7511	0.05	Sitka Work Center
7512	0.02	Forest Service Dock
7513	1.00	Starrigavan Campground
7514	0.03	Forest Service Housing
7569	0.35	Sawmill Creek Campground
7576	4.00	Harbor Mountain Road
7577	2.20	Blue Lake Road
7581	0.36	Starrigavan Picnic Ground
7598	0.16	Cascade Creek Trailer Court
Total miles:	**8.17**	

OML 5

OML 5 roads provide a high degree of user comfort and convenience. These roads normally have two lanes and are paved. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is to encourage use. No Level 5 roads are located within the Assessment Area.

OML 3, 4, and 5 roads must be managed in accordance with the requirements of the Highway Safety Act of 1966 (P.L. 89-564).

Temporary, Decommissioned, and Unclassified Roads

Temporary roads are authorized by contract, permit, lease, or other written authorization, or by emergency operation. They are not intended to be a part of the forest transportation system and are not necessary for long-term resource management. Temporary roads may be up to a mile in length, but are generally less than ½ mile long. A common example of a temporary road would be a road leading to a log landing where equipment has been placed to harvest timber.

Decommissioned roads are unneeded roads that have been stabilized and restored to a more natural state. Decommissioning includes reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation. Culverts and bridges are removed, water bars are added, and the road entrance is generally blocked to motorized traffic. The temporary road mentioned above would normally be decommissioned after the timber was removed from the harvest unit and the log trucks were finished hauling the timber to a mill site.

Unclassified roads are roads not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization. An example of an unclassified road is the temporary road mentioned above that was not decommissioned after it was no longer needed. Once the road was not decommissioned after it's authorized use terminated (the timber sale), it became an unclassified road.

There are no temporary roads in the Assessment Area. However, the Assessment Area contains 4.7 miles of known decommissioned roads and 44.3 miles of unclassified roads.

Management Decisions Pertaining to Roads

The distinction between maintenance levels is not always sharply defined. Maintenance levels are selected based on the best overall fit for the needs of those who use the road. In those situations where roads have multiple uses, the road may overlap two different maintenance levels.

Forest Plan standards and guidelines for transportation require a managed road system based on road management objectives using the criteria listed below:

1. National Forest System Roads are to be kept open for public motorized use unless:

    - use conflicts with Land Use Designation objectives, such as the need to protect fish of wildlife habitat or to retain a non-motorized recreation experience;
    - financing is not available to maintain the road or manage the associated use of adjacent lands;
    - use causes unacceptable damage to roadway or adjacent soil and water resources;
    - use results in unsafe conditions; or
    - there is little or no public need for the road.

2. Manage road use by seasonal closure if any of the following conditions are anticipated:

    - seasonal conflicts with Land Use Designation objectives, such as the need to provide security for wildlife during critical times of the year; or
    - traffic hazards of unacceptable damage to roadway or adjacent soil and water resources due to weather or seasonal conditions.

3. Restrict public use by temporary closure if:

    - concurrent use between commercial and other traffic is unsafe; or
    - the potential for damage to equipment from vandalism is high.

4. Allow administrative use of closed or restricted roads when needed for emergency use or uses otherwise deemed appropriate by the Forest Service officer with delegated authority.

Road Condition Surveys

Road condition surveys (RCS) are conducted to gather information on the general condition of roads and to identify problem areas where roads have failed or where there is erosion, undersized or collapsed cross drains, or inadequate ditches.

Road condition surveys have also been used to gather data on blocked culverts. Culverts that hinder or obstruct the passage of aquatic species such as fish have been named "red pipes." The red pipe analysis takes into account a variety of factors, including the species of aquatic organisms and the amount of suitable habitat upstream and downstream from the road crossing. The repair of red pipes has become a forest priority.

In 1999, the Sitka Ranger District began conducting road condition surveys (RCS) on forest roads on the District. RCS data was used to ascertain the current condition of Assessment Area roads and their associated resource problems and/or concerns. The RCS data fields that were queried for Assessment Area Roads are described in Table 3-23 below.

Table 3-23. Road Condition Survey Data Fields Queried for Assessment Area Roads

Data Field and Title	Definition	Codes
7 – Descriptive Parameter	This data field provides descriptive information about a feature such as a culvert or ditch.	CE – cut slope erosion FE – fill slope erosion QE – quarry erosion SE – road surface erosion WR – water flowing on road DE – ditch erosion SL – slides SA – stream abutment erosion EC – stream encroachment on the roadway
8 – Access Travel Management	Indicates a feature that blocks, closes or influences travel on the road.	SLD – slide blocking traffic WO – washout blocking traffic
10 – Failure or Problem Mechanism	Indicates the mechanism causing the problems encountered during the survey.	RG – road crown needs grading SDD – sediment accumulation in ditch SDC – sediment accumulation in culvert FS – road fill slump or slide CSC – cut slope slump into culvert CSD – cut slope slump into ditch EC – hydraulic capacity of culvert or bridge exceeded DF – debris flow MDB – missing/inadequate ditch (material where blasting is required) MDD – missing/inadequate ditch (material that is diggable) SD – stream in ditch SS – subsidence of the roadway
18 – Inlet Erosion	Indicates erosion at a culvert inlet and what corrective measures should be taken to remedy the problem.	F – fill slope protection needed I – inlet improvement needed B – bank protection needed O – other
59 – Special Site Condition	Indicates road conditions that predispose future problems.	FH – sediment transport potential into fish stream WQ – sediment transport degrades water quality

Table 3-24 summarizes the results of the RCS data analysis. Data were available for seven road systems in the Assessment Area: Fish Bay (7580), St. John the Baptist Bay (7583, 75831, 75832, 7584, and 7584), Noxon Creek (7574), Harbor Mountain (7576), Blue Lake (7577), Camp Coogan Bay (7594), and Kizhuchia Creek (7582 and 75821). RCS data were not available for the roads in the Nakwasina, Katlian, or Lisa Creek watersheds. The table shows the number of instances obtained for each data field for each road.

Table 3-24. Road Condition Survey Summary for the Assessment Area

Road	Descriptive Parameter (instances)	Access and Travel Management (instances)	Failure or Problem Mechanism (instances)	Inlet Erosion (instances)	Outlet Erosion (instances)	Culvert Blockage (instances)	Total Instances	Survey Distance (miles)
7574	13	6	3	3	2	3	**30**	**3.19**
7576	16	1	39	7	4	28	**95**	**5.00**
7577	12	0	33	2	1	17	**65**	**2.20**
7580	7	0	0	2	2	3	**14**	**2.76**
7582	11	0	1	3	4	24	**43**	**6.19**
75821	1	0	1	0	0	0	**2**	**1.53**
7583	15	0	2	1	1	11	**30**	**6.79**
75831	2	0	4	0	1	1	**8**	**1.30**
75832	9	0	7	1	1	4	**22**	**1.69**
7584	24	0	6	3	3	18	**54**	**4.32**
7585	3	0	1	0	0	2	**6**	**1.94**
7594	3	0	4	0	0	0	**7**	**2.14**

Description of Assessment Area Roads

A description of Assessment Area roads and information from the Road Condition Surveys follows.

Road 7574—Noxon Creek Watershed

Road 7574 is an OML 1 road. It is currently receiving OHV traffic. Road condition surveys identified 30 locations along this road where erosion is present or there is a high potential for erosion. The majority of the locations were associated with surface and fillslope erosion and water on the road on a section located on an alluvial fan (milepost 2.1 to 2.5). A field evaluation of these locations indicated that the RCS data is accurate in its description of the road's condition. The road is washed out in several areas, and water is running down it. However, this section of the road does not appear to be impacting Noxon Creek. The tributaries to Noxon Creek, which flow across the road, are alluvial fan channels that naturally transport large sediment loads. The channels have eroded the road and in some places have been diverted down the road.

Four culverts were identified during the 2001 RCS. Each of them was found to be functioning properly; no red pipes were identified. There is very little fish habitat in the channel's side streams, and those that do function as fish habitat, do not appear to be affected by improperly installed or failed culverts. Bridges crossing the main channel have been removed, and the low crossings are stable.

The bulk of road 7574 falls within the Modified Landscape and Timber Production LUDs. Roading is consistent with the Modified Landscape LUD, provided road management emphasizes multiple uses and fish and wildlife habitat values. Roading is also consistent with the Timber Production LUD, giving consideration to both resource requirements and future recreation access.

Road 7576—Harbor Mountain (pre Bypass Road construction)
Road 7576 is open seasonally and maintained for passenger cars at OML 3. Road condition surveys on Harbor Mountain Road identified 95 locations that have the potential to erode or to become sediment source areas. The majority of the problems recorded relate to sediment accumulation in the culvert due to cutslope failure. This is reflected in the high number of culvert blockages and cutslope and fillslope failures. No red pipes were identified on this road.

Road 7576 is currently classified as a forest highway that crosses both Non-National Forest lands and lands with a Semi-remote Recreation LUD. Roads in the Semi-remote Recreation LUD are generally used to improve access for motorized and non-motorized recreation. New road is not generally constructed in this LUD except to link existing roads or provide access to adjacent LUDs.

Road 7577—Blue Lake Road
Road 7577 crosses both Non-National Forest lands and lands with a Semi-remote Recreation LUD. It is open seasonally and maintained for passenger cars at OML 4. The road condition survey for Blue Lake Road identified 65 road locations that have the potential to erode and/or become a source of sediment. The majority of the concerns identified related to sediment accumulation in the ditch due to cutslope failures. Culvert blockages were noted at 17 locations, and cutslope and fillslope erosion was identified at 8 locations. No red pipes were identified on this road.

Road 7569—Sawmill Creek Campground
Road 7569 is within the Semi-remote Recreation LUD. It is open seasonally and maintained for passenger cars at OML 4. No red pipes were identified on this road.

Road 7580—Fish Bay Road
Road 7580 is an OML 1 road. While RCS data shows that the road is becoming overgrown with vegetation, it also shows signs of OHV use. Incomplete data for this road were obtained; only 2.7 out of the 4.3 miles of road were surveyed. RCS data suggest that 14 locations along the road have the potential to erode or become sediment source areas. Water on the road from nearby beaver ponds was the major concern identified for this road.

A field check of the RCS locations on Fish Bay Road 7580 was conducted. However, even though the RCS elements collected by the contract crew in 2001 were accurate, the actual condition of the road is much worse than the data indicated.

Most of the drainage structures in the Fish Bay Road have been left in place. Of the erosion features identified by the RCS and the field evaluation, 30 percent were associated with drainage structures. These drainage structures have been in the road for approximately 25 years and are starting to rust or have become blocked with sediment and debris. These blockages are restricting fish migration. Furthermore, the associated erosion has probably affected water quality and fisheries resources. The RCS data did not adequately describe the overall condition of the road and the potential impacts of road related erosion to water quality and fisheries resources.

The section of road that was not surveyed by the RCS crew in 2001 was briefly evaluated in the field in 2002. The primary concerns about this section of road relate to its drainage structures. These structures are now failing and may be blocking fish passage and contributing sediment to the streams. The existing RCS data failed to identify any red pipes on road 7580.

The Fish Bay Road System falls entirely within the Old -growth Habitat Reserve LUD. Existing roads within this LUD should be managed to provide favorable conditions for old-growth and associated fish and wildlife species. New road construction is inconsistent with this LUD, but roads may be constructed if no feasible alternative route is available.

Road 7582—Kizhuchia Creek Road
Road 7582 is an OML 2 road that is not currently being maintained. The RCS data collected for this road shows that vegetation is beginning to overtake the road, but it is still passable by OHVs. Road condition data for the Kizhuchia Creek Road identified 43 road locations where erosion and sedimentation are problematic. The majority of concerns recorded relate to surface erosion and fillslope erosion. Culvert blockages occur at 24 locations. Four red pipes were identified along this road. This road crosses a private allotment at the mouth Kizhuchia Creek. The Forest Service has no Right-of-Way access on this portion of the road.

Road 75821—Kizhuchia L Spur
Road 75821 is an OML 1 road; however, it is not restricted by brush and shows signs of OHV use. The road condition survey for the Kizhuchia L Spur identified one location that has the potential to erode or become a source of sediment. The single RCS feature identified was fillslope erosion. No red pipes have been identified on this road.

The Kizhuchia road system is within Semi-remote Recreation and Modified Landscape LUDs. Roads in a Semi-remote Recreation LUD should generally be managed to allow access for motorized and non-motorized recreational opportunities. New road is not generally constructed in the Semi-remote Recreation LUD except to link existing roads or provide access to adjacent LUDs. Existing roads and new road construction are consistent with the Modified Landscape LUD, and roads should be managed for a variety of uses with an emphasis on fish and wildlife habitat values.

Road 7583—St. John the Baptist Bay Road System
Road 7583 is an OML 2 road that is not currently being maintained. RCS data show that the road is passable and receiving OHV traffic. The data suggest that 30 locations along the road have the potential to erode or become a source of sedimentation. The predominant concerns recorded were surface erosion and cutslope erosion. This is supported by a high number of culvert blockages (11 locations). One red pipe was identified.

Road 75831—St. John the Baptist Bay Spur 1
Road 75831 is an OML 1 road. RCS data suggest that erosion or sedimentation is a problem at 8 different road locations and that the entire length of the road is receiving OHV traffic. The primary concern identified for this road is a missing or inadequate ditch. No red pipe analysis has been conducted for Road 75831.

Road 75832—St. John the Baptist Bay Road System
Road 75832 is an OML 2 road that is not currently being maintained but is passable with OHVs. RCS data show minor OHV traffic and 22 road locations that act as a source of sediment or that have erosion problems. Surface erosion and ditch erosion are the primary concerns associated with this road. Culverts are blocked at four different locations. No red pipe analysis has been conducted for Road 75832

Road 7584—St. John the Baptist Bay Road System
Road 7584 is an OML 2 road that is not currently being maintained. However, it remains passable by OHVs. Fifty-four locations have been identified as potential sources of sedimentation or as having erosion problems. Surface erosion of the road and cutslope erosion were the primary concerns noted for this road. The high number of culvert blockages (at 18 locations) supports this. In addition, the hydraulic capacity of four culverts is exceeded. One red pipe was identified for this road.

Road 7585—St. John the Baptist Bay Road System
Road 7585 is an OML 1 road. RCS data for this road show that it is passable by OHV and has been receiving traffic. The data also identify six road locations that either have erosion problems or are acting as a source of sediment. The predominant problems noted were surface erosion of the road and cutslope erosion that blocked two culverts. No red pipes have been identified on this road.

The road system beginning in St. John the Baptist Bay includes roads 7583, 7584, 7585, 75831, and 75832, and traverses Timber Production and Old-growth Habitat Reserve LUDs. Roads and new road construction are consistent with a Timber Production LUD, considering resource requirements and future recreational access. Roads found within the Old-growth Habitat Reserve LUD are to be managed with old-growth habitat and associated fish and wildlife as the primary considerations. New roads are inconsistent with this LUD.

Road 7594—Camp Coogan Bay
Road 7594 is an OML 1 road that has recently received corrective maintenance treatment on one section. Seven locations along the road had been identified as having the potential to erode or to act as sediment sources. Cutslope erosion and stream encroachment were identified as the greatest concerns about this road. No red pipes have been identified. These data were field verified in 2003, and major repairs have been made to remedy the stream encroachment.

Camp Coogan Bay Road 7594 is entirely within a Semi-remote Recreation LUD. Roading in Semi-remote Recreation generally provides access for motorized and non-motorized recreation. New road is not generally constructed in the Semi-remote Recreation LUD except to link existing roads or provide access to adjacent LUDs.

Marine Access Facilities

The Assessment Area contains eleven former Marine Access Facilities (MAFs) (previously referred to as Log Transfer Facilities [LTFs]). Marine access facilities were constructed for the transfer of equipment and harvested timber from roads to salt water. These facilities are an integral part of the Assessment Area's transportation system because most of the road systems are only accessible by water. Some of the MAFs still provide access to road systems for administrative and recreational use.

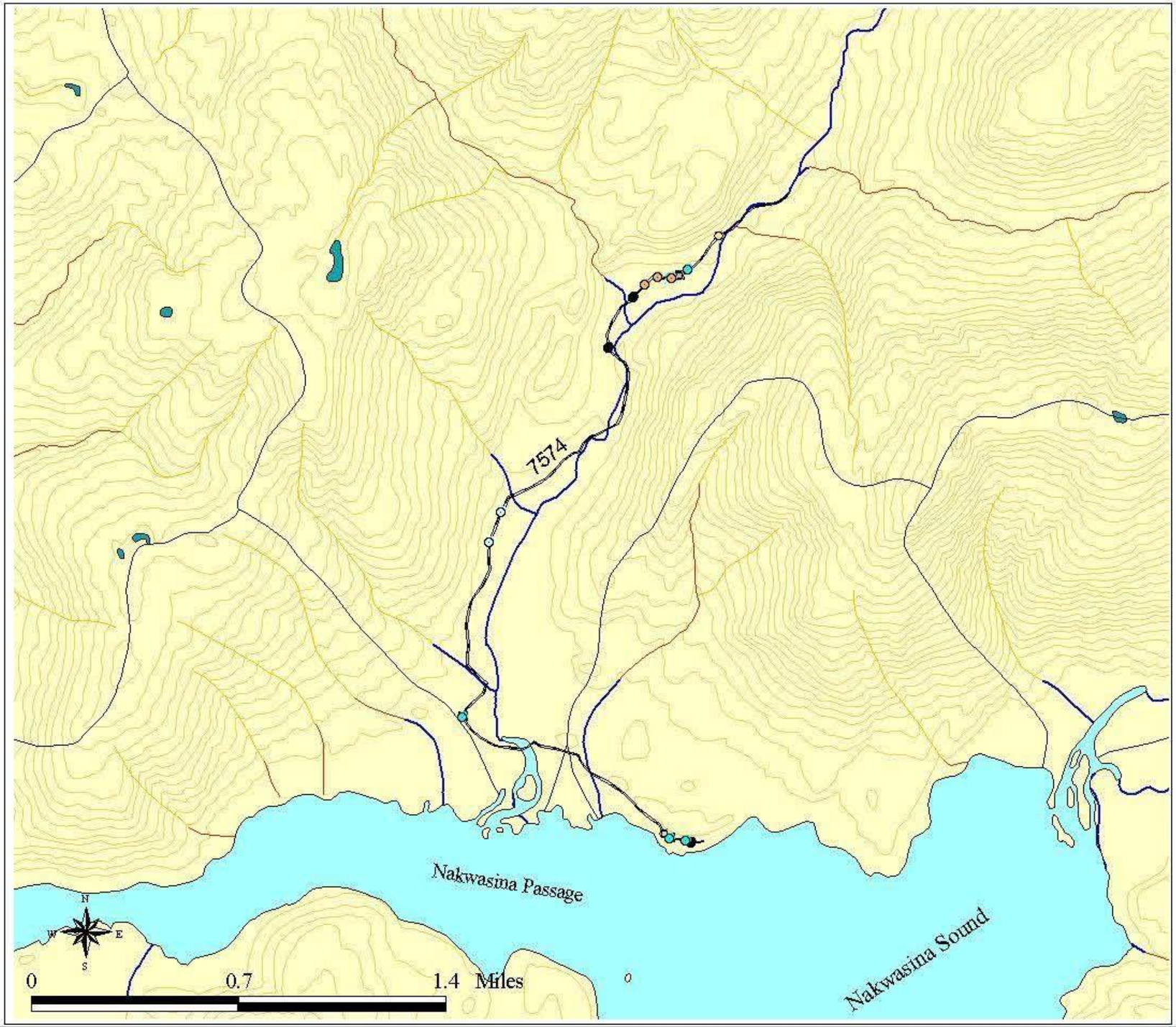


Figure 3-11. RCS Data for Noxon Creek Road System Sitka Sound Landscape Assessment

Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

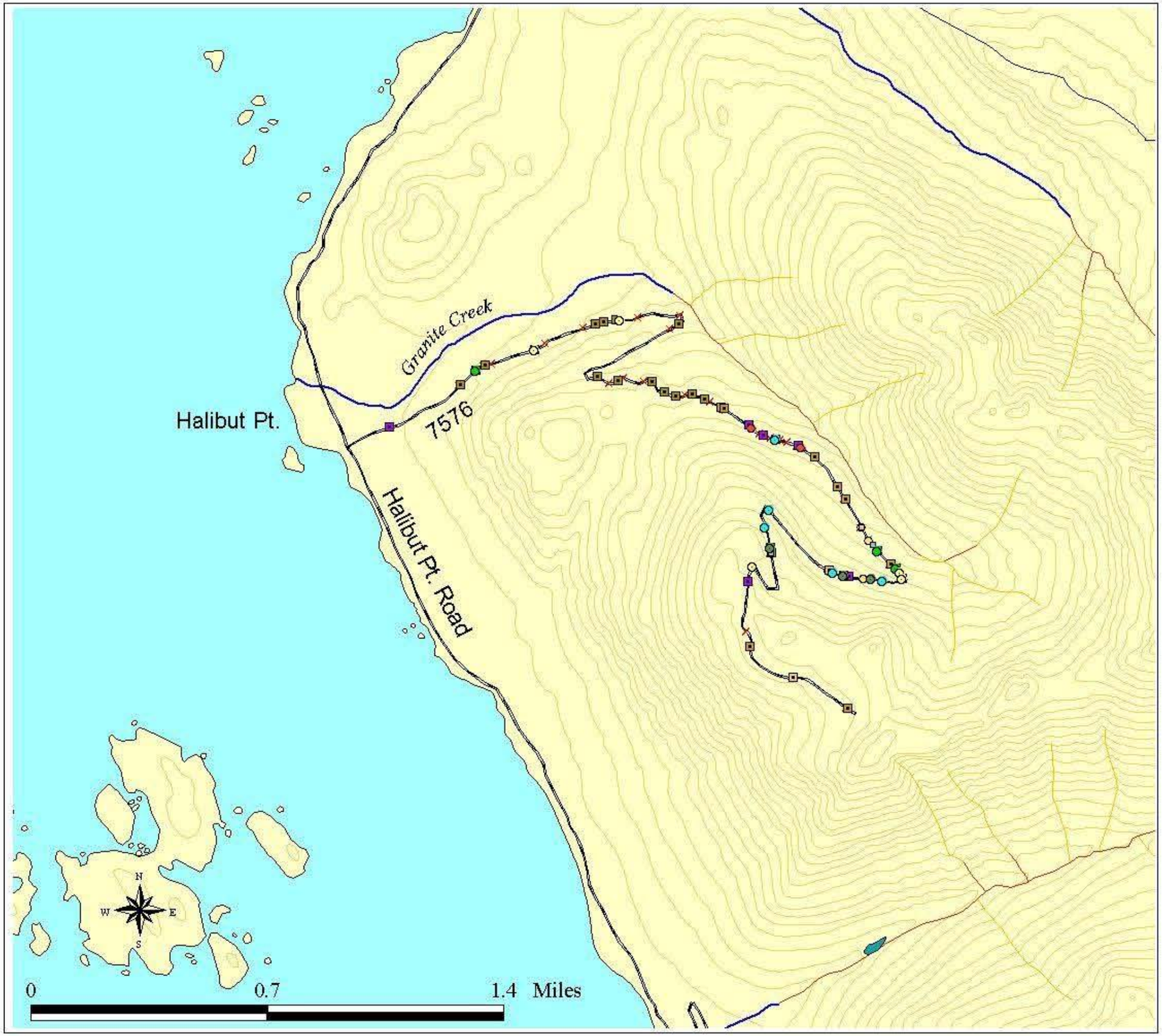


Figure 3-12. RCS Data for Harbor Mtn. Road Sitka Sound Landscape Assessment

Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

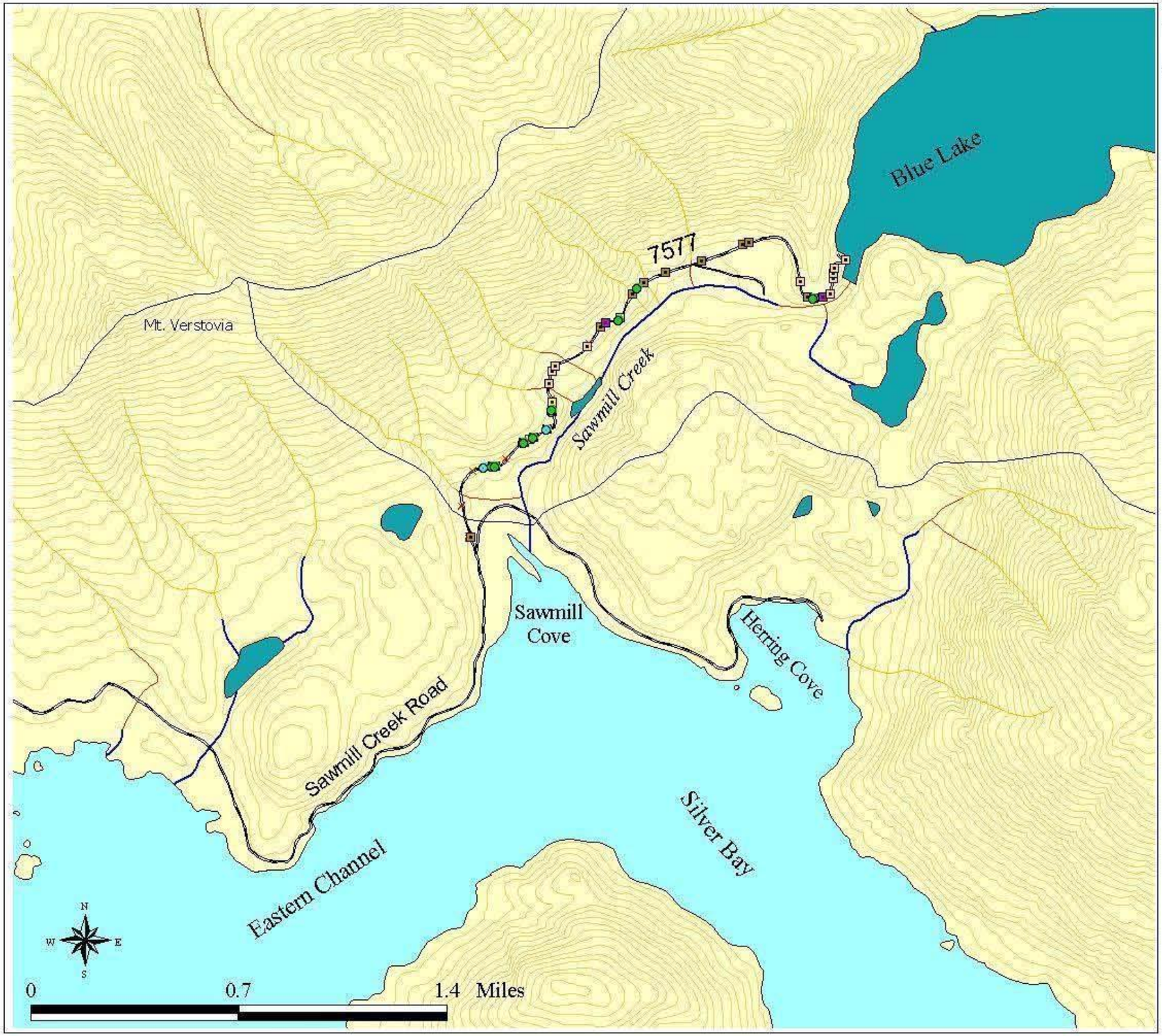
Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

Figure 3-13. RCS Data for Blue Lake Road
Sitka Sound Landscape Assessment



Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

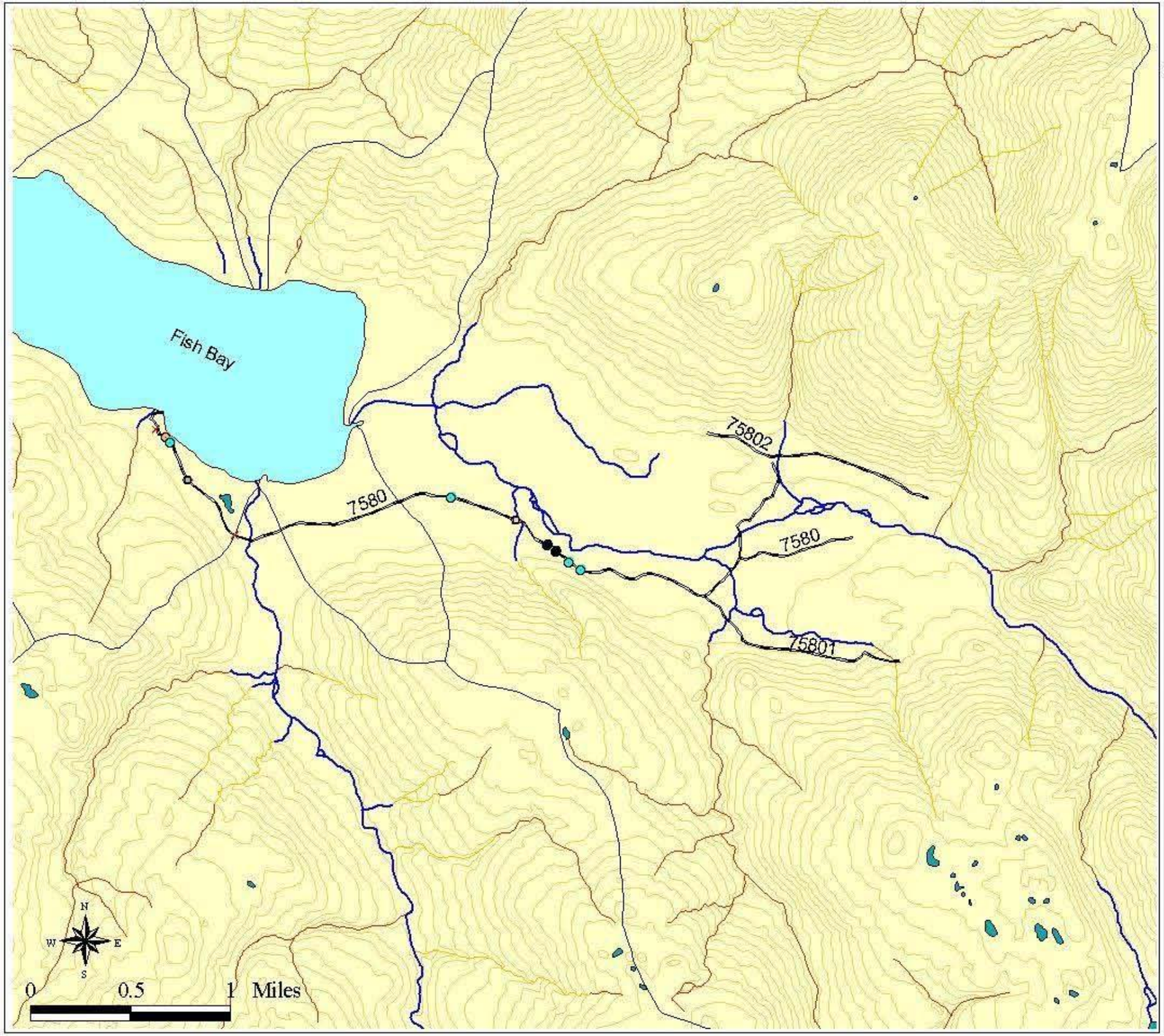


Figure 3-14. RCS Data for Fish Bay Road System Sitka Sound Landscape Assessment

Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

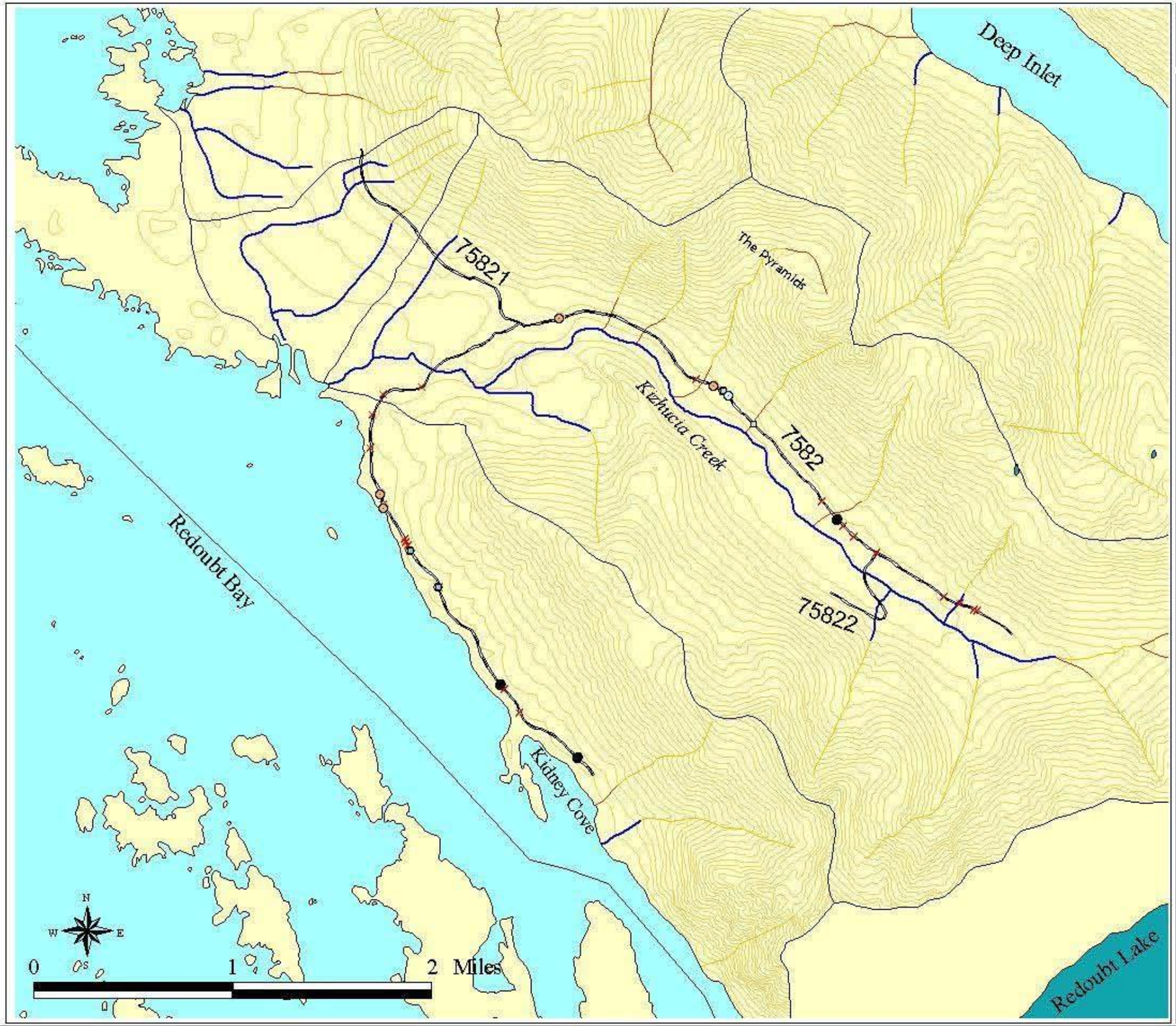


Figure 3-15. RCS Data for Kizhuchia Road System Sitka Sound Landscape Assessment

Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

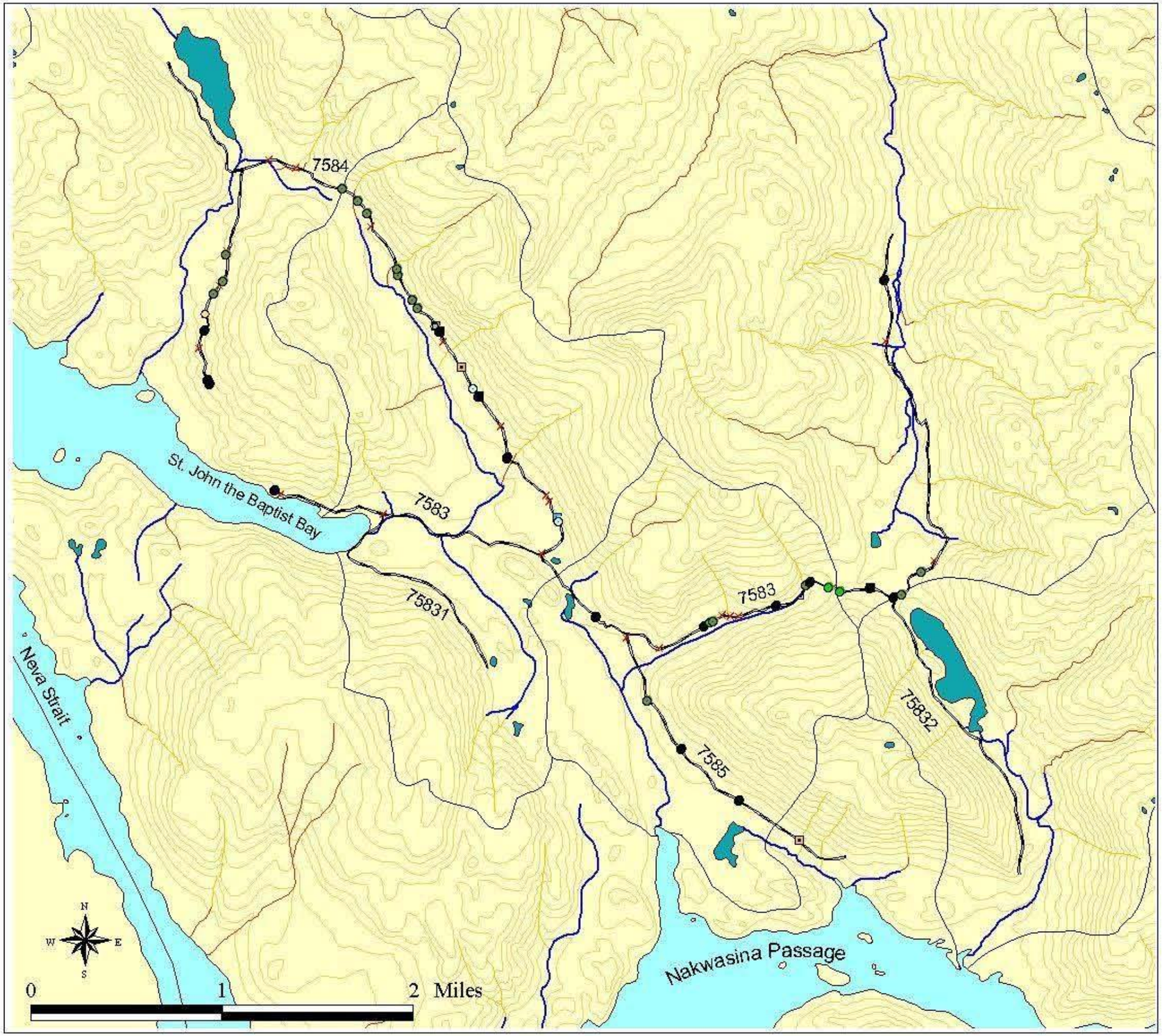


Figure 3-16. RCS Data for St. John Road System
Sitka Sound Landscape Assessment

Parameter
- Cutslope Erosion
- Ditch Erosion
- Stream Encroachment
- Fillslope Erosion
- Surface Erosion
- Slide
- Water on Road

Outlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Other

Inlet Erosion
- Bank Protection Needed
- Fillslope Protection Needed
- Inlet Improvement Needed

Failure or Problem Mechanism
- Cutslope slump into Culvert
- Debris Flow
- Hydraulic Capacity Exceeded
- Fill Slump or Slide
- Road Crown Needs Grading
- Sediment Accumulation in Culvert
- Sediment Accumulation in Ditch
- Culvert Blockage

Access & Travel Management
- Slide Blocking Traffic
- Washout Blocking Traffic

Streams
- Class I
- Class II
- Class III
- Roads

Recreation Use and Facilities

The Assessment Area possesses a remarkable and unique combination of natural features, including inland waterways with cobbled shorelines, rugged mountain terrain, ice fields, and large and/or unusual fish and wildlife populations. Outdoor recreation opportunities available in the Tongass National Forest play an important role in the quality of life for the majority of Southeast Alaska residents. Many residents have favorite places where they go to fish, hunt, beachcomb, hike, or just to get away. Many non-residents visit the Tongass to participate in these same activities (USDA FS 1997 [Forest Plan FEIS], p. 1-4).

The Forest Service's authority for management of National Forest System (NFS) lands extends from the uplands to the mean high tide mark along the beaches. The State of Alaska has management authority from mean high tide into the saltwater. Though the Forest Service has no authority to manage activities that take place below the mean high tide mark, the agency cannot ignore such activities because they are intricately related to the recreation experiences that take place on NFS lands. Thus, a holistic approach that includes recreational activities occurring in or near saltwater is called for when assessing the recreation resource. For this reason, this section will address both saltwater and land based recreation activities.

Recreation Facilities, Sites, and Use

The following narrative describes recreation use in the Assessment Area by Value Comparison Unit (VCU). Unless otherwise noted, all access to the forest is by boat or plane. The most common recreation activities that occur in the area are power boating, berry picking, hunting, fishing, kayaking, hiking, biking, ATV riding, sightseeing, and camping. In addition, areas identified in the *Revised Sitka District Coastal Management Program: Public Use Mangement Plan* (CBS PD 1993) as offering outstanding recreation and subsistence opportunities are noted in the text that follows.

VCU 2880

Baby Bear Bay, a designated State Recreation Area and Special Management Area (CBS PD 1993), is the chief recreation access point in this VCU. It has four viable anchorages that are used year-round by local residents and the area's fishing fleet. Tide levels can limit access to the anchorages. No human development is apparent in this VCU.

VCU 2870

VCU 2870 contains at least six anchorages. The six mile long Fish Bay contains at least three anchorages and is the primary recreation access point for this VCU. A Forest Service mooring buoy and three-sided survival shelter are located at Kakul Narrows at the southern entrance to the bay. The Piper Island recreation cabin and a dispersed campsite are located in Shultz Cove in the northwest section of Fish Bay. In 2002, this cabin had 400 visitors. The head of the bay contains two dispersed campsites, each of which has identified anchorages associated with it. This area is popular for deer and duck hunting. The FY2001 Tongass Outfitter and Guide Use Report (USDA FS 2001) suggests that two guides used this area for camping and/or freshwater fishing during the

2001 fiscal year. The guides brought at least four groups and fifteen clients to the area.

A road system (Forest Road 7580) begins at the estuary and continues into the Fish Bay valley for four miles. The system is to be managed to encourage use by hikers, bicyclists, and skiers, and to eliminate use of high-clearance vehicles.

A small natural hot spring is located near the northern spur of the road. While this site has not been developed for general public use, it is a popular destination for hikers who use this area and has been identified as a Special Management Area (CBS PD 1993).

VCU 3020

Neva Strait and St. John the Baptist Bay are included in this VCU. Five anchorages have been identified in this area: two in Neva Strait, two in the St. John the Baptist Bay, and one at Bee Hive Island. Sitka residents use this area heavily for deer hunting. The St. John the Baptist Bay road system (Forest Road 7583) is to be managed to encourage use by hikers, bicyclists, and skiers; to accept snowmobile, motorbike, and OHV use; to discourage high-clearance vehicle use; and to eliminate passenger vehicle use.

One guide is reported to have used Neva Strait as a camping site for an 11-person group during the 2001 fiscal year. Another guide camped with 24 clients in three separate groups at Bee Hive Island (USDA FS 2001).

VCUs 3000, 2990, and 3010 (Nakwasina Sound and Passage)

West Nakwasina Sound and Halleck Island are heavily used by the people of Sitka. Deer and duck hunting, crabbing, fresh and saltwater fishing, sightseeing, and camping are the main uses. Most of the saltwater and shoreline area within the northern section of the Passage has been identified as a Special Management Area (USDA 1983). VCU 3000 contains the Allen Point Cabin, which had 416 registered occupants in 2002.

Three anchorages have been identified in VCU 3000. One is at the Allen Point Cabin and is marked by a mooring buoy. A second is just north of the cabin. The third anchorage is located at the end of Neva Strait where Forest Road 7585 meets the saltwater. One anchorage has been identified in VCU 3010 approximately 2.5 miles into the Sound from Olga Strait. VCU 2990 contains no anchorages.

Three road systems (Forest Roads 7583, 7585, and 7574) are located within VCU 3000. The Traffic Management Strategy for Forest Road 7583 (St. John Baptist Bay Road) is to encourage use by hikers, bicyclists, and skiers; to accept snowmobile, motorbike, and OHV use; to discourage high-clearance vehicle use; and to eliminate passenger vehicles. On Forest Road 7585 (Limit Island), use by hikers, bicyclists, and skiers is encouraged; snowmobiles, motorbikes, and OHVs are discouraged; and passenger vehicle use is to be eliminated. Forest Road 7574 (Noxon Creek) is to be managed to encourage use by hikers, bicyclists, and skiers; to accept snowmobile, motorbike, and OHV use; and to eliminate passenger vehicles. VCU 2990 contains six miles of non-system roads. These roads are not being maintained for any type of vehicle use and are no longer listed in the Forest Service system roads inventory. VCU 3010 contains one road, Forest Road 7558 (Lisa Creek), which extends 3.5 miles into the VCU. The road is managed to encourage

use by hikers, bicyclists, and skiers; to discourage snowmobile, motorbike, and OHV use; and to eliminate passenger vehicle use.

Seven guides are reported to have brought 47 clients in 10 separate groups to the Nakwasina Sound and Passage area for camping, hiking, brown bear hunting, and/or freshwater fishing during the 2001 fiscal year. In addition, one guide was reported hiking with 131 clients in 3 groups on Halleck Island (USDA FS 2001).

VCU 3130 and 3120

Northern and Southern Katlian Bay receive the same amount and type of recreation use as Nakwasina Sound. Deer hunting, crabbing, fresh and saltwater fishing, sightseeing, and camping are the main uses. The Shee Atiká Native Corporation owns two-thirds of the shoreline in this bay but has allowed the general public access to the NFS lands. This area contains three Forest Roads: 7579 (Katlian Bay), 75797 (Katlian River), and 75791 (South Katlian). These roads are managed to encourage use by hikers, bicyclists, and skiers; to discourage snowmobile, motorbike, and OHV use; and to eliminate high-clearance vehicle use. Three guides are reported to have brought a total of fourteen clients in five groups to the area for camping and/or goat hunting during the 2001 fiscal year (USDA FS 2001).

VCU 3110

Because the city of Sitka is contained within VCU 3110, it receives heavy recreation use, including all types of skiing (e.g., cross country, telemark, alpine, etc.) and snowboarding. This VCU contains several designated Special Management Areas: the Starrigavan Bay area, Halibut Point Recreation Area, Sandy Beach, Pioneer Park, and the Sitka National Historical Park Fort Site. The Starrigavan Complex, which has six day use areas, 36 camping sites, and four trail systems, is also located in this VCU. Twenty two hundred people are reported to have visited the Starrigavan campground and day use areas in 2000. Campground reconstruction, which had been under way for the past two years, was completed in July 2003. Finally, VCU 3110 also contains the Harbor Mountain Recreation Area, which offers four-day use picnic sites; one-day use picnic shelter; scenic vistas of Mt. Edgecumbe, the surrounding mountains, and the Pacific Ocean; and a bird's eye view of Sitka. Two guides are reported to have used the Harbor Mountain Recreation Area for day trip sightseeing during the 2001 fiscal year. They guided 16 clients in two separate groups (USDA FS 2001).

Trails

A number of trails are located within VCU 3110. Many of these trails are interconnected and are cooperatively managed by the Forest Service and city and state governments. The table below displays the high use trails accessible by passenger car located within this VCU.

Table 3-25. Trails Located in VCU 3110

Mosquito Cove Loop Trail	Cross Trail
Starrigavan Valley Trail	Indian River Trail
Starrigavan Estuary Life Boardwalk Trail	Mount Verstovia Trail
Starrigavan Forest and Muskeg Trail	Thimbleberry/Heart Lake Trail
Harbor Mountain/Gavan Hill Trail	

Data for the Harbor Mountain/Gavan Hill Trail has been collected sporadically during the spring, summer, and fall seasons from 1996 through 2001. On average, five groups used this trail each day during this period. The trail follows the alpine ridgeline of both mountains for four miles and then descends two miles into Sitka proper. A small Forest Service hut has been constructed for public overnight use at the point at which the trail traverses from Harbor Mountain onto Gavan Hill**.** These trails are used primarily for full day hikes. The Gavan Hill Trail bisects the Cross Trail, which is owned by the City of Sitka and runs four miles along the base of Gavan Hill. The Cross Trail runs from the Gavan Hill Housing Subdivision to the Indian River Trailhead. Two guides are reported to have accompanied 92 clients in three groups on camping and/or hiking excursions along the Harbor Mountain/Gavan Hill Trail (USDA FS 2001).

The Indian River Trail follows the Indian River for 4.57 miles to a waterfall. Data collected inconsistently from 1997 through 2001 suggest that an average of five groups use this trail per day. Two guides are reported to have used this trail to sightsee and hike with 28 clients in two groups during the 2001 fiscal year (USDA FS 2001).

The Mount Verstovia Trail area was conveyed to the Forest Service in the spring of 2003 from the Alaska Mental Health Trust Fund. The trail traverses the side of the mountain for 2.5 miles. Hikers can extend their walk by continuing along the ridgelines that lead to the summit of Mount Verstovia. Hikers wishing to reach the summit must perform some technical climbing.

The Starrigavan Complex includes four trails: the Mosquito Cove Loop Trail (on State Land), the Starrigavan Valley Trail, the Estuary Life Boardwalk Trail, and the Forest and Muskeg Trail (on State Land). Outfitter and guide use data from the 2001 fiscal year are available for three of these trails. Two guides are reported to have used the Mosquito Cove Loop Trail for guided hiking. One guide hiked with 53 clients in two groups, and the other guide hiked with 2,000 clients in 143 groups. One guide is reported to have used the Starrigavan Estuary Life Boardwalk Trail to guide 1,520 clients in 54 separate groups. Finally, two guides used the Starrigavan Forest and Muskeg Trail to conduct guided hikes. One guide hiked with 50 clients in two groups, and the other guide hiked with 877 clients in 63 separate groups.

Roads

VCU 3110 contains two Forest Roads. Forest Road 7578 (the Nelson Logging Road or Starrigavan Creek) is managed to encourage hikers, bicyclists, and skiers, and to accept use by passenger cars and high clearance vehicles. Approximately 2.5 miles of ATV trails have been developed for recreation use one mile from Halibut Point Road.

Forest Road 7576 (Harbor Mountain Road) is open to all types of recreation traffic from mid-May to late November. Winter recreation off-road vehicles are allowed to use this road from around mid-December to late April provided adequate snow levels exist. This road is the only road in Southeast Alaska that links a community directly to an alpine area. Town residents and visitors frequently use the road and the recreation sites at the top of the mountain because of the scenic views they provide and to access the Harbor Mountain/Gavan Hill trailhead.

VCU 3180

The Blue Lake VCU is accessed by Forest Road 7577, a 1.5 mile road connecting Sawmill Creek Road to the Blue Lake Reservoir. This road is managed to accept all vehicles, but the road is gated closed from January 1 through April 15. A wide range of recreation activities is possible in this area, including all types of skiing and snowboarding. One guide is reported to have used this area once during the 2001 fiscal year to take one client goat hunting (USDA FS 2001).

The Sawmill Creek Campground and Beaver Lake Trailhead are located along Forest Road 7569. The Sawmill Creek Campground has eleven camping sites. It hosted 1,000 campers in 2000. The Beaver Lake Trail begins at the campground, climbs out of the Blue Lake Canyon, and ends at the Beaver Lake fishing pier. Completion of a 1.25 mile loop trail around the lake was completed in 2004. One guide is reported to have hiked the Beaver Lake Trail with an 11 client group during the 2001 fiscal year (USDA FS 2001).

Plans are under way to construct the Thimbleberry/Heart Lake Trail. A trail from Herring Cove to Beaver Lake is also proposed.

Green Lake Road, a seven mile road owned by the City and Borough of Sitka, begins in VCU 3180 and continues through VCUs 3250 and 3240. Though the city keeps this road along Silver Bay gated shut, it allows public use of the road for non-motorized recreation. Many people use this road to access the NFS land located one-half mile beyond the city's boundaries. There they hike, hunt, fish (fresh water), and camp at the nearby high lakes in VCU 3250. During the 2001 fiscal year, one guide is reported to have conducted a sightseeing excursion for three clients in this VCU (USDA FS 2001).

VCU 3250

A number of recreation activities are possible in VCU 3250, including all types of skiing and snowboarding. This VCU may be accessed via a non-system trail that starts at the Medvejie Hatchery along the Green Lake Road. This trail is half a mile long and ends at Medvejie Lake. Some hikers continue from this point to cross the Baranof Island ice fields to reach Baranof Lake or the community of Baranof Warm Springs.

VCU 3240
A number of recreation activities are possible in VCU 3240, including all types of skiing and snowboarding. This VCU contains Silver Bay, which is five miles long and one half mile across. The Salmon Lake/Redoubt Trail trailhead, a designated Special Management Area, is also located within this VCU. This Salmon Lake/Redoubt Trail winds for six miles through the forest and ends at a cabin on Redoubt Lake. A permitted Alaska state land recreation resident is located half a mile from the trailhead. Another old trail, the Silver Bay Trail, begins along Silver Bay where the recreation resident is located and continues for three miles to Pinta Lake and the Lucky Chance Mine. One guide is reported to have used the Silver Bay area during the 2001 fiscal year to camp with an 18-client group. Another guide used the Salmon Lake Trail to take a two-client group fishing (USDA FS 2001).

VCU 3230
This VCU corridor is a designated Special management Area (CBS PD 1993). VCU 3230 contains the Salmon Lake Cabin, which is just off the Salmon Lake Trail two miles from the Silver Bay trailhead. A total of 206 visitors used the cabin during the 2001 fiscal year. The trail continues through the drainage for another four miles and ends at Redoubt Cabin in VCU 3500.

VCU 3190
Camp Coogan is recognized as a bay that can be used as an anchorage and is designated in the Sitka Coastal Management Plan as an approved site for float houses. The Forest Service has granted permits to two recreation residents within the boundaries of this VCU. Forest Road 7594 is located within this VCU. No motorized vehicles are allowed on the road.

VCU 3200 and 3220
Cape Burunof and Deep Inlet are normally accessed by recreation boaters. A number of the small islands in the Cape Burunof VCU are privately owned and include homes that are used year round. Three Special Management Areas are located within this VCU: Samsing Cove, Pirate's Cove, and Three Entrance Bay. Five areas (Aleutkina Bay, Sandy Cove, Samsing Cove, Pirates Cove, and Three Entrance Bay) have been identified as anchorages. One guide is reported to have taken a 17-client group hiking in Aleutkina Bay during the 2001 fiscal year. During the same period, one guide is reported to have camped with a six-client group in both Samsing Cove and Pirates Cove. The Samsing Cabin, which is managed by the Forest Service, is located in this VCU. A total of 728 patrons visited the cabin during the 2001 fiscal year.

VCU 3210
Kizhuchia, an old log transfer site, has been identified as an anchorage site in this VCU. This VCU contains Forest Road 7582. Currently, this road is managed at OML2, but is being considered for OML1 status. However, the lower portion of the road is on private property with no Right-of-Way access to the upper section of Forest Road. Trespass is prohibited on this private section of road and permission must be obtained from the landowner prior to use.

Subsistence

According to the Alaska National Interest Lands Conservation Act (ANILCA), subsistence is defined, in part, as "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation" (ANILCA, Sec. 803). ANILCA provides for the continuation of these uses "consistent with sound management principles, and the conservation of healthy populations of fish and wildlife" (ANILCA, Sec. 802). For many rural Alaskans subsistence is a way of life; and also carries cultural and religious meaning.

The act of gathering subsistence resources is an important practice that reflects deeply held attitudes, values, and beliefs. Some traditional foods are not available through any means other than subsistence and, the occasions for gathering wild foods and edible plants are often social events. Historical patterns of movement, such as the annual cycle of dispersal into small family groups at summer fishing camps and then to larger groups at protected winter villages, are also linked to the tradition of subsistence gathering.

In addition, sharing subsistence resources is important not only with other household members, but also with extended families and friends (including those households unable to harvest resources) and with other communities. Fish and game are widely preferred sources of food among Southeast Alaska households, regardless of household income. Average per capita income may not indicate the importance of subsistence to a community. While members of low-income households may have a greater dependence on subsistence gathering, those with higher incomes may simply be in a position to have a more comfortable lifestyle because they combine their subsistence activities with their ability to purchase goods. Higher incomes do not deter individuals from gathering resources and sharing those with friends and family (Kruse and Muth 1990).

Subsistence resources include deer, bear, marine mammals, birds, clams, fish, shellfish, marine invertebrates, furbearers, firewood, herring eggs, berries, and edible plants. Subsistence goods may be eaten, traded, given away, or made into useful or decorative items. For example, the skins from brown bear or fur from the marten or sea otter may be used for regalia costumes used in ceremonies and dances (Kruse and Muth 1990). Table 3-26 summarizes some of the subsistence harvest data for the Sitka area.

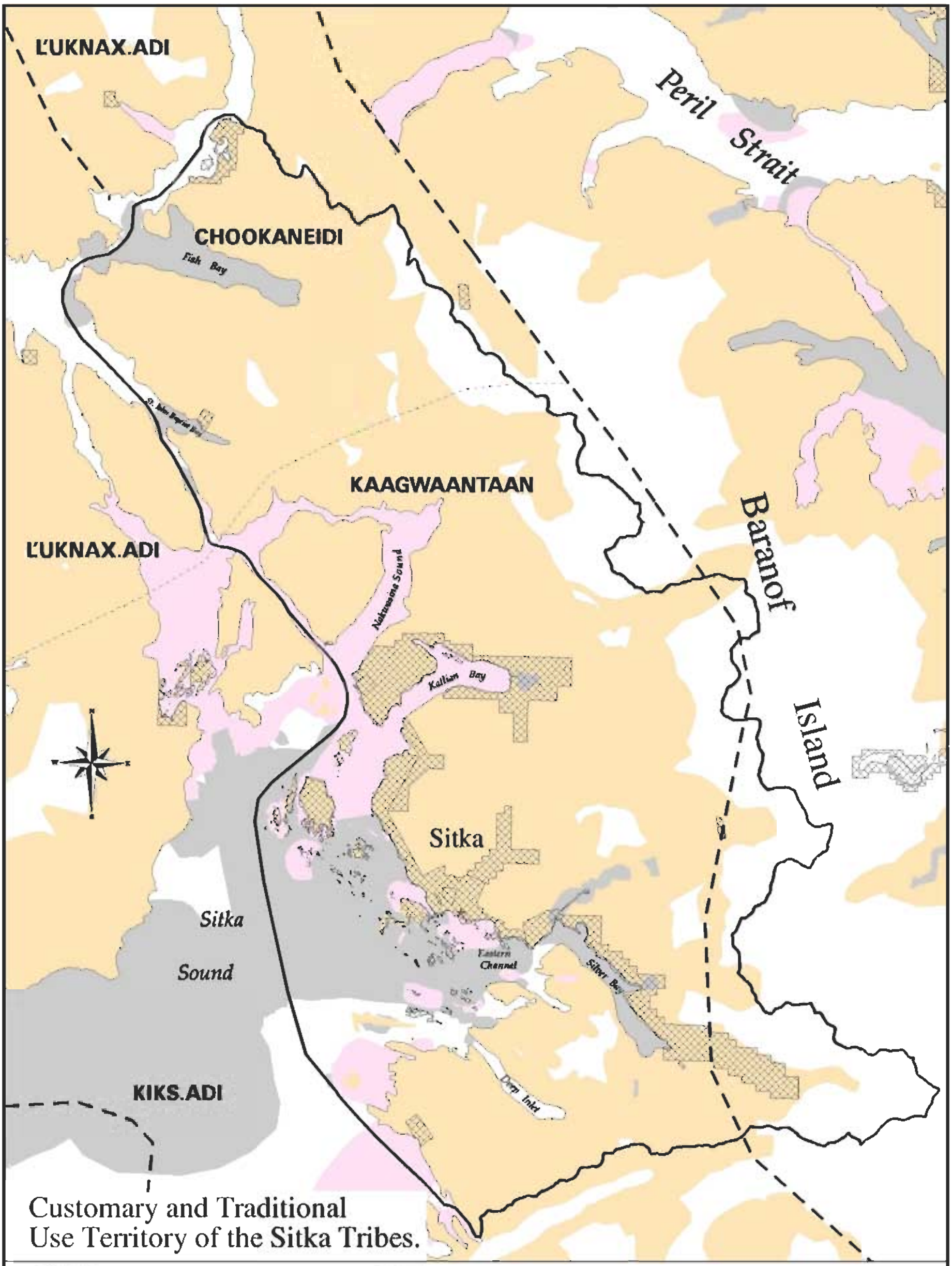
Table 3-26. Subsistence Harvest and Use by Sitka Residents in 1996

Resource	Percent of Households					Estimated Harvest			
	Using	Trying	Harvesting	Receiving	Giving	Number	Pounds	Ave. Pounds	Pounds Per Capita
All Resources	97	85	83	93	74		1,749,772	573	205
Fish	95	67	65	82	67		953,207	312	112
Salmon	89	60	58	64	51	83,114	493,542	162	58
Non-Salmon Fish	92	60	57	67	47		459,665	151	54
Land Mammals	64	44	36	41	24	7,269	434,971	142	51
Large Land Mammals	64	44	35	41	23	5,001	434,225	142	51
Small Land Mammals	4	3	3	2	1	2,268	746	0	0
Marine Mammals	17	8	8	12	10	1,081	62,358	20	7
Birds and Eggs	8	9	8	1	5	5,761	5068	2	1
Marine Invertebrates	72	45	44	61	32		234,496	77	27
Vegetation	70	61	60	29	28		59,671	20	7

Source: ADF&G, Division of Subsistence (2002)

Marine Invertebrates and Finfish

Patterns of current subsistence use are rooted in the cultural traditions of the modern Tlingit people. We know humans have used resources within the Assessment Area for at least the past 10,000 years. There is an observable spatial relationship between the distribution of prehistoric sites and the current marine invertebrate and finfish subsistence use patterns in the Assessment Area. Figure 3-16 displays local Tlingit Clan boundaries and approximate subsistence areas by species type for the Assessment Area. Because information concerning the exact location of archeological sites is protected by law, we have not shown the locations for single or groups of prehistoric sites on this figure. As described previously, investigations have identified 91 archeological and historic components in the Assessment Area. Distribution of these components is presented in Table 3-19 by larger watersheds. Table 3-19 and Figure 3-17 illustrate that prehistoric inhabitants utilized many of the land mammals, marine invertebrates and salmon resource areas of which current subsistence practitioners make use.



Customary and Traditional Use Territory of the Sitka Tribes.

Figure 3-17

In 1988, ADF&G gathered subsistence use data based on interviews with samples of households in 33 Southeast Alaska communities (Tongass Resource Use Cooperative Surveys or TRUCS, Kruse & Frazier 1988). This data was used to map subsistence harvest locations by community for deer, marine animals, salmon, and marine shellfish. Some observable, interesting patterns of the use of marine shellfish, finfish, and deer by all communities are discussed in the following paragraphs. Twenty-four communities, including Sitka, have since been resurveyed over a five-year period to update information (ADF&G 2002). The complete community summary for Sitka is included in Appendix D.

Subsistence Use of Salmon

According to these data, in 1996 nearly every household in Sitka (97 percent) used at least one wild resource species. Almost as many attempted to harvest, harvested, or received at least one wild species. Eighty-nine percent of Sitka households used at least one salmon species, and almost 92 percent used at least one non-salmon fish species. Somewhat fewer households were actively involved in harvesting resources (83 percent). Fifty-eight percent harvested salmon, and 57 percent harvested non-salmon fish species. Sockeye salmon comprised the largest portion of the Sitka salmon harvest in terms of numbers of fish and pounds of useable weight. Coho, Chinook, and pink salmon followed respectively in order of importance and use (ADF&G-DS 2002).

The composition of the salmon harvest in any particular year may vary considerably, depending on a number of factors such as species abundance, timing of the runs, and interface with commercial salmon fishing activity and with the growing charter vessel sport fishing business in the waters of northern Southeast Alaska and Sitka Sound in particular (ADF&G-DS 2002).

Subsistence Deer Hunting

Sitka black-tailed deer receive the highest sport hunting and subsistence use of any terrestrial species in Southeast Alaska. Due to their proximity to Sitka, nearly all of the watersheds within the Assessment Area have been identified as important deer hunting areas. The Forest Plan evaluated three levels of deer use for each community for WAAs in which the community most relies: 1) use by community residents only, 2) use by all rural (subsistence) hunters, and 3) use by all hunters (including those from non-rural communities and hunters from out of state, neither of whom are considered subsistence users under ANILCA). These data indicate that Sitkans obtain approximately 75 percent of their average annual deer harvest from four WAAs within the Assessment Area: 3001, 3002, 3003, and 3014. Because Sitka is classified as a rural area, Alaska residents that live in Sitka qualify for subsistence hunting of deer. Although hunters from other Alaska communities and areas outside of Alaska hunt within the Assessment Area, most hunters are residents of Sitka and therefore are subsistence hunters.

The Assessment Area lies in Game Management Unit (GMU) 4 as designated by ADF&G. GMU 4 includes all of Admiralty, Baranof, and Chichagof Islands. Both state and federal subsistence hunting regulations have been in effect in this area since 1990. Although season lengths and regulation vary with each agency, the Federal Subsistence Board promulgated regulations for the harvest of wildlife that apply only to federal lands,

giving federal qualified subsistence hunters more liberal bag limits and season dates. State sport hunting bag limits are three to four deer, while the federal bag limits are six deer.

Between 1999 and 2000, GMU 4 accounted for 40 percent of the Southeast Alaska region's hunter effort and 61 percent of the deer harvest (Paul and Straugh 2000 from ADF&G 2001). In 2000, the Alaska Board of Game established a management goal to maintain a population of 125,000 deer while maintaining an annual harvest of 7,800 deer for this area. Management objects for GMU 4 include maintaining a deer population capable of sustaining a mean reported harvest of at least 1.5 deer per hunter, a minimum reported success rate of 1 deer killed per 4 days hunting effort and the male component of the deer harvest at a minimum of 60 percent.

Table 3-27 is a summary of ADF&G deer harvest data collected from 1995 to 2002 for the Wildlife Analysis Areas (WAAs) included in the Assessment Area. Figure 3-7 shows the location of the WAAs within the Assessment Area. Note that some of the WAAs extend beyond the boundaries of the Assessment Area.

Table 3-27. All Hunter Deer Harvest Summary by WAA for the Assessment Area

WAA	Total Deer Harvest by Season							7-year Ave.
	95-96	96-97	97-98	98-99	99-00	00-01	01-02	
3001	425	236	473	487	351	528	677	**454**
3002	463	234	292	330	368	264	500	**350**
3003	254	96	129	164	146	112	190	**156**
3312	35	37	99	104	105	48	118	**78**
3314	215	78	172	186	149	71	118	**141**
Total	**1,392**	**681**	**1,165**	**1,271**	**1,119**	**1,023**	**1,603**	**1,179**

Source: ADF&G-DWC, Deer Hunter Survey Summary Statistics 1995-2002.

Chapter 4 - Trends and Interpretation

Physical Trends and Interpretation

Soils

Management Influences and Implications

Management practices that tend to reduce soil productivity include the construction of roads, trails, and campgrounds. The loss of productivity is caused by removal of the surface organic layers and disturbance of surface and subsurface layers.

The level of soil disturbance varies with the type of activity or management practice and site characteristics. Soil Quality Standards (FSM 2554) address the potential for affecting soils through compaction, puddling, displacement, surface erosion, altered wetness, and severe burning. Soil Quality Standards are national standards that set limits on the amount of soil in an activity area allowed to be in a disturbed condition.

Minor soil disturbance, erosion, and the associated loss of productivity resulting from a project or activities could occur if the activities involve ground disturbance or compaction. Most effects resulting from recreational and small-scale management activities are typically relatively short term, lasting until disturbed sites recover with indigenous species sufficient to protect the soil surface and maintain soil productivity. The level of disturbance at any given site dictates the level of revegetation needed.

To date there has been no in-depth analysis of soil disturbance within the Assessment Area. Popular dispersed campsites along shorelines and streams, as well as those areas adjacent to developed campsites and trails are known to have isolated instances of minor soil compaction, puddling, and erosion. The extent and duration of these disturbances is believed to be minor and short-term. OHV use, an activity that has the capacity to disturb soils, has been increasing in recent years (both in the Assessment Area and beyond it). OHV use on remote forest road systems primarily occurs during the hunting seasons (spring and fall). Soil disturbances related to this activity have been evident in areas such as the Fish Bay, St. John the Baptist, Nakwasina, Katlian, and Starrigavan watersheds, as well as on top of Harbor Mountain. At present, the full extent of soil disturbance due to this type of activity is unknown.

A further discussion of soils, soil stability, and sedimentation is included later in this chapter within the Fisheries section.

Hydrology

Cumulative Impacts on Watersheds and Water Quality

The scope of this landscape assessment does not allow for an in-depth sampling and analysis of specific stream reaches. Instead, we used analysis models such as the Watershed Risk Index (WRI) and Fish Capability Model, as well as cumulative information on management activities, including timber harvest and road construction activities in stream riparian areas, to provide a general summary of conditions and vulnerability of each watershed**.** Because most prior and existing impacts to water quantity and quality within the Assessment Area are so interrelated with fisheries and aquatic habitats, they are largely discussed within the Fisheries section of this chapter.

Water Quality

Overall water quality within the Assessment Area is presumed to be good, with a few exceptions. The beneficial uses of some watersheds have been affected by previous management activities such as timber harvest and road construction. Stream bank destabilization caused by the complete removal of riparian trees and associated yarding techniques is responsible for much of the decline in water quality. Road construction and location immediately adjacent to streams has also contributed to the decline. Landslides on unstable slopes caused by these management activities have also contributed to water quality declines following management activities. Some landslides may still be contributing to water quality reductions.

Despite these reductions to water quality in previously managed watersheds, tree stands have largely recovered since the time of timber harvest. Most stands along higher elevation first and second order stream channels have reached the stem exclusion stage. In addition, most riparian stands near lower elevation floodplain stream channels, including those with fish habitat, have also reached the stem exclusion stage. However, the species composition in many of these stands has changed; red alder now dominates areas once characterized by conifer species. Due to this conversion, the larger stream channels (FP4 and FP5) are now more susceptible to bank erosion because red alders have a lower root depth and are not as strong as conifers. Riparian thinning prescriptions have been implemented in some watersheds to speed the natural process of succession back to conifer dominated stands (see the Vegetation section).

Assessment Area road systems have been the source of sedimentation and the cause of flow alterations. They have also blocked fish passage. Many of these problems, however, have been eliminated through the proper closure of roads upon completion of timber harvest activities or through naturally occurring road closure (i.e., the natural revegetation of disturbed sites). Despite such closure, problems still exist. Chapter 3 contains a description of the number and type of resource problems associated with Assessment Area roads.

Biological Trends and Interpretation

Fisheries

Fish Escapement Conditions and Trends

Escapement is defined as the number of fish that return to the spawning grounds of a stream or lake during any given year. Escapement numbers are collected by aerial estimates, stream/lakeside counts, and at weirs where fish are counted as they pass. Weir counts are the most accurate means of estimating escapement, but it is a costly process and is used only occasionally on key fish streams. For this reason, aerial and foot escapement estimates are primarily used. Though not as accurate as weir data, these methods do provide escapement data that can be used to compare the year-to-year variability in salmon escapement numbers.

Biological Diversity (Fish)

The highest natural diversity of salmonid species occurs in the lower reaches of Assessment area streams. During at least part of the year, the lower reaches of many of the larger streams contain juvenile or adult pink, chum, and coho salmon, steelhead and cutthroat trout, Dolly Varden char (resident and anadromous), and coastal sculpin. Sockeye salmon are present in only the Salmon Lake system. Several salt-tolerant species may use the estuary channels. Straying adult and juvenile fish from nearby streams and from resident upstream populations also provide genetic diversity within species.

Key Fish Populations

Due to lack of escapement data for Assessment Area streams, a potential fish production model was used to determine and compare potential fish production between key watersheds. Pink and coho salmon productivity numbers were compared between key watersheds by estimating annual production capabilities, which depend upon stream channel type capabilities. Past stream and channel type studies based on the available habitat in each type of channel have been conducted on the Tongass National Forest to determine the number of pink and coho smolts that streams can produce.

First, GIS data is used to calculate the length of channel types that provide fish habitat. This number is then multiplied by a smolt production value assigned to given channel types. Finally, the total number of smolts is then multiplied by a survival rate to determine the watershed's potential fish production capabilities. Table 4-1 details the results of this model.

Though fish production capability estimates are not accurate for predicting fish populations, they do allow us to compare the potential productivity between watersheds. For this analysis, the assumption was made that fish could access all of the channel types where fish production is possible. Estimates of the number of fish produced in lakes were not included in this calculation. Lakes make up only 7 percent of Class I and II habitat in the Assessment Area. The model does not take into account the natural and management-related factors that influence fish populations.

Table 4-1. Fish Production Capability Model Results

Watershed Number	Watershed Name	ADF&G Stream Number	ADF&G Cataloged Species Present[1]	Adult Pink Capability[2]	Adult Coho Capability[2]
8	Fish Bay River	113-65-10040	P CH CO	275,112	2,430
48	Katlian River	113-44-10030	P CH CO DV	593,058	2,875
29	Nakwasina River	113-43-10010	P CH CO SH	285,387	1,964
61	South Katlian	113-44-10050	P CH CO DV	123,990	1,413
21	South Fish Bay	113-65-10050	P CH CO	112,809	1,530
65	Indian River (Sitka)	113-41-10190	P CH SH	93,565	1,561
86	Salmon Lake	113-41-10320	P CH CO S SH CT DV	53,171	5,984
62	Starrigavan River	113-41-10150	P CH CO DV	35,459	565
90	Kizhuchia Creek	113-41-10420	P CH CO DV	34,425	739
28	Noxon Creek	113-92-10035	P CH CO	30,361	533
46	Lisa Creek	113-43-10050	CH P CO	26,716	488
74	Camp Coogan Creek	113-41-10350	P CH CO	18,567	307
33	Nakwasina Passage (West)	113-42-10020	P CH CO CT	16,073	177
63	Sitka (North)	Many [3]	P CH CO	8,883	179
49	Coxe Creek	113-44-10020	P CO CV	7,318	111
39	South Nakwasina	113-43-10030	CO DV	3,470	76
64	Blue Lake	113-41-10210	P CH CO SH	2,727	188
34	Limit Island	113-42-10060	P CH CO CT	1,443	79
32	Neva	113-66-10020	P CH CO	613	82

[1]P=Pink Salmon; CH=Chum Salmon; CO=Coho Salmon; S=Sockeye Salmon; SH=Steelhead Trout; CT=Cutthroat Trout; DV=Dolly Varden Char
[2]Survival rate from smolt to adult estimated at 0.024 for pinks and 0.10 for coho
[3]113-41-10170, 10175, 10180, 10185

Sport Fisheries

Most of the larger Assessment Area streams that produce salmon and larger trout or char receive at least light sport fishing use. Much of this use is concentrated in estuary areas and bays near the mouths of streams or where existing roads provide access to streams and lakes. However, some stream systems that are accessible from the Sitka road system or are within a short boat ride from town receive substantially higher sport fishing pressure than most. Tables 4-2 and 4-3 display reported sport harvest numbers for the more popular fish species within the Assessment Area.

Table 4-2. Reported Annual Coho Salmon Sport Harvest by Water Bodies within the Assessment Area

Water Body	Harvest Years						Total
	1996	1997	1998	1999	2000	2001	
Fish Bay Streams	57	-	-	-	-	-	**57**
Katlian River	0	20	145	338	83	10	**596**
Nakwasina Passage	-	-	-	22	-	-	**22**
Nakwasina Sound Streams	0	-	76	131	0	-	**207**
Salmon Creek	30	-	-	-	-	0	**30**
Salmon Lake	0	0	0	44	10	0	**54**
St. John the Baptist Creeks	-	-	12	-	-	-	**12**
Total	**87**	**20**	**239**	**535**	**93**	**10**	**984**

Source: Howe and others 2001a, b, c, d, and e.
Note. – Denotes no respondents reported fishing within those water bodies that year. All estimates are based on fewer than 12 responses. Estimates based on fewer than 12 responses are only useful for documenting that fishing occurred.

Table 4-3. Reported Annual Sport Harvest of Freshwater Fish Species by Water Body within the Assessment Area.

Location	Species	YEAR					
		1996	1997	1998	1999	2000	2001
Bear Lake	Cutthroat Trout		65	114			
	Dolly Varden		216	202			
	Responses		**3**	**3**			
Beaver Lake	Grayling	12	0	8	11	0	
	Responses	**6**	**2**	**1**	**1**	**3**	
Blue Lake	Rainbow Trout	865	108	160	224	230	179
	Responses	**13**	**4**	**6**	**7**	**7**	**7**
Green Lake	Brook Trout	49		0	27	39	38
	Responses	**2**		**1**	**1**	**3**	**1**
Heart Lake	Rainbow Trout	0	0	0	12		
	Brook Trout	24	0	0	0		
	Responses	**2**	**1**	**1**	**1**		
Indian River (Baranof)	Dolly Varden				0	59	
	Responses				**2**	**2**	
Katlian River	Rainbow Trout	0	0	0	0	24	0
	Dolly Varden	0	32	8	66	61	22
	Responses	**1**	**4**	**3**	**4**	**11**	**2**
Nakwasina Sound Streams	Cutthroat Trout	0		0	10	0	
	Dolly Varden	0		0	145	0	
	Responses	**1**		**2**	**7**	**3**	
Salmon Creek	Dolly Varden	25					0
	Responses	**5**					**1**
Salmon Lake	Rainbow Trout	0	0	8	12	35	0
	Cutthroat Trout	0	16	0	10	90	36
	Dolly Varden	61	41	34	44	239	43
	Responses	**3**	**6**	**3**	**6**	**15**	**4**
Sawmill Creek	Rainbow Trout	32	0	8	0		0
	Dolly Varden	133	0	0	0		0
	Brook Trout	0	0	0	27		0
	Responses	**9**	**1**	**2**	**4**		**1**
Starrigavan River	Dolly Varden		0	25		0	0
	Responses		**2**	**2**		**1**	**2**
TOTAL	Rainbow Trout	897	108	176	248	289	179
	Cutthroat Trout	0	81	114	20	90	36
	Dolly Varden	219	289	269	255	359	65
	Brook Trout	73	0	0	54	39	38
	Grayling	12	0	8	11	0	0

Source: Howe and others 2001a, b, c, d, and e.
Note: Estimates based on fewer than 12 responses are only useful for documenting that fishing occurred. Estimates based on 12 to 29 responses can be useful in indicating relative magnitude and trend.

In addition to these fish species, steelhead is present in most of the larger streams within the Assessment Area. Steelhead run strength varies widely depending on stream size, habitat, and harvest pressure. Although there are few good estimates of escapement, foot surveys indicate that the number of returning steelhead in area streams is inherently low.

Impacts to Fish Habitat and Populations

Natural Impacts

In-Stream Predation

The more common bird species that are potential predators on either young or adult fish include the bald eagle (*Haliaeetus leucocephalus*), American dipper (*Cinclus mexicanus*), common merganser (*Mergus merganser*), belted kingfisher (*Ceryle alcyon*), and great blue heron (*Ardea herodias*). Brown bear feed heavily on returning adult salmon, especially where they congregate in shallow riffle areas.

Flooding

High flow events change channel morphology by redistributing large woody debris, scouring pool areas, undercutting stream banks, mobilizing larger substrates, and transporting sediments. These changes can be both beneficial and negative. Without adequate in-stream large woody debris and stable banks, the pool habitat and associated cover necessary for rearing juvenile salmonids can decrease substantially during major flood events. Also, spawning gravel can be scoured and transported downstream.

Windthrow

A natural process called windthrow (or blowdown) along stream riparian areas is a primary source for in-stream large woody debris and for maintaining and creating fish habitat. Though windthrow is typically a natural process, management activities such as clearcut timber harvest and road use next to streamside riparian areas can greatly increase the rate of blowdown along a stream and can negatively impact future stream habitat conditions.

Landslides

Whether natural or management induced, most slides occur on steep slopes and when heavy rainfall has saturated the soil. Landslides typically begin on open slopes and are a mixture of rock, soil, and vegetation. In most inventoried landslides within Southeast Alaska, only a relatively small amount of fine sediment reaches the stream (Swanston and Marion 1991). However, if this mixture reaches a headwater channel (Class III and IV streams) where enough water has concentrated, it can become a fast-moving debris torrent, which can scour the channel and move a large amount of sediment and woody debris. If this debris torrent reaches a main stream channel, it can create local accumulations of sediment and large woody debris and cause the bedload to shift, which can be detrimental to fish habitats.

Management Impacts

Fish Harvest (commercial, sport, subsistence)
Directed fisheries for chum, pink, and coho salmon can substantially reduce the number of spawning adult salmon returning to Assessment Area streams in a given year.

Roads and Timber Harvest
Most roads and timber harvests in the Assessment Area are associated with pre-1980 land management direction. In key watersheds (i.e., watersheds managed by the Forest Service with a high Watershed Concern ranking and a high/medium Fish Capability ranking), 2,105 acres and 28 percent of the Riparian Management Areas (RMAs) have been harvested and roaded (Table 4-4).

Table 4-4. Management Impacts on Watersheds

Watershed[1]	Name	Watershed Size (acres)	Total Harvest (acres)[2]	Percent RMA Harvested	Miles of Road in Watershed	Miles of Road in RMA	Number of Road - Stream Crossings
8	Fish Bay	21,360	1,253	30	6.8	5.1	7
48	Katlian	24,563	1,750	40	13.4	11.4	32
29	Nakwasina	21,076	1,365	36	8.5	6.9	28
61	South Katlian	8,357	913	63	8.1	7.4	23
21	South Fish Bay	7,940	275	11	4.0	1.9	14
86	Salmon Lake	7,375	77	7	0.0	0.0	0
62	Starrigavan	4,102	727	90	5.3	3.8	23
90	Kizhuchia	5,747	693	47	5.8	4.2	12
28	Noxon	6,458	387	41	4.0	3.9	12
46	Lisa Creek	4,851	455	39	4.0	2.7	15
74	Camp Coogan	3,540	300	52	3.4	2.4	7

[1]Watersheds with a high Watershed Concern ranking and a high/medium Fish Capability ranking that are managed by the Forest Service.
[2]All acres listed were harvested prior to 1980 except for 455 acres in the Lisa Creek Watershed.

Roads can have various impacts on watersheds. Road construction involves ground disturbance that can create increased erosion and change hydrologic systems (Ried and others 1994). Cut and fill slopes associated with road construction can be sources of erosion and, in some cases, landslides. Road surfaces concentrate runoff, producing fine sediment, which, when discharged to a stream channel, can have negative effects on stream habitat (Ried and others 1994). Factors such as soil type and hill slope gradient influence road erosion. Other impacts can include surface compaction, interception of surface and subsurface flows, increased peak flows, and channel alteration due to road runoff. Most Forest Roads in the Assessment Area are 20 to 30 years old, have received little or no maintenance since initial road closure, and are covered with vegetation. For more specific information on the amount and types of road impacts on water resources, see the Road Condition Survey summaries in Chapter 3.

Forest roads can impact fish during every stage of their life cycle. Upstream and downstream migration to spawning and rearing habitat can be blocked by improperly installed drainage structures (Flanders and Cariello 2000). Stream crossings can also be a source of fine and course sediment from roads (Kahklen 2001). Salmon require specific stream gravel sizes for reproduction (Furniss and others 1991). Sediment from roads can cement gravels together or cover them so that salmon are unable to dig their spawning redds (Furniss and others 1991). Sediment decreases the habitat available to the aquatic macroinvertebrates on which young fish feed and can also reduce the flow of water to salmon eggs laid in the substrate, causing eggs to suffocate (Furniss and others 1991). Increased flows and sedimentation from roads can cause channel aggradations that can reduce the amount of stream habitat available for rearing juvenile salmon in a river (Ried and others 1994). Information on the condition of roads in the Assessment Area and their potential impacts on aquatic habitat can be found in the Transportation and Facilities section of this chapter.

Impacts from timber harvest and roads in the RMAs along streams include reduction in bank stability, temperature moderation, overhanging bank cover, input of organic matter, in-stream large woody (LW), and terrestrial insects to the channel. These changes in RMAs can lead to increased sediment inputs and may reduce the amount of fish spawning and rearing habitat. Loss of riparian vegetation associated with blowdown along timber harvest units and roads may provide high levels of LW in the short term but can have long-term effects such as the elimination of future sources of LW and destabilization of stream banks.

Cumulative Impacts on Watersheds and Aquatic Habitat

The scope of this landscape assessment does not allow us to complete in-depth sampling and analysis of specific stream reaches. Instead, we used analysis models such as the Watershed Risk Index (WRI) and fish capability model as well as cumulative information on management activities, including timber harvest activities in stream riparian areas, to provide a general summary of the condition and vulnerability of each key watershed.

This summary of condition and vulnerability, including fish capability, was used to determine the level of concern for each watershed in the Assessment Area. These models identified 15 watersheds for which there is medium to high concern due to past management, fisheries production, and watershed condition. Three of these watersheds (Sitka [a group of watersheds in the Sitka area], Indian River, and Blue Lake), were dropped from the model analysis either because the Forest Service lacks the authority to management them or because they are located in a non-development LUD (Blue Lake).

As mentioned in Chapter 3, two key watersheds in the Assessment Area, Katlian and Nakwasina, are on the State's 303(d) list of impaired watersheds, and Total Maximum Daily Load (TMDL) are to be developed in the future. In our analysis, Katlian rated the highest on the Scaled Watershed Risk Index (WRI) (Table 4-5) and was also found to have high fish production capability. Factors influencing Katlian's high WRI ranking include its large number of depositional stream channels, the high proportion (69 percent) of the watershed in the high hazard soil group (MM 3&4), the high level of previous harvest in RMAs, and its road density. The Nakwasina Watershed had a high WRI ranking for the same reasons. In contrast to the Katlian Watershed, 81 percent of the

Nakwasina Watershed is in the high hazard soil group. Both of these watersheds are important fisheries streams. Other watersheds with a high-risk ranking were the Fish Bay, Starrigavan, Noxon, and South Katlian Watersheds.

Watersheds with a medium risk ranking included the Lisa Creek, Camp Coogan, Salmon Lake, and Kizhuchia Watersheds. These watersheds generally had less fisheries capability but still had a high risk of sedimentation because of their soil types, the amount of RMA harvest within them, and their road densities. All of these streams are important fisheries streams.

Watershed Rehabilitation

About 11 of the 97 watersheds within the Assessment Area have experienced significant impacts from human activities (Table 4-4). Some of these impacts have harmed fish habitat or other aspects of aquatic health.

To address these concerns we try to determine which factors most limit watershed function and health and then design projects to address them. The Forest Plan provides direction for planning and implementing watershed rehabilitation projects. After inventorying the streams, riparian vegetation, road system, and landslides, we plan and complete projects to help remedy identified problems. Watershed rehabilitation work intended to restore, stabilize, and improve water quality and fish habitat includes the following activities:

- stabilizing landslides, roads, and cut banks along streams;
- repairing or removing drainage structures along existing roads;
- placing large wood (LW) into streams currently devoid of large wood;
- connecting borrow ponds (fish rearing habitat) to streams; and
- thinning riparian young growth stands to increase understory diversity and promote faster growth of large trees for future sources of in-stream LWD and channel stability.

To date, inventory work has included:

- stream habitat surveys at Fish Bay, Nakwasina, Katlian, and Starrigavan;
- stream riparian surveys at Nakwasina and Katlian; and
- road surveys of the Fish Bay, St. John, Noxon, Lisa Creek, Camp Coogan, and Kizhuchia Road Systems.

Table 4-5 lists the watershed rehabilitation work by that has been completed within the Assessment Area.

Table 4-5. Watershed Restoration and Inventory Projects with the Assessment Area.

Watershed	Type of Restoration or Inventory Completed					
	Stream Surveys (miles)	Riparian Thinning (acres)	In-Stream LWD (# or miles)	Borrow Ponds Connected	Road Repairs	Other
Fish Bay		35	36 structures	2		
Noxon		284				
Nakwasina	17.5	75	1 mile			
Katlian	9.9		2 miles			
Starrigavan		25	59 structures	4	Fish Passage	
Blue Lake (Beaver Lake)			6 structures			
Camp Coogan					Stabilization	
Kihuchia						2 fishpasses

Vegetation

Small Sales

Over the past several years there have been a greater number of requests for small timber sales and an increased interest in red alder logs by local timber operators and mill owners. Currently there are several small timber operators in the Sitka area and an equal number of small portable sawmills. A small blowdown salvage sale was recently sold near False Island, and several small red alder sales are in the process of being prepared for sale. While these small sales are outside the Assessment Area, they represent the growing interest in sales of this type. High logging costs, low timber values, undeveloped markets, and the lack of an infrastructure for producing value added wood products (e.g., dry kilns, planers, etc.) are currently limiting opportunities for a small-scale timber industry in Southeast Alaska.

Stress testing of Alaska hemlock, yellow cedar, and Sitka spruce is currently being conducted to determine the strength properties of these species. Initial findings suggest that Alaska old-growth timber has strength properties that far exceed that of Douglas fir. If these findings hold, Alaska is likely to acquire its own grade stamp for #1 structural select and #2 grade hemlock, Sitka spruce, and yellow cedar, and timber values for Alaskan species could increase markedly. This, in conjunction with ongoing work by the Forest Service Alaska Wood Utilization Research and Development Center, could substantially improve the opportunity for an economically viable, value-added wood products industry in Southeast Alaska.

Special Forest Products

Special forest products (SFP) are defined as products derived from non-timber biological resources that are used for subsistence, personal, spiritual, educational, commercial, or scientific use. SFP resources include, but are not limited to mushrooms, boughs, Christmas trees, bark, ferns, moss, burls, berries, cones, conks, herbs, roots, and wildflowers. SFP resources also include cuttings (such as of willow used for restoration) and transplants (as for landscaping purposes). SFP resources do not include items such

as saw-timber, pulpwood, cull logs, small round-wood, house logs, utility poles, minerals, animals, animal parts, rocks, water, or soil (except for research samples where soil microorganisms are the target product). At this time, permits are not required for the personal or subsistence use of SFPs. Permits are required and fees are charged for the commercial harvest of SFP resources.

Overall demand for SFPs is low within the Assessment Area but is expected to increase. In the past year there has been a request for a wildflower and mushroom gathering permit.

Free Use

Alaska residents may take green or dried timber from the National Forests in Alaska for their own personal use. Permits must be obtained for green saw timber, but other material as described above under Special Forest Products may be taken without permit. The amount of material granted to any one person in one year shall not exceed 10,000 board feet of saw timber, 25 cords of wood, or an equivalent volume in some other form. No portion of free use material can be sold, traded, bartered, exported, or used in a commercial business or venture.

Free use within the Assessment Area over the past several years has been minimal. One free use permit was issued in 2002 for material north of Fish bay near Baby Bear Bay, and a firewood permit was issued for material in front of Halleck Island along Olga Strait.

The special forest products and free use programs are managed in accordance with Forest Plan standards and guidelines (USDA FS 1997, p. 4-98) and Forest Plan LUD management objectives.

Proposed or Active Timber Harvest

Presently there are no active commercial timber sales occurring within the Assessment Area. The current ten-year timber sale schedule, which is updated annually to reflect specific project viability, market conditions, and other operational constraints (USDA FS 1997, p. 4-95), includes the Shultz Cove and St. John timber sales, which are located within the Assessment Area. These two sales were part of the Northwest Baranof Record of Decision signed on February 5, 1996 and were offered for sale twice in the late 1990s. The sales did not sell due market conditions at the time of offer. As recent as 2002, these sales were considered for reoffer while selective harvest was occurring on Mental Health Trust and other private lands in Katlian Bay. Again, no interest was shown. The Forest Service is planning to reevaluate the Schultz Cove and St. John timber sales to determine their economic viability under current market conditions. The sales would be redesigned to improve economic viability, taking into consideration the potential for 10-year timber sale contracts. Since the Record of Decision for these sales was signed prior to the 1997 Forest Plan revision, they would need to be analyzed for consistency with the revised Forest Plan.

The suitable timber base within the Assessment Area is managed for the production of sawtimber and other wood products on an even flow, long-term, sustained yield by providing for healthy stands representing a balanced mix of age classes from young

stands to trees of harvestable age (USDA FS 1997, pp. 2-4). Based on a total of 11,937acres of suitable and available acres within the Vegetation Analysis Area and assuming a 120-year rotation, approximately 100 acres are available for harvest on an annual basis (or 1000 acres per decade). Although it has been roughly eight years since a large timber sale on the Sitka Ranger District has sold, it is important to realize that the Forest Plan designates timber harvest as one of the dominant uses of land in the Assessment Area. Market conditions and high logging and transportation costs are largely responsible for the lack of timber sales from the district in the recent past. A lack of value-added manufacturing capability among the existing timber industry has also been a factor. If and when market conditions improve, this trend could change. The development of new markets, an Alaska grade stamp, and value-added manufacturing capabilities will also be critical to maintaining a viable timber industry in Sitka and the surrounding communities. A more detailed discussion of this situation and recommendations for a course of action are provided in Chapter 5.

Precommercial Thinning

Past timber harvest has generated 10,521 acres of young-growth on National Forest System lands within the Vegetation Analysis Area. Approximately 80 percent of this harvest occurred between 1960 and 1975. Consequently, the majority of young-growth in the area is nearly 30 years old and bumping up against the window of opportunity for precommercial thinning. An additional 2,307 acres of young-growth exist on Non-NFS Lands in the area. Chapter 5 includes a more detailed discussion of thinning needs and opportunities.

Commercial Thinning

To date, the commercial thinning or other harvest of young-growth timber has been limited in Southeast Alaska due to the small size of the trees, the lack of a market for small logs, and high logging costs. Commercial thinning in the Assessment Area is not likely to occur in the near future for these reasons. However, this could change as new markets develop and technology advances. The Forest Service Alaska Wood Utilization Research and Development Center based in Sitka is conducting research in primary and secondary wood processing in an effort to enhance economic opportunities for the Alaska timber industry.

Wetlands

Distribution and Types

Like much of Southeast Alaska, the Assessment Area contains a large proportion of wetlands. The U.S. Army Corps of Engineers' Wetland Delineation Manual (1987) provides the standard for determining a site's wetland status. The U.S. Fish and Wildlife Service (USFWS) has completed wetland mapping for the Tongass National Forest. Original USFWS mapping was created from aerial photography and field sampling. The wetlands were delineated and classified on the photographs using the USFWS hierarchical wetland classification system (Cowardin and others 1979). The USFWS mapping, called the National Wetland Inventory (NWI), classifies 23 percent (63,527 acres) of the Assessment Area as wetlands. The actual amount of wetlands in the area

may be as much as 15 to 20 percent higher than the USFWS estimates because wetlands smaller than one acre in size were not mapped and because forested wetlands were often not detected on the NWI photographs.

Different wetland types are found at different elevations. Resource values associated with these wetlands vary depending on the wetland's biological qualities, proximity to water bodies, and the position on the landscape.

The wetland classification is a hierarchical system with its broadest level divided into 5 major wetland systems: marine, estuarine, riverine, lacustrine, and palustrine (Cowardin and others 1979). The Forest Service does not administer subtidal activities in marine or estuarine wetlands. Intertidal estuarine wetlands are generally those in the intertidal zone that have a brackish component (i.e., part salt water, part fresh water). Riverine wetlands include wetlands found within fresh water river and stream channels. Lacustrine wetlands are defined as those wetlands and deepwater habitats within lakes deeper than two meters and larger than 20 acres in size. Palustrine wetlands are generally known as marshes, bogs, muskegs, fens, and forested wetlands. Table 4-6 displays the wetland habitat types found in the Assessment Area. Table 4-7 displays the wetland habitat types by watersheds either within development LUDs or with high value fisheries. Not displayed on these tables are the acres of subtidal and deepwater estuarine and marine wetlands. For a more in-depth description of these four major wetland systems and their function, see Appendix E.

Table 4-6. Wetlands in the Assessment Area

Wetland Systems and Subsystems	Wetland Acres	Percent of Project Area
Estuarine		
Intertidal	4,389	1.60
Riverine		
Tidal	0	0.00
Perennial	326	0.12
Total Riverine	326	0.12
Lacustrine		
Lakes, ponds, aquatic beds, and shores	4,222	1.54
Palustrine		
Moss-lichen	0	0.00
Emergent	9,439	3.45
Scrub-shrub	11,063	4.04
Forested	34,088	12.45
Total Palustrine	54,590	19.94
Total	**63,527**	**23.20**

Table 4-7. Wetland Habitat Types by Watersheds

Watershed Number	Intertidal Acres	Aquatic Acres	Emergent Acres	Forested Acres	Scrub-Shrub Acres	Moss-Lichen Acres	Pond & Shore Acres	Tidal Acres	Perennial Acres	Lacustrine Acres	Total Acres
2	25	0	89	465	0	0	0	0	0	0	579
3	1	13	154	1,269	605	0	4	0	0	0	2,046
4	8	0	6	33	0	0	0	0	0	0	47
5	6	1	265	426	154	0	0	0	0	0	852
6	18	3	419	1,336	0	0	0	0	0	50	1,826
8	32	22	904	2,077	1,338	0	7	0	0	84	4,464
9	0	0	118	436	99	0	0	0	0	0	653
21	2	12	1,008	1,893	1,774	0	0	0	0	0	4,689
27	0	2	253	757	167	0	0	0	0	0	1,179
28	6	1	845	397	302	0	6	0	0	0	1,557
29	6	0	101	652	232	0	5	0	62	257	1,315
32	24	4	228	1,711	63	0	0	0	0	0	2,030
33	12	13	202	455	3	0	1	0	0	0	686
35	14	0	46	233	0	0	0	0	0	0	293
36	10	1	10	197	0	0	0	0	0	0	218
37	15	0	21	181	87	0	0	0	0	0	304
39	59	0	34	443	156	0	10	0	0	0	702
46	8	0	7	394	81	0	9	0	0	0	499
48	0	0	8	352	932	0	3	0	199	75	1,569
49	0	0	7	57	34	0	2	0	0	100	200
52	7	0	9	120	24	0	0	0	0	0	160
58	0	0	6	192	220	0	0	0	0	0	418
61	3	0	2	492	436	0	0	0	6	0	939
62	8	0	1	182	183	0	5	0	0	0	379
74	14	0	83	226	47	0	6	0	0	0	376
85	2	0	116	161	61	0	23	0	0	0	363
86	11	0	878	536	122	0	30	0	0	109	1,686
89	14	0	15	337	0	0	0	0	0	0	366
90	2	0	315	757	2	0	1	0	0	0	1,077
92	10	0	70	135	0	0	0	0	0	0	215
Total	**317**	**72**	**6,221**	**16,900**	**7,122**	**0**	**114**	**0**	**267**	**675**	**31,687**

Note: Summaries are for entire watersheds with at least part of their acreage with a development status LUD. **Bold** type indicates watersheds with High Watershed Concern ranking and High/Medium Fish Capability Ranking that area managed by the Forest Service.

Management Activities in Wetlands

Executive Order 11990, as amended, requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands. The Forest Plan includes Forest-wide standards and guidelines directed at avoiding or minimizing the loss of wetlands as well as maintaining and/or enhancing the values and functions of existing wetlands. The Forest Plan also provides more specific protection of estuaries through standards and guidelines.

The Forest Service is required by Executive Order 11990 and Section 404 of the Clean Water Act to preserve and enhance the natural and beneficial values of wetlands wherever practicable when carrying out its land management responsibilities

Direct and Indirect Effects

Current disturbances to wetlands stem primarily from recreational activities. Most of the disturbance is likely from foot traffic, use of viewing areas, use of picnic areas, and Off Highway Vehicle (OHV) use. The total area of wetland currently affected is believed to be very small for the Assessment Area as a whole. However, the level of disturbance may range from low to high for any given site, depending on the number of individuals visiting the site, the frequency of visits to the site, and the type of activity occurring there. Impacts are most likely to occur in the more open wetlands (emergent and estuarine) and those adjacent to existing road systems and trails, since these areas are attractive to visitors and can be easily traversed. Disturbance impacts on wetlands may be short-term if visits are few and infrequent. On the other hand, impacts may be long-term if visits are numerous and frequent. Vegetation will return to disturbed sites only when trampling terminates and if erosion, ponding, and/or altered wetness do not exceed soil quality standards.

Other direct impacts to wetlands resulting from activities may include loss of wetland functions and values. Current use levels are not likely to cause much, if any, loss of wetland functions or values for the Assessment Area as a whole. However, site-specific losses may range from low to high, depending on the disturbances involved.

Erosion and Increased Sediment Loading into Wetlands

Recreation activities, primarily OHV use and foot traffic, can increase sediment loads in runoff. These activities can destroy vegetation and expose mineral soils. However, since most wetland soils are not mineral, erosion and increased sediment loading into waters associated with recreation activities is likely to be minor. Erosion of organic materials is not generally considered a sediment concern.

Puddling of Organic Soils Due to Trampling

Heavy traffic in wetlands can destroy vegetation and disturb the organic matt that covers organic soils, leading to puddling of the soils. Puddling results in a loss of soil porosity, which, in turn, results in decreased water movement through the soil (permeability). Water is generally transported through soil through soil macropores. For organic soils, porosity is dominated by micropores, which hold on to water through adhesion. Organic soils inherently have low permeability rates. Foot traffic and ORV use will result in ruts and footprints. Over time and with increased levels of use, these activities will disturb the surface organic matt.

The potential for puddling due to trampling will be highest in areas popular for camping and wetland areas adjacent to existing road systems. The duration of effects will vary depending on the type and intensity of use in the area. Organic soils that have been trampled can recover in the short term, but areas experiencing repeated ORV use may incur long-term impairment. As with other types of disturbance, the potential for puddling is related to the level of use.

Loss of Flood Flow Modulation Capability

Flood flow of wetlands may be impaired due to filling or dredging activities. Filling of wetlands would predominantly be in the form of overlay rock for trail and road construction. Any filling of wetlands for road or trail construction would require a Section 404 permit from the U.S. Army Corps of Engineers. Mitigation for the loss of wetlands would be a requirement of the permit. The mitigation would be, in part, for the purpose of avoiding any alteration in the flood flow modulating functions of the wetlands.

Loss of Wetland Wildlife Habitat

Loss of wildlife habitat in wetlands is expected to be temporary and seasonal due to the regeneration of vegetation on disturbed sites and loss of habitat during use of the area. Minor permanent loss of habitat could result if road or trail construction is necessary in the future due to increased recreation use or any proposed future management activities. Impacts associated with management activities and human use would also include increased disturbance and displacement of species that are not tolerant of human presence and disruption of wetland migration corridors.

Cumulative Effects

Because of the vast expanse of wetlands within Southeast Alaska, the effects on wetlands are expected to be minor. Much of the prime wetland habitat on the Tongass National Forest has been protected either by land use designations or by standards and guidelines specifically addressing wetlands. Mitigation requirement and implementation of Best Management Practices, as well as the ability of vegetation to regenerate, are expected to minimize the number of cumulative effects. Several sites within the St. John the Baptist, Nakwasina, and Starrigavan watersheds show signs of rutting, puddling, and loss of vegetation due to OHV use. These impacts range from minor to extreme. Most of these impacted sites have the potential to naturally recover with discontinued use. However, with the increased popularity of OHVs and the lack of rider education program or a Sitka District OHV plan, impacts such as these are expected to continue and grow.

Biological Diversity and Management Indicator Species

Biological Diversity

The availability and spatial arrangement of OGR, non-development LUDs, POG, and riparian, estuary and beach buffers are important in reducing fragmentation of wildlife habitat, maintaining habitat connectivity, and providing habitat for Management Indicator

Species (MIS) within the Assessment Area.

Timber harvest, road construction, or other activities that significantly alter forest vegetation cover could fragment habitat and affect habitat connectivity within the Biodiversity Analysis Area. The Tongass National Forest Land and Resource Management Plant Implementation Policy Clarification (referred to as TPIT) states that although there is no requirement to ensure connectivity between all small reserves or between small reserves and non-development LUDS, opportunities to maintain connectivity should be assessed (USDA FS 1998a, p. 14). The *Tongass National Forest Land and Resource Management Plan Implementation Policy Clarification* (TPIT) identifies areas in which the old-growth strategy may not be fully functional due to past harvest activities, private lands, or other factors within areas expected to function as corridors (USDA FS 1998a, p. 14). None of the areas identified in TPIT lie within the Biodiversity Analysis Area. Corridors adjacent to St. John the Baptist, Nakwasina, and Katlian Bays should be further assessed because of the amount of low elevation harvest that has occurred.

At the landscape scale, it appears that the current availability and distribution of POG and riparian, estuary and beach buffers provides habitat connectivity between OGR and other non-development LUDs (Figure 3-8). An estimated 30 percent of the Biodiversity Analysis Area is POG habitat (Table 3-12). Twenty-eight percent of this is classified as HPOG, and 13 percent is classified as coarse canopy habitat (Table 3-12).

Timber Harvest

Productive old growth has been reduced in the Assessment Area as a result of timber harvest activities. Harvest activities, particularly clearcut harvests that occur in POG habitat, have the potential to alter stand structure and diversity. Although the initial loss of vegetative biodiversity following clearcutting is well documented, there are also long-term changes to treated stands. Following the clearcut harvest of trees, canopy cover is reduced or eliminated. This results in an increase in sunlight and the regeneration and rapid establishment of conifers, shrubs, and herbaceous plants. This stand initiation stage results in an understory biomass peak after about 15 to 25 years. Although this flush of vegetation provides summer and fall forage for some species, this habitat is generally not available during the winter due to the increased snow accumulation resulting from the reduced canopy cover. After about 25 to 35 years, when the canopy closes, stands are said to have reached the stem exclusion stage. During this period, stands are extremely dense with conifers that are typically uniform in diameter and height. These stands lack the multi-layered, diverse structure and shrub-herb component that is found in old-growth stands (Deal 2001). The stem exclusion stage can persist for 50 to 100 years in Southeast Alaska (Alaback 1984) and can have implications for wildlife that depend on understory plants as forage. Once the stand reaches the stem exclusion stage, the stands are not likely to provide foraging habitat or nesting habitat for many species during any season.

The largest amount of harvest has occurred in VCUs 3010, 3120, and 3210. Harvest activities were concentrated in the St. John the Baptist, Nakwasina (VCU 2990, 3000, 3010), Katlian (VCUs 3100, 3120, 3130), and No Thorofare Bays (VCU 3190), Deep Inlet (VCU 3210), and in the area around the town of Sitka (VCU 3110). Table 4-7 displays the cumulative change in productive old-growth forest as a percentage of that

which existed in 1956. As of 2003, an estimated 86 percent of the POG that was available in 1956 remains.

Table 4-8. Cumulative Change in Productive Old-growth (POG) Forest in the Biodiversity Analysis Area

VCU	Acres of NFS Land Harvested[1]	Percent of NFS Land Harvested	Acres of Non-NFS Land Harvested	Percent of the VCU Harvested	Acres of POG in 1956[2]	Acres of POG in 2003	Percentage of POG Remaining in 2003
2870	895	2	0	2	14,366	13,471	94
2880	0	0	0	0	1,910	1,910	100
2990	1,651	7	0	7	4,492	2,841	63
3000	1,345	7	0	7	9,771	8,426	86
3010	826	15	0	14	3,182	2,356	74
3020	589	3	73	3	10,918	10,191	93
3100	0	0	225	4	1798	1,573	88
3110	478	4	438	3	5803	5,076	87
3120	946	10	255	11	2,571	1,375	53
3130	1,470	5	1,268	8	5,035	2,305	46
3180	0	0	0	0	1,970	1,970	100
3190	268	5	0	5	3,043	2,775	91
3200	30	0	0	0	5,482	5,460	100
3210	931	10	0	10	6,131	4946	81
3220	0	0	0	0	3,977	3,977	100
3230	0	0	0	0	3,922	3,922	100
3240	0	0	0	0	2,156	2,156	100
3250	0	0	0	0	198	198	100
Total	**9,429**	**4**	**2,259**	**4**	**86,725**	**74,928**	**86**

Source: Stangl 2003

[1] All figures for timber harvest in this table are for harvests occurring between 1956 and 1985.

[2] Assumes all harvest to be clearcut and all in productive old-growth habitat

Thinning of harvested stands that have reached the stem exclusion stage may increase forage availability for deer and other species. Thinning increases the amount of light emitted into a stand and promotes an increase in tree diameter and in the shrub-herb component. Approximately 90 percent of the harvest generated young forest within the Biodiversity Analysis Area has been thinned, and 41 percent was thinned to achieve wildlife and fisheries objectives. However, depending on the stand composition and location, thinning may need to be completed more than once.

The availability and distribution of POG in lower elevation habitats is important to some species. Goshawks, bald eagles and other raptors prefer to nest in POG habitat below 1000 feet in elevation. Sitka black-tailed deer appear to prefer high-volume old-growth stands with southern aspects that receive little snowfall and are located in areas below 800 feet in elevation for winter habitat use.

Figure 3-8 shows that non-development LUDs located around Deep Inlet in the south end of the Biodiversity Analysis Area (VCUs 3190, 3200, 3210, 3220, and 3230) and in the northern portion of this area north of Nakwasina and Fish Bay (VCUs 2870, 2880, 3000, and 3020) contain quality POG, riparian, and beach habitat at lower elevations that provide connectivity for wildlife. An estimated 64 percent of the land in non-development LUDs in the north end of the Biodiversity Analysis Area consists of lower elevation habitat (below 1000 feet). Approximately 60 percent of the land in non-development LUDs in the south end of the area consists of lower elevation habitat. However, only 23 percent of the land in non-development LUDs from the northern part of Silver Bay to Nakwasina (VCUs 2990, 3010, 3110, 3120, 3130, 3180, 3240, and 3250) is lower elevation habitat. An estimated 85 percent (8,968 acres) of harvest activities on NFS lands in the Biodiversity Analysis Area have taken place in stands that are below 1,000 feet in elevation, altering lower elevation habitat in approximately 4 percent of the area.

Riparian Habitat

Riparian timber harvest (20% of total RMA within the Assessment Area), road construction, and recreation activities have the capacity to impact riparian habitats. Forest-wide standards and guidelines for managing riparian areas, beaches, and estuaries were specifically designed to protect habitat for species that rely on these habitats. Such species include bald eagles, river otters, and Vancouver Canada geese. Additional levels of protection for bald eagles, waterfowl, shorebirds, seabirds, and marine mammals are specified in the Forest Plan (USDA FS 1997 [Forest Plan], p. 4-117 to 4-118).

Although brown bears will utilize a wide range of habitats throughout the year, they depend on fish in riparian areas during the summer. Therefore, the Forest Plan requires that important bear foraging sites be identified and assessed at the project level to determine whether additional riparian buffers should be implemented (USDA FS 1997 [Forest Plan], p. 4-114). As indicated in Chapter 3, the Biodiversity Analysis Area contains an estimated 227 miles of class one streams and approximately 142 miles are located within the moderate gradient, mixed control, and floodplain process groups (Table 3-14). Although riparian standards and guidelines in the Forest Plan protect a majority of bear foraging habitat, these streams have not been surveyed to determine whether they contain important bear foraging habitat.

Road Access

Roads provide motorized and non-motorized access to recreation, subsistence, hunting, and trapping use areas. Because roads increase human access to these areas, they are capable of affecting the wildlife in the area. For example, where roads are connected to communities (Flynn and Schumacher 2001) and road densities exceed 0.2 miles of road per square mile (mi/mi^2), marten densities decrease due to their susceptibility to over-trapping (Suring, Flynn and DeGayner 1992). Motorized access also leads to increased opportunities for human-induced bear mortality through legal hunting, defense of life or property incidents, and illegal mortality (Unit 4 Brown Bear Management Team 2000, p. 20).

The Assessment Area contains approximately 124 miles of road. An estimated 37 miles of road are on private lands, and 87 miles of roads are on National Forest System Lands. Of the latter, 60 miles are National Forest System Roads (Appendix C), and 27 miles are non-system roads. While the Assessment Area contains 60 miles of system road, only 25 miles are open to motorized vehicles, and only 10 miles are passable with either standard passenger vehicles or high clearance vehicles. Many of the system roads are single-track trails that are overgrown with alder. Non-system roads are generally closed to motor vehicles but may be used by hikers and hunters.

The total road density average for the Assessment Area is 0.28 miles of roads per square mile (Table 4-9). Of the approximately 400 square miles of NFS lands in the Biodiversity Analysis Area, the system and non-system road density is approximately 0.22 miles per square mile. The system roads alone average an estimated 0.15 miles of road per square mile.

As would be expected, VCUs in and around the town of Sitka (3010, 3100, 3110, 3120 and 3210) have higher road densities. Higher road densities in VCU 3110 increase the potential for human/bear incidents in and around Sitka. Higher road densities also have the potential to increase trapping pressure on marten and hunting pressure on deer. However, most of these road systems (with the exception of the system in VCU 3110) are not interconnected and are therefore isolated from any community road systems.

An estimated 23 miles of road lie within designated OGRs. Road management objectives for these roads should be reviewed to determine whether they meet LUD objectives.

Table 4-9. Miles of Road and Road Densities in the Assessment Area

	All Ownerships				National Forest System Lands					
	VCU		Roads		VCU		System & Non-system Roads		System Roads	
VCU	Acres	Square Miles	Miles	Density	NFS VCU Acres	Square Miles	Miles	Density	Miles	Density
2870	41,776	65.28	11.85	0.18	41,776	65.28	11.85	0.18	9.15	0.14
2880	7,168	11.20	0.00	0.00	6,116	9.56	0	0.00	0.00	0.00
2990	23,457	36.65	10.52	0.29	23,458	36.65	10.52	0.29	0.00	0.00
3000	19,670	30.73	11.57	0.38	19,670	30.73	11.57	0.37	8.8	0.29
3010	5,785	9.04	4.65	0.51	5,648	8.83	4.65	0.53	4.40	0.50
3020	21,623	33.79	8.80	0.26	21,464	33.79	8.80	0.25	7.65	0.23
3100	5,228	8.17	1.30	0.16	2,328	3.64	1.30	0.35	1.29	0.35
3110	21,173	33.08	22.69	0.69	12,866	20.10	10.79	0.39	5.62	0.28
3120	10,872	16.99	8.04	0.47	9,762	15.25	8.04	0.45	5.00	0.33
3130	32,291	50.45	18.88	0.37	27,823	43.47	18.88	0.13	5.71	0.13
3180	26,768	41.83	6.47	0.15	25,486	39.82	2.54	0.17	2.54	0.06
3190	5,017	7.84	3.84	0.49	5,017	7.84	3.84	0.48	2.00	0.26
3200	7,939	12.40	0.00	0.00	7,719	12.06	0.05	0.00	0.00	0.00
3210	9,138	14.28	14.67	1.03	8,815	13.77	8.95	0.61	7.90	0.57
3220	7,498	11.72	0.00	0.00	7,498	11.72	0.00	0.00	0.00	0.00
3230	7,645	11.95	0.00	0.00	7,645	11.95	0.00	0.00	0.00	0.00
3240	23,384	36.54	0.00	0.00	18,621	29.10	0.00	0.00	0.00	0.00
3250	4,660	7.28	0.89	0.12	4,131	6.45	0.00	0.00	0.00	0.00
Total	**281,092**	**439.22**	**124.17**	**0.28**	**255,843**	**400.01**	**101.78**	**0.22**	**60.06**	**0.15**

Source: Stangl 2003

Human Use Trends and Interpretation

Heritage Resources

The Assessment Area has played an important role in regional history. Sitka has served as the center of government and commerce for the Sitka Kwaan, the Russians, and the Americans. This importance is reflected in the number and type of historic sites in the Assessment Area.

The lives of all inhabitants of the area have been integrally tied to the marine and terrestrial resources of the region. While the Tlingit lifestyle depended on marine resources (especially salmon, shellfish, seaweed, and marine mammals), terrestrial resources were also essential for their culture. Wood may have been the most important of these, since almost all utilitarian and artistic items were made from spruce, cedar, hemlock, or alder. For example, houses, canoes, weirs, baskets, hats, mats, nets, bows, arrows, spears, utensils, boxes, and clothing were all made from wood, bark, or roots.

Regional resources such as timber, fish, minerals, fur, and resources important to tourism have been important to inhabitants of the Assessment Area throughout all historic periods. Evidence of each of these periods and types of use are present in the Assessment Area.

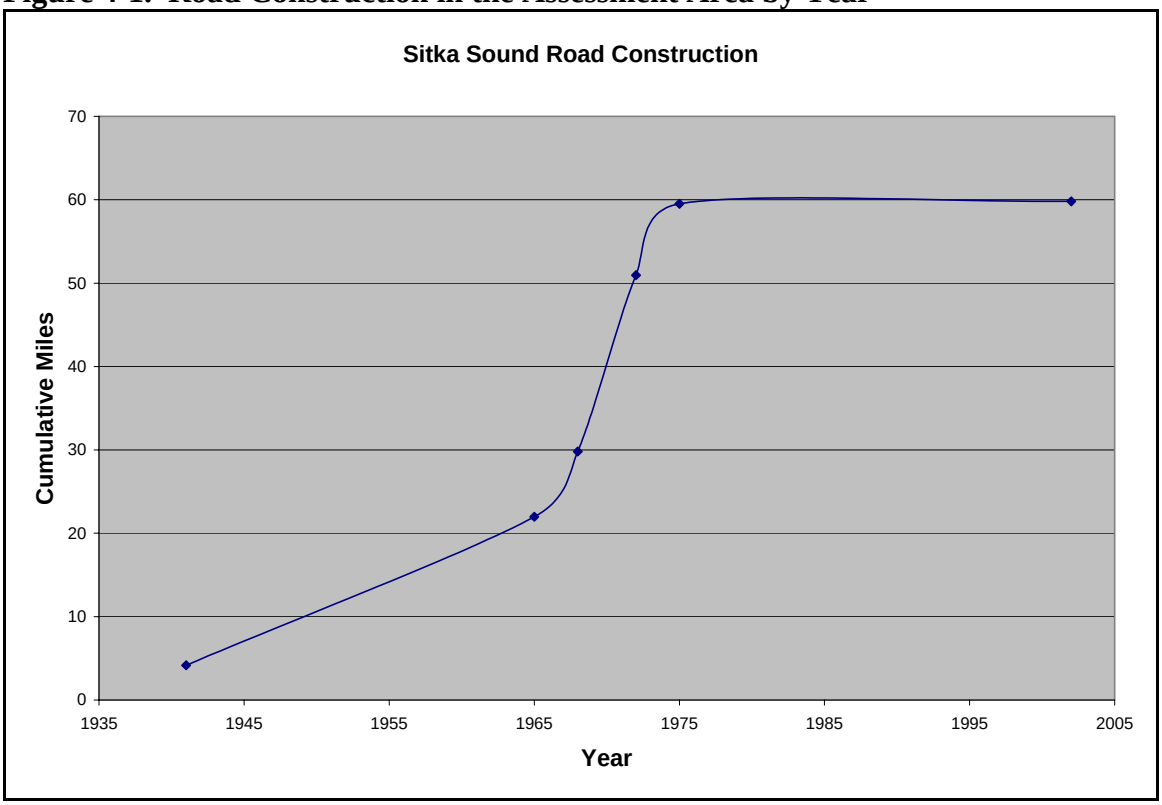
Increasing population, ease of access, and growing numbers of tourists may increase the likelihood that historic sites will be damaged. Furthermore, increasing numbers of visitors may increase the demand for interpretation of regional history.

Transportation and Facilities

Sitka Sound Road History

There were very few forest roads in the Sitka Sound Area until the late 1930s and early 1940s when the Harbor Mountain Road (7576) was constructed for national defense (Figure 4-1). In the 1940s and 1950s, the first roads from the shoreline to timber units were under construction in the Camp Coogan Bay and Silver Bay areas. The bulk of road construction in the Assessment Area took place between the mid-1960s and the mid-1970s when roads were established in Katlian Bay, Nakwasina, St. John the Baptist Bay, and Fish Bay.

Figure 4-1. Road Construction in the Assessment Area by Year



With the exceptions of Harbor Mountain Road and access roads to administrative sites, all of the National Forest System Roads were constructed in support of timber sales and were intended for log transport. The Construction of System roads in the Assessment Area was complete by 1980 and the last 20 years have seen no system road construction on National Forest lands except for an extension to Road 7513 (Starrigavan Campground).

Road Management Objectives

Table 3-24 in Chapter 3 displays the key areas of resource problems and concerns recorded for roads with existing road condition surveys (RCS). This data could be used to rank individual roads by totaling the number of problems recorded in the RCSs, but doing so may not truly reflect the importance of certain features. For example, 28 blocked culverts on non-fish streams may not present the same risk to a resource as 1 blocked culvert on a fish stream on the Tongass.

Based on examination of the RCS data, the number of key resource problems and concerns does not seem to be completely dependent on the current maintenance level assigned to the road. Rather, the number of problems and concerns is based on multiple factors, including the quality of the terrain, the number and types of streams the road crosses, and construction techniques used to build the road. For instance, the Harbor Mountain Road (7576) is an OML 3 road, but due to the techniques used in its construction (cut and fill on steep slopes) and the lack of adequate ditching, the road has had many failures and culvert blockages. In contrast, Limit Island Road (7585) is an OML 1 road, but it has very few failures or culvert blockages because it was constructed well on gentle terrain and was closed properly.

The majority of miles of road in the Assessment Area are managed at OML 1 or 2. The RCS data has proven that roads that are properly maintained or closed and put in storage produce the fewest resource problems. The disinvestments (or discontinuance of maintenance) of roads that have not been properly stored is leading to increased resource damage within the Assessment Area. Therefore, if the objective maintenance criteria are not being met, then either road maintenance should increase or the road maintenance level should be reduced and the road should be put into storage correctly.

Road management decisions often depend on future plans for the area and road maintenance funding. In some instances, low road maintenance funding has led to the reduction in annual maintenance. Subsequently, the amount of deferred maintenance has increased. Deferred maintenance results in a backlog of maintenance tasks that need to be performed.

With the continued low funding for road maintenance, the agency will have to determine which roads are necessary and which roads are not. There is a possibility that some roads or entire road systems will have to be closed completely so that maintenance funds can be focused on roads that are essential for administration, commercial activities, and public use.

The Sitka Ranger District is currently completing an Access and Travel Management (ATM) Plan. This plan is likely to recommend changing the maintenance levels for some roads including changing some OML 2 roads (open) to OML 1 (closed). Roads deemed unnecessary may be decommissioned and removed from the National Forest Road System.

Road management also takes into account changes in usage trends. Changes in use, such as increasing or decreasing recreational or administrative traffic, can be used to plan for changes in the maintenance or structure of a road. Provided funding is available, trends can be properly analyzed and programs can be implemented to accommodate for change in the use or necessity of a road.

Public Road Use

Public use of the forest roads that are connected to the Sitka road system is high. These roads are primarily used for recreation purposes such as berry picking, sightseeing, subsistence hunting, and to gain access to trailheads. Most road-related recreation takes place on the local roads such as Harbor Mountain Road (7576) or Blue Lake Road (7577). Traffic counts on Harbor Mountain Road show that over 6,000 vehicles and pedestrians passed over the road during a 9-month period. These roads also provide quality vehicle access to campgrounds and trailheads as well as seasonal access for OHV users.

Those who wish to use the forest roads in the Assessment Area that are not physically connected to the Sitka road system (remote forest roads) must boat to them. Use of these roads has been estimated through public comments, outfitter/guide surveys, and RCS results. RCS data include signs of vehicle traffic at waterbars and the presence of blocking structures. Ten of the remote forest roads in the Assessment Area showed signs

of use by non-highway vehicles such as OHVs, ATVs, and motorcycles. Foot travel probably accounts for the greatest usage of these remote roads, but it is difficult to quantify use without trail counters or a greater amount of public comment.

The Forest Plan and the Forest Travel Plan state that all forest roads in the Assessment Area are open to the public and may be used in accordance with the appropriate maintenance level. Public use of motorized vehicles may temporarily be prohibited for safety reasons during maintenance or commercial activities. However, all forest roads in the Assessment Area are continuously open to non-motorized and foot traffic, although most OML 1 roads have earthen barriers and heavy brush which can make walking challenging.

Public use of most road systems within the Assessment Area is expected to continue to increase. Public comment regarding road access indicates a desire for more roads open to all types of use, including OHV use and foot and bicycle traffic. In particular, public comments have revealed a desire for a greater number of roads that can be accessed from the Sitka road system for recreation purposes.

Since the local terrain and dense vegetation limit off road vehicle use, operators of off-highway vehicles (OHV) such as motorcycles, three and four wheelers, and all-terrain vehicles use forest roads for recreation and travel purposes. The Forest Travel Plan designates the entire forest open to OHV use but provides for road closure in designated areas. Currently, Harbor Mountain Road is the only road in the Assessment Area for which OHV access is limited (seasonal closure). Federal regulations prohibit the use of vehicles off roads "in a manner which damages or unreasonably disturbs the land, wildlife, or vegetative resources" (36 CFR 261.13). These regulations, in combination with the limiting terrain, keep most OHV operators on existing roads.

The use of OHVs on the National Forest System Roads in the Assessment Area is expected to remain high if not increase in the coming years. As more roads become impassable due to brush growth and washouts, OHV use is likely to become concentrated on the roads that are more accessible. Concentrated use, like that currently occurring on some areas of Kruzof Island, can lead to resource damage.

As the RCS database is updated and more public comments are compiled it will become more apparent which roads are becoming impassable and which roads are receiving the greatest amount of use.

Administrative Road Use

Various Federal, state, and local agencies use the existing road system for utilities maintenance, research, inventories, and field monitoring for projects involving fish, wildlife, and forest vegetation. The existing transportation structure helps reduce the costs and time associated with field observations. Law enforcement activities in the area are relatively infrequent, but when they do occur, the road system is utilized. If timber harvests are planned within the Assessment Area’s Timber Production LUDs, then some additional roads may be needed to facilitate harvest activities.

Forest roads connected to the Sitka road system are needed for administrative access to campgrounds (Starrigavan and Sawmill Creek), day-use areas (Harbor Mountain and the Starrigavan ATV trailhead), administrative sites, and government housing. The local government also requires access to service and improve utilities. Remote forest roads in the Assessment Area are currently needed to allow administrative and contractor access for a variety of purposes. These include silvicultural purposes such as stand exams and thinning; fish and wildlife studies; habitat improvement activities; heritage site assessments; and timber sale planning and administration.

Administrative use of the road systems in the Assessment Area is expected to remain consistent with current levels. If public use continues to increase, then administrative traffic might also increase to respond to an increased need for monitoring and law enforcement. The level of administrative use of forest roads will also depend on the number of special use permitees and the size, number, and location of timber and public works contracts.

Commercial Road Use

Forest roads that are physically connected to the Sitka road system have many commercial users, including tour operators, water distributors, and maintenance contractors. Commercial use of the Assessment Area road system by small operators (primarily in the tourism industry) is expected to increase.

Remote road systems such as Noxon Creek Road 7574 are used for commercial purposes to carry out thinning contracts and other forest stand improvement activities in areas where timber harvests have taken place. The remote road systems in the Assessment Area also see some use by commercial outfitters and guides.

Timber sales that have been planned in the Assessment Area call for the commercial use and reconstruction of certain roads. Roads 7583 and 75831 (both part of the St. John the Baptist Bay road system) were included in the 1996 Record of Decision for the Northwest Baranof Timber Sale. Should this sale sell, further analysis of these roads will be required to determine whether road reconstruction is consistent with the Forest Plan.

Marine Access Facilities (MAF)

With the decline of timber sale activities, many of the Assessment Area MAFs have become popular with recreationists who use them to access remote forest roads. MAFs (formerly LTFs) were constructed for the commercial transfer of machinery and timber. Because they were not designed to accommodate the loading and unloading of small craft, those who attempt to use them for recreation or administrative purposes may find them difficult to use. Since forest roads in the Assessment Area will continue to be used for administrative purposes and may experience increased public and commercial use, it is likely that use of MAFs will increase.

Recreation Use and Facilities

Management Direction

The integrated management of all resources in the Assessment Area, including recreation resources, is directed by the goals, objectives, and desired conditions stated in the Forest Plan. Forest management is accomplished by following the standards and guidelines set forth for each resource as well as for each land use designation (LUD).

Recreational Opportunity Spectrum (ROS): Trends

The Recreation Opportunity Spectrum (ROS) is a Forest Service classification system used to map the types of recreation experiences available on forests (USDA FS 1982). There are seven ROS classifications: Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, Roaded Modified, Rural, and Urban. Indicators that provide the parameters for the type of recreation experience to expect have been identified for each ROS classification. These indicators are visual quality, access, remoteness, visitor management, on-site recreation development, social encounters, and visitor impacts (see Appendix F).

ROS mapping reflects the actual condition of the recreation resource (i.e., what kind of recreation experience the resource currently provides). The Forest Plan specifies the goals, objectives, and desired conditions for each ROS classification. It also associates a specific ROS classification with each LUD and provides guidance for managing the LUDs to achieve a particular type of recreation experience. Table 4-10 lists the Forest Plan direction for the VCUs within the Assessment Area. Figure 4-2 displays the ROS classifications associated with the LUDs in the Assessment Area.

Because of the recent decline of timber harvest on the Sitka District, there has been no change to the existing ROS inventory for the district in the last five years. From the 1950s through the 1990s, ground disturbing activities associated with timber harvest were responsible for creating opportunities for more developed types of recreation experiences. With the decline of such activities, areas on the district are slowly changing and are beginning to offer a more undeveloped recreation experience. The transformation of the landscape and associated move from a developed to an undeveloped recreation experience can be hastened by silvicultural enhancement techniques.

There has been a gradual shift in preference for a particular type of recreation experience. More and more people are seeking undeveloped types of recreation experiences, using the forest for spiritual, physical, and mental rest and renewal (USDA FS 1998b; Hammitt 1987). One indicator of social preferences regarding recreation is the survey administered to members of the Alaska Recreation Tourism Group between October 2000 and September 2001. A 24 percent response rate was obtained for this survey (Fay 2003 using 2002 data from the Alaska Department of Community and Economic Development). The average respondent was 54 years old and lived in a household of 2.4 people. The majority of the respondents were female (56 percent), and 49 percent were employed full-time. Table 4-11 summarizes the respondents' attitudes toward land management and congestion.

Sitka Sound Landscape Assessment Area

Recreation Opportunity Spectrum

(ROS)

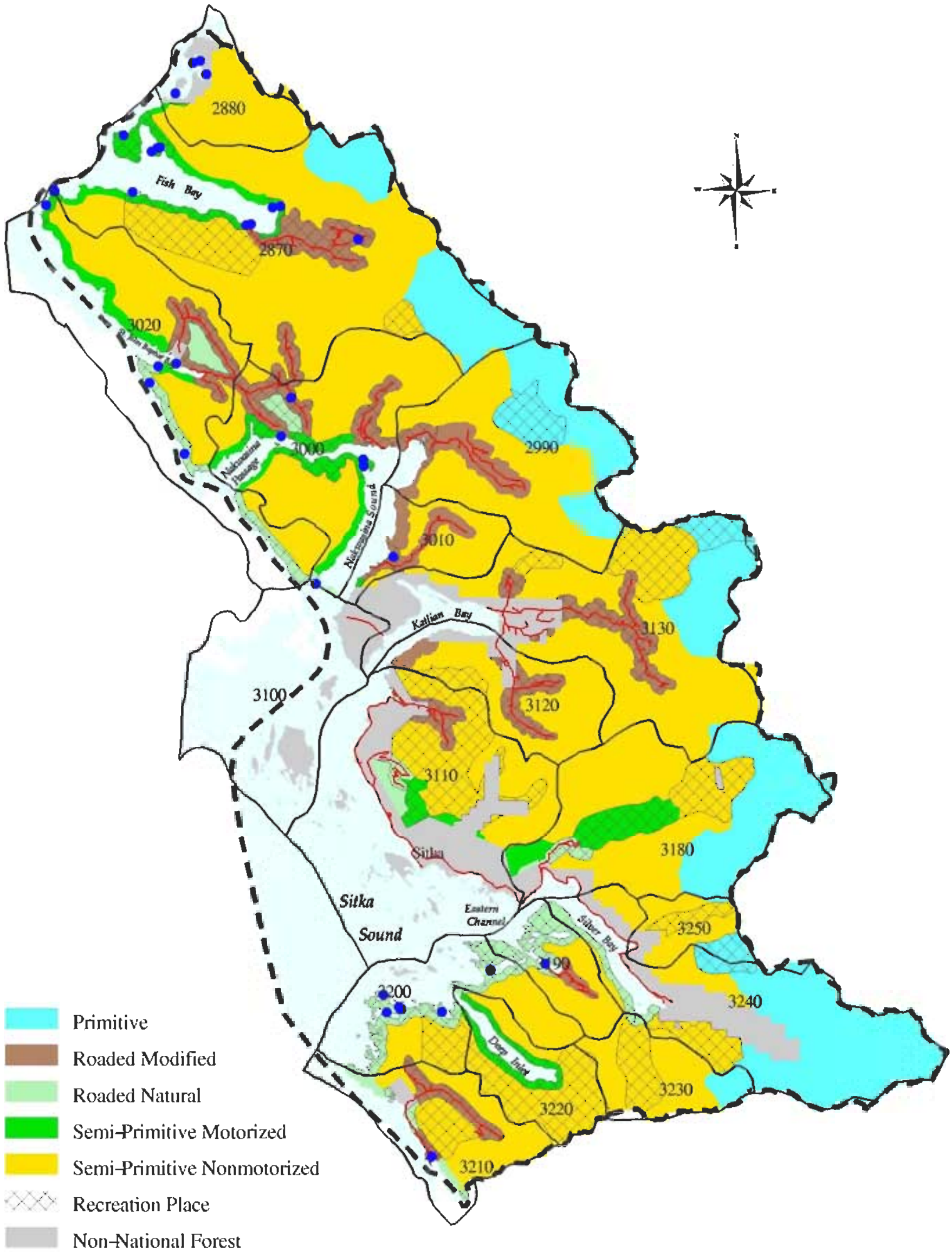


Figure 4-2

Table 4-10. Forest Plan Direction for Recreation Opportunity Spectrum (ROS) by Land Use Designation (LUD)

VCU	Name	LUD	ROS Direction
2880	Baby Bear Bay	Old-growth Habitat Reserve	Semi-Primitive
		Scenic Viewshed	Semi-Primitive to Roaded Modified
		Timber Production	Primitive to Urban
2870	Fish Bay	Semi-Remote Recreation	Semi-Primitive
		Old-growth Habitat Reserve	Semi-Primitive
		Scenic Viewshed	Semi-Primitive to Roaded Modified
		Modified Landscape	Semi-Primitive to Roaded Modified
3020	Neva Straits and St. John Baptist Bay	Semi-Remote Recreation	Semi-Primitive
		Old-growth Habitat Reserve	Semi-Primitive
		Scenic Viewshed	Semi-Primitive to Roaded Modified
		Timber Production	Primitive to Urban
2990, 3000, 3010, and 3130	Northeast, and Southeast Nakwasina Sound and Halleck Island, Northern Katlian Bay	Semi-Remote Recreation	Semi-Primitive
		Old-growth Habitat Reserve	Semi-Primitive
		Modified Landscape	Semi-Primitive to Roaded Modified
		Timber Production	Primitive to Urban
3120	Southern Katlian	Semi-Remote Recreation	Semi-Primitive
		Timber Production	Primitive to Urban
3110, 3190, 3200, and 3220	Sitka Town Site, Camp Coogan, Cape Burunof and Deep Inlet	Semi-Remote Recreation	Semi-Primitive
3180 and 3250	Blue Lake and Upper Silver Bay	Remote Recreation	Primitive
		Semi-Remote Recreation	Semi-Primitive
3240	Silver Bay	Remote Recreation	Primitive
		Semi-Remote Recreation	Semi-Primitive
		Modified Landscape	Semi-Primitive to Roaded Modified
3230	Salmon Lake Trail	Old-growth Habitat Reserve	Semi-Primitive
		Modified Landscape	Semi-Primitive to Roaded Modified
3210	Kizhuchia	Semi-Remote Recreation	Semi-Primitive
		Modified Landscape	Semi-Primitive to Roaded Modified

Source: USDA FS [Forest Plan] 1997

One of the limitations of this study identified by the researchers is that it fails to assess the opinions and preferences of local residents. They recommend that the State consider local preferences when making any decisions regarding recreation and tourism.

This research suggests that a greater number of undeveloped areas are needed in order for visiting tourists to continue to be satisfied with their recreation experience. At this time, visitors' expectations are being met; they did not feel that there were too many people or motorized vehicles in the areas that they were using.

Table 4-11. Alaska Visitor Statistics Program, October 2000 through September 2001

Statements Measuring Attitudes Toward Management	Percentage Neutral or in Agreement with Statement	Statements Measuring Attitudes Toward Congestion	Percentage Neutral or in Agreement with Statement
More importance should be places on keeping public lands healthy than on helping people use them as they want.	82%	The areas where I visited in Alaska were more developed than I would have liked.	44%
There should be more area where hunting is not allowed so people can watch wildlife.	77%	Generally speaking, I did not encounter more people than I would have liked in remote areas of Alaska.	86%
There should be areas of public lands where commercially guided tours are not allowed.	85%	There was too much water traffic (boats, large ships, barges, jet skis, etc.) in places I visited in Alaska.	34%
There should be no limit on the number of commercial tours that use public lands.	24%	The noise level of air traffic (planes, helicopters) did not detract from the enjoyment of my visit to Alaska.	93%
Too much tourism will spoil Alaska communities and culture.	66%		
I am not concerned about too much tourism hurting public lands, waters and wildlife.	41%		
I get less satisfaction from recreational activities on public lands if I have to pay a fee to use the area.	58%		

Source: Fay 2003 presenting 2002 data from the Alaska Department of Community and Economic Development.

An emerging recreation trend on the Sitka Ranger District is an increase in the use of Off Highway Vehicles (OHV). This type of use is motorized and must be managed in accordance with Forest Plan standards and guidelines set forth for all resources. This motorized activity is permitted in all LUDs except for Wilderness and Remote Recreation, and any area to which a Primitive or Semi-Primitive Non-Motorized ROS classification has been assigned (existing or goal). The wet weather typical of Southeast

Alaska renders some lands particularly vulnerable to resource damage. Hardened trails or road prisms are required to prevent ecological damage resulting from OHV use.

Forest Plan LUD direction recommends that Tongass National Forest resources be managed to compliment private recreation facilities. Some people are exploring the possibility of constructing lodges on private lands within the Assessment Area (e.g., at the Siginaka Islands, St. John Baptist Bay, and Katlian Bay).

Both guided and unguided recreation and tourism levels for the area are high and continue to increase. In 2001, 81 percent of people who visited Alaska traveled to Southeast Alaska and the Tongass National Forest. Recreation use on the forest has grown 70 percent in the last decade. Most people visit the forest to view scenery and wildlife (Pendleton 2003). Between 1988 and 2000 there was a 390 percent increase in the number of Recreation Special Use Permits issued in the Alaska Region (Marshall, 2003). These increases need to be absorbed into the management of the recreation resource program while still preserving the forest management direction.

Forest Plan direction for tourism development in the Assessment Area is integrally tied to the residents' recreation use of the forest. The Plan allows up to half of the recreation carrying capacity of the forest to be allotted to commercial uses. A recreation carrying capacity is the estimated maximum number of groups of people who could recreate in an area and still have a specified type of recreation experience. It is used to make informed decisions about the amount and type of recreation use that will be allowed in a given area.

A social carrying capacity was established along of the coastline (i.e., from mean high tide to half a mile inland) of the Sitka District in 1998 to inform managers of the maximum number of people that could be present in an area at one time (one day span) while maintaining an acceptable recreation experience (USDA FS 1998b). This information was used to develop the Shoreline Outfitter/Guide Draft Environmental Impact Statement (EIS) (USDA FS 2002). The Shoreline Outfitter/Guide Final EIS is currently being finalized. This document will determine the outfitter carry capacity allotment and the non-guided carrying capacity along the coastline of the Sitka District. A decision is expected in 2004.

A trend in the Forest Service's management of recreation resources is the integration of recreation information with other groups such as the Alaska Department of Natural Resources, Sitka Trails, and the City and Borough of Sitka. When the *Northern Southeast Area Plan* (Alaska Department of Natural Resources 2002) and the *Shoreline Outfitter/Guide DEIS* (USDA FS 2002) were being prepared, the AKDNR and Forest Service shared inventoried information and management strategies so that the projects would compliment each other. Information from the *Revised Sitka Coastal Zone Management Program, Public Use Management Plan* (CBS PD 1993) was also incorporated into Shoreline project. The Forest Service's recreation staff will continue this type of interagency cooperation.

Subsistence

As stated in Chapter 3, subsistence resources are of great importance to rural residents, including those that live within the Assessment Area. To illustrate the importance of these resources, consider the following eloquent testimony given by two residents at hearings on planned timber sales on the Sitka Ranger District:

> The Chichagof and Baranof coastline represent a way of life to all of our Tlingit nation. The animals and berries we collect make me and my family healthy people (STA 1996).
>
> Subsistence hunting and fishing are really the very core of my life. I will defend my hunting and my fishing as dearly as I'll defend anything that matters to me in my life. It is the center of my existence. It's why I live here. Food is what connects me to this place. Food is what binds my heart and my soul to this place that's my home (Nelson 1996*)*.

Presented in this section is a discussion of trends relating to some of the more commonly used subsistence resources within the Assessment Area.

Salmon Lake Subsistence Sockeye Fishery

Salmon lake is located approximately 9 miles southeast of Sitka at the terminus of Silver Bay in eastern Sitka Sound. The lake lies at 50 feet in elevation and is fed by two inlet streams opposite the 0.7 mile outlet stream. The lake supports populations of sockeye, pink, chum, and coho salmon, Dolly Varden char, cutthroat trout, and steelhead.

Salmon Lake is one of eight sockeye salmon subsistence fisheries along the outer coast of Baranof and Chichagof Islands. It is one of two such fisheries within Sitka Sound, and it is the only one within the Assessment Area. Although subsistence harvest at Salmon Lake is relatively small, the lake is still important to local subsistence fishers because it supports a significant population of sockeye salmon and is easily accessed from Sitka. Additionally, Salmon Lake has a long history of use by the Tlingit people.

Since 1985, the reported subsistence harvest from Salmon Lake has been as high as 353 sockeye salmon (18 permits) and as low as 17 (5 permits). The reported subsistence sockeye harvest at Salmon Lake rose considerably starting in 1993, but has declined since. The trend appears to be the result of declining sockeye returns. Sockeye salmon fishing at Salmon Lake has been closed several times within the past ten years due to low adult returns. (Gordon 2003).

Salmon Lake sockeye and coho are intercepted in intensive commercial and sport fisheries that occur in Sitka Sound and Silver Bay, and in a subsistence fishery that occurs in the terminal area.

A cooperative stock assessment project was initiated at Salmon Lake in 2001 to investigate concerns of declining sockeye and coho returns. Cooperators consisted of the Sitka Tribe of Alaska, ADF&G's Sportfish Division (SFD), Northern Southeast Regional

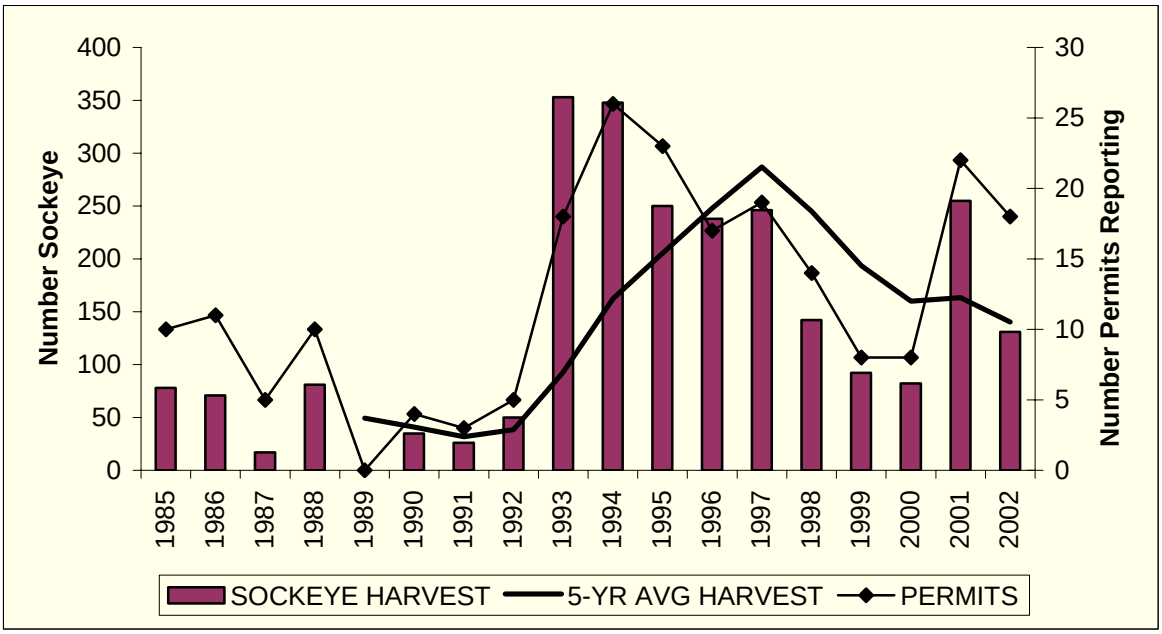
Aquaculture Association (NSRAA), and the Forest Service. Funding was obtained from the Federal Subsistence Program to operate the project from 2001-2003. Weir and mark-recapture techniques were used to estimate sockeye and coho salmon escapement. Coded wire tags were used to determine Commercial and Sport interception rates. Subsistence harvest is estimated through an existing harvest permit system (Table 4-12 and Figure 4-3). In 2001, 2,529 sockeye and 1,717 coho salmon escaped to Salmon Lake (Tydingco and others 2002). In 2002, 1,051 sockeye and 1,139 coho returned (Tydingco and others 2003). The first coded wire tags will be recovered in 2003. Wier and tagging results are pending for 2003.

Table 4-12. Salmon Lake Subsistence Sockeye Harvest Summary

YEAR:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Permits	0	11	5	10	-	4	3	5	18	26	23	17	19	14	8	8	22
Sockeye Harvested	78	71	17	81	-	35	26	50	353	348	250	238	246	142	92	82	255
Sockeye per Permit	8	6	3	8	-	9	9	10	20	13	11	14	13	10	12	10	12
5-year Average Harvest					49	41	32	38	93	162	205	248	287	245	194	160	163

Source: ADFG-CFD 2003

Figure 4-3. Salmon Lake Subsistence Sockeye Harvest, 1985-2002



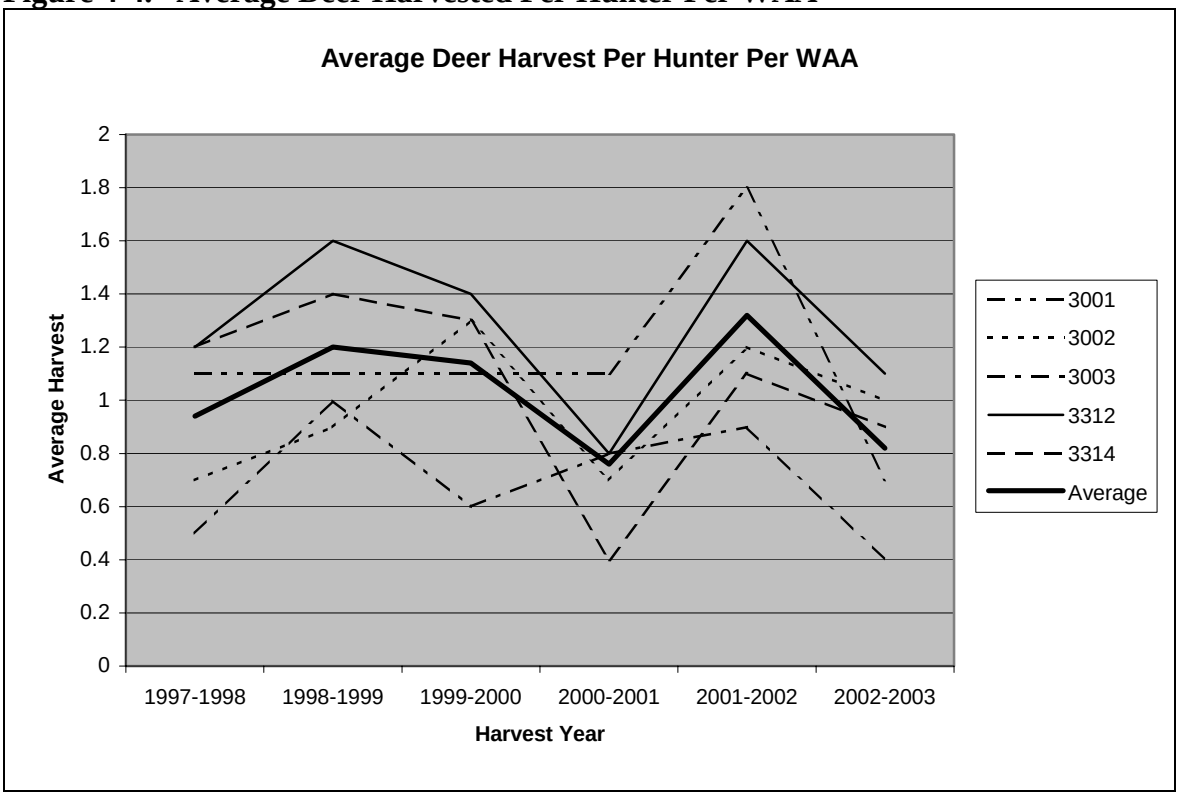
Source: ADFG-CFD. 2003

Subsistence Deer Hunting

A hunter harvest of approximately 10 percent of habitat capability should be sustainable and should provide a reasonably high level of hunter success (USDA FS 1997 [Forest Plan FEIS], p. 3-596). Hunter success can be expected to decline in areas where demand represents 10 to 20 percent of habitat capability. If demand exceeds 20 percent of habitat capability, harvest of deer by hunters may be directly or indirectly restricted (USDA FS 1997 [Forest Plan FEIS], p. 3-537). The Forest Plan determined that the average deer hunter harvest was 29.6 percent of the deer habitat capability for the Assessment Area in 1995.

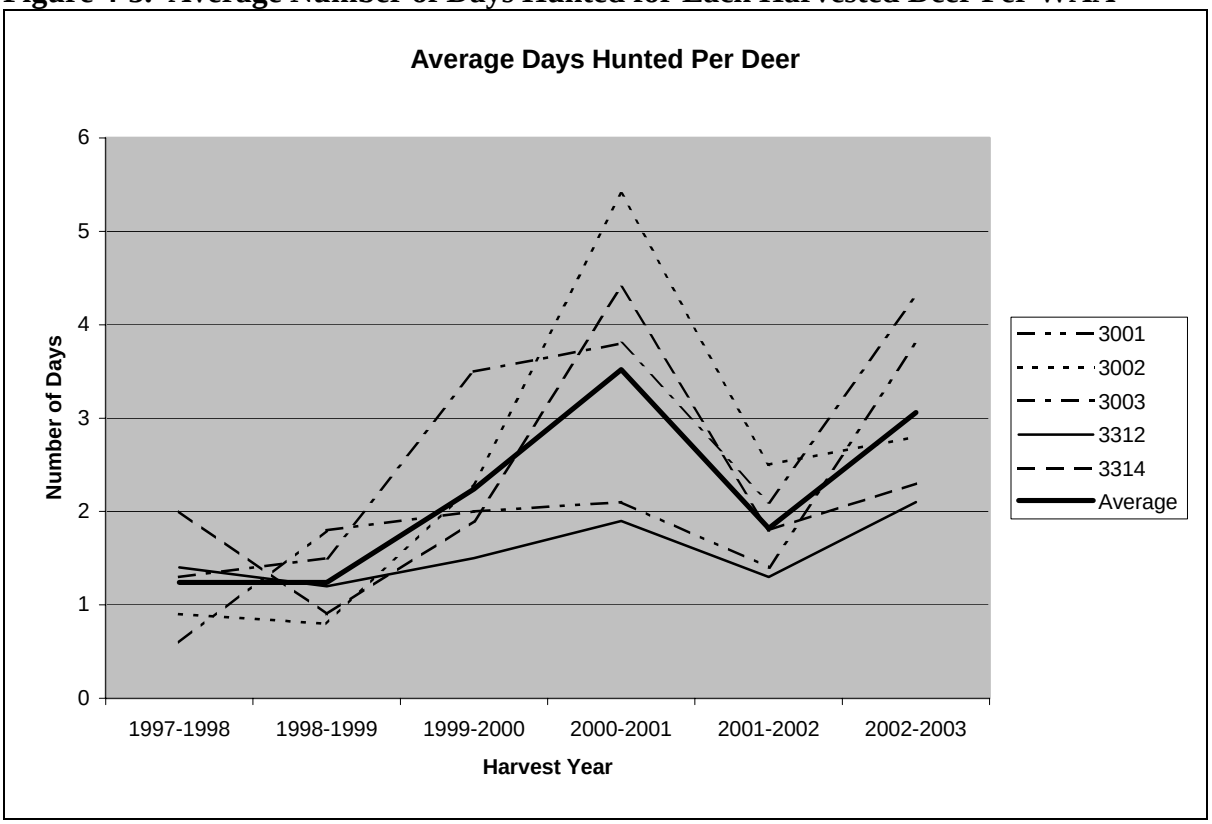
Figure 4-4 shows that, for the years where data is available, an average of 1.3 deer was harvested per hunter for the WAAs in the Assessment Area. Figure 4-5 shows that, for the years where data is available, for each deer harvested an average of 2.2 days were expended hunting. As mentioned in Chapter 3, management objectives for Game Management Unit 4 include maintaining a deer population capable of sustaining a mean reported harvest of at least 1.5 deer per hunter and a minimum reported success rate of 1 deer killed per 4 days hunting effort. The data suggest that the objectives for the number of deer harvested per hunter are not being met but that the objectives for the number of hunting days per deer are being met.

Figure 4-4. Average Deer Harvested Per Hunter Per WAA



Source: ADF&G-DWC, Deer Hunter Survey Summary Statistics 1995-2002.

Figure 4-5. Average Number of Days Hunted for Each Harvested Deer Per WAA



Source: ADF&G-DWC, Deer Hunter Survey Summary Statistics 1995-2002.

Under ANILCA, a priority for use is to be granted to rural subsistence users if restrictions on use of a resource are necessary. Although these data indicate that the present supply of deer may not be adequate for meeting all hunter harvest and demand, providing a quality experience for hunters, and maintaining deer populations in a particular year, there are several other factors to consider. Deer harvest rates and deer populations can vary from year to year and are influenced by numerous dynamic factors. Harvest rates can fluctuate due to variables such as changes in the deer population, hunting regulations, road access, and weather conditions during the hunting season. Hard winters with low temperatures and heavy snows can cause deer to concentrate in lower elevation habitat making deer easier to hunt.

Changes in deer abundance can result from harsh winters, timber harvests, increased hunting access, and increases in rural and non-rural hunter demand for deer. Winters with low temperatures and heavy snows can increase mortality of deer and reduce the number of deer available for hunters to harvest. Clearcut harvests reduce cover and result in a rapid establishment and regeneration of conifers, shrubs, and herbaceous plants. This flush of vegetation provides forage for deer for up to 35 years. However, this understory vegetation will not likely be available during the winter due to snow accumulation. Once stands reach the stem exclusion stage, they are not likely to provide foraging habitat for deer during any season. Thinning such stands increases forage availability in the short-term. New roads constructed in association with timber sales increase hunter access to areas. In some cases, because harvest activities may increase the number of people in an area or community, the demand for deer harvest may also increase.

Deer pellet transects demonstrate that deer populations are likely being maintained in the Assessment Area. Deer pellet counts are conducted annually to assess trends in habitat use areas and population trends of deer in specific areas. Between 1981 and 2001, deer pellet group densities were at a high density (greater than 2 pellet groups per plot) for survey areas in WAA 3001 and 3003 and a moderate density (1-2 pellet groups per plot) in WAA 3314. Nakwasina (VCU 3000) is a popular hunting area that has been surveyed for pellets since 1984. In 2001, pellet densities averaged 2.33 per plot (Kirchoff and White 2002). Between 1984 and 2001, pellet densities for these plots ranged from 1.24 to 4.57.

Chapter 5 – Recommendations

Introduction

This chapter includes recommendations for future management activities and projects within the Assessment Area. These recommendations were developed collaboratively by ID Team members through discussion of the results of the analyses performed for this landscape assessment. The chapter begins with a discussion of general area wide recommendations for the Assessment Area that is organized by each resource area. The chapter concludes with specific recommendations and opportunities for activities in the Value Comparison Units (VCU) within the Assessment Area.

Watershed Rehabilitation

Riparian Thinning Treatment Areas

Within the Assessment Area, many of the previously harvested stands associated with riparian areas are approaching or have reached the age and size at which canopy closure begins to occur. Silviculturists and other resource specialists, including those from fisheries, wildlife, hydrology, and soils, should collectively produce prescriptions for these areas and implement thinning activities within the next ten years. Potential silvicultural treatments should address the desirable species mix, understory biodiversity, and site conditions. General suggestions for implementing riparian regeneration treatments are listed in Appendix G of the Forest Plan.

Instream Large Woody Debris

Future watershed rehabilitation should continue the placement of large wood (LW) into streams currently lacking large wood. Where available, stream survey information should be used to assess the current condition and trends of key stream habitats and to determine the locations at which additional instream LW is needed. Additional stream surveys should be completed in areas impacted by past management activities for which data are lacking.

Borrow Ponds

Rehabilitation work should include identifying existing borrow ponds that can be connected to nearby streams to provide additional fish rearing habitat.

Lake Habitat (Sockeye Salmon) Restoration

The Salmon Lake sockeye salmon stocks are important subsistence fishery resources for many people in this area. Because the Salmon Lake weir project has and continues to provide valuable information that can help restore and enhance this subsistence fishery, it should continue to receive funding.

Road Maintenance and Restoration

Restoration work should involve placing or removing drainage structures and/or ditching at existing washout sites, cleaning partially plugged culverts, stabilizing or removing unstable road fills and cutbanks, and removing artificial barriers to fish passage (as determined from completed and planned road inventories).

Future Watershed Work

During project level planning, we recommend that the following work be completed:

1) Assess the major sub-basins and reaches within each watershed, and determine the site-specific potential for management-induced sediment production, transport, and deposition.
2) Complete inventories of existing system and non-system roads to assess sediment source areas and potential fish barriers, and recommend road rehabilitation work, closure, or removal.
3) Complete additional stream riparian transects by channel types to verify and improve the existing stream riparian width information.
4) Update the existing stream, fen, and stream riparian GIS layers using field verification, digital orthophoto overlays, and aerial photo interpretation. Use this to update the information presented in this landscape assessment.
5) Use available stream survey information or complete additional stream surveys for representative channel reaches to assess the current condition and trends of key stream habitat within planning area watersheds. As directed in the 1997 Forest Plan, compare stream survey information (by channel type) to Regional Fish Habitat Objectives (Width to Depth Ratio, Percent Pool Area, Percent Pool Length, amount and distribution of Large Woody Debris, etc.).
6) Complete Water Quality Restoration Plans or equivalent work to address the 303d listed watersheds (i.e., the Nakwasina and Katlian Watersheds)

Wetlands

In wetland areas that experience heavy foot traffic, loss of wetland vegetation would, in most instances, be temporary. Loss of vegetation will impact only a fraction of the Assessment Area as a whole; however, vegetation loss may be high in any given activity area or within areas affected by ground-disturbing management projects.

A greater potential for effects to wetland vegetation would occur in the Large Use Areas, enclaves, and areas where road and trail construction is taking place.

Continued high recreation use levels in wetlands are likely to require trail construction in the future. This would result in the permanent loss of wetland vegetation. Trail construction in wetlands, with the exception of boardwalk trails, typically requires a Clean Water Action Section 404 permit from the U.S. Army Corps of Engineers.

Measures to Avoid or Minimize Effects to Wetlands

Executive Order 11990 as amended (42 U.S.C. 4321 et. Seq) requires Federal agencies that exercise statutory authority and leadership over Federal lands to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands. Where practicable, direct or indirect support of new construction or modifications in wetlands must be avoided.

The Administration's August 24, 1993 Wetlands Plan established a short-term goal of no overall net loss of the Nation's remaining wetlands and long-term goals of increasing the quantity and quality of the Nation's wetland resources. The 1993 Wetlands Plan also created an Alaska Wetlands Initiative to address concerns with the implementation of the Clean Water Act Section 404 permit program in Alaska. The Alaska Wetlands Initiative Summary Report (USEPA 1994) reaffirms that the "no net loss" policy is applied throughout the United States on a permit-by-permit basis. However, it also recognizes that in Alaska, the goal of "no net loss" may not be attained for each 404 permit issued, especially where a high proportion of developable lands within a watershed are wetlands and where practicable opportunities for compensatory mitigation (i.e., wetland restoration or creation) are limited. This regulatory flexibility is consistent with the Clean Water Act Section 404(b)(1) Guidelines (USDA FS 1997).

Appendix F of the Forest Plan identifies the objectives of a wetland mitigation plan. The production of a wetland mitigation plan will be required for any Section 404(f) permit for proposed filling or dredging activities in Assessment Area wetlands. This Appendix describes Federal guidelines for sequencing the implementation of wetland mitigation measures.

Vegetation

Timber Harvest

Present market conditions, in conjunction with high logging and transportation costs, currently make timber sale offerings from the Sitka Ranger District marginally attractive to existing purchasers in Wrangell and Hoonah. Although it does not currently exist, there is potential in Sitka and surrounding areas for a small-scale, value-added industry that produces dried, planed, and finished wood products. This would be particularly true if Alaska acquires its own structural quality grade stamp. Sitka currently lacks the infrastructure (e.g., dry kilns, planers, etc.) needed to produce value-added wood products. The city's limited system of usable roads is another a limiting factor. These factors make such business endeavors risky undertakings. Consequently, in the short term, economically viable timber sale opportunities within the Assessment Area are quite limited. However, there is potential for an ambitious entrepreneur with the ability to invest and pursue grant opportunities to build a viable small-scale industry.

Thinning

As new markets develop for small diameter wood and/or technology improves to allow the selective harvest of trees without damage to residual crop trees, opportunities for commercial thinning of young-growth may emerge. Most young-growth stands within the Assessment Area are approximately 60 to 70 years from meeting the minimum 100-year rotation age for regeneration harvest (i.e., even-aged management such as clearcutting).

Precommercial thinning has the potential to enhance or maintain timber values as well as wildlife and fisheries habitat values. Specific stand objectives should be determined so that funding for thinning can be pursued and stand prescriptions can be developed. The Region 10 Silviculture Information System database (SIS) tracks thinning needs and maintains records for both timber and other resource emphasis treatments. Thinning needs that do not have a timber emphasis (e.g., thinning to enhance or maintain fish and wildlife habitat) are not currently tracked in SIS as "needs" but rather are scheduled as planned treatments. The soon-to-be-released National FACTS database will allow the Forest Service to more easily track non-timber thinning needs. National Forests in all regions will use the FACTS database for tracking, planning and reporting vegetation management treatments.

SIS currently identifies 312 acres in need of precommercial thinning within the Vegetation Analysis Area (Table 5-1). These stands were evaluated between 1997 and 1999 for timber emphasis thinning and are within the suitable and available timber base. These stands may have outgrown the precommercial thinning window since 1997 and should be reevaluated prior to developing prescriptions. In most instances, making such a determination will require field reconnaissance and/or aerial overflights.

Table 5-1. Thinning Needs presently identified in the SIS Database within the Vegetation Analysis Area on Acres Suitable and Available for Timber Harvest

VCU	Stand No.	Acres	Harvest Date	Remarks
2990 (Nakwasina)	69	163	1960	Evaluate for multiple emphasis thinning; field reconnaissance is needed.
3130 (Katlian)	122	45	1962	Evaluate for multiple emphasis thinning; field reconnaissance is needed.
3130	127	49	1962	
3130	313	31	1962	
3130	315	24	1963	
Total		**312**		

Source: Heuer 2003 - Tongass SIS database

Table 5-2. shows the thinning status of all harvested acres within the vegetation analysis area by VCU. Many of the unthinned acres listed in this table have outgrown the precommercial thinning window, have been evaluated for thinning but determined to not meet thinning requirements or need to be reevaluated for thinning opportunities. The recommendations section below addresses each VCU individually and makes recommendation and describes potential opportunities.

Table 5-2. Acres of Thinned and Unthinned Young-growth by VCU within the Vegetation Analysis Area

VCU	Beach Fringe		Old-Growth Reserve		Timber Management		Semi Remote Recreation		TOTAL		
	Thinned	Not Thinned	Thinned	Not Thinned	Thinned	Not Thinned	Thinned	Not Thinned	Thinned	Not Thinned	All
287	67	155	826	600	0	0	0	0	893	755	1648
299	191	28	26	0	801	511	94	0	1112	539	1651
300	173	137	480	0	485	8	85	27	1223	172	1395
301	213	30	27	0	393	4	128	32	761	66	827
302	32	84	376	83	96	3	0	0	504	170	674
310	0	0	0	0	0	0	0	0	0	0	0
311	0	0	0	0	0	0	0	478	0	478	478
312	118	0	0	0	356	340	128	0	602	340	942
313	0	0	0	216	00	1245	0	0	0	1461	1461
319	25	31	0	0	0	0	114	196	139	227	366
320	0	51	0	0	0	0	0	14	0	65	65
321	52	79	0	0	796	4	19	4	867	87	954
322	0	50	0	0	0	0	0	24	0	74	74
323	0	22	0	10	0	45	10	0	10	77	87
Total	**871**	**667**	**1735**	**909**	**2927**	**2160**	**578**	**775**	**6111**	**4511**	**10,622**

Source: Heuer 2003 - Tongass GIS database

Vegetation Recommendations Summary

- Evaluate St. John the Baptist Bay for small timber sale opportunities within the development LUDs that would utilize the existing road system (Forest Service Roads 75831 and 7583). Consider opening and /or maintaining selected portions of this road system through small-scale timber harvest or stewardship contracts.
- Evaluate the St. John and Schultz Cove timber sales for reoffer. Consider redesigning one or both of these sales for better economic viability or for 10-year timber sale contracts.
- Evaluate thinning opportunities for wildlife and fisheries/riparian objectives in the Fish Bay, Katlian, Nakwasina, St. John the Baptist Bay, Camp Coogan, and Kizhuchia Creek drainages. Conduct interdisciplinary field and/or aerial reconnaissance, and prioritize treatment needs.
- Reevaluate existing thinning needs to determine whether needs still exists or whether stands have outgrown the precommercial thinning window. Conduct aerial reconnaissance, and follow up with field reconnaissance as needed. Update the SIS database with revised thinning needs.
- Monitor past thinning for effectiveness, and assess the need for additional treatments.
- Pursue opportunities to improve or maintain existing roads for a future small-scale timber industry as well as for recreational opportunities.

Biological Diversity

Summary

The Forest Plan contains a comprehensive conservation strategy to maintain viable populations of native and desired non-native fish and wildlife species and subspecies that may be associated with old-growth forests (Forest Plan 1997, p. 3-76). This strategy involves the maintenance of a system of old-growth reserves (OGR) designed to provide old-growth habitats in combination with other non-development Land Use Designations (LUD). This strategy also includes the maintenance of riparian, beach, estuary and other species-specific key habitats as well as connectivity between OGR and non-development LUDs. The OGR and non-development LUDs within the Assessment Area appear to be functioning to maintain biodiversity. As stated in the Forest Plan, the habitat quality and location of small OGRs should be assessed during any project level analysis.

Timber harvest activities have reduced the availability of low elevation habitat for wildlife. However, less than 4 percent of the NFS Land in the area has been harvested, so the effects of timber harvests on connectivity have been limited. Although the location of non-development LUDs and the availability of productive old-growth (POG) and riparian, beach and estuary buffers appear to provide connectivity within the Sitka Sound Landscape, connectivity in isolated areas, including the Saint John the Baptist, Nakwasina, and Katlian Bays, should be carefully assessed in the future.

General Opportunities and Recommendations

Old-growth Habitat Reserves

Determine whether large and medium Old-growth Habitat Reserves meet Forest Plan standards and guidelines.

Habitat Connectivity

- Work with the Alaska Department of Fish and Game (ADF&G) and the US Fish and Wildlife Service (USFWS) to identify key connectivity routes between non-development LUDs.
- Maintain habitat connections by utilizing innovative timber harvest techniques to replicate natural disturbances (reduce opening size, selective harvest).
- Update the GIS databases to reflect private land harvest activities.
- Update the GIS databases so that they contain the location and use status of public and private trails and roads.

Brown Bears

- Identify criteria to characterize critical brown bear riparian foraging habitat.
- Assess whether there are opportunities to thin previously harvested stands (and previously thinned stands) to enhance riparian habitat.

Deer and Marten

- Continue to identify and evaluate deer winter use habitat. Compile GIS data and acquire information on deer winter use from ADF&G.
- Develop opportunities to survey for deer winter habitat.
- Validate the Habitat Capability Model for deer and marten. Work to improve the output of these models.
- Determine whether opportunities exist to thin previously harvested stands and previously thinned stands to enhance forage for black-tail deer, especially in deer winter habitat.
- Identify a method to assess the population size of Sitka black-tailed deer and the location of winter deer habitat.

Heritage Resources

The Forest Plan specifies several management activities related to Heritage Resources, including project clearance, project implementation, mitigation measures, enhancement measures, and site inspections.

The National Historic Preservation Act also governs the ways in which land management activities are carried out. This Act mandates that Federal agencies evaluate the potential effects of undertakings to historic properties. Section 106 of the Act encompasses this process, and includes clearance, implementation, and mitigation procedures. Most archeological investigations conducted by land managing agencies are performed to comply with this legislation. Perhaps the most important investigations are those performed to identify, document, and evaluate the significance of historic and prehistoric sites. Site inspection and enhancement can also be conducted in conjunction with other project activities or as Heritage projects.

The Assessment Area was a place of great significance in the history of Southeast Alaska, especially during the historic period. For this reason, the area has a relatively high density of historic and archeological sites. Within the Assessment Area there are heritage sites that represent the Tlingit, Russian, and early American eras as well as more recent events such as fur farming and World War II. Heritage projects in the Assessment Area could include monitoring, surveying, excavating, and interpretation activities. Other opportunities relating to heritage resources within the Assessment Area are listed below.

- Several sites in the Assessment Area, especially those near Sitka, offer opportunities for interpretation of several historic periods.
- The northern portion of the Assessment Area has been surveyed to identify sites; however, fewer investigations have been conducted on the south end. There is an opportunity to conduct surveys in this area.
- Documented sites should be examined periodically to assess the current condition and verify the accuracy of site documentation.
- Investigations could greatly increase our understanding of local and regional historic events. The results of these investigations could be used for public presentations that could enhance public understanding of historic patterns.
- Passport In Time (PIT) projects could be used to conduct investigations.

Roads

Summary

Roads within the Assessment Area are, for the most part, deteriorating. Most OML 1 roads have had the majority of their drainage structures removed and are being allowed to "brush in" in accordance with the Road Management Objectives. However, some continue to have drainage and erosion problems that are contributing to resource damage. The OML 2 roads have neither been brushed nor maintained as outlined in the Forest Service Manual and are developing drainage and erosion problems. The OML 3 and 4 roads are being maintained and are functioning, but there are specific locations along Harbor Mountain Road and Blue Lake Road that are in danger of failure.

Analysis of Road Condition Survey (RCS) data shows that portions of the existing road system are contributing to resource damage. Motorized vehicle use on OML 1 and 2 roads and unclassified roads is causing resource damage within the Assessment Area. The deteriorating road system is becoming inadequate for the current level of public, commercial, and administrative use. The public has expressed a desire for more roads and better quality roads to be used for recreation purposes. As use of all kind continues to increase, the existing road system will become even less adequate.

Road Condition Surveys

All roads in the Assessment Area should be periodically reviewed so that the RCS database may be kept current. This database is used as a tool in decision-making, and an informed decision is predicated on current data. The Assessment Area contains approximately 24 miles of classified National Forest System Road and 30 miles of unclassified road for which no RCS data have been collected. Table 5-3 displays the classified roads for which RCSs need to be completed. Completion of surveys on these roads will provide the data needed to address access management and usage issues as well as maintenance needs. The surveys will also identify locations along roads at which resources damage is currently occurring or is likely to occur. Opportunities to repair these roads and damaged resources will arise with the collection and analysis of RCS data.

Table 5-3. Classified Roads in the Assessment Area Lacking RCS Data

Road Number	Road Name/Location
7558	Lisa Creek
7579	Katlian Bay
75790	Katlian Bay
75791	Katlian Bay
75792	Katlian Bay
75797	Katlian Bay
7580	Fish Bay
75801	Fish Bay
75802	Fish Bay
75803	Fish Bay
75842	St. John the Baptist Bay

Road condition survey data collection on unclassified roads will be primarily focused on locations with high road densities such as the Nakwasina Creek drainage. The opportunity exists to enter into cooperative efforts with landowners and agencies to collect data on classified and unclassified roads that pass through Non-National Forest lands.

Finishing the RCSs in the Assessment Area will further the effort to obtain a complete database of National Forest System Roads on the Sitka Ranger District.

Southeast Alaska Proposed Public Road and Ferry Projects

Southeast Alaska Proposed Public Road and Ferry Projects

Plans are moving forward in the development of the transportation infrastructure in Southeast Alaska. In March of 2003 the US Forest Service prepared a report for the Southeast Conference titled *Southeast Alaska Proposed Public Road and Ferry Projects*. This report identifies possible locations within the Assessment Area for roads that could be constructed to connect the City of Sitka to Rodman Bay to the north, Kelp Bay to the northeast, and Warm Springs Bay to the east. The *Across Baranof Route* proposal consisted of three alternatives (see Figure 5-1). Each alternative calls for the design and construction of two lane gravel roads with posted speed limits reaching 35 miles per hour where feasible. Each alternative would also require construction of new ferry terminals and associated facilities. A brief description of each alternative follows.

Alternative A would connect Sitka to Rodman Bay using approximately 22 miles of existing roads and would require 30 miles of new construction. Under this proposal, Forest Road 7574 could be reconstructed.

Alternative B would connect Sitka to Warm Springs Bay by constructing 15 miles of new road. This alternative would not likely use any existing National Forest System roads but would cross some unroaded areas in the Assessment Area.

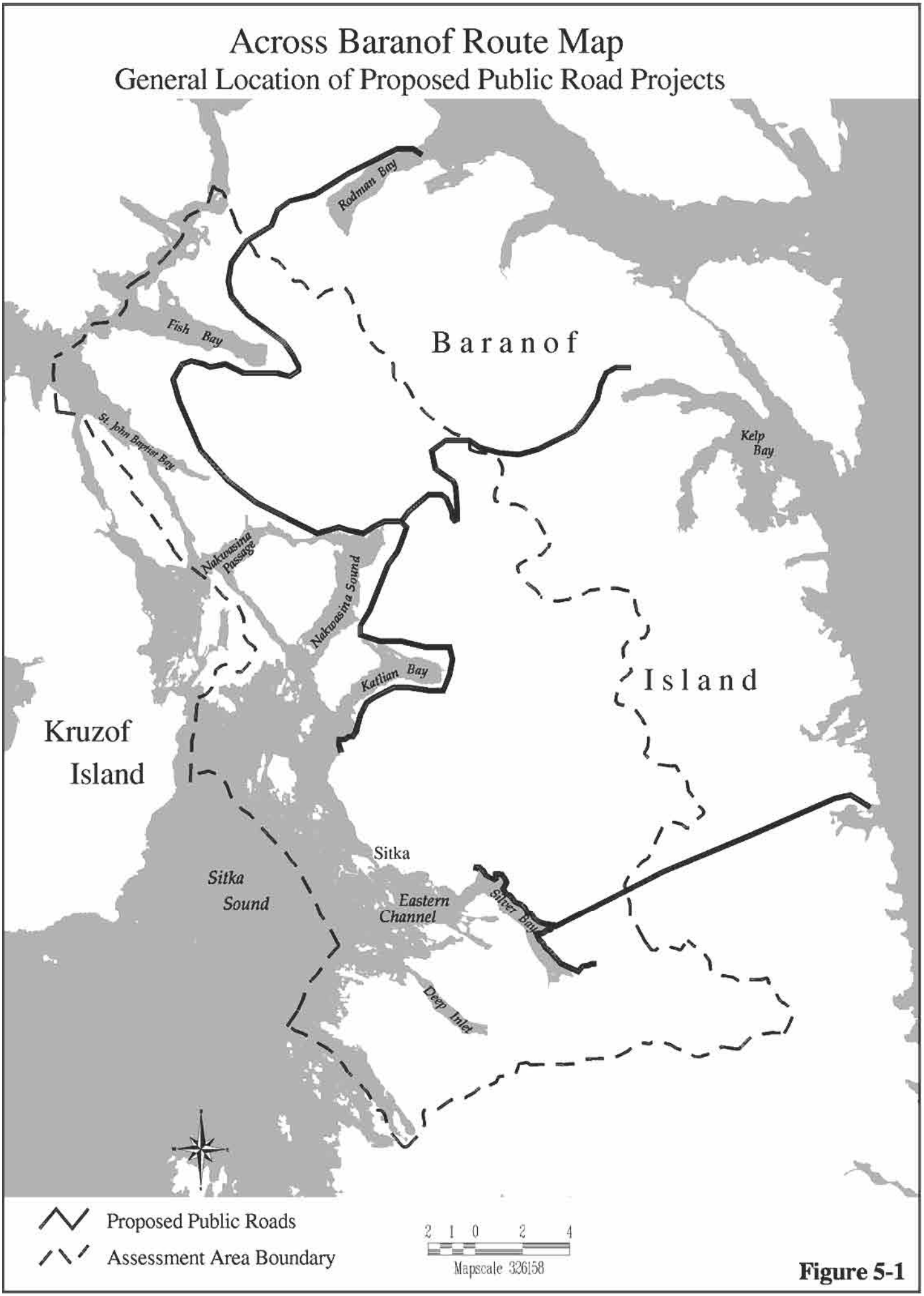

Across Baranof Route Map
General Location of Proposed Public Road Projects
Redman Bay
Fish Bay
Baranof
St. John Baptist Bay
Kelp Bay
Nakwasina Passage
Nakwasina Sound
Katlian Bay
Island
Kruzof Island
Sitka
Sitka Sound
Eastern Channel
Silver Bay
Deep Inlet
Proposed Public Roads
Assessment Area Boundary
2 1 0 2 4
Mapscale 326158

Figure 5-1

Alternative C would connect the Sitka to the head of Kelp Bay on northeast Baranof Island. Existing roads that would be partially or wholly reconstructed in this proposal include: 7579, 75790, and 7574.

To date, there has been no formal study to analyze beneficial or negative environmental impacts.

Southeast Alaska Transportation Plan (SATP)

The State of Alaska Department of Transportation and Public Facilities is updating the Southeast Alaska Transportation Plan (SATP). The updated plan builds upon the previous plan, recent department studies, work recently performed by the USDA Forest Service for the Southeast Conference, and the initiatives of Alaska Governor Frank Murkowski. The plan is one of a series of regional, multi-modal transportation plans that are components of the *Statewide Transportation Plan*. This area plan identifies area needs, provides general guidance on area transportation development, and recommends specific transportation improvements for Southeast Alaska. The SATP provides a framework for long-range transportation system investments to be implemented during the period ending in 2025. It describes the long-range transportation vision for the regional transportation system, which provides for travel between communities in Southeast Alaska, through the region, and between Southeast Alaska and the rest of the world (ADOT&PF 2004).

The 2004 Draft plan presents new ideas and opportunities developed since the 1999 SATP and Addendum One were published. This update discusses the changes that are planned for 2011 to 2025 and also recommends initiation of projects in 2004 and 2005 to pursue development of four additional roads. Of these four, only one occurs within the Assessment Area. This segment is listed as; Sitka Access, a road from Sitka across Baranof Island and ferry terminal (ADOT&PF 2004).

There are two primary alternatives for the Sitka route and port location (Figure 5.2): (1) the Rodman Bay port location accessed by a road around the north end of the island, estimated at about $160 million for both road and terminal; and (2) the Warm Spring Bay port location accessed by a road through the mountains, estimated at about $250 million for both road and terminal. The Baranof Warm Springs route is complicated by the need for a two-mile-long tunnel that has significant capital cost as well as some operating cost implications (ADOT&PF 2004).

A Sitka Access Alternatives Feasibility and Reconnaissance Study is proposed to be accomplished in 2004 by ADOT. The study would conduct a more detailed assessment of the two principal road alternatives across Baranof Island and any other alternatives, including routes across the mountains to locations such as Kelp Bay and ferry alternatives. If one or more options is found feasible and supported by the communities affected, an EIS would follow as soon as possible thereafter at an estimated cost of $5 million (ADOT&PF 2004).

Figure 5-1a. Southeast Alaska Transportation Plan Proposed Roads, Ferry Routes and Electrical Intertie Corridors – Draft – January 2004.

Source: ADOT&PF 2004

RAP and ATM

The Roads Analysis Process (RAP) is an integrated approach to transportation planning that takes into account the ecological, social, and economical impacts of existing and planned roads. The RAP for north Baranof Island will build from this Sitka Sound Landscape Assessment and will include technical recommendations for roads. The Access and Travel Management Plan (ATM) for the Sitka Ranger District is a comprehensive plan that will utilize the recommendations from the multiple RAPs that have been completed for the district to formulate a transportation and access strategy for the future.

Roads Associated with the Schultz Cove and St. John the Baptist Bay Timber Sales

The planned timber sales near Schultz Cove and St. John the Baptist Bay both call for new road construction. Because these sales and the associated roads were planned prior to implementation of the 1997 Forest Plan, they will need to be reevaluated to determine whether they are consistent with the current Forest Plan. Portions of proposed road in the Schultz Cove area could be used in the Southeast Alaska Public Road and Ferry Project to connect Sitka with Rodman Bay. Road construction and reconstruction associated with these timber sales would improve commercial access and provide public access to new places within the Assessment Area.

Signage

All road users would benefit from proper signing along roads. Signs providing information on the types of access allowed, road numbers, hazards, and directions should be placed on the forest roads that are to remain part of the National Forest Road System.

Marine Access Facilities (MAF)

An opportunity exists for the Forest Service to work cooperatively with multiple agencies and landowners to improve the MAFs that provide access to road systems that are needed for commercial, administrative, or public access. A number of users would benefit from enhancing access to existing road and trail systems and providing safe loading and unloading areas at salt water. Improvement of the former MAFs will be considered in the RAP and ATM.

Transportation System Recommendations

Because roads often cross VCU boundaries, recommendations for roads are listed in this section by road rather than in the VCU recommendation summary section.

Roads 7580, 75801, 75802, and 75803—Fish Bay Road System

The Fish Bay Road System, which is currently in a non-development LUD, is in poor condition. Road condition surveys should be completed for these roads, and repairs should be completed on road portions that are contributing to resource damage. An opportunity exists to improve portions of the Fish Bay Road System for non-motorized use along the existing road prism. Non-motorized traffic on Road 7580 would be in keeping with the LUD. In addition, keeping the road on the National Forest Road System is preferable to decommissioning it because this road could be reconstructed as part of a

proposed public road project. Upon completion of the RCS, roads not listed in the proposed public roads projects should be examined in the RAP and ATM, and considered for decommissioning. If decommissioned, these roads could be maintained as hiking trails.

Roads 7583, 7584, 7585, 75831, and 75832 —St. John the Baptist Bay Road System
The OML 2 roads on this system that are located within development LUDs could be improved for both recreation and commercial uses. By maintaining the road and repairing or replacing existing structures, access for motorized recreation and fish passage would both be improved. Small timber sale opportunities may exist in this area; these sales could be combined with road maintenance activities in stewardship contracts. The OML 2 roads that are in non-development LUDs should be scrutinized in the RAP and ATM and should be considered for storage and closure. If it is determined that these roads should be stored and/or closed, it should be carried out in such a way as to allow for reconstruction in accordance with the proposed public road projects. Road storage and closure may or may not accommodate OHV use. In the meantime, these roads could be enhanced for foot traffic.

Road 7574—Noxon Creek Watershed
This road should continue to be monitored for use, resource damage, and access related issues. This road should remain stored and closed. The road prism should be preserved for potential use in the proposed public roads project.

Roads 75790, 75791, 75792, and 75797—Katlian Road System
Road condition surveys need to be carried out for the Katlian Road System. An opportunity exists for the Forest Service to work cooperatively with other landowners and agencies to survey, restore and improve this road system. Portions of this road system are listed in proposed public roads projects. The system is heavily used for recreation and subsistence activities.

Road 7576—Harbor Mountain
Reconstruction is planned for Harbor Mountain Road to improve recreation and subsistence access. Portions of the road that are currently contributing to resource damage or are likely to cause resource damage in the future will be repaired, as will those locations that currently pose a threat to human safety. This road will continue to receive annual maintenance and monitoring.

Roads 7577 and 7569—Blue Lake Road System
Blue Lake road should continue to receive annual maintenance to enable continued public, municipal, and administrative access. Proposals to improve the stability, safety, and reliability of this road should continue to be put forth. Road 7569 provides access to the Sawmill Cove Campground.

Road 7594—Camp Coogan Bay Road
The Camp Coogan Bay Road has received corrective treatment to prevent stream encroachment. Further opportunities exist to improve water resources along this road

system and for stewardship thinning contracts. This road is maintained as an OML 1 road to provide for public, contract, and administrative access.

Roads 7582 and 75821 —Kizhuchia Creek Road System

Access over approximately 0.64 miles of former road 7582 is prohibited by a recent land conveyance at the mouth of Kizhuchia Creek. There is an opportunity to regain access to the upper reaches of Kizhuchia Creek either by agreement with the current owners or by new road construction above the private lands. There are locations along the road at which resource damage is occurring or likely to occur. Repairs at these locations could improve conditions for motorized recreation. Repairing or removing the red pipes located on this road would enhance fish passage. Removing or repairing the old log stringer bridges, which are beginning to fail would improve safety.

Administrative Sites

National Forest System Roads used to access administrative and recreational sites off of the City of Sitka and state road systems should continue to receive maintenance and be improved. Opportunities to improve administrative access roads in Sitka, such as Forest Road 7512 (used for Forest Service dock access), include placement of crushed rock surfacing or pavement, sign placement, and installation of curbs or gutters. The Starrigavan ATV use area could be expanded and/or improved to provide more motorized recreational opportunities accessible by road from Sitka.

Transportation Recommendations for Further Work

- Complete Road Condition Surveys on Forest Roads within the Assessment Area.
- Conduct field visits to determine the accuracy of existing Road Condition Survey data and to correct any errors.
- Maintain up-to-date Road Condition Survey data to allow correct estimates of the deferred maintenance backlog and to set maintenance priorities.
- Evaluate safety concerns, failure and problem mechanisms, erosion features, site conditions, and fish blockages associated with specific roads, and set priorities for corrective measures.
- Evaluate current and planned road usage as well as usage trends through further public comment, trail counters, etc. Complete the Roads Analysis Process.
- Develop and implement a new Access and Travel Management Plan for the Assessment Area. Include in this plan the revised Road Management Objectives that reflect the new traffic management strategies for various administrative, commercial, recreational, and subsistence uses of the road system.
- Evaluate open and closed roads in non-development LUDs to determine whether they should be decommissioned or considered for alternative uses.
- Evaluate Marine Access Facilities for possible improvements or replacement.
- Analyze access alternatives to address the loss of right-of-way on the Kizhuchia road system.
- Analyze the possibility of connecting isolated road systems, and provide recommendations to improve administrative, recreational, and commercial access.

Recreation Facilities and Use

Inventory, Monitoring, and Recreation Planning Opportunities

The Forest Plan requires monitoring for recreation and tourism (USDA FS 1997, pp. 6-8). Monitoring is performed to determine whether the Recreation Opportunity Spectrum (ROS) direction in the Forest Plan is being followed and whether Off Highway Vehicles (OHV) adversely affecting other resources. This information is incorporated and printed in the *Tongass National Forest Annual Monitoring and Evaluation Report*. This type of reporting will continue until Forest Plan direction is changed.

There is an opportunity to monitor forest areas for recreation use and compliance with the Forest Plan, and to use this data to update the Infrastructure database. Doing so could help secure more comprehensive funding for recreation management.

A decision for the Shoreline Outfitter and Guide Final EIS is expected in 2004. If no effects are noted, it is possible that the number of permits available to guides may be increased or more service days may be awarded to them. This decision will produce further opportunities for action.

Specific opportunities for trail improvements, the construction of recreational facilities, and other activities are listed later in this chapter for each VCU.

Recreation Opportunity Spectrum

The Forest Plan specifies the type of recreation experience appropriate for each Land Use Designation (LUD). However, the actual conditions within LUDs do not always provide for the appropriate type of recreation experience. A Recreation Opportunity Spectrum (ROS) inventory was completed in 1985, and areas inventories have been monitored annually for vegetation disturbance. This monitoring has revealed locations at which changes in vegetation have changed the type of recreation experience available.

Most of the changes in the types of recreation experiences available in the Assessment Area have been from an undeveloped experience to a more developed experience. The majority of these changes are the result of ground disturbing activities associated with timber harvest. Silvicultural regeneration techniques intended to hasten the regeneration of forest vegetation could be applied in those LUDs that do not comply with Forest Plan ROS direction. This would reduce the amount of time that it would take for the forest to convert to a more undeveloped looking state.

Timber harvest is not the only reason some LUDs do not comply with Forest Plan ROS direction. Some LUDs are out of compliance not because they have been physically altered but because the definitions from the 1985 ROS guidelines were changed in the 1997 Forest Plan. The recreation experiences available in these LUDs need to be inventoried again and evaluated against current Forest Plan standards and guidelines. Conditions may convert naturally over time to bring the areas in compliance with Forest Plan ROS direction. Alternatively, a Forest Plan amendment may be needed to change

the LUD designation to reflect the existing recreation experience provided by the area.

The Assessment Area LUDs that currently offer a type of recreation experience that is inappropriate for the LUD are identified in the section of this chapter titled *Recommendations by VCU*. Activities that could help bring these LUDs into compliance with the Forest Plan are also listed in that section.

Off-Highway Vehicles Use

Many opportunities exist to develop more areas for Off Highway Vehicle (OHV) use without causing further resource damage. The Forest Service manages many old roads that could be maintained for this purpose. The Sitka Ranger District plans to develop a comprehensive OHV plan in the next five years.

Assessment Area roads that are best suited for providing OHV opportunities are listed in the section of this chapter that describes specific recommendations for each VCU. These roads were considered in the context of all of the other resources and how they would be affected by allowing OHV use on the roads.

Special Use Permits (SUP) for Recreation

Opportunities exist for recreation special uses permits in the Sitka Area Recreation Complex (VCU 3110 and 3180) once the carrying capacity analysis has been completed. These opportunities would include working cooperatively with the City of Sitka, Alaska Mental Health Trust, the Alaska Department of Natural Resources, Sitka Tribe of Alaska, Sitka Trails, the National Park Service, and Sheldon Jackson College to develop a comprehensive plan to connect all of the resident and tourism uses of the trail system throughout the community.

Interpretation Program

Opportunities exist to develop interpretive programs for the public that allow the Forest Service to sustain the recreation experience and opportunities. These programs should include school programs, cruise ship programs, interpretive walks, seasonal programs, Natural History programs, displays, and programs to make use of the environmental education publications the agency has produced. Many such programs already exist such as the Leave No Trace, Watchable Wildlife, and Limits of Acceptable Change programs.

Interagency Relations

The Sitka Ranger District's Recreation Staff consistently interacts with a variety of Federal and State agencies and local organizations (e.g., the City of Sikta, Alaska Mental Health, the Alaska Department of Natural Resources, Sitka Tribe of Alaska, Sitka Trails, the National Park Service, and Sheldon Jackson College) to share ideas and information. The opportunity to maintain and further develop these collaborative relationships remains. Doing so would benefit all parties involved and would help insure the production of works that compliment one another.

Recommendations by VCU

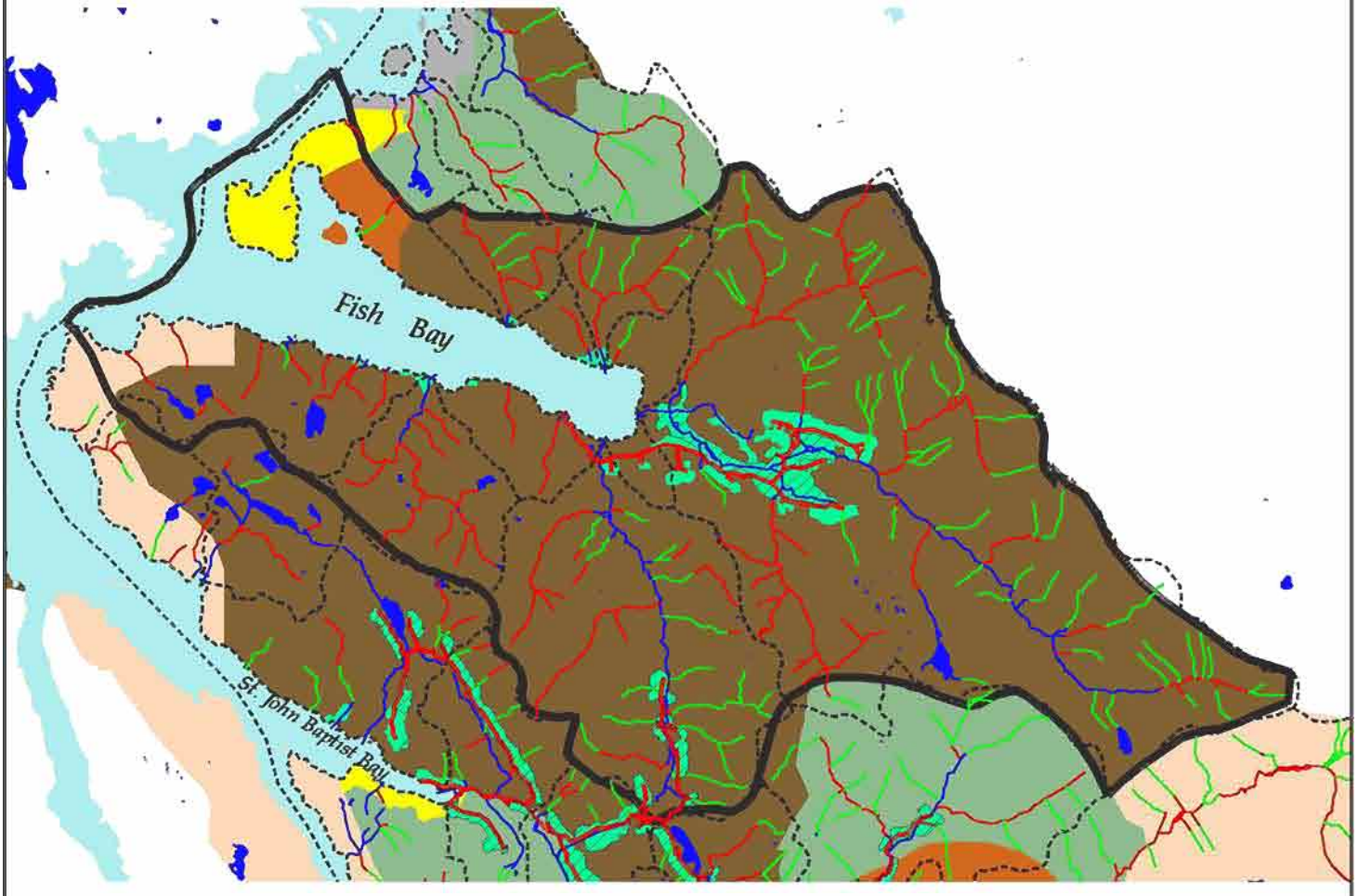
The following pages list the specific opportunities within and recommendations for each VCU within the Assessment Area. These recommendations were developed collaboratively by ID Team members through discussion of the results of the analyses performed for this landscape assessment. Maps of each VCU are provided for the reader's convenience. No recommendations are listed for VCU 3100 (Gavanski Island) because this VCU is comprised of Non-National Forest Land.

Recommendations For and Opportunities within VCU 2870: Fish Bay

- Complete RCS surveys within the Fish Bay watershed.
- Remove existing drainage structures and repair other problem areas identified within the RCS.
- Close roads within non-development LUDs, with consideration of possible reconstruction in the future along the portion of the Forest Road for passenger vehicle use as proposed in the *Southeast Alaska Transportation Plan*.
- Where roads occur in Old-growth Habitat Reserves, develop or update road management objectives to meet the objectives of the Land Use Designation.
- Close roads to OHVs.
- Evaluate thinning opportunities in previously harvested RMAs for Fisheries and Watershed improvements.
- Evaluate thinning opportunities for wildlife, fisheries, and riparian objectives in beach fringe, riparian management areas, and Old-growth Habitat Reserves.
- Monitor previous instream large wood (LW) work and evaluate further opportunities and/or need for LW projects.
- Develop the hot spring and provide hike-in access.
- Landscape conditions within the Old-growth Habitat Reserve do not provide the appropriate type of recreation experience for this LUD. An opportunity exists to thin trees to help bring this LUD into better compliance with the Forest Plan.
- With the help of ADF&G, identify important Brown Bear foraging areas.

Sitka Sound Landscape Assessment Area

VCU 2870 –Fish Bay



- Modified Landscape
- Enacted Municipal Watershed
- Old Growth Habitat
- Remote Recreation
- Semi–Remote Recreation
- Scenic Viewshed
- Timber Production
- Non –National Forest
- Previous Harvest
- Thinned Units
- Class 1 Streams
- Class 2 Streams
- Class 3 Streams
- Roads
- VCU Boundary
- Watershed Boundaries

0 2.37 4.73 Miles

Map Scale 1:149922

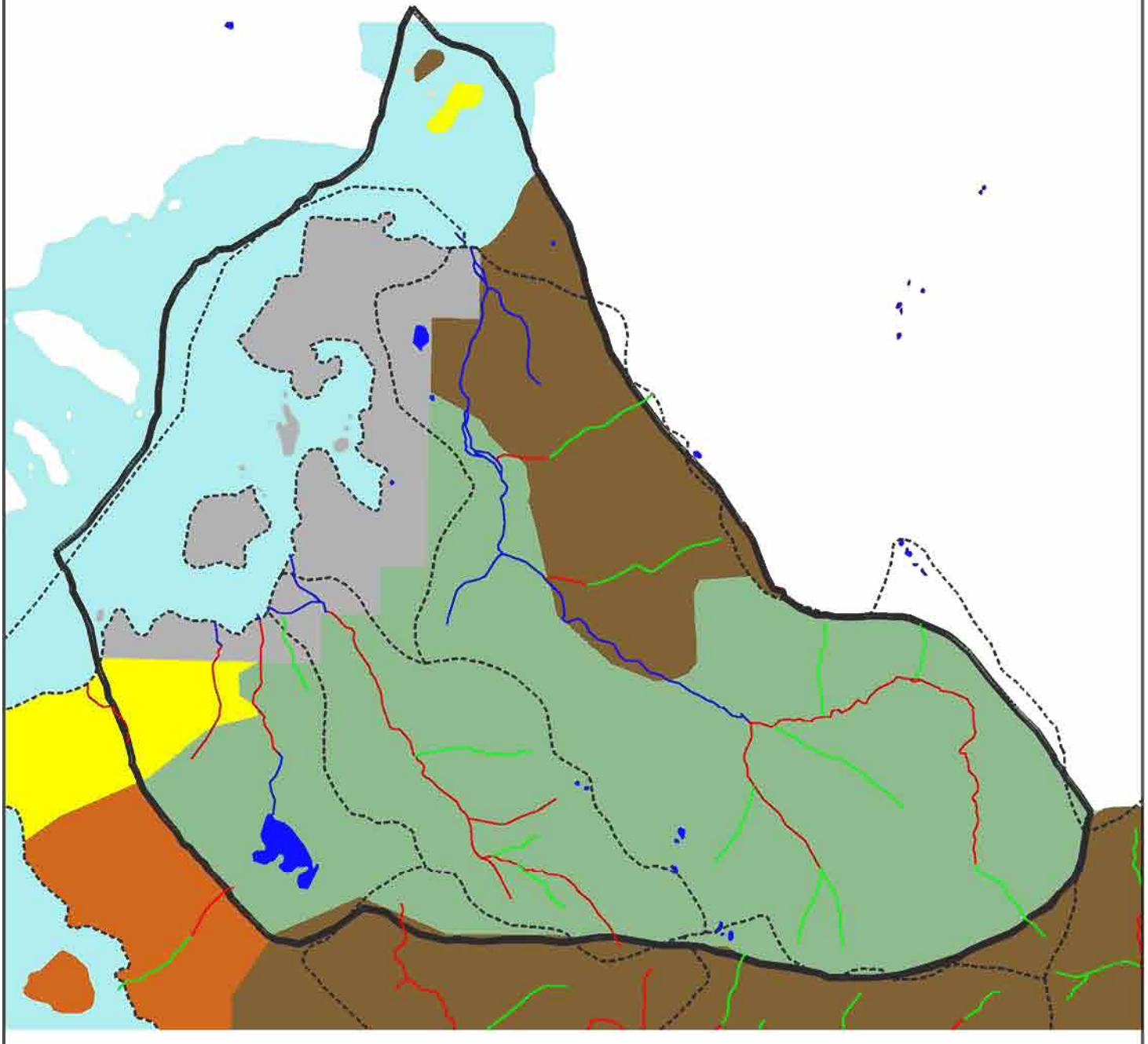
Figure 5-2

Recommendations For and Opportunities within VCU 2880: Range Creek

- Determine whether the small Old-growth Reserve in this VCU provides quality habitat. Meet with ADF&G to review the location of the small OGR.
- Work with ADF&G and USFWS to develop a proposal for a small OGR in VCUs 2990, 3130, and 3230 to meet Forest Plan standards and guidelines.
- Continue Deer Pellet Transects surveys.

Sitka Sound Landscape Assessment Area

VCU 2880 –Range Creek



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.76 1.52 Miles

Map Scale 1:48215

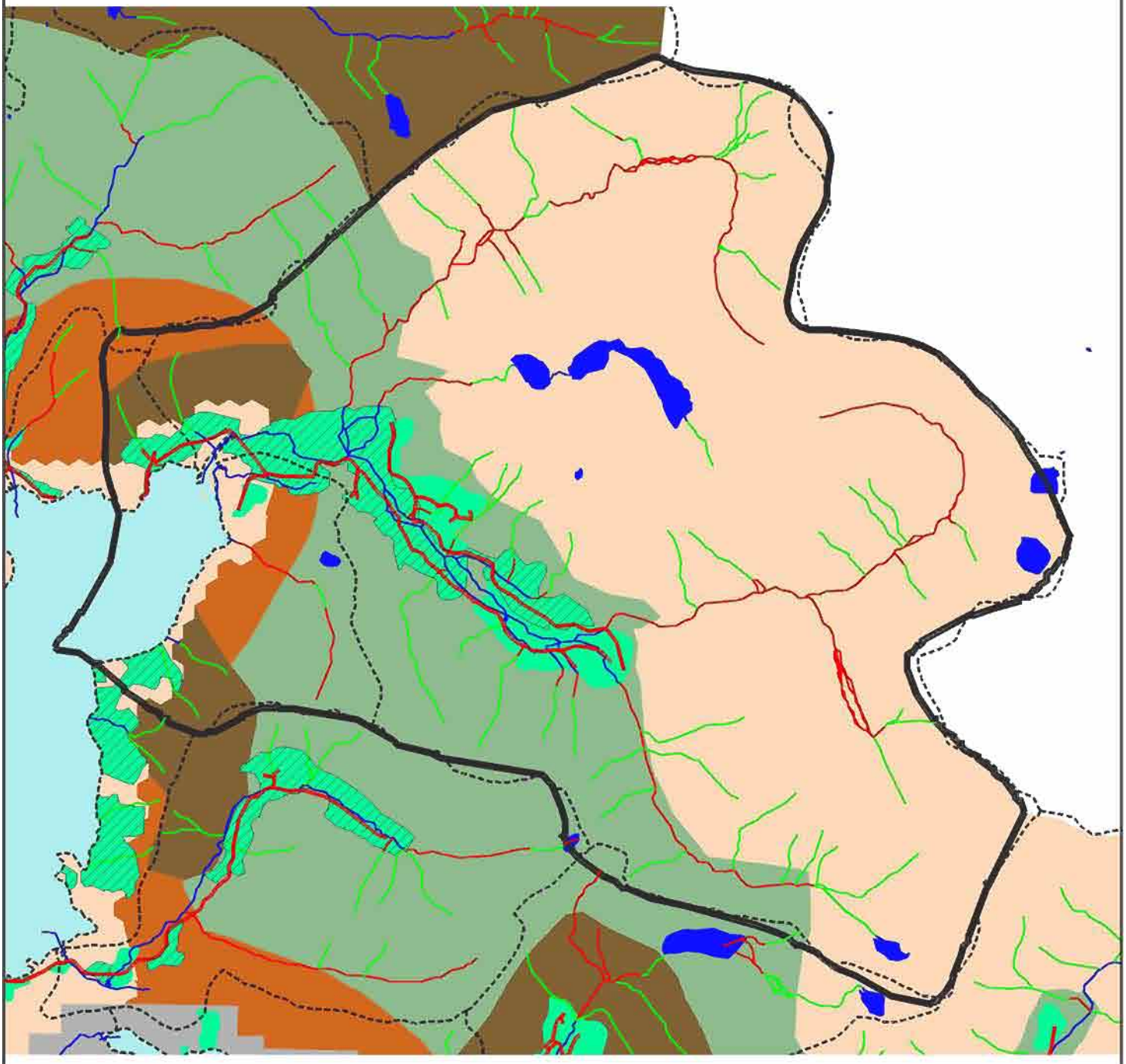
Figure 5-3

Recommendations For and Opportunities within VCU 2990: Annahootz Mountain (Nakwasina)

- Complete RCS surveys within the Nakwasina Road System.
- Remove and/or repair problem areas identified within this RCS.
- Obtain road condition data on the unclassified road.
- Evaluate ATV use concerns.
- Evaluate additional riparian thinning and instream LW project opportunities and/or needs in previously harvested RMAs for Fisheries and Watershed improvements.
- Evaluate past riparian thinning and instream LW projects in riparian areas.
- Monitor past thinning for effectiveness, and assess the need for additional treatments.
- Monitor previously thinned acres for recreation ROS conversion.
- Reevaluate thinning needs in stands 37, 69, 63, 83, 81, and 121.
- Complete a Water Quality Restoration Plan to address the 303d listing.
- Determine whether the small Old-growth Reserve in this VCU provides quality habitat. Meet with ADF&G to review the location of the small OGR.
- Work with ADF&G and USFWS to develop a proposal for a small OGR to meet Forest Plan standards and guidelines.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. An opportunity exists to harvest the regeneration to help bring this LUD into compliance with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 2990 –Annahootz Mountain



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.23 2.45 Miles

Map Scale 1:77622

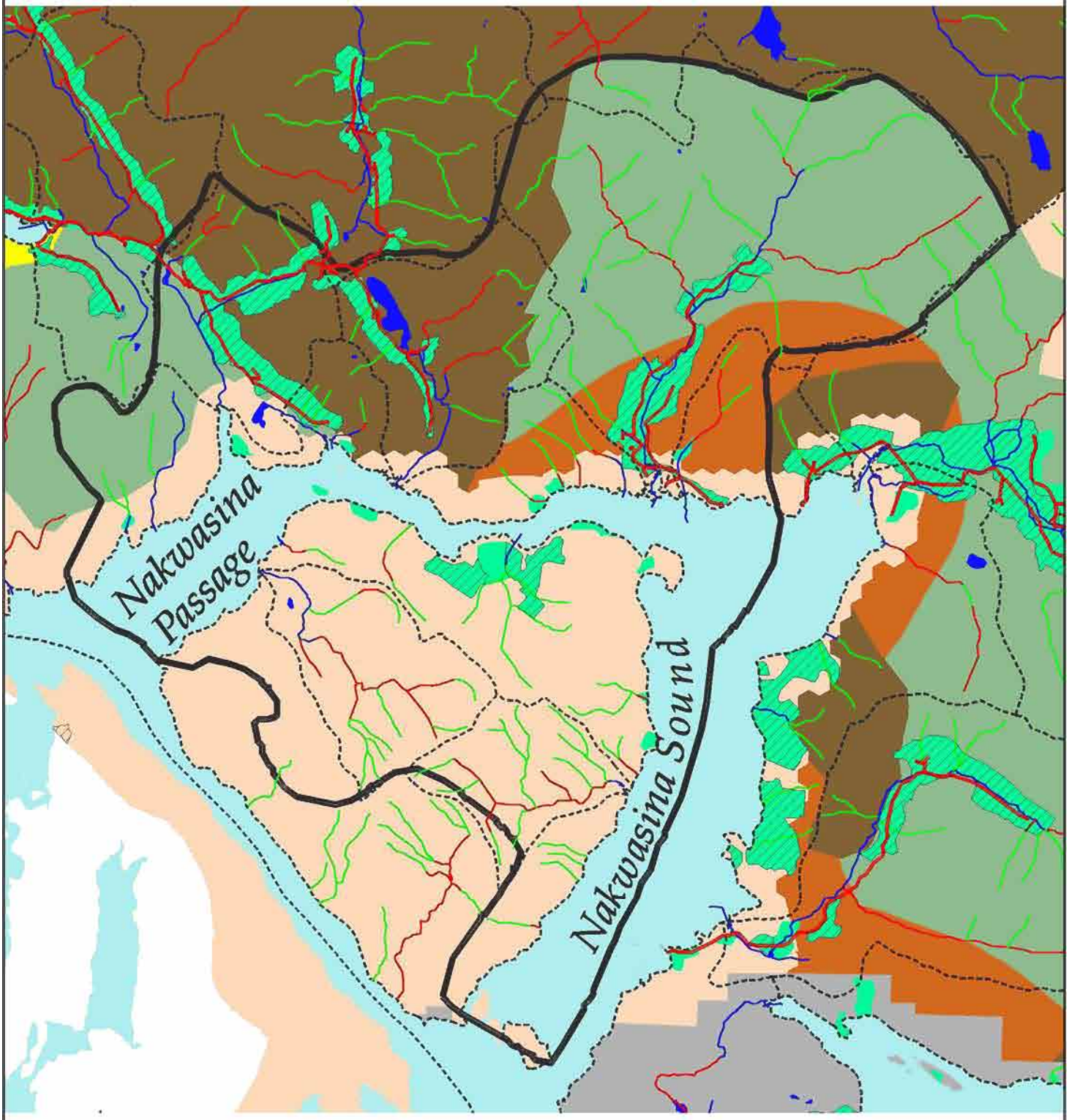
Figure 5-4

Recommendations For and Opportunities within VCU 3000: Nakwasina Passage

- Remove and/or repair problem areas identified within the RCS.
- Close roads within non-development LUDs.
- Monitor completed riparian thinning in previously harvested RMAs for continued Fisheries and Watershed improvement.
- Monitor past thinning for effectiveness, and assess the need for additional treatments.
- Develop or update road management objectives to meet Land Use Designation objectives for roads that occur in the Old-growth Habitat Reserve.
- Monitor previously thinned stands for recreation ROS conversion.
- Consider developing Forest Road 7583 for OHV use.
- Consider developing Forest Road 7585 for OHV use.
- Place travel management signs along roads to encourage appropriate OHV use.
- Continue to monitor roads for increased use.
- Consider proper closure of Forest Road 7582 because it is a road proposed for use in the *Southeast Alaska Transportation Plan*.
- Landscape conditions within the Old-growth Habitat Reserve and Semi-remote Recreation LUDs do not provide the appropriate type of recreation experience for these LUDs. An opportunity exists to harvest the regeneration to help bring these LUDs into compliance with the Forest Plan.
- Continue Deer Pellet Transects surveys.
- Evaluate Free Use program.

Sitka Sound Landscape Assessment Area

VCU 3000 –Nakwasina Passage



- Modified Landscape
- Enacted Municipal Watershed
- Old Growth Habitat
- Remote Recreation
- Semi–Remote Recreation
- Scenic Viewshed
- Timber Production
- Non –National Forest
- Previous Harvest
- Thinned Units
- Class 1 Streams
- Class 2 Streams
- Class 3 Streams
- Roads
- VCU Boundary
- Watershed Boundaries

0 1.26 2.51 Miles

Map Scale 1:79558

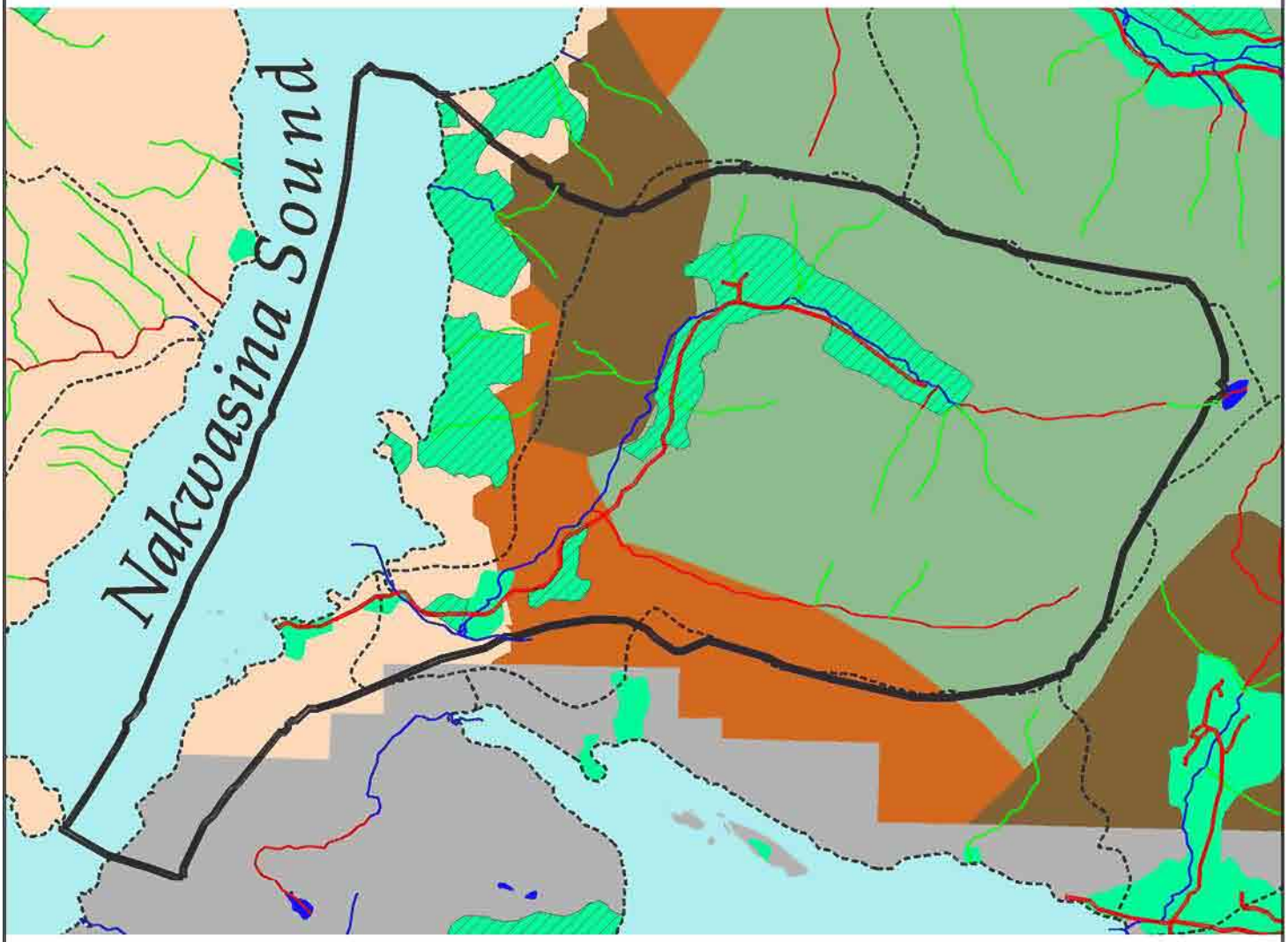
Figure 5-5

Recommendations For and Opportunities within VCU 3010: Nakwasina Sound

- Complete RCS surveys within the Lisa Creek Road System.
- Remove and/or repair problem areas identified within this RCS.
- Evaluate thinning opportunities in previously harvested RMAs for Fisheries and Watershed improvements.
- Evaluate need for instream LW work.
- Evaluate wildlife thinning opportunities in the beach fringe for stand 34.
- Evaluate riparian thinning opportunities for restoring large wood recruitment and function in riparian areas.
- Monitor previously thinned acres for recreation ROS conversion.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. An opportunity exists to thin trees to help bring this LUD into compliance with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3010 –Nakwasina Sound



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.84 1.68 Miles

Map Scale 1:53246

Figure 5-6

Recommendations For and Opportunities within VCU 3020: Neva Strait

- Complete RCS surveys within the St John Road System.
- Remove and/or repair problem areas identified within the RCS, including fish passage barriers.
- Close roads within non-development LUDs.
- Develop or update road management objectives to meet Land Use Designation objectives for roads that occur in the Old-growth Habitat Reserve.
- Opportunity to reconstruct the Forest Road for passenger vehicle use as proposed in the *Southeast Alaska Transportation Plan*.
- Consider developing Forest Road 7583 for OHV use.
- Evaluate need for instream LW work.
- Reevaluate the St. John Timber Sale. Consider redesigning the sale for better economic viability or for 10-year timber sale contracts. This sale is currently on the 10-year timber sale schedule.
- Evaluate land within developmental LUDs near St. John the Baptist Bay for small timber sale opportunities that would utilize the existing road system (Forest Service Roads 75831 and 7583). Consider opening and /or maintaining selected portions of this road system through small-scale timber harvest or stewardship contracts.
- Monitor past thinning for effectiveness, and assess the need for additional treatments. Conduct aerial reconnaissance and follow up with field reconnaissance as needed. Update the SIS database with revised thinning needs.
- Reevaluate outfitter and guide permits in non-development LUDs.

Sitka Sound Landscape Assessment Area

VCU 3020 –Neva Strait

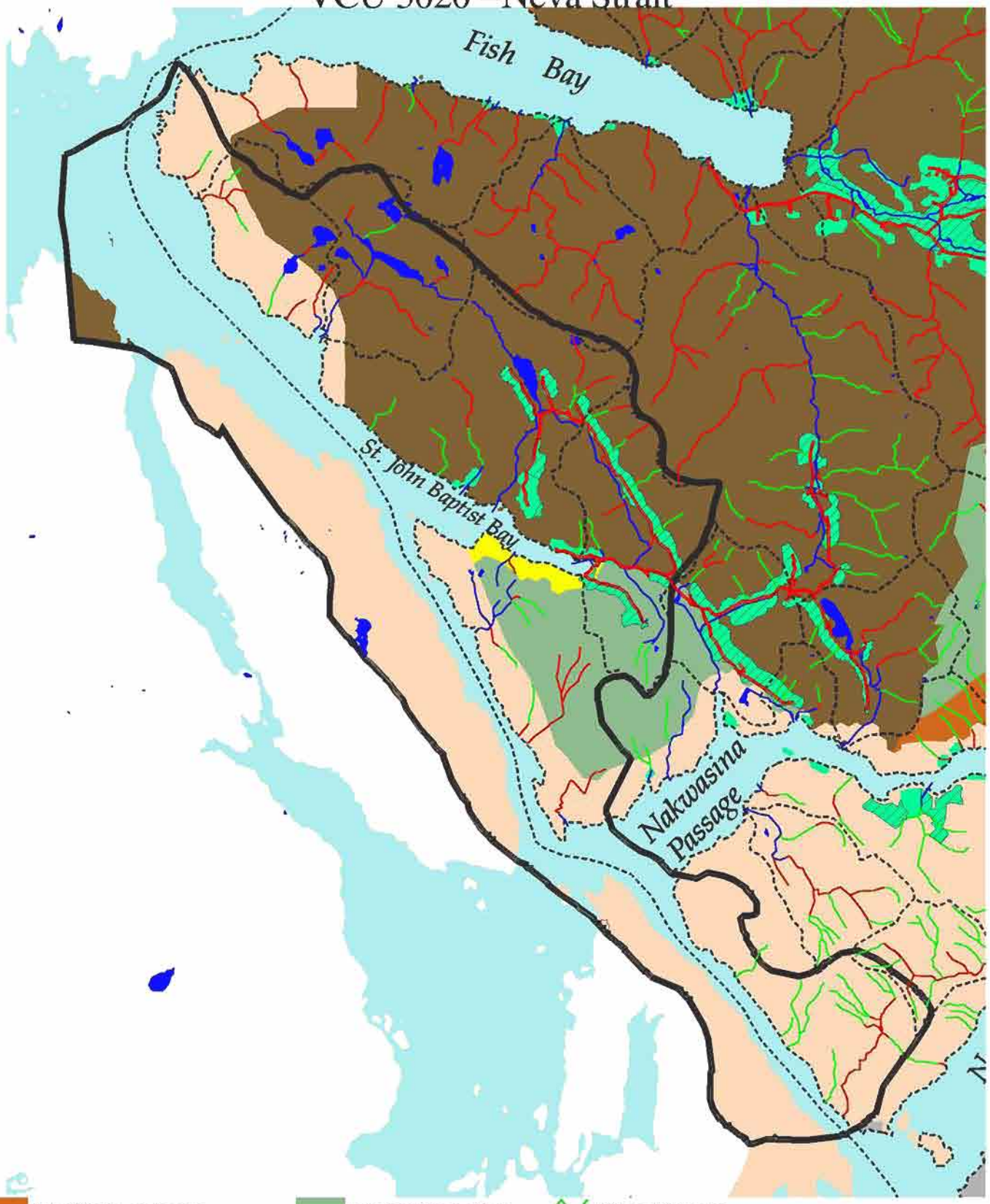


Figure 5-7

Recommendations For and Opportunities within VCU 3100: Gavanski Island

No recommendations or opportunities were identified for this VCU.

Sitka Sound Landscape Assessment Area

VCU 3100 –Gavanski Island

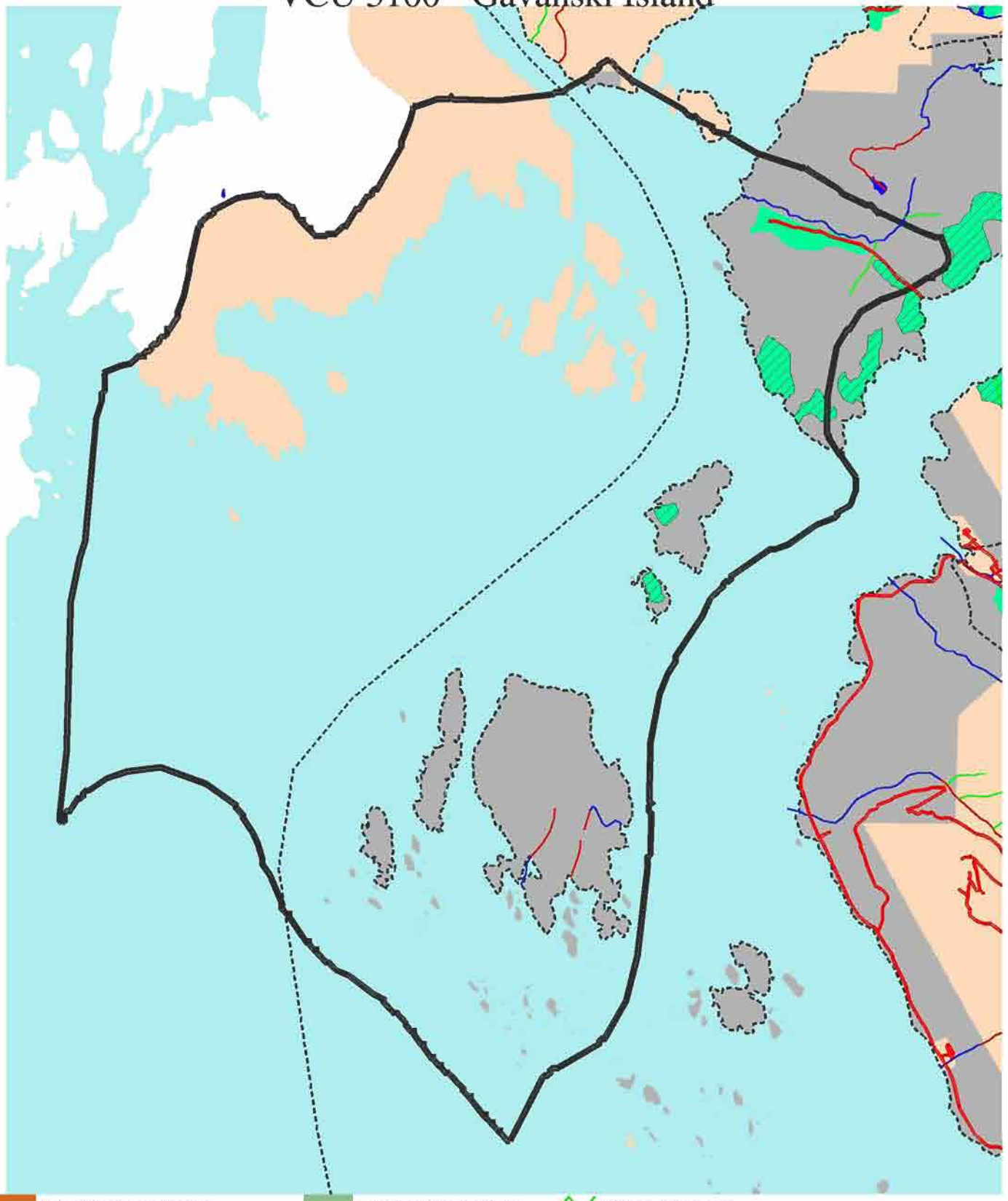


Figure 5-8

Recommendations For and Opportunities within VCU 3110: Sitka

- Evaluate thinning opportunities in previously harvested RMAs for Fisheries and Watershed improvements.
- Evaluate young growth in Starrigavan for multi-resource thinning opportunities.
- Evaluate need for instream LW work.
- Work cooporatively with other land owners on watershed and fisheries programs (for education and for maintaining and improving watershed conditions).
- Monitor and maintain previously installed instream LW structures, connected borrow ponds and riparian thinning.
- Continue natural resource education opportunities (e.g., the Swan Lake fishing derby, 5th grade field day, interpretive thinning plots, Cabin Fever talks, wilderness education programs, ATV education programs, etc.).
- Monitor/maintain the Starrigavan Demonstration Thinning and Pruning Interpretive Site.
- Continue interpretive tours on the history and stand dynamics of the Russian Verstovia forest.
- Work with the community of Sitka to reduce available wildlife attractants (e.g., garbage, compost, etc.).
- Consider developing FR 7576 for OHV use and reevaluating its maintenance level.
- Consider developing FR 7578 for OHV use and reevaluating its maintenance level.
- Consider potential ATV trails when completing the Access and Travel Management Plan.
- Consider thinning at Starrigavan to create new ATV trails.
- Develop recreational stewardship contracts (e.g., provide goods for services such as firewood for thinning).
- Reconstruct the Starrigavan Trail System.
- Reconstruct the Harbor Mountain/Gavan Hill Trails.
- Reevaluate the Starrigavan ATV Trail Plan. Consider extending ATV trails into the Starrigavan Valley and changing existing road maintenance levels.
- Update the Harbor Mountain Recreation Area Plan to account for OHV use and increased use in general.
- Develop a more comprehensive recreation plan for Sandy Beach in conjunction with the City of Sitka.
- Construct a hike-in cabin at the Starrigavan Complex.
- Construct a tent campground off the Verstovia Trail that is accessible from Sitka by foot (Note: this activity is currently being considered).
- Monitor authorized ATV trails for impacts, as well as unauthorized OHV use.
- Complete the Sitka Area Recreation Complex Carrying Capacity to allocate Recreation Special Use Permits.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. An opportunity exists to thin trees to help bring this LUD into compliance with the Forest Plan.
- Construct a Fishing Pier at Starrigavan campground.
- Construct a Hike-In cabin(s) along the existing trail or road system or off a new trail.

Sitka Sound Landscape Assessment Area

VCU 3110 –Sitka

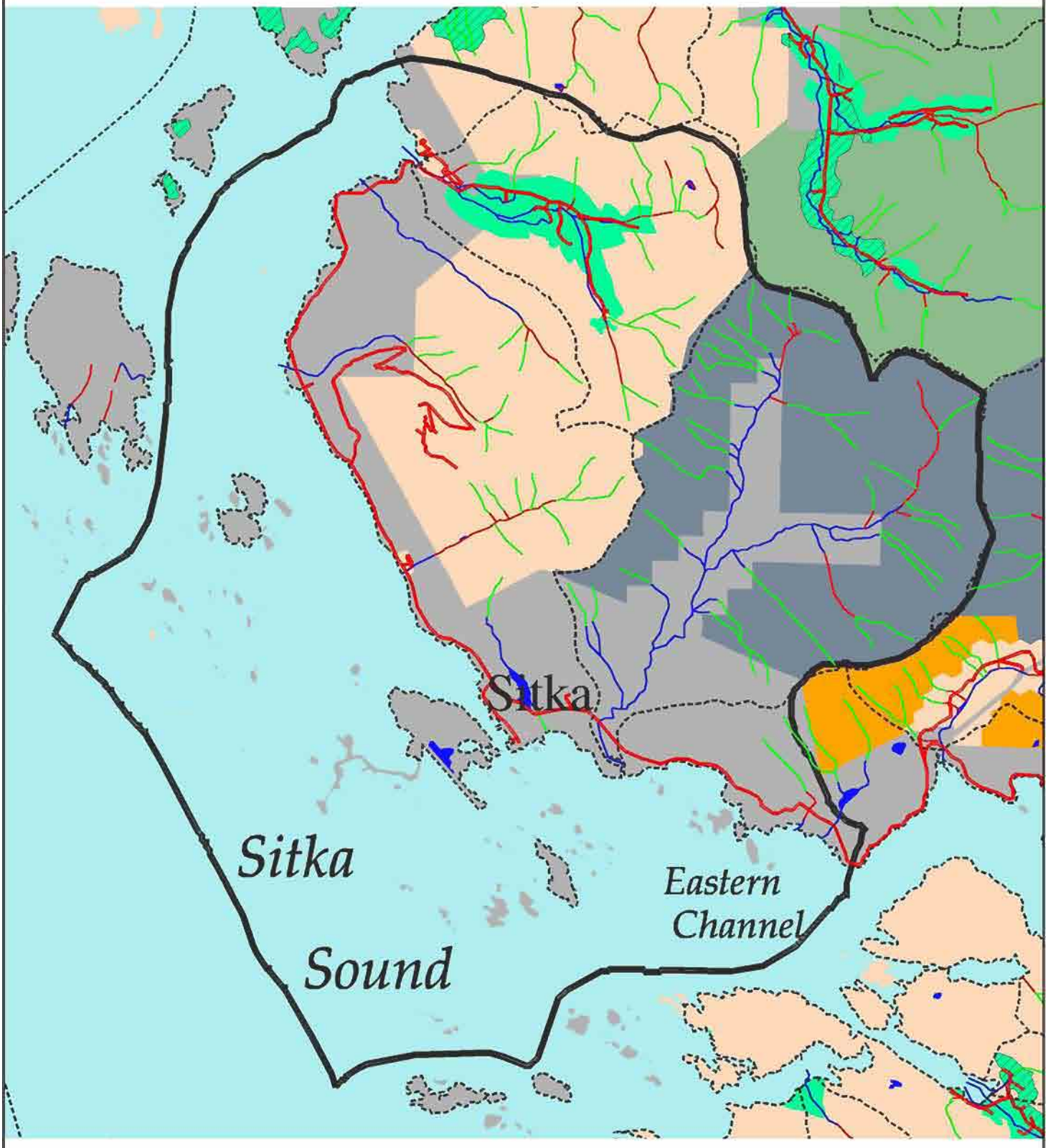


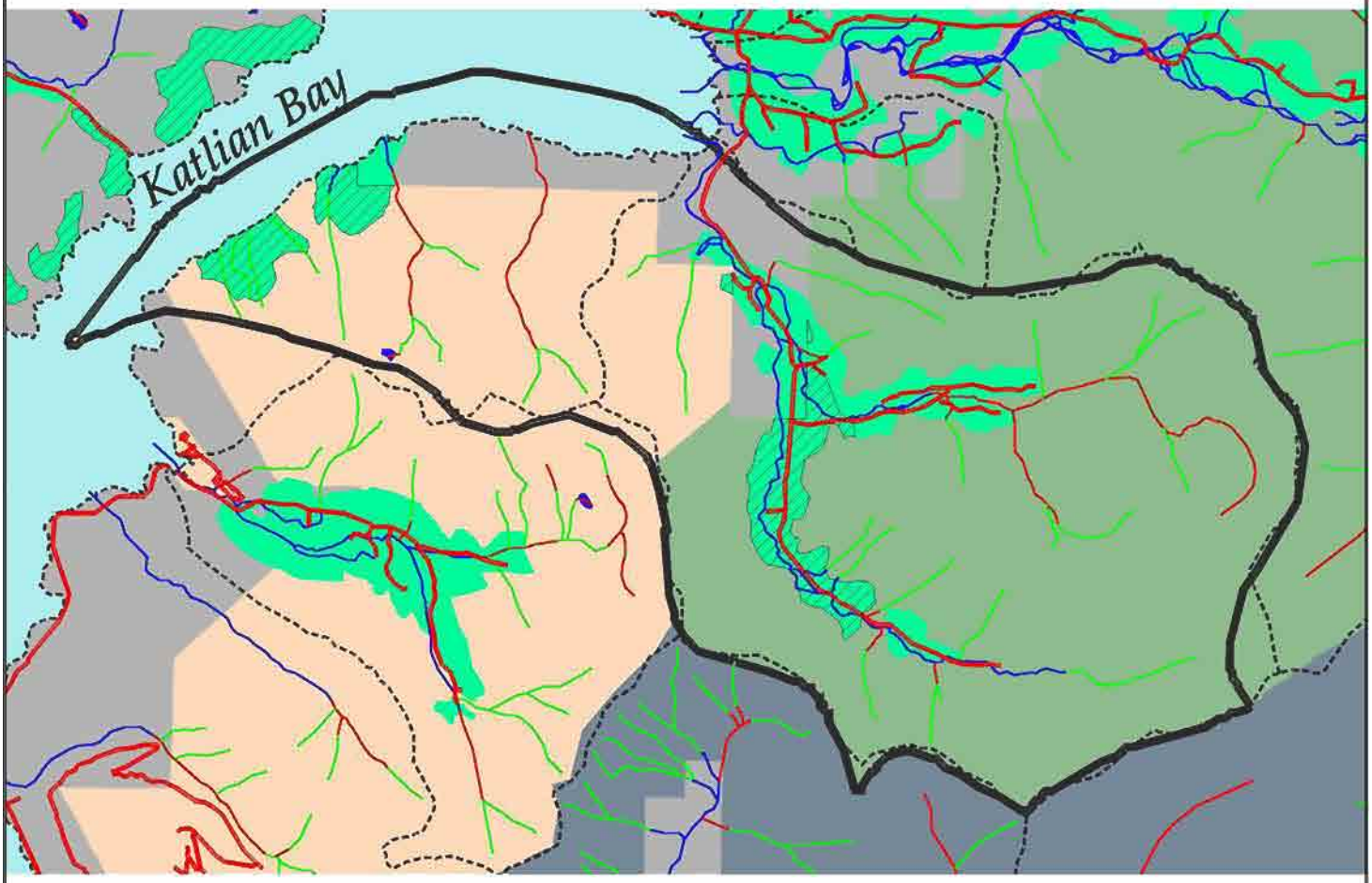
Figure 5-9

Recommendations For and Opportunities within VCU 3120: Katlian Bay

- Incorporate recommendations of the Katlian Watershed Assessment and work cooporatively with Shee Atika Inc. and STA on watershed improvement projects.
- Complete Road Condition Surveys.
- Address water-related concerns identified in Road Condition Surveys.
- Evaluate riparian emphasis thinning and instream LW restoration needs.
- Monitor previously thinned areas for recreation ROS conversion.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. The harvest units are too old to be thinned. Natural regeneration will convert the landscape and eventually bring this LUD into compliance with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3120 –Katlian Bay



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.18 2.37 Miles

Map Scale 1:74956

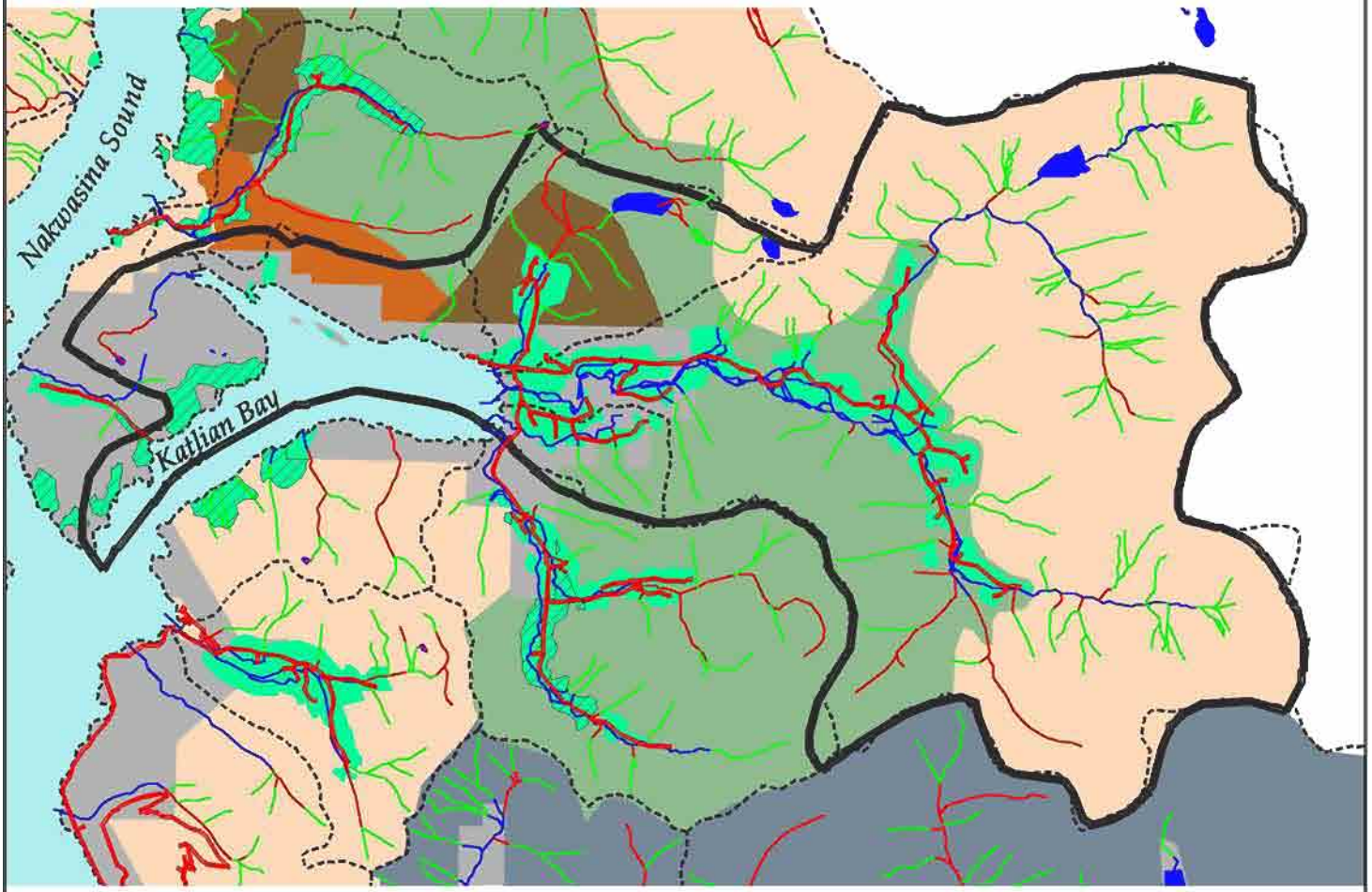
Figure 5-10

Recommendations For and Opportunities within VCU 3130: Katlian River

- Incorporate recommendations of the Katlian Watershed Assessment and work cooporatively with Shee Atika Inc. and STA on watershed improvement projects.
- Complete RCS surveys within the Katlian Road System.
- Remove and/or repair problem areas identified in this RCS.
- Evaluate thinning opportunities in previously harvested RMAs for Fisheries and Watershed improvements.
- Evaluate need for instream LW work.
- Complete a Water Quality Restoration Plan to address the 303d listing.
- Evaluate thinning opportunities for promoting future large wood recruitment in riparian areas.
- Monitor previously thinned areas for recreation ROS conversion.
- Determine whether the small Old-growth Reserve provides quality habitat. Meet with ADF&G to review the location of the small OGR.
- Work with ADF&G and USFWS to develop a proposal for a small OGR to meet Forest Plan standards and guidelines.
- Develop or update road management objectives to meet Land Use Designation objectives for roads that occur in the Old-growth Habitat Reserve.
- Forest Road proposed for use in the *Southeast Alaska Transportation Plan*.
- Landscape conditions within the Old-growth Habitat Reserve and Semi-remote Recreation LUDs do not provide the appropriate type of recreation experience for these LUDs. The harvest units are too old to be thinned. Natural regeneration will convert the landscape and eventually bring these LUDs into compliance with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3130 –Katlian River



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.97 3.95 Miles

Map Scale 1:125089

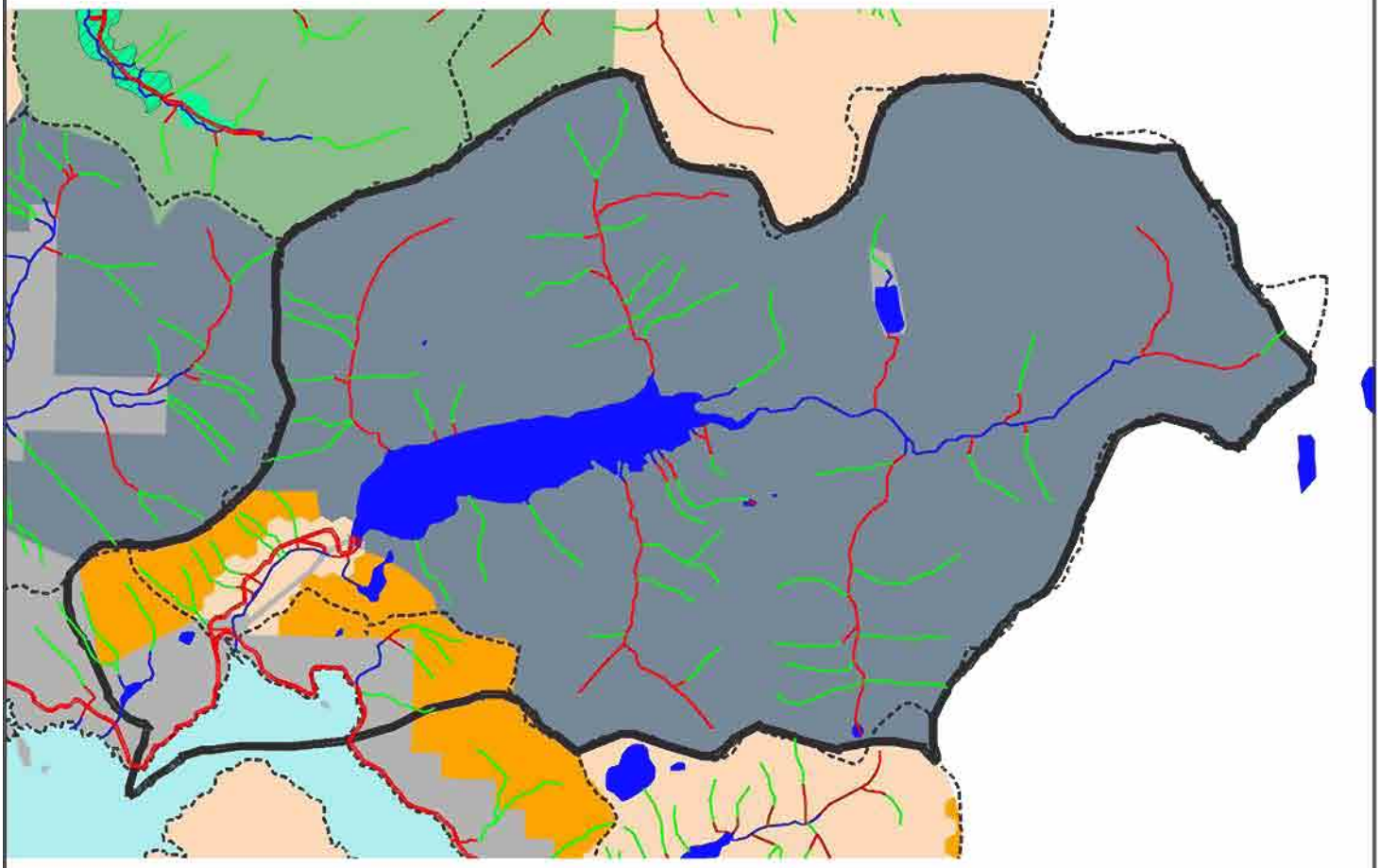
Figure 5-11

Recommendations For and Opportunities within VCU 3180: Blue Lake

- Maintain or improve the existing road system.
- Construct a trail from Herring Cove to Beaver Lake.
- Construct a hiking/biking trail at Thimbleberry/Heart Lake.
- Replace the bridge at the Blue Lake Campground
- Construct a hike-in cabin near Beaver Lake.
- Update the Sawmill Creek Campground Plan to account for increased use.
- Develop a comprehensive Recreation Plan for the Blue Lake Campground.
- Complete the Sitka Area Recreation Complex Carrying Capacity for allocation of Recreation Special Use Permits.
- Landscape conditions within the Remote Recreation and Semi-remote Recreation LUDs do not provide the appropriate type of recreation experience for these LUDs. Forest Plan LUD and Recreation Opportunity Spectrum (ROS) designations should be reviewed and potentially changed so that these LUDs comply with the Forest Plan.
- Work with the City of Sitka, as well as other State and Federal agencies to complete the Blue Lake FERC relicensing work.

Sitka Sound Landscape Assessment Area

VCU 3180 –Blue Lake



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed

Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams

Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.6 3.2 Miles

Map Scale 1:101514

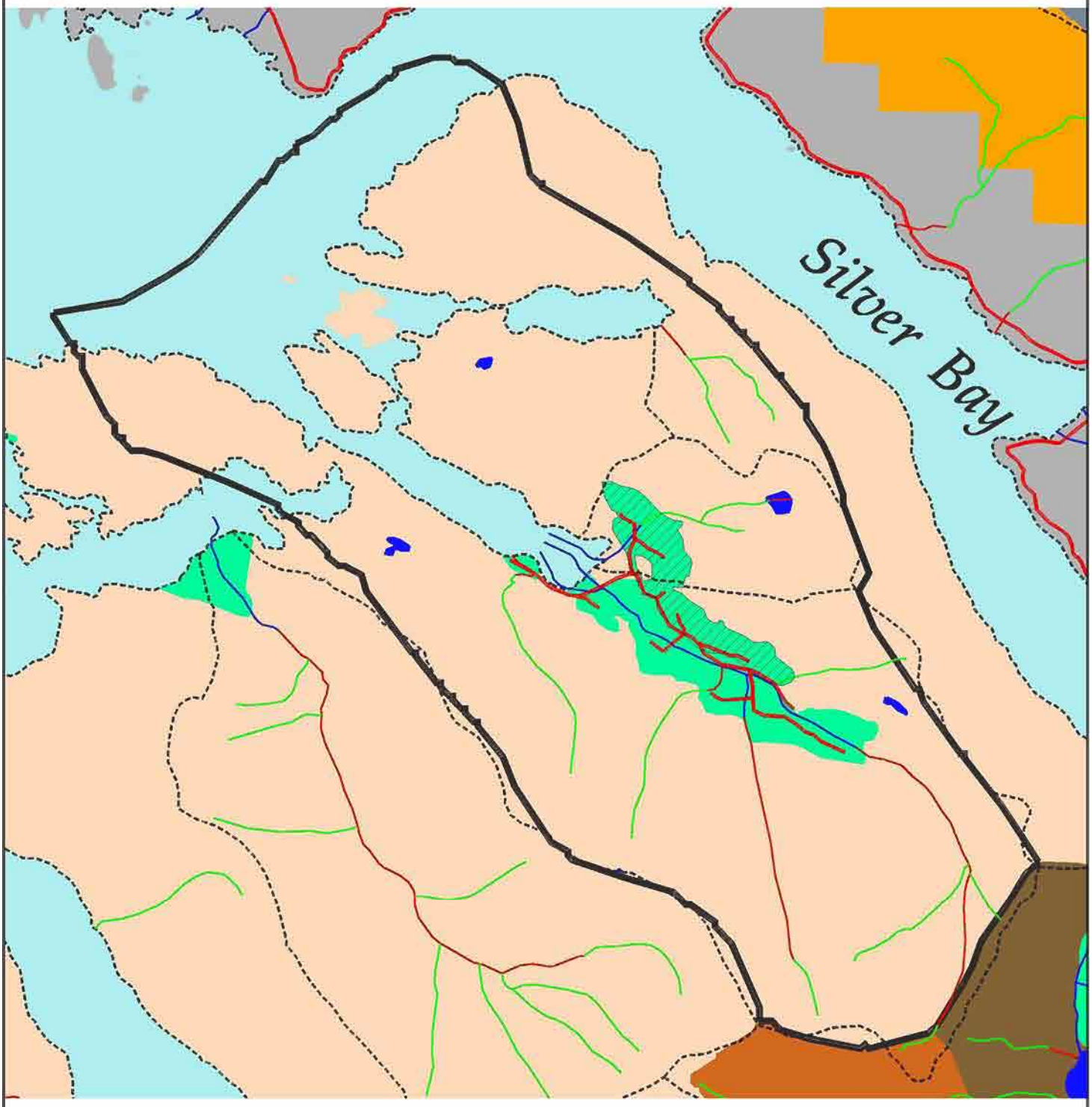
Figure 5-12

Recommendations For and Opportunities within VCU 3190: Sugarloaf Mountain

- Evaluate the accuracy of Road Condition Survey data.
- Remove and/or repair problem areas identified within this RCS.
- Evaluate thinning opportunities in previously harvested RMAs for Fisheries and Watershed improvements (stewardship contracts).
- Evaluate need for instream LW work.
- Monitor and maintain previously installed LW/debris jam structures.
- Evaluate thinning opportunities with riparian and recreation emphases.
- Consider stewardship contracting for thinning and other restoration work.
- Construct survival shelters.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. Forest Plan LUD and Recreation Opportunity Spectrum (ROS) designations should be reviewed and potentially changed so that this LUD complies with the Forest Plan. There is also the opportunity to harvest the regeneration to help bring the area into compliance with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3190 –Sugarloaf Mountain



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.68 1.36 Miles

Map Scale 1:43122

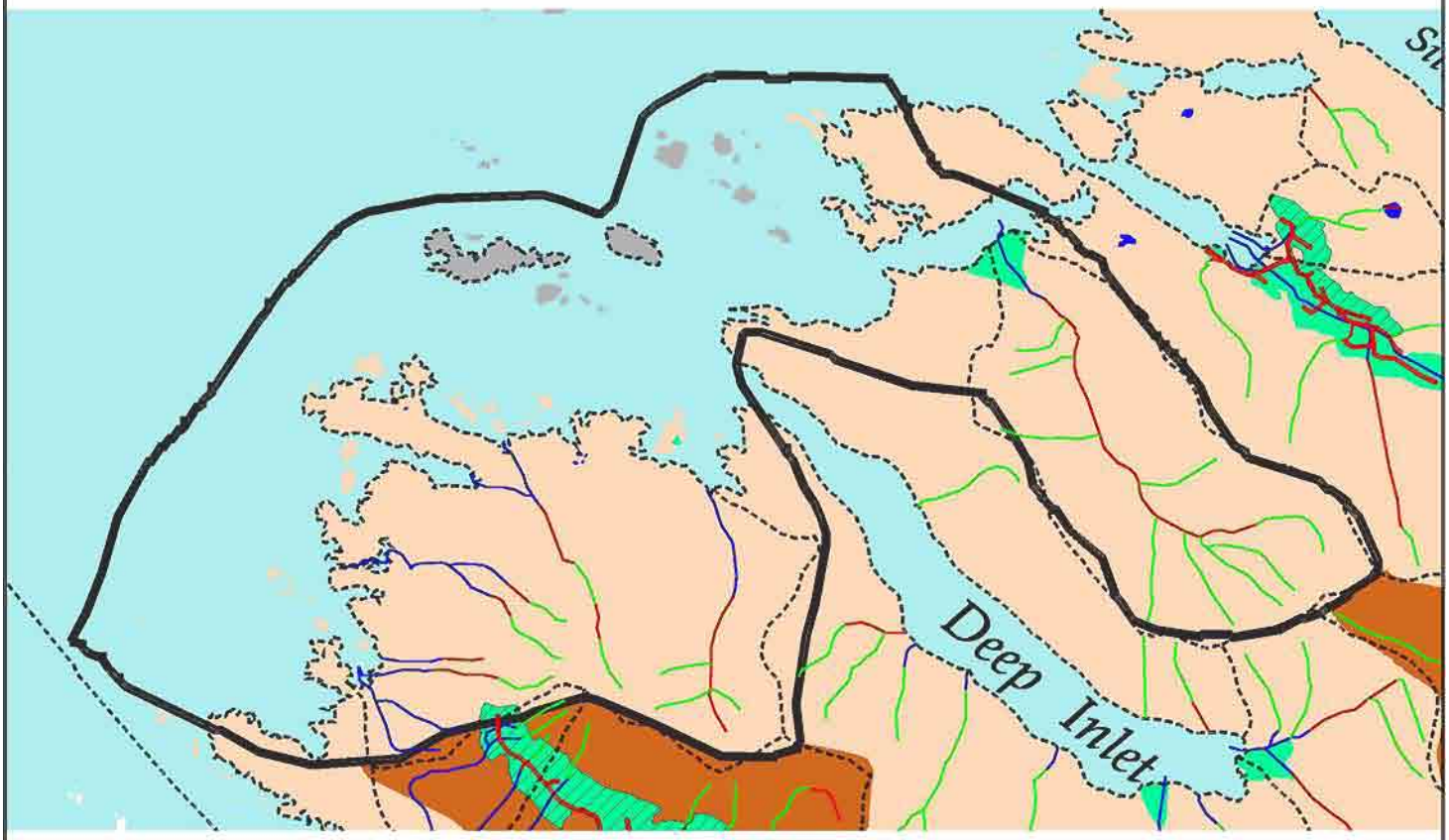
Figure 5-13

Recommendations For and Opportunities within VCU 3200: Aleutkina Bay

- Construct survival shelters.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. Forest Plan LUD and Recreation Opportunity Spectrum (ROS) designations should be reviewed and potentially changed so that this LUD complies with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3200 –Aleutkina Bay



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.3 2.6 Miles

Map Scale 1:82506

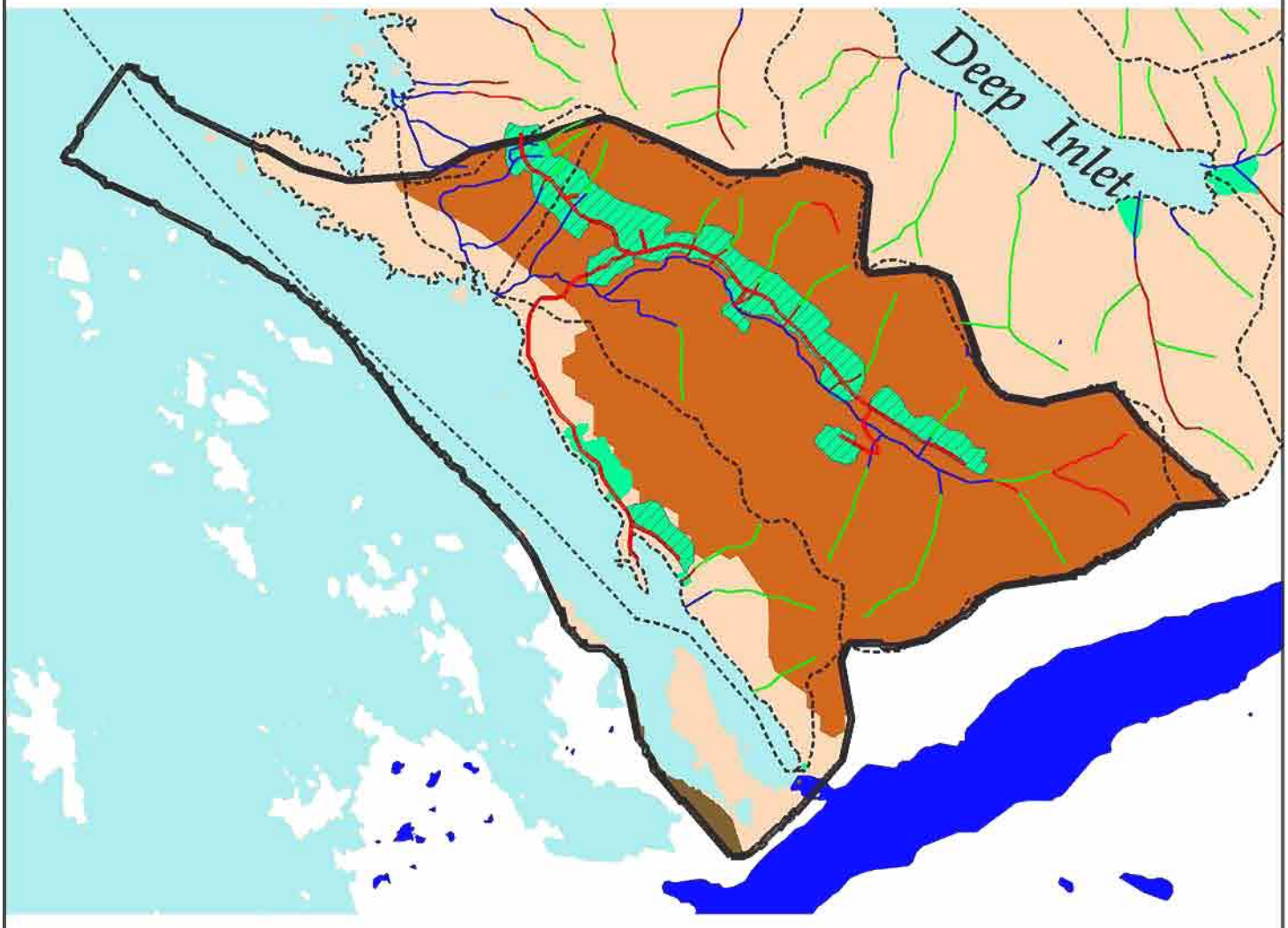
Figure 5-14

Recommendations For and Opportunities within VCU 3210: Redoubt Bay

- Evaluate thinning opportunities for wildlife and fisheries/riparian objectives in the Kizhuchia Creek drainage.
- Evaluate current OML2 status for road 7582 for possible change to OML1.
- Assess current condition of the two Fishpass structures on Kizhuchia Creek and determine future management and maintenance needs.
- Monitor past thinning activities.
- Conduct interdisciplinary field and/or aerial reconnaissance and prioritize treatment needs.
- Construct a road to regain access to the existing Forest Road for public and administrative purposes.
- Develop roads for ATV use.
- Address red pipe concerns.
- Construct survival shelters.
- Landscape conditions within the Semi-remote Recreation LUD do not provide the appropriate type of recreation experience for this LUD. Forest Plan LUD and Recreation Opportunity Spectrum (ROS) designations should be reviewed and potentially changed so that this LUD complies with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3210 –Redoubt Bay



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.25 2.5 Miles

Map Scale 1:79119

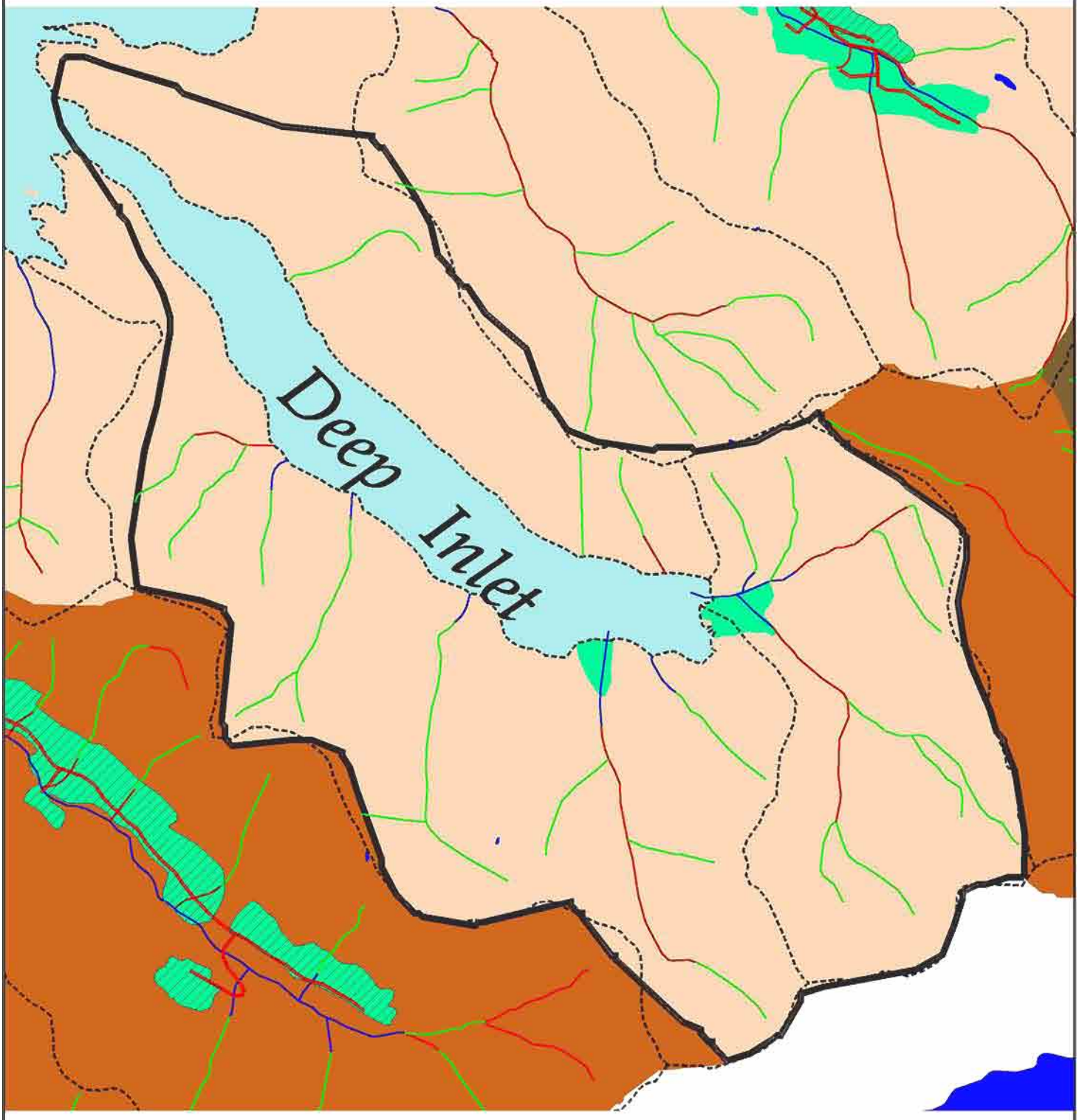
Figure 5-15

Recommendations For and Opportunities within VCU 3220: Deep Inlet

- Construct survival shelters.

Sitka Sound Landscape Assessment Area

VCU 3220 –Deep Inlet



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.75 1.5 Miles

Map Scale 1:47565

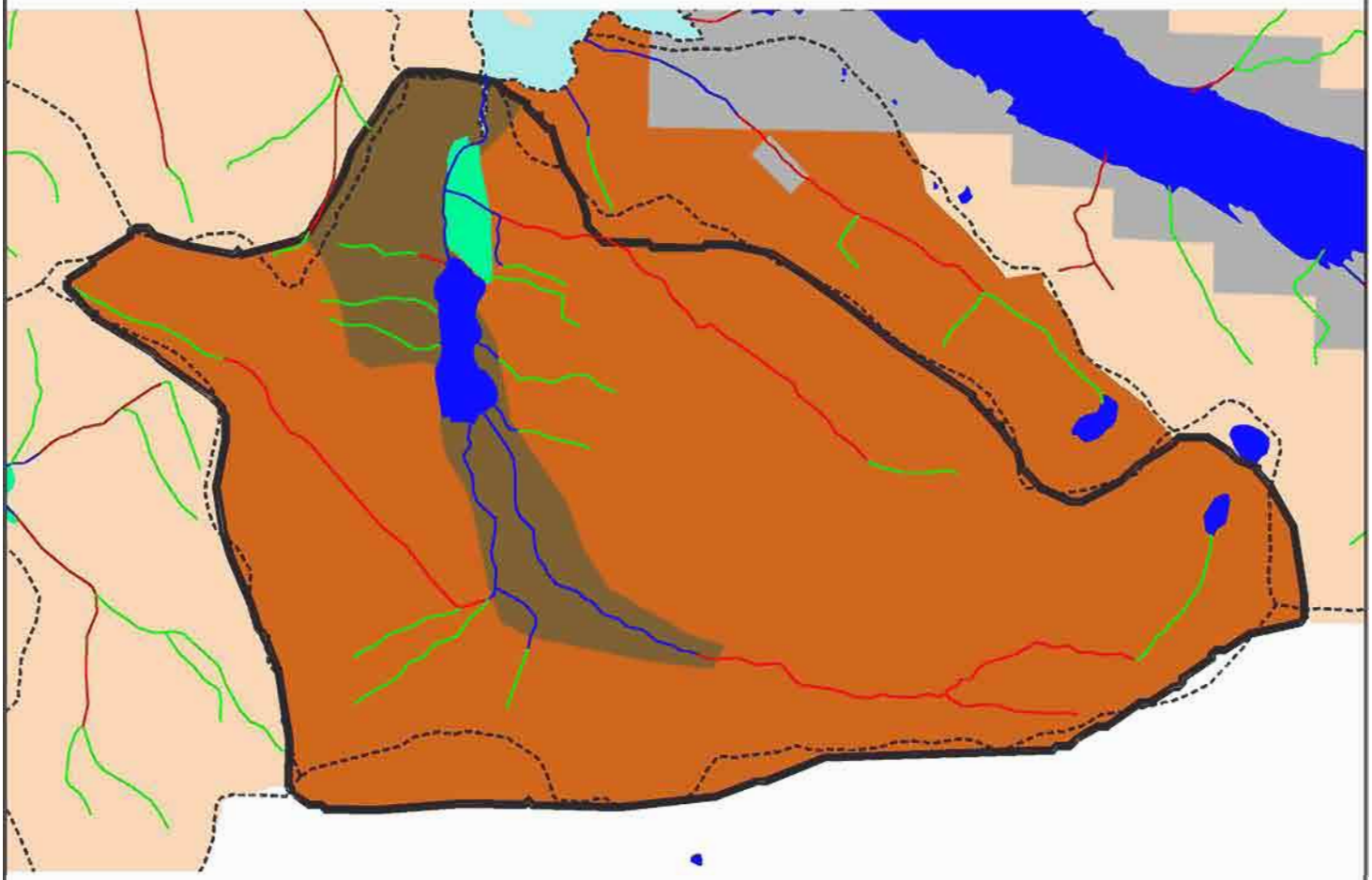
Figure 5-16

Recommendations For and Opportunities within VCU 3230: Salmon Lake

- Continue to support the Salmon Lake weir and fisheries evaluation project.
- Determine whether the small Old-growth Reserve provides quality habitat. Meet with ADF&G to review the location of the small OGR.
- Work with ADF&G and USFWS to develop a proposal for the small OGR to meet Forest Plan standards and guidelines.
- Reconstruct the Lucky Chance/ Salmon Lake Loop Trail.
- Reconstruct the Salmon Lake to Redoubt Lake/Cabin Trail.
- Evaluate stewardship opportunities to have the blowdown removed to clear trails.

Sitka Sound Landscape Assessment Area

VCU 3230 –Salmon Lake



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.87 1.75 Miles

Map Scale 1:55380

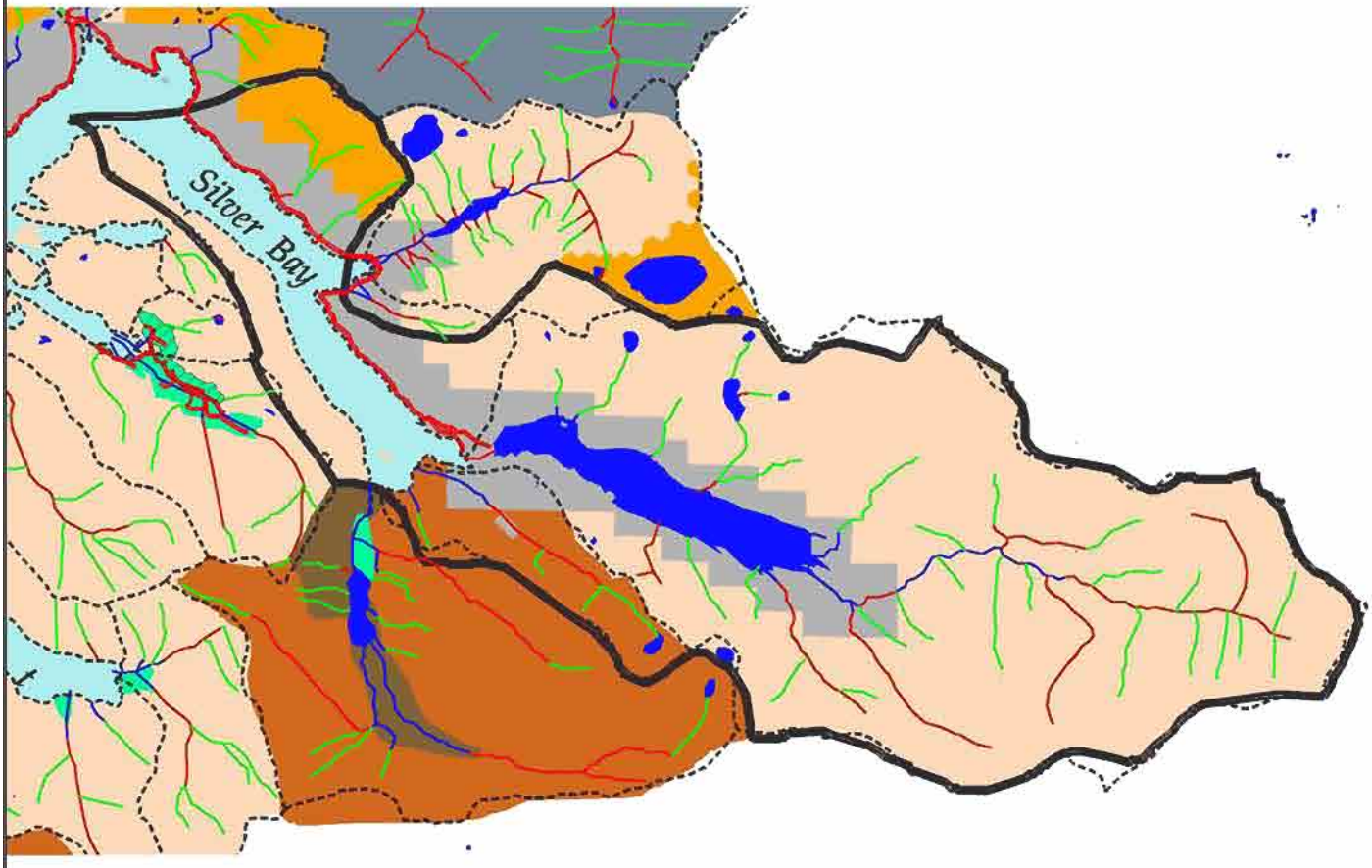
Figure 5-17

Recommendations For and Opportunities within VCU 3240: Greek Lake

- Reconstruct the Lucky Chance/ Salmon Lake Loop Trail.
- Landscape conditions within the Remote Recreation and Semi-remote Recreation LUDs do not provide the appropriate type of recreation experience for these LUDs. Forest Plan LUD and Recreation Opportunity Spectrum (ROS) designations should be reviewed and potentially changed so that these LUDs comply with the Forest Plan.

Sitka Sound Landscape Assessment Area

VCU 3240 –Green Lake



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 1.97 3.93 Miles

Map Scale 1:124645

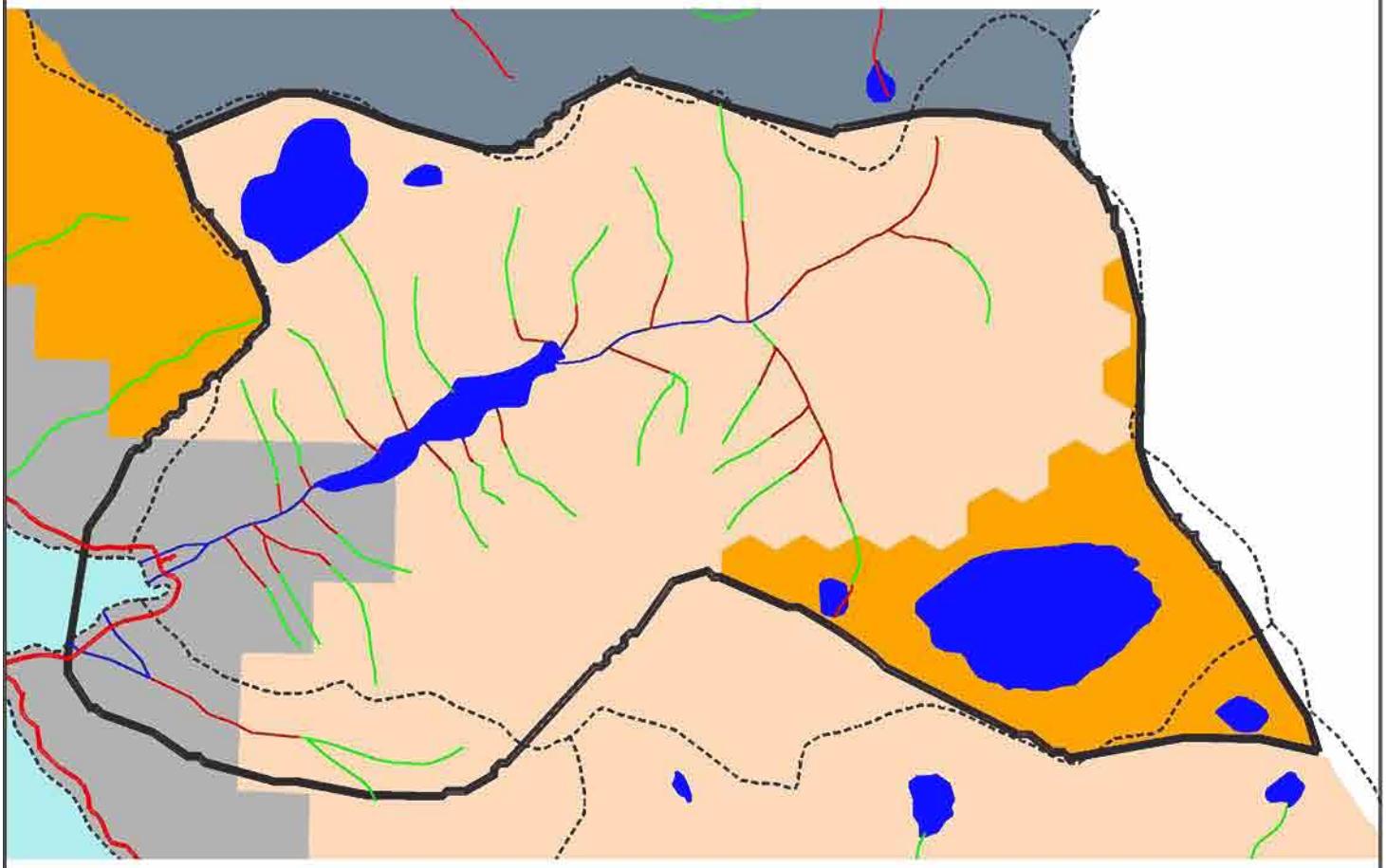
Figure 5-18

Recommendations For and Opportunities within VCU 3250: Bear Cove

- Construct a trail to Medvejie Lake.
- Construct a cross-island trail from Medvejie Lake to Baranof Warm Springs.

Sitka Sound Landscape Assessment Area

VCU 3250 –Bear Cove



Modified Landscape
Enacted Municipal Watershed
Old Growth Habitat
Remote Recreation
Semi–Remote Recreation
Scenic Viewshed
Timber Production
Non –National Forest
Previous Harvest
Thinned Units
Class 1 Streams
Class 2 Streams
Class 3 Streams
Roads
VCU Boundary
Watershed Boundaries

0 0.63 1.27 Miles

Map Scale 1:40207

Figure 5-19

Chapter 6 – Glossary and References

Glossary

Adfluvial
Fish that live in lakes and migrate into streams to spawn.

Alluvial Fan
A cone shaped deposit of organic and mineral material made by a stream where it runs out from a narrow valley (or V-notch) onto a plain or meets a slower stream.

Anadromous Fish
Fish that spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steelhead trout. There are also anadromous Dolly Varden char.

Angle of Repose
The maximum slope or angle at which soil or loose rock material remains stable.

Beach Fringe
The area inland from salt-water shorelines, which is typically forested.

Bedload
Sediment moving on or near the stream bed and frequently in contact with it.

Biodiversity
(Also referred to as **Biological Diversity**.) The variety of life forms and processes, including the complexity of species, communities, gene pools, and ecological functions, within the area covered by a land management plan.

Biomass
The total quantity, in a given time, of living organisms of one or more species per unit area or all of the species in a community.

Bog
Wetlands where sphagnum moss growth has separated the peat surface from ground water (e.g., domed bog). They receive their mineral supply solely from rain and snow.

Classified Roads
Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads,

county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service.

Colluvial / Colluvium
A general term for loose deposits of soil and rock moved by gravity; e.g. talus.

Cutlslope
The surface exposed, usually of undisturbed soil, above a road or excavation.

Decommissioned Roads
Roads that are no longer needed and that have been stabilized and restored to a more natural state. These roads are not managed as part of the National Forest Road System and no maintenance is performed after decommissioning. The process of decommissioning a road includes reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation. Culverts and bridges are removed, water bars are added, and the road entrance is generally blocked to motorized traffic. Temporary roads are typically decommissioned upon completion of timber sale activities.

Ecosystem
A complete, interacting system of organisms considered together with their environment (e.g., a marsh, a watershed, or a lake).

Ecosystem Management
Using an ecological approach to land management to sustain diverse, healthy and productive ecosystems. Ecosystem management is applied at various scales to blend long-term societal and environmental values in a dynamic manner that may be modified through adaptive management.

Erosion
The wearing away of the land surface by running water, wind, ice, gravity, or other geologic activity.

Estuary
An ecological system at the mouth of a stream where fresh and salt water mix and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.

Even-Aged Management
The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcutting is an example of this type of management.

Fen
A tract of low, wet ground containing sedge peat that is relatively rich in mineral salts, alkaline in reaction, and characterized by slowly flowing water. Vegetation is generally sedges and greases, often with low shrubs and sometimes a sparse cover of trees. Sphagnum mosses are absent or of low cover. Unlike peatlands (commonly referred to as bogs or muskegs), fens contribute to stable stream flows, provide nutrient input to streams and often contribute to fish rearing habitat.

Fill Slope
Surface formed, often of loose soil at the angle or repose, on the downslope side of a road, trail, or landing as a result of earthmoving in construction.

Fish Habitat
The combined aquatic and surrounding terrestrial environments that afford the necessary physical and biological support systems required by fish species during various life stages.

Floodplain
That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages in response to a 100-year storm event.

Fluvial Processes
Processes driven by moving water, such as formation of floodplains, alluvial fans or deltas, and stream channel scour.

Forbs
A grouping/category of herbaceous plants, which are not included in the grass, shrub, or tree groupings/categories; generally smaller flowering plants.

Forest Plan
See the entry for Tongass Land and Resource Management Plan.

Geographic Information System (GIS)
A system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps to support the decision-making process.

Glacial Processes (Glaciation)
Processes related to moving ice or glaciers. These processes include the scraping away of soils and substrates, deposition of materials held in the ice (e.g., till or moraines), and formation of kettle lakes where ice chunks break off, are buried, and later melt.

Glacial Till Deposit
Non-sorted, non-stratified sediment laid down by a glacier.

Glide
A slow moving , relatively shallow type of run. See Run. Calm water flowing smoothly and gently, with moderately low velocities (10-20cm/sec), and little or no surface turbulance.

Habitat Capability
The estimated maximum number of fish or wildlife that can be supported by the amount and distribution of suitable habitat in an area.

Heritage Resources
The physical remains of districts, sites, structures, buildings, networks, events, or objects used by humans in the past. They may be historic, prehistoric, architectural, or archival in nature. Heritage resources are non-renewable aspects of our national heritage.

Land Use Designation (LUD)
A defined area of land to which specific management direction is applied.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having a diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Muskeg
A wetland developed over thousands of years in depressions or flat areas on gentle to steep slopes. These bogs have poorly drained, acidic, organic soils that support vegetation that can be sphagnum moss; herbaceous plants; sedges, rushes, and forbs; or may be a combination of sphagnum moss and herbaceous plants. These vegetation types may have a few shrubs and stunted trees.

National Forest System Road
A classified forest road that is under the jurisdiction of the Forest Service.

Nonforest Land
Land having less than ten percent tree cover. Land that has never supported forests and lands formerly forested but now developed for such nonforest uses as crops, improved pasture, etc.

Non-productive Forest Land
Forest land that does not produce or is incapable of producing more than twenty cubic feet per acre per year of industrial wood.

Old-Growth Forest
Ecosystems distinguished by old trees and related structural attributes. Old-growth includes the later stages of forest stand development that typically differ from earlier stages in a variety of characteristics. These characteristics may include larger tree size, higher accumulations of large dead woody material, multiple canopy layers, different species composition, and different ecosystem function. The structure and function of an

old-growth ecosystem will be influenced by its stand size, landscape position, and context. Also defined as timber stands over 150 years in age with an average volume of at least 8,000 board feet per acre.

Old-growth Habitat Reserve (OGR)
A contiguous unit of old-growth forest habitat managed to maintain the integrity of the old-growth forest ecosystem.

Old-growth Habitat Reserve Strategy
A system of large, medium, and small habitat reserves that are part of a landscape conservation strategy used to address National Forest Management Act requirements to maintain habitat to support viable wildlife populations well distributed across the Tongass National Forest. Also known as Habitat Conservation Areas (HCAs).

- Large Reserves: A landscape of at least 20,000 acres of productive old growth forest, within a landscape of at least 40,000 acres. To address habitat quality, at least 50 percent (10,000 acres) of the old growth must be highly productive. To ensure interaction of species and dispersal between large reserves, they must be no more than 20 miles apart.
- Medium Reserves: A landscape of at least 5,000 acres of productive old growth of which at least 2,500 acres must be the highly productive component. Old growth must occur within a landscape of at least 10,000 acres. Medium reserves should be no less than 8 miles apart to facilitate dispersal and re-colonization.
- Small Reserves: Provide at least one 800 acres block of productive old-growth forest within an area of at least 1600 acres within each 10,000 acres landscape (e.g., 16 percent of each VCU).

Overstory
In a stand with several vegetative layers, the overstory is the uppermost layer usually formed by the tallest trees.

Palustrine
Nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.50 percent.

Plant Association
Climax forest plant community type representing the endpoint of succession.

Plant Community
An assemblage of plants that, in general, occur together on similar site conditions.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Productive Forest Land
Forest land that produces or is capable of producing more than twenty cubic feet per acre per year of industrial wood.

Productive Old-growth (POG)
POG is forest land having a timber volume of greater than eight thousand board feet per acre and is categorized as volume strata low, medium, and high in the GIS database. POG generally provides important cover and forage habitat for wildlife as a result of the dense canopy, which reduces snow accumulations in the understory during the winter but is open enough to provide understory vegetation during the spring, summer, and fall.

Recreation Opportunity Spectrum (ROS)
A system for planning and managing recreation resources that categorizes recreation opportunities into seven classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use. The ROS classes are:

- Primitive. An unmodified environment generally greater than 5,000 acres in size and located generally at least 3 miles from all roads and other motorized travel routes. A very low interaction between users (generally less than 3 group encounters per day) results in a very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge, and risk. Evidence of other users is low. Restrictions and controls are not evident after entering the land unit. Motorized use is rare.
- Semi-Primitive Non-Motorized. A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located at least 1/2 mile but not further than 3 miles from all roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge, and risk. There is a minimum of subtle on-site controls. No roads are present in the area.
- Semi-Primitive Motorized. A natural or natural-appearing environment generally greater than 2,500 acres in size and located within 1/2 mile of primitive roads and other motorized travel routes used by motor vehicles; but not closer than 1/2 mile from better-than-primitive roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. Moderate probability of experiencing solitude, closeness to nature, and tranquility, with a high degree of self-reliance, challenge and risk in using motorized equipment. Local roads may be present; along saltwater shorelines there may be extensive boat traffic.
- Roaded Natural. Resource modification and utilization are evident, in a predominantly natural-appearing environment generally occurring within 1/2 mile from better-than-primitive roads and other motorized travel routes. Interactions between users may be moderate to high (generally less than 20 group encounters per day), with evidence of other users prevalent. There is an opportunity to affiliate with

other users in developed sites but with some chance for privacy. Self-reliance on outdoor skills is only of moderate importance with little opportunity for challenge and risk. Motorized use is allowed.

- Roaded Modified. Vegetative and landform alterations typically dominate the landscape. There is little on-site control of users except for gated roads. There is moderate evidence of other users on roads (generally less than 20 group encounters per day), and little evidence of others or interactions at campsites. There is opportunity to get away from others but with easy access. Some self-reliance is required in building campsites and use of motorized equipment. A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities.
- Rural. The natural environment is substantially modified by land use activities. Opportunity to observe and affiliate with other users is important, as is convenience of facilities. There is little opportunity for challenge or risk, and self-reliance on outdoor skills is of little importance. Recreation facilities designed for group use are compatible. Users may have more than 20 group encounters per day.
- Urban. Urbanized environment with dominant structures, traffic lights, and paved streets. May have natural appearing backdrop. Recreation places may be city parks and large resorts. Opportunity to observe and affiliate with other users is very important, as is convenience of facilities and recreation opportunities. Interaction between large numbers of users is high. Outdoor skills, risk, and challenge are unimportant except for competitive sports. Intensive on-site controls are numerous.

Resident Fish
Fish that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Riparian Management Area (RMA)
Land areas delineated in the Forest Plan (1997 TLRMP) to provide for the management of riparian resources. Specific standards and guidelines, by stream process group, are associated with riparian management areas. Riparian management areas may be modified by watershed analysis.

Road
A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary.

Run
An area of swiftly flowing water, without surface agitation or waves, which approximates uniform flow and in which the slope of the water surface is roughly parallel to the overall gradient of the stream reach.

Sediment Source Area (SSA)
Steep, highly dissected uplands that are primary source areas for sediment delivery to stream systems. Snow avalanching, mass wasting, V-notch sideslopes, and rill erosion are the dominant erosion processes.

Seedling/Sapling Stage
The stage following timber harvest when most colonizing tree and shrub seedlings become established (usually 1 to 25 years). Also referred to as the understory colonization stage.

Silviculture
Forest management practices that deal with the establishment, development, reproduction, and care of forest trees to meet certain objectives.

Slash
Debris left over after a logging operation, such as limbs, bark, and broken pieces of logs.

Slough
(a) Low, swampy ground or overflow channels where water flows sluggishly for considerable distances. (b) Side channel slough formed by channelization. (c) A sluggish channel of water, such as a side channel of a stream, in which water flows slowly through low, swampy ground, or a section of an abandoned stream channel containing water most or all of the year, but with flow only at high water, and occurring in a flood plain or delta. (d) A marsh tract lying in a shallow, undrained depression on a piece of dry ground. (e) A term used for a creek or sluggish body of water in a bottomland.

Smolt
A young salmon residing in an estuary area or stream system preparing to outmigrate to the ocean.

Stand
A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

Stand Structure
The horizontal and vertical distribution of forest stand components, including the height, diameter, crown layers and stems of trees, shrubs, herbaceous understory, snags, and down woody debris.

Stream Class
A means to categorize stream channels based on their fish production values. There are four stream classes on the Tongass National Forest:

- Class I. Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.
- Class II. Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams from 0-5 percent gradient), where no

anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.

- Class III. Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sufficient sediment and debris to have an immediate influence on downstream water quality or fish habitat capability. These streams generally have bank full widths greater than 5 feet and are highly incised into the surrounding hillslope.
- Class IV. Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope.
- Non-streams. Rills and other watercourses, generally intermittent and less than one foot in bank full width, little or no incisement into the surrounding hillslope, and with little or no evidence of scour.

Successional Stage
One stage in a series of changes affecting the development of a biotic community. On its path to a climax stage, the community will pass through several stages of adaptation to environmental changes.

Temporary Roads
Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management.

Timtyp
A source of data contained in the Forest Service Geographic Information System (GIS) database. The forest is mapped into areas/stands/polygons based on vegetation composition, stocking, and productivity characteristics that comprise a GIS data layer referred to as Timtyp.

Tongass Land and Resource Management Plan (1997 TLRMP or the Forest Plan)
The ten-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the Forest. See also Land Use Designation.

Unclassified Roads
Roads on National Forest System Lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.

Understory
Anything growing in a stratum definitely below the main crown canopy in a forest.

Value Comparison Unit (VCU)
First developed for the 1979 Tongass Land Management Plan as distinct geographic areas that generally encompass a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. There are 926 units established to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

Volume
Amount of wood in a stand of timber based on standing net board feet per acre by Scribner Rule.

Volume Strata
Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan (1997 TLRMP) for each Administrative Area.

Watershed
The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Watershed Analysis
A systematic procedure for characterizing and evaluating ecological processes within a watershed for use in ecosystem management and project planning. A procedure for assessing important geomorphic processes and functions and for describing key riparian, wetland, and aquatic habitat conditions and trends. Focuses interdisciplinary discussion on key watershed-level management issues and provides a basis for integrating project designs. (See Appendix J in the Forest Plan for watershed analysis from an aquatic perspective.)

Wetlands
Areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include peatlands, muskegs, marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCUs) for the purpose of wildlife analysis.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windthrow
Areas where trees are uprooted, blown down, or broken off by storm winds.

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Appendix A—Public Comments

SITKA SOUND LANDSCAPE ASSESSMENT

Public Meeting
Sign-in Sheet

Date: 2-13-03

Name	Address (optional)
J. Rayment	2028 HPR Sitka 99835
Greg Overturf	PO Box 3025 Sitka 99835
LEO EVANS	~~Box 902~~ Bx 902 Sitka "
Bradley Shaffer	479 Kathleen #3
SPENCER OVERTURF	P.O. BOX 3025 SITKA
James Craig	1709 HPR #22 Sitka
Jess Poreya	456 Kathleen Street
Lynne McGowan	CITY OF SITKA 100 LINCOLN
Rob Jammer	PO Box 6285 Sitka
Clyde Bright	PO Box 1534 Sitka
Valerie Bright	P.O. Box 1534 Sitka
James Bright	Po Box 1534 Sitka

Tongass National Forest

We invite you to comment on the Sitka Sound Landscape Assessment. All comments will be incoporated into the planning process. Please return comments within 30 days of February 13, 2003.

You may leave this form with us or fold and mail it to the address on the reverse side. If you prefer, you can call Martin Becker (907) 747-6671. Or this form can be faxed to (907)747-4253.

Here are my comments for the Sitka Sound Landscape Assessment:

I have an intense concern about accessible recreation areas being closed or regulated. I want more recreation areas, not fewer. I think trails connecting old logging roads would be awesome. Four wheeling & camping would be a wonderful option for the island bound citizens. I believe conservationists and recreationists can live & work together; one need not dictate and control the other. I appreciate that this group is interested in public concerns.

Tongass National Forest

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Here are my comments for the Sitka Sound Landscape Assessment:

Protect Blue Lake water quality
Improve trail from Salmon Lake to Redoubt Lake

Tongass National Forest

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Here are my comments for the Sitka Sound Landscape Assessment:

My comment pertains to access — I respectfully request that no roads be decommissioned within the Sitka Sound Landscape Assessment Area. If any projects are proposed to do so, I would strongly suggest the need be based on "sound science" with turbidity, and sediment analysis to determine the negative effects on other resources. IE How much turbidity can a fish absorb and how much sediment will occur which may be of benefit to spawning and rearing habitat, in coordination with introduced structures for enhancement purposes. As I increase in ~~age~~, the decommissioning of roads will definitely limit my access for whatever purpose to public lands, and there is no other place to go.

Question: when is the fs going to ~~clean~~ clean up the field campsite they used 10-15 years ago in Fish Bay —

Thank you

Greg Overturf

Tongass National Forest

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You may leave this form with us or fold and mail it to the address on the reverse side. If you prefer, you can call Martin Becker (907) 747-6671. Or this form can be faxed to (907)747-4253.

Here are my comments for the Sitka Sound Landscape Assessment:

I would like to see a trail at least 10ft. wide be put in from Sitka to Redman bay conecting logging roads. By doing that it would be easier to access recreational areas, and would increase the amount of tourists threw sitka. I would also like to see [redacted] if and when this trail or road is put in, areas are selected for ATV use [redacted] only, and not hikeing/bikeing.

Tongass National Forest

We invite you to comment on the Sitka Sound Landscape Assessment. All comments will be incoporated into the planning process. Please return comments within 30 days of February 13, 2003.

You may leave this form with us or fold and mail it to the address on the reverse side. If you prefer, you can call Martin Becker (907) 747-6671. Or this form can be faxed to (907)747-4253.

Here are my comments for the Sitka Sound Landscape Assessment:

The Sitka Sound ~~Assessment~~ Assessment is related to describing a current condition with a negative aspect rather than defining and describing opportunities of a positive nature;

IE – What amount of reading has occured in Riparian Areas which may effect water quality.

Rather than

What amount of reading can occur in Riparian Areas as an opportunity for future management activities.

Thank you

Tongass National Forest

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We invite you to comment on the Sitka Sound Landscape Assessment. All comments will be incoporated into the planning process. Please return comments within 30 days of February 13, 2003.

You may leave this form with us or fold and mail it to the address on the reverse side. If you prefer, you can call Martin Becker (907) 747-6671. Or this form can be faxed to (907)747-4253.

Here are my comments for the Sitka Sound Landscape Assessment:

I would like to see a multiuse trail put in from the end of the Sitka road system (northend) that goes up through the logged areaes and allows the use of these logging road systems for recreational use. This trail system should be able to be used by hikers, campers, bikers, snow machiners and RV users. This trail system would allow many non-sitkans to come to Sitka and have access to and be able to use this area of the Tongass. I believe such a trail system would greatly increase the recreational use of this area of the Tongass and allow more people to be aware of the Tongass.

Tongass National Forest

Drey Overturf –

① St. John – subsistence / hunting
Rd system – campsite

② Nakwasina Rd system

} ATV maintenance of roads

③ Old FS Camp completely cleaned up
Fish Bay – S. shore

④ Krestof – Hamilton Bridge – FS camp – garbage
stove pipes, tin cans,

World like to have more chance to comment on project

Drey Overturf

Sitka Conservation Society Box 6533 Sitka AK 99835 907-747-7509

Martin Becker
Sitka Ranger District
U.S. Forest Service
Sitka, AK 9935

March 14, 2003
Dear Mr. Becker:
We appreciate the opportunity to comment on the Sitka landscape assessment. We believe that it is important for the Forest Service to manage our surroundings based on good scientific data and local input and knowledge. We support efforts to do comprehensive rather than piecemeal planning, and to consider cumulative impacts of past and future actions.

We are concerned that it might be difficult to gather wide public input into this planning process. The public may be perplexed as to the value of this planning effort, what will come of it, how will the information make a difference, and whether it seems redundant given other local and regional planning efforts that have gone on in recent years.

We hope you will be able to reach out to the public in ways that inform them of the value of participation in this project, and encourages their involvement and local knowledge. Perhaps you could provide some examples of how this assessment will influence future decisions. Perhaps you could sponsor some sort of fun evening, a photo contest, or story telling about happenings in these areas, so that people are drawn into the planning process.
We encourage you to review some the site-specific testimony that has been provided for other planning documents. We also encourage you to meet with some of the local groups, such as the Fish and Game Advisory Committee, the Sitka tribe, the Sitka Coastal Zone Coordinator, and our organization, since these are groups with members who have a rich repository of knowledge about the local area. If you work through these groups, as well as advertising to the general public, it might be easier to attract attention to the Assessment.

Thoughts on the key questions of the Assessment:
How can roads be managed to reduce long term impacts while maintaining recreation and land management?
Proper construction, and cooperation with biologists from Alaska Dept. of Fish and Game, US Fish and Wildlife Service, will help prevent problems. It is critical that maintainance needs and funding are emphasized All terrain vehicles are a concern. We believe it imperative that enforcement money be ample to catch those using the roads only as a starting point for creating new trails.

What is the current recreation/subsistence use associated with roads?
Existing roads are extensively used for recreation and subsistence.

What is the condition of important fish streams?
The Forest Service has done extensive stream survey work in the Sitka area and should have data to answer this question, along with

data from the Alaska Department of Fish and Game. Katlian River is listed as an impaired waterbody, due to sedimentation from past and present timber harvest. Sedimentation is also a concern in the Nakwasina River. Half of the watersheds in the Sitka local use area with salmon producing streams have experienced timber harvest with some level of impact to the streams.

Where are important recreation/subsistence/commercial fish streams?
The Forest Service has done extensive stream survey work in the Sitka area and should have data to answer this question, along with information from the Alaska Department of Fish and Game. The Department of Fish and Game has requested an instream flow reservation on Sawmill Creek to protect fish, but has not received that reservation. Meanwhile, water rights and export have been approved. It is important to maintain sufficient water in the stream at all times of year to protect the fish.

What restoration opportunities exist?
We believe that there are important restoration opportunities in the harvested areas, such as Nakwasina River, Starrigaven Valley, and Katlian Bay,

What are the subsistence, sport, and non-consumptive wildlife uses in the area?

Our members, and other Sitkans use the surrounding lands very extensively for subsistence, sport, and wildlife viewing. Allan Marine has built a very prosperous business on marine and shoreline wildlife viewing, and other smaller operators have emulated their success. It is important to remember that subsistence harvest extends to marine seaweed and invertebrate species as well as the better known deer and other larger mammals. On land, mushrooms and other forest plants, especially berries, are gathered.

Haw has management activity been distributed across the landscape? What are the potential impacts to biodiversity from future land management activities?
As the Forest Service is aware, and documented in the S.E. Chichagof landscape analysis and final Wilderness SEIS, past timber harvest has been concentrated in certain landforms, ecological subsections, areas of high site index, and high volume coarse canopy forest. If future management continues to target these landforms and habitat types, old-growth dependent species as well as rare forest stand types are at risk. Our board believes that the timber industry has had their fair share of the timber in the Sitka area, and the remaining forest has most value left standing.
Furthermore, large-scale tourism operations run the risk of displacing wildlife from key habitat areas if tourism management is not carefully considered. Enclaves and other tourism operations should not be located in high habitat value estuaries and other locations critical to wildlife.

What is the extent of old-growth forest within the analysis area and does it maintain connectivity?
It is important to differentiate types of old-growth forest, and their value as habitat. In the Landscape Assessment please provide

fine-scale information on the structure classes within the old growth forest.

As mentioned above, we are concerned that past timber harvest has compromised the highest habitat value stands. Connectivity is difficult naturally in the highly fragmented and heterogeneous Tongass, and has been made worse by past timber harvest. As more and more recreational users target the beach fringe, connectivity through other pathways may become even more important to wildlife. In 1997 the ROD was issued for the new Tongass Land Management Plan. In a statement made by the members of the Peer Review committee assembled to review the viability strategy of the Tongass (Powell, et al, 1997), the committee members concluded that the Plan will not ensure the continued viability of wildlife species on the Tongass. The 4 problem areas identified are 1) habitat reserve size and design, 2) high-grading, 3) landscape connectivity and 4) clearcutting.

Connectivity. "Robust corridors, wide enough to provide secure interior habitat and wide enough to survive windthrow and other disturbance events, and designed with topography in mind, have not been designated among reserves. (p.8)" "The riparian standards do not add buffers wide enough to accomplish this goal (p.9)" "A 1,000 foot beach fringe is too narrow, subject to blowdown, and in at least someplaces is degraded by past logging. To provide secure wildlife movement among reserve areas (and to facilitate regular genetic interchange), corridor standards should at least be on the order of those described in Lande's contribution to the 1994 Peer Review: a no-cut zone of 2,000 feet in width(p.9)"
Harvest in the riparian zones of Starrigavan Valley and Katlian Bay has changed their ecological character and value to wildlife and diminishes their efficacy as corridors. No complete analysis of this degradation in corridor capability has been made.
During the TLMP process, a panel of brown bear scientists recommended that a 153 meter no-cut buffer be placed on all salmon spawning streams used by brown bears. This was weakened in the TLMP decision to a "discretionary 153 meter buffer only on 'important' foraging streams." In a radiotelemetry study of brown bears, it was found that the 1000 m buffer contained over 60% of the radiotelemetry locations during the peak period of salmon spawning, while only 36% of the bears were within the 153 m buffer. (Titus & Beier, 1999).

The Neva stait area has been identified as an important linkage area for wildlife (MacDonald and Cook, 1999) Timber harvest in the St. John the Baptist Bay area may affect wildlife movement patterns.

Data available from the Ecological Subsections study (Nowacki et al. 2000)

The watersheds within the Landscape Assessment all fall within the Sitka Sound complex.
Hemlock-spruce forests make up 35%, mixed conifer (13%), lodgepole pine (11%), hemlock (11%), other (7%) in the subsection as a whole. Productive forests are 49%, nonproductive 36%, and nonforested 15%. 17% of the subsection has a site index greater than 80. It would be interesting to examine the percentage of that high site index that

has been harvested. Upland wetlands make up 67% of the subsection. 24% of the subsection is assigned to development LUDS. 8, 420 acres have been harvested, or about 9% of the productive forest. There are 111 miles of road on National Forest lands in the subsection, leading to a road density of 0.36 miles per sq. mile. None of the subsection has been protected as Wilderness.

Across the subsection, within a 500' buffer of the beach, 7% of the forest is second growth. Within a 100" riparian buffer, 15% of the forest is second growth, (DeGayner, pers. Comm. 2002)

It will be interesting to compare watershed specific information to these averages across the subsection.

Data available from the Final Wilderness SEIS
The Sitka Sound complex contains 1,162 acres of remaining high volume coarse canopy forest (table 3.2-15). 10% of the original productive old growth has been harvested (table 3.2-15). High volume coarse canopy forest was targeted in historic harvest, and makes up about 10% of the productive old growth forest across the Tongass.

Thank you for the opportunity to comment on the Landscape Assessment. We hope this input is useful to you.

Sincerely,

Page Else, Research Director

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Page Else, GIS Analyst
Sitka Conservation Society

http://home.gci.net/~sitkawild

Appendix B—Water Quality

The following information about TMDLs and Water Quality Standards is taken from the State of Alaska – Department of Environmental Quality website (http://www.state.ak.us/dec/regulations/pdfs/70mas.pdf).

Section 303(d) of the federal Clean Water Act (CWA) requires states to identify waterbodies that do not meet state clean water goals, called *water quality standards (WQS)*. The list of identified waterbodies is called *the state's 303(d) list.* A waterbody on this list often is referred to as an "impaired" or "listed" waterbody.

The 303(d) listing is related specifically to the particular standard that is exceeded. This means that if a waterbody contains a pollutant in excess of the standard, then the waterbody must be listed for that pollutant. Section 303(d)(1)(C) of the CWA and the United States Environmental Protection Agency (EPA) implementing regulations (40 Code of Federal Regulations [CFR] Part 130) require the establishment of a total maximum daily load (TMDL) to achieve state WQS when a waterbody is water-quality limited.

A TMDL is a written report that contains three main features:

- Assessment of water quality problems,
- Identification of pollutant sources, and
- Pollutant discharge allocations for the sources.

For a given pollutant, a TMDL identifies the maximum amount of pollutant or loading capacity that can be received by a waterbody while still meeting WQS. A TMDL also establishes load allocations and wasteload allocations that allocate shares of the loading capacity to various nonpoint sources and point sources, respectively, for the given pollutant. It also must include a margin of safety, and account for any seasonal variation that might affect the budgeted allocation. A TMDL also may include an implementation plan that describes mechanisms for sources to achieve allocations. These mechanisms can include effluent limits in state and federal discharge permits, Best Management Practices (BMPs), monitoring requirements, and other measures.

The TMDL program does not establish any new implementation authority. TMDLs are to be implemented using existing federal, state, and local authorities and under voluntary programs.

Table B-1. Water Quality Criteria for the State of Alaska

Criteria	Most Stringent Fresh Water Use	Water Quality Standard
ph	(A)(i) Water Supply	May not be less than 6 or greater than 8.5
Turbidity	(A)(i) Water Supply	My not exceed 5 NTU above background when natural is 50 NTU or less, and may not have more than 10% increase when natural is greater than 50 NTU, not to exceed a maximum increase of 25
Fecal Coliform Bacteria	(A)(i) Water Supply	In a 30-day period, the geometric mean may not exceed 20 FC/100 ml, and not more than 10% of the samples may exceed 40FC/100 ml.
Dissolved Gas	(C) Growth and Propagation of Fish	D.O. must be greater than 7mg/l in waters used by anadromous and resident fish. In no case may D.O. be less than 5mg/l to a depth of 20 cm in the interstitial waters of gravels used by anadromous or resident fish for spawning
Temperature	(A)(iii) Water Supply Aquaculutre	May not exceed 20C at any time. The following maximum temperatures may not be exceeded, where applicable Migration Routes 15C Spawning Areas 13C Rearing Areas 15C Egg & Fry incubation 13C
Dissolved Inorganic Substances	(A)(i) Water Supply	TDS from all sources may not exceed 500 mg/l.
Sediment	???	???
Toxics and Other Deleterious Organic and inorganic substances	???	???
Color	(A)(i) Water Supply	May not exceed 15 color units or the natural condition, whichever is greater
Oils and Grease	(A)(i) Water Supply	No visible sheen
Radioactivity	(A)(i) Water Supply	Drinking Water Standards

Source: Alaska Department of Environmental Conservation: (http://www.state.ak.us/dec/regulations/pdfs/70mas.pdf).

Table B-2. Water Quality Limited Waterbodies within the Assessment Area

Waterbody	Pollutant Sources	Pollutant Parameters	Narrative Explanation
Granite Creek	Sediment, Turbidity	Gravel Miniing	A TMDL has been development for Granite Creek. This waterbody was placed on the 1996 Section 303(d) list for turbidity and sediment. Information shows that the lower 1.5 miles of the creek is impaired from sediment and turbidity. Since a TMDL has been completed for Granite Creek it is removed from the Section 303(d) list and moved to Category 4a. EPA approved the Granite Creek TMDL on September 30, 2002.
Katlian River	Sediment, Turbidity	Timber Harvest	Katlian River was Section 303(d) listed as impaired in 1998 and remains on the 2003 Section 303(d) list for non-attainment of the Sediment and Turbidity standards. Past land use activities have created a number of concerns for water quality, and fish habitat. The harvest of riparian timber and location and lack of maintenance of the road system created the following concerns: decreased channel stability, landslides and small slope failures, increased sediment levels, loss of aquatic habitat, siltation of holding pools for migrating salmon, and alteration of watershed hydrology. Watershed effects resulted in use impairment for aquatic life.
Nakwasina River	Sediment, Turbidity	Timber Harvest	Nakwasina River remains on the 2003 Section 303(d) list for non-attainment of the Sediment and Turbidity standards. Past land use activities have created a number of concerns for water quality and fish habitat. The harvest of riparian timber and location and lack of maintenance of the road system created the following concerns: decreased channel stability, landslides and small slope failures, increased sediment levels, loss of aquatic habitat, siltation of holding pools for migrating salmon, and alteration of watershed hydrology. Watershed effects resulted in use impairment for aquatic life.

Source: Alaska Department of Environmental Conservation.: (http://www.state.ak.us/dec/water/tmdl/tmdl_index.htm).

Appendix C—Roads

Sitka Sound Landscape Assessment Area

Roads

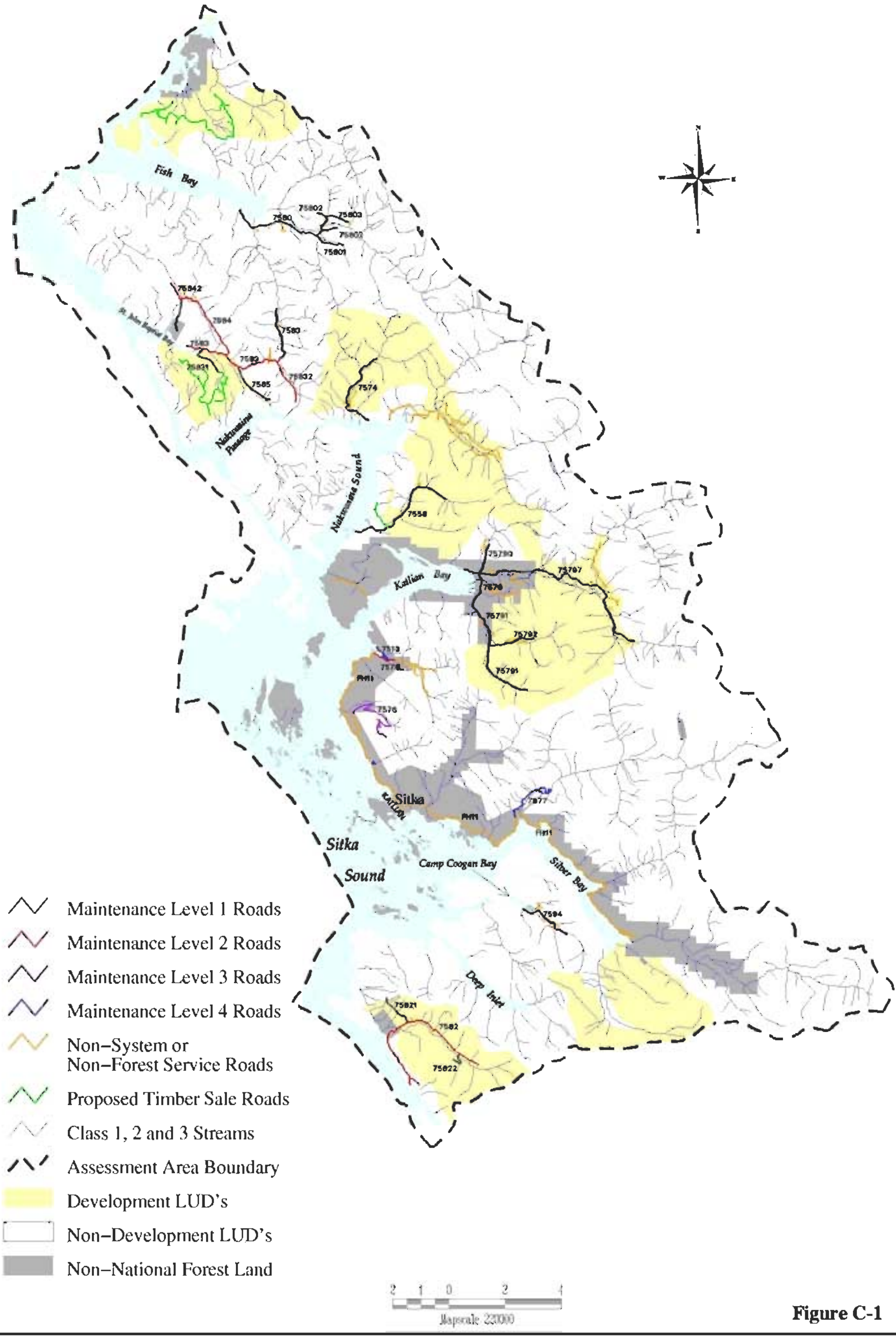


Figure C-1

Appendix D—Subsistence

Source: Alaska Department of Fish and Game, Department of Subsistence, Southeast Regional Office. 2002. Subsistence Harvest and Use of Salmon and Selected Non-Salmon Species: Southeast Alaska Community Summaries. ADF&G, Division of Subsistence, Juneau, Alaska.

XXVI. SITKA

Sitka is located on western Baranof Island along the outer coast of southeastern Alaska. It is one of the largest communities in the region, with a heterogeneous population and relatively mixed economic base. The following description of the community is taken from Betts et al 1994: Sitka (Rev. 1/98).

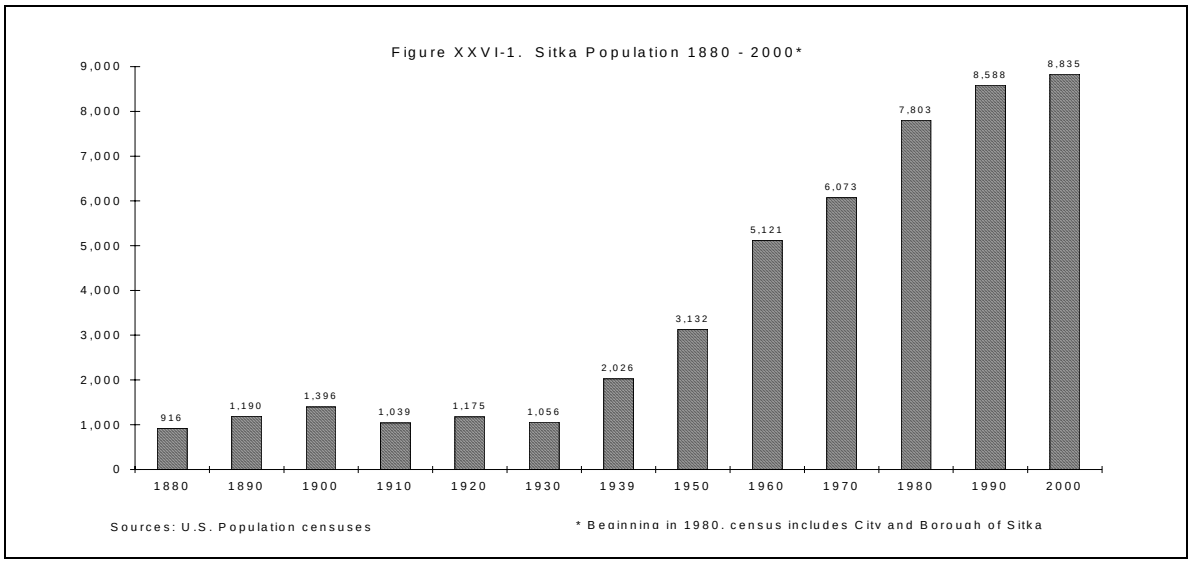
> "The Tlingits have resided in the Sitka area for many centuries, living in several villages scattered throughout the area. …..Traditionally the Tlingits of Sitka used a wide area surrounding the community for hunting, fishing, and gathering wild resources.
>
> "The rich coastal resources of the area, especially the sea otter, attracted traders of many nationalities including Russians, Americans, and English. By 1799, Sitka Sound was a favored trading spot on the northwest coast. In that year Alexander Baranof, the manager of the Russian-American Company, made Sitka (then called New Archangel) the headquarters of its vast fur trading business.
>
> "Sitka remained the major center of Russian activity and settlement until Alaska was purchased by the United States in 1867. ……When the territorial capital moved to Juneau in 1906, Sitka became a quiet village. The development of refrigeration, which opened new markets for fisheries, led to the opening of Sitka's first cold storage plant in 1913, which processed salmon, halibut, crab, and black cod. Salmon canneries set up operations along the waterfront. The old Cutting and Company had left in 1880, but the Sitka Packing Company began operations in 1917 and the Pyramid Packing Company in 1918. ….Major changes in Sitka since 1940 have included a large military presence during World War II.
>
> "Logging operations at Sitka began during the Russian occupation. …. Modern growth of the lumber industry began in 1959 when a large pulp mill, operated by the Alaska Lumber and Pulp Company, opened in Sitka. It has processed timber continuously"….until 1993, when it closed.
>
> "Sitka is a community of diverse origins with several subgroups using resources in a variety of ways; Tlingit culture has traditionally been defined largely by its relationship to the environment. For many non-Natives in Sitka, resource harvesting is a crucial element in the adaptation to life in Alaska." (Betts et al 1994: Sitka (Rev. 1/98)

The Division of Subsistence conducted household surveys of harvest and use of wild resources in Sitka in 1983, 1987 and in 1996.

POPULATION AND DEMOGRAPHICS

Sitka appears in the U.S. Census of Population for the first time in 1880, with the "non-indigenous population recorded at 916. Forty-five years earlier, in 1835, the Russian Orthodox Father Veniaminov estimated the Tlingit population in the Sitka area at 7500. A population count for the area for 1839 reported 850, and another for 1861 reported a large population of 2,365 including the non-indigenous population at Sitka and the indigenous settlements in the "Sitka environs" (Rogers 1960). It reached a high of 1,396 in 1900, and in the following three decades lost population. Since 1930 Sitka has grown significantly, almost doubling between 1930 and 1939, and continuing to rise during the decades since, reaching 6,073 in 1970. The Sitka Borough was organized in 1970, and subsequent censuses include population in the outlying areas. In 1993 Sitka's population was estimated to be 9,059. There has been a slight decline in population since then, coinciding with the closure of the Sitka Pulp Mill in 1993. The 2000 Census of Population

reports a population of 8,835 for the Sitka Borough, in 3,278 households (Figure XXVI-1). In 2000 the average household size was 2.61. The median age of the population in the Sitka Borough in 2000 was 35.2 years. Alaska Natives represented 24.7 percent of the population of Sitka.



PARTICIPATION IN HARVESTING OR USING WILD RESOURCES

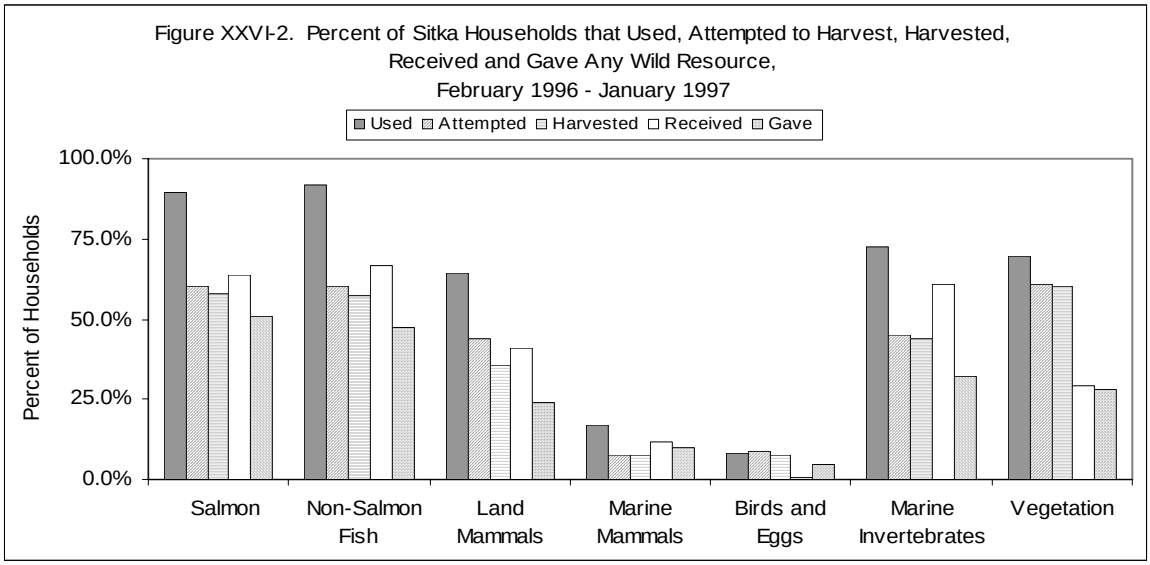
Hunting, fishing and gathering are an important part of the economy of Sitka. In 1996 nearly every household in Sitka (97.4 percent) used at least one wild resource species. Almost as many attempted to harvest, harvested, or received at least one wild species. Eight-nine percent of Sitka households used at least one salmon species, and almost 92 percent used at least one non-salmon fish species.

Somewhat fewer households were actively involved in harvesting resources. Eight-three percent of Sitka households reported harvesting at least one wild resource. Fifty-eight percent harvested salmon and 57.3 percent harvested non-salmon fish species.

Table XXVI-1. Percentages of Households Using, Attempting to Harvest, Harvesting, Receiving and Giving Wild Resources, Sitka 1996

Resource Category	Used	Attempted	Harvested	Received	Gave
All Resources	97.4%	84.9%	83.2%	92.9%	74.0%
Fish	95.4%	67.1%	64.5%	81.6%	67.2%
Salmon	89.4%	60.1%	58.0%	63.6%	50.6%
Non-Salmon Fish	91.7%	60.2%	57.3%	66.8%	47.4%
Land Mammals	64.4%	43.6%	35.6%	41.0%	24.0%
Marine Mammals	17.2%	7.6%	7.6%	11.5%	10.1%
Birds and Eggs	8.2%	8.7%	7.8%	0.7%	4.9%
Marine Invertebrates	72.4%	44.9%	43.7%	60.7%	32.1%
Vegetation	69.6%	60.6%	60.2%	29.4%	28.3%

Sharing of wild resource is common too. Seventy-four percent of households reported giving at least one resource to other households, and 93 percent of surveyed households received at least one resource from their neighbors. Figure XXVI-2 displays the percentage of Sitka households that used, attempted to harvest, harvested, received or gave by resource category.



DIVERSITY AND QUANTITY OF RESOURCES USED

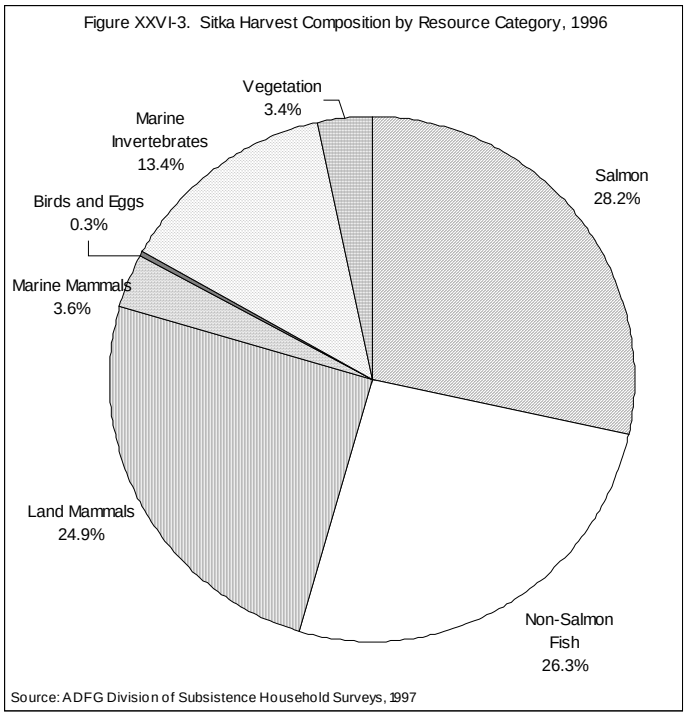
Some Sitka households used as many as 49 different animal or plant species, while other households used none. The average (mean) number of different wild resources used by Sitka households was 13, out of a possible 157 species listed on the survey. The average number of resources harvested by Sitka households was over 8, ranging from 0 to 49.

Based on the sample in 1996, it is estimated that more than 1,749,772 pounds of wild resources were harvested by Sitka households from February 1996 through January 1997 (measured in pounds of useable weight). The harvest came from six main resource categories - fish, land mammals, marine mammals, birds and eggs, marine invertebrates, and plants. Overall the average Sitka household used 573.1 pounds of wild resources in the survey year. This amounts to 205.0 pounds per person in the community.

Table XXVI-2. Estimated Community Harvest by Resource Category, Sitka 1996

Resource Category	Total Pounds Harvested	Mean Pounds Per Household	Pounds Per Person
All Resources	1,749,772.00	573.13	205.01
Fish	953,207.00	312.22	111.68
Salmon	493,542.00	161.66	57.83
Non-Salmon Fish	459,665.00	150.56	53.86
Land Mammals	434,971.00	142.47	50.96
Marine Mammals	62,358.00	20.43	7.31
Birds and Eggs	5,068.00	1.66	0.59
Marine Invertebrates	234,496.00	76.81	27.47
Vegetation	59,671.00	19.54	6.99

Fish (salmon and non-salmon species) contributed the major portion of the useable weight harvested (54.5 percent), while land mammals contributed 24.9 percent, and marine invertebrates contributed 13.4 percent. Table XXVI-2 shows the estimated total pounds of usable weight for the community, average (mean) pounds per household and average pounds per person by resource category. Figure XXVI-3 shows the composition of the harvest and the percentage each resource category comprises of the total, as measured in pounds.



The top ten species used by most Sitka households is shown in Table XXVI-3. Species used by 50 percent or more of the households included three salmon species - chinook, sockeye, and coho - as well as halibut, deer, and dungeness crab. Other species in the top ten included rockfish, shrimp, king crab and herring.

Table XXVI-3. Top Ten Species Used by the Most Sitka Households, 1996

	Sitka 1996	% HH
1	Halibut	80.8%
2	Chinook Salmon	78.6%
3	Deer	61.9%
4	Sockeye Salmon	55.8%
5	Dungeness Crab	53.4%
6	Coho Salmon	52.2%
7	Rockfish	44.7%
8	Shrimp	43.6%
9	King Crab	38.5%
10	Herring	36.6%

SALMON

Harvest Size and Composition

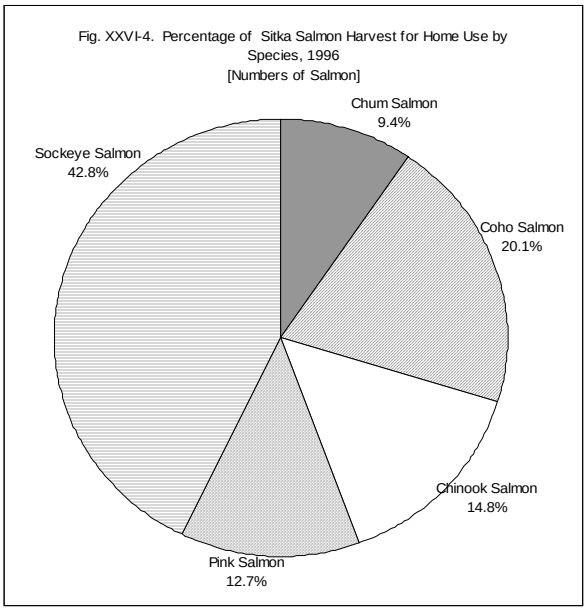
The five salmon species made up 28.2 percent of the wild resource harvest for home use in Sitka in 1996, as measured in pounds of useable weight, contributing 493,542 pounds for the community, or about 161.7 pounds per household. Sockeye salmon comprised the largest portion of the Sitka salmon harvest in terms of numbers of fish, and in terms of pounds of useable weight, providing 35,597 fish and 168,729 pounds for the community, and almost 127 fish per

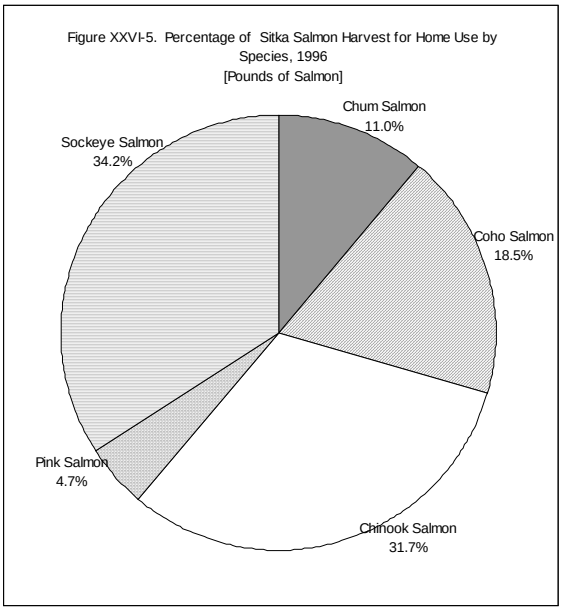
household. Coho salmon were next in importance, in numbers of fish contributing 16,746 fish and 91,098 pounds for the community, and about 5.5 fish per household. Fewer chinook salmon (12,326) contributed 156,289 pounds for the community, providing almost 4 chinook per household. Sitka households reported an estimated 10,594 pink salmon in 1996, totaling 23,094 pounds for the community, and about 3.5 fish per household (Table XXVI-4)

Table XXVI-4. Sitka Salmon Harvest for Home Use, by Species, 1996

Species	Estimated Total		Per Household Number	Per Capita Number	Per Household Pounds	Per Capita Pounds
	Number	Pounds				
Salmon	83,114	493,542	27.22	9.74	161.66	57.83
Chum Salmon	7,851	54,332	2.57	0.92	17.80	6.37
Coho Salmon	16,746	91,098	5.49	1.96	29.84	10.67
Chinook Salmon	12,326	156,289	4.04	1.44	51.19	18.31
Pink Salmon	10,594	23,094	3.47	1.24	7.56	2.71
Sockeye Salmon	35,597	168,729	11.66	4.17	55.27	19.77

The composition of the salmon harvest in any particular year may vary considerably, depending on a number of factors, such as species abundance, timing of the runs, inter-face with commercial salmon fishing activity by Sitka fishers and by others, and with the growing charter vessel sport fishing business in the waters of northern southeast, and Sitka Sound in particular. Figure XXVI-4 shows the composition of the Sitka salmon harvest by numbers of fish, and Figure XXVI-5 shows the composition by pounds. The varying size and weight of the several species accounts for the different values when calculated by weight.



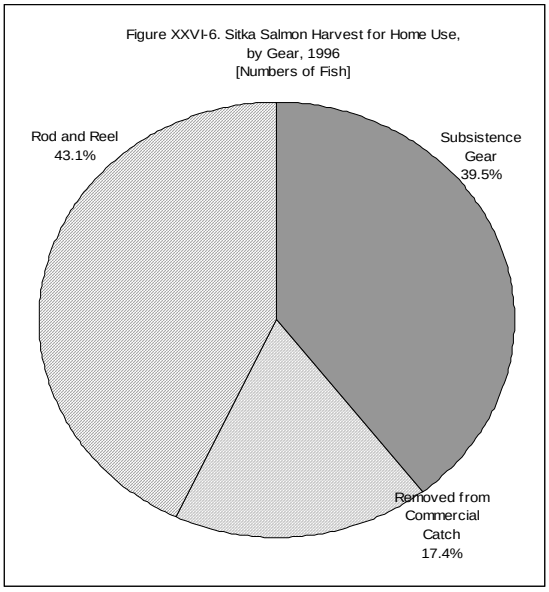


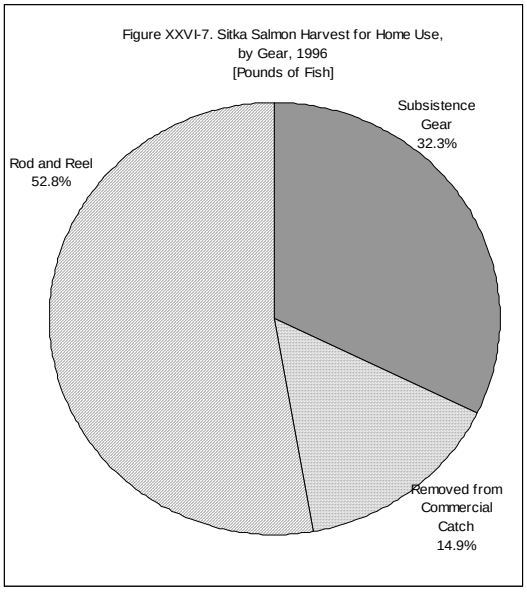
Salmon Harvest Methods

Salmon were harvested using a variety of methods, including beach seines, set and floating gillnets, and dipnets. In 1996 salmon harvested with rod and reel represented 43 percent of the numbers of salmon for home use, but almost 53 percent of the salmon harvest measured in pounds of salmon. Subsistence gear, primarily beach seines and dipnets, comprised 39.5 percent of the salmon harvested for home use in numbers of fish. Salmon removed from commercial catches by households involved in commercial salmon fisheries as permit holders and crew members represented 17.4 percent of the numbers of salmon harvested. Figures

XXVI-6 and XXVI-7 show the composition of the Sitka salmon harvest in 1996 by gear type used, in numbers of fish and pounds of fish.

The predominant method used differed by salmon species (Tables XXVI-5 and XXVI-6). Sockeye salmon was the species most commonly harvested with recognized subsistence gear, beach seines and dipnets - representing 96 percent of all salmon harvested with subsistence gear by Sitka households, and 89 percent of all sockeye salmon harvested for home use. Almost 76 percent of cohos harvested for home use were harvested using rod and reel, and cohos comprised 35 percent of salmon caught with rod and reel. Eighty-four percent of all chinook salmon were harvested using rod and reel, and chinooks comprised about 29 percent of the rod and reel harvest in 1996. The largest portion of the salmon removed from commercial catches were pinks (37.9 percent), followed by coho (26.9 percent), chum (13.5 percent), and a few sockeye (11.3 percent), and chinook (10.4 percent).





Fifty-eight percent of Sitka households reported harvesting salmon in 1996. Forty-seven percent harvested salmon using rod and reel, 19.6 percent used subsistence gear, and about 11 percent removed salmon from commercial catches (Table XXVI-7).

Location, Use Patterns and Factors Affecting Sitka Salmon Fishing

The information on "areas used for fishing during the past 5 years" collected as part of the Division's household harvest survey for 1996 is not available at this time. Sitka households identified areas used for salmon fishing on maps as part of the Division's 1987 household harvest survey project. No text summary of the mapped information was included in Betts et al 1994: Sitka (Rev. 1/98). The following discussion about salmon fishing locations, patterns of use and factors affecting salmon fishing is taken from Gmelch & Gmelch 1985, which reports the findings of an earlier survey conducted in Sitka for 1983 harvests.

> "Sitka residents harvest salmon throughout the region -- in open ocean, protected salt water areas, and spawning streams. .....by far the greatest salmon fishing activity takes place in the waters of Sitka Sound and the surrounding islands and bays. A second focal area is the complex of waterways and islands from Olga Strait north to Salisbury Sound and Peril Strait. More specific salmon fishing areas which were frequently listed by survey respondents include the following: Vitskari Rocks, Starrigavan River, Hayward Strait, the waters between Sugarload Point and Povorotni Point, Silver Bay, Redoubt Bay, Katlian Bay, Biorka Island, Nakwasina Sound, Neva Strait, and

Table XXVI-5. Estimated Salmon Harvest by Gear Type, Sitka, 1996

		Subsistence Methods												Removed from Commercial Catch		Rod and Reel		Any Method	
		Net		Set Net		Floating Net		Seine		Other		Subsistence Gear Any Method							
	Harvest Units	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean	Total	HH Mean
Salmon	numbers	0.00	0.00	3,245.92	1.06	4,766.39	1.56	14,249.79	4.67	10,566.71	3.46	32,828.81	10.75	14,496.83	4.75	35,787.86	11.72	83,113.50	27.22
	pounds	0.00	0.00	15,385.68	5.04	23,665.61	7.75	70,455.32	23.08	50,019.71	16.38	159,526.32	52.25	73,602.51	24.11	260,413.41	85.30	493,542.23	161.66
Chum Salmon	numbers	0.00	0.00	0.00	0.00	114.48	0.04	286.21	0.09	0.00	0.00	400.69	0.13	1,957.33	0.64	5,493.45	1.80	7,851.47	2.57
	pounds	0.00	0.00	0.00	0.00	792.22	0.26	1,980.55	0.65	0.00	0.00	2,772.77	0.91	13,544.74	4.44	38,014.67	12.45	54,332.18	17.80
Coho Salmon	numbers	0.00	0.00	0.00	0.00	137.38	0.04	0.00	0.00	0.00	0.00	137.38	0.04	3,906.29	1.28	12,702.31	4.16	16,745.98	5.49
	pounds	0.00	0.00	0.00	0.00	747.34	0.24	0.00	0.00	0.00	0.00	747.34	0.24	21,250.20	6.96	69,100.56	22.63	91,098.11	29.84
Chinook Salmon	numbers	0.00	0.00	0.00	0.00	91.59	0.03	343.45	0.11	0.00	0.00	435.03	0.14	1,502.77	0.49	10,387.84	3.40	12,325.65	4.04
	pounds	0.00	0.00	0.00	0.00	1,161.31	0.38	4,354.92	1.43	0.00	0.00	5,516.24	1.81	19,055.10	6.24	131,717.87	43.14	156,289.21	51.19
Pink Salmon	numbers	0.00	0.00	0.00	0.00	0.00	0.00	171.72	0.06	25.97	0.01	197.69	0.06	5,486.66	1.80	4,909.32	1.61	10,593.67	3.47
	pounds	0.00	0.00	0.00	0.00	0.00	0.00	374.36	0.12	56.61	0.02	430.97	0.14	11,960.92	3.92	10,702.31	3.51	23,094.20	7.56
Sockeye Salmon	numbers	0.00	0.00	3,245.92	1.06	4,422.94	1.45	13,448.41	4.40	10,540.74	3.45	31,658.02	10.37	1,643.78	0.54	2,294.94	0.75	35,596.74	11.66
	pounds	0.00	0.00	15,385.68	5.04	20,964.74	6.87	63,745.48	20.88	49,963.10	16.37	150,059.00	49.15	7,791.54	2.55	10,877.99	3.56	168,728.53	55.27
Unknown Salmon	numbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	pounds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: "Other" subsistence gear refers to dip net.

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 1997

Table XXVI-6. Estimated Percentages of Salmon Harvest By Resource, Gear Type, and Salmon Total Harvest, Sitka, 96

		Subsistence Methods															
		Set Net		Floating Net		Beach Seine		Other		Subsistence Gear Any Method		Removed from Commercial Catch		Rod and Reel		Any Method	
Resource	Percent Base	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Salmon	geartype	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		
	resource	3.91	3.12	5.73	4.80	17.14	14.28	12.71	10.13	39.50	32.32	17.44	14.91	43.06	52.76		
	total	3.91	3.12	5.73	4.80	17.14	14.28	12.71	10.13	39.50	32.32	17.44	14.91	43.06	52.76	100.00	100.00
Chum Salmon	geartype	0.00	0.00	2.40	3.35	2.01	2.81	0.00	0.00	1.22	1.74	13.50	18.40	15.35	14.60		
	resource	0.00	0.00	1.46	1.46	3.65	3.65	0.00	0.00	5.10	5.10	24.93	24.93	69.97	69.97		
	total	0.00	0.00	0.14	0.16	0.34	0.40	0.00	0.00	0.48	0.56	2.36	2.74	6.61	7.70	9.45	11.01
Coho Salmon	geartype	0.00	0.00	2.88	3.16	0.00	0.00	0.00	0.00	0.42	0.47	26.95	28.87	35.49	26.53		
	resource	0.00	0.00	0.82	0.82	0.00	0.00	0.00	0.00	0.82	0.82	23.33	23.33	75.85	75.85		
	total	0.00	0.00	0.17	0.15	0.00	0.00	0.00	0.00	0.17	0.15	4.70	4.31	15.28	14.00	20.15	18.46
Chinook Salmon	geartype	0.00	0.00	1.92	4.91	2.41	6.18	0.00	0.00	1.33	3.46	10.37	25.89	29.03	50.58		
	resource	0.00	0.00	0.74	0.74	2.79	2.79	0.00	0.00	3.53	3.53	12.19	12.19	84.28	84.28		
	total	0.00	0.00	0.11	0.24	0.41	0.88	0.00	0.00	0.52	1.12	1.81	3.86	12.50	26.69	14.83	31.67
Pink Salmon	geartype	0.00	0.00	0.00	0.00	1.21	0.53	0.25	0.11	0.60	0.27	37.85	16.25	13.72	4.11		
	resource	0.00	0.00	0.00	0.00	1.62	1.62	0.25	0.25	1.87	1.87	51.79	51.79	46.34	46.34		
	total	0.00	0.00	0.00	0.00	0.21	0.08	0.03	0.01	0.24	0.09	6.60	2.42	5.91	2.17	12.75	4.68
Sockeye Salmon	geartype	100.00	100.00	92.79	88.59	94.38	90.48	99.75	99.89	96.43	94.07	11.34	10.59	6.41	4.18		
	resource	9.12	9.12	12.43	12.43	37.78	37.78	29.61	29.61	88.94	88.94	4.62	4.62	6.45	6.45		
	total	3.91	3.12	5.32	4.25	16.18	12.92	12.68	10.12	38.09	30.40	1.98	1.58	2.76	2.20	42.83	34.19
Unknown Salmon	geartype	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	resource	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: "Other" subsistence gear refers to dip net.

SOURCE: Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 1997

Table XXVI-7. Percentage of Households Harvesting Salmon By Gear Type And Species, Sitka, 1996

Resource	Subsistence Methods					Removed from Commercial Catch	Rod and Reel	Any Method
	Set Net	Floating Net	Seine	Other	Any Subsistence Gear			
Salmon	0.85	2.35	9.23	8.65	19.58	11.51	47.25	58.00
Chum Salmon	0.00	0.37	0.37	0.00	0.75	2.45	12.90	15.36
Coho Salmon	0.00	0.37	0.00	0.00	0.37	8.30	33.02	39.72
Chinook Salmon	0.00	0.37	0.75	0.00	1.12	8.58	38.87	45.85
Pink Salmon	0.00	0.00	0.37	0.85	1.23	2.08	10.63	13.93
Sockeye Salmon	0.85	1.98	8.10	8.65	19.21	4.05	6.60	28.74

Note: "Other" subsistence gear refers to dip net.
SOURCE: Alaska Department of Fish and Game, Division of Subsistence, Household Survey, 1997

> Salisbury Sound. About twenty other areas were specifically identified by respondents, ranging from Klag Bay in the north to Snipe Bay in the south, and as far east as Sitkoh Bay at the mouth of Peril Strait. (Gmelch & Gmelch 1985:21)

This open-water salmon fishing involved the use of rod and reel gear. Gmelch and Gmelch point out that for those Sitkans who do not have boats, waters along the road system were popular in 1983 for rod and reel fishing for pink salmon, including "……Starrigavan at the northern terminus of the road system and the shore near Sheldon Jackson hatchery in town". (Gmelch & Gmelch 1985:19). Dip nets were used at specific locations which are suited to that gear, notably below the falls at the head of Redoubt Bay, when the salmon are schooling to ascend the falls into Redoubt Lake (Gmelch & Gmelch 1985:26)

Sitkans use recognized "subsistence" gear to harvest sockeye at designated "subsistence/personal use" areas listed on the Department's Sitka Management Area Office Subistence/Personal Use Salmon Permit. These included Surge Bay, Hoktaheen Cove, Klag Bay, Ford Arm and Lake Anna, Leo's Anchorage, Redoubt Bay, Salmon Lake, Necker Bay, Politofski Lake, Redfish Bay, Lake Eva, Sitkoh Lake, Gut Bay and Falls Lake. The focus of fishing activity in any particular year may be influenced by ADF&G regulations regarding possession limits, strength of runs, competition from sport fishers, etc. See below for a brief discussion of the salmon permit records, and Appendix A for harvest data from Sitka permit returns and Appendix B for sample of permit form.

HARVEST AND USE OF CUTTHROAT, RAINBOW TROUT, STEELHEAD, EULACHON AND DOLLY VARDEN

These five non-salmon species contributed modestly to the fish harvested for home use in Sitka. They are valued for the diversity they provide. The trout and char species are usually eaten fresh, while eulachon may be eaten fresh or smoked, or if harvested in sufficient quantities, rendered into oil. In 1996 relatively few Sitka households reported using these trout and char species. Table XXVI-8 shows the household participation in use, harvest, and sharing, and the amounts harvested.

Table XXVI-8. Harvest and Use of Eulachon, Dolly Varden, Cutthroat and Rainbow Trout and Steelhead for Home Use, Sitka, 1996

	Percent of Households				Estimated Amount Harvested				Est. Pounds Harvested		
	Used	Harvested	Received	Gave	Total	Units	HH Mean	Per capita	Total	HH Mean	Per capita
Eulachon	7.1%	0.7%	6.3%	1.9%	149	gal.	0.0	0.0	1,339	0.4	0.2
Dolly Varden	10.2%	10.2%	0.0%	2.7%	4,301	ea.	1.4	0.5	11,612	3.8	1.4
Cutthroat Trout	4.8%	4.8%	0.0%	2.4%	1,528	ea.	0.5	0.2	2,292	0.8	0.3
Rainbow Trout	10.5%	10.1%	0.4%	3.9%	2,455	ea.	0.8	0.3	4,911	1.6	0.6
Steelhead	5.8%	4.7%	1.1%	2.2%	650	ea.	0.2	0.1	5,528	1.8	0.7

Note: Using a conversion factor of 72 fish/gal, 149 gal = 10,728 eulachon total; 3.5 per/hh; 1.26/ per capita

Location, Use Patterns and Factors Affecting Sitka Non-Salmon Fishing

The information on "areas used for fishing during the past 5 years" collected for the Division's household harvest survey for 1996 is not available at this time. The Division's 1987 household harvest survey project mapped information on areas used for fishing for non-salmon species by Sitka residents, but no text summary was included in Betts et al 1994:Sitka (Rev. 1/98). Of these five non-salmon fish species, the Gmelch and Gmelch report only discusses harvest and use of dolly varden, based on the 1983 survey:

> Dolly varden are taken all summer, especially up in the rivers just before and during the salmon run. For shoreline fishermen the primary locations for catching "dollies" are Starrigavan, Katlina, Nakwasina, and the Sheldon Jackson Hatchery. These areas are considered especially good in spring when the "dollies" are feeding on outmigrating (salmon) fry. For residents with boats the favorite locations for catching "dollies" are Nakwasina Sound and Katlian Bay, where they are abundant and large fish up to six pounds can be caught. The south fork of Katlian River is known to have a run of unusually large fish." (Gmelch & Gmelch 1985:34)

SUBSISTENCE/PERSONAL USE SALMON PERMIT REPORTING

The Alaska Department of Fish and Game, Southeast Region, Division of Commercial Fisheries administers an annual subsistence/personal use salmon permit reporting system for all salmon species in designated waters. Sitka residents use permits issued from the Sitka Management Area Office. According to permits returned for 1997 through 2001, Sitka residents harvested sockeye salmon primarily in Necker Bay Lake. Other locations reported with important quantities of sockeye during that period included Redoubt Lake outlet, Fish Camp-Klag Bay, Lake Stream-Ford Arm, and Redfish Bay Head. Small numbers of pink and chum salmon were reported from these locations. The harvest record reported on the permits for the period 1990 - 2001, by community, and for 1997-2001 by community and stream is found in Appendix A. Samples of the permit form used by each southeast area management office are found in Appendix B.

COMMERCIAL FISHERIES

The Commercial Fisheries Entry Commission maintains records on participation in the various commercial fisheries. Not all persons holding permits fish their permits every year. Sitka's commercial fishing fleet is diverse, fishing in a variety of fisheries. Salmon power troll, and purse seine, sablefish, shellfish other than crab, halibut and other groundfish fisheries had the highest numbers of participants. Of the Sitka residents holding permits in 1987, 450 persons participated in the several commercial salmon power and hand troll, and drift gillnet, sablefish, and other groundfish fisheries, and halibut, herring and crab fisheries, fishing 873 permits. By 1990 this had risen, with 521 Sitka residents participating in commercial fisheries, fishing 1,016 permits (salmon drift gillnet, halibut, crab, shrimp, herring, miscellaneous groundfish and miscellaneous other commercial fisheries). By 1996 fewer Sitkans were active in commercial fishing. Of those Sitkans holding commercial fishing permits, 449 persons fished 902 permits.

In 2000 participation of Sitka fishers in commercial fishing showed a continued decline to close to the 1987 level - 444 permit holders participated in the commercial fisheries, fishing 832 permits. This included 206 permit holders who fished 202 salmon power troll permits, 154 permit holders who fished 154 halibut IFQs, and 106 permit holders who fished 131 sablefish permits.

Appendix E—Wetlands

Wetland Systems and Subsystems

Estuarine

Estuarine wetlands include tidal wetlands adjacent to deepwater tidal habitats that are generally semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by fresh water runoff from the land. The estuarine system includes estuaries and lagoons. Estuarine water regimes and water chemistry are affected by oceanic tides, precipitation, and freshwater runoff from land areas, evaporation and wind. The intertidal subsystem of estuaries is exposed and flooded by tides, and includes the associated splash zone. Estuarine intertidal subsystems are subdivided into several classes: rock bottom, unconsolidated bottom, aquatic bed, reef, streambed, rocky shore, unconsolidated shore, emergent wetland, scrub-shrub wetland, and forested wetland. These subsystems were not analyzed for this project.

Estuarine wetlands support complex and productive ecosystems for critical fish and wildlife habitat. Grasses and sedges are the dominant species in the upper tidal zone. Common plants on the upper beaches include beach-carrot, beach pea, large-headed sedge, paintbrushes, and lupine. Estuaries are protected by Forest Plan standards and guidelines with at least a 1000-foot buffer.

Riverine

Riverine wetlands includes all wetlands and deepwater habitats contained within a channel, with two exceptions: 1) wetlands dominated by trees, shrubs, persistent emergent and emergent moss or lichens and 2) habitats with water containing ocean derived salts in excess of 0.5%. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water. Riverine wetlands are associated with riparian areas; however, all riparian areas are not wetlands. Water is usually, but not always flowing in riverine systems. Uplands or palustrine wetlands may occur in the channel, but they are not included in the riverine system. Riverine systems are divided into four subsystems: tidal, lower perennial, upper perennial and intermittent. The riverine subsystems calculated for total acres in Tables 4-14 and 4-15 are the tidal and perennial riverine wetlands.

Lacustrine

The lacustrine system includes wetlands and deepwater habitats with all of the following characteristics: 1) situated in a topographic depression or a dammed river channel; 2) lacking trees, shrubs, persistent emergent and emergent mosses or lichens with grater than 30% area cover; and 3) total area exceeds 20 acres. Lacustrine systems may be tidal or non tidal, but ocean-derived salinity is always less than 0.5%. This system includes permanently flooded lakes and reservoirs, intermittent lakes, and tidal lakes with ocean-

derived salinities below 0.5%. Typically in SE Alaska, they include large lakes with or without islands of palustrine wetland within the boundaries of the lacustrine system. This system is divided into two subsystems: limnetic and littoral. For the purposes of this assessment, differentiation between lacustrine subsystems and classes of subsystems is not necessary.

Palustrine

The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergents mosses or lichens and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is less than 0.5%. The palustrine system is bounded by uplands (non wetlands) or by any of the other wetland systems. The palustrine wetlands are traditionally called muskegs, swamps, bogs, fens, and marshes. It also includes small, shallow, permanent or intermittent ponds. There are no subsystems classified under the palustrine system, but several classes are named and identified as important for this project: moss-lichen wetland, emergent wetland, scrub-shrub wetland and forested wetland.

Moss-lichen wetland class includes areas where mosses or lichens cover substrates other than rock and where emergents, shrubs or trees make up less than 30% of the aerial cover.

Emergent wetlands class is characterized by erect, rooted, herbaceous plants adapted to saturated conditions (hydrophytes), excluding mosses and lichens. Perennial plants usually dominate them and vegetation is present for most of the growing season. Locally in the project area, these types include bogs (muskegs) and fens. Emergent wetlands are important for a variety of wildlife species, both resident and migratory.

Bogs are locally known as muskegs and are most commonly found in broad valley bottoms and on rounded hilltops. Muskegs are dominated by sphagnum moss with a wide variety of other plants adapted to very wet, acidic, organic soils. They typically contain some stunted lodgepole pine trees. These wetlands function as areas for recharge of groundwater and streams and for deposition and storage of sediment and nutrients. They are a valuable source of biological and vegetative diversity.

A diverse community of sedges and forbs, with occasional stunted trees of spruce or hemlock, characterizes fens. They occur in landscape positions where they receive some runoff from adjacent slopes resulting in somewhat richer nutrient status than muskegs. These wetlands function as areas for recharge of groundwater and streams, deposition and storage of sediment and nutrients, and for waterfowl and terrestrial wildlife habitat.

Scrub-shrub wetlands include areas dominated by woody vegetation less than 20 feet tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.

Scrub-shrub wetlands may represent a successional stage leading to forested wetlands, or they may be relatively stable communities. Two subclasses for this group occur in the project area: broad-leaved deciduous and needle-leaved evergreen. The broad-leaved deciduous subclass includes areas dominated by Sitka alder or willow. The needle-leaved evergreen subclass include areas dominated by young trees or stunted trees of lodgepole pine, Alaska yellow cedar and western hemlock that typically occur in muskegs or in the transition zone between bogs and forested wetlands. For the purposed of this assessment, all scrub-shrub wetlands are grouped together.

*Forested wetland*s are characterized by woody vegetation that is 20 feet or taller and normally possess an overstory of trees, and understory of young trees or shrugs and herbaceous layer. Forested wetlands are the most common wetland type in the Assessment Area.

Forested wetlands include a number of forested plant communities with hemlock, cedar, or mixed conifer overstories, and ground cover consisting largely of skunk cabbage and deer cabbage. They produce commercial forest products. These wetlands function as recharge areas for groundwater and streams, and for deposition of sediment and nutrients.

Wetland Functions

Wetland functions are specific roles the wetlands play in a landscape in terms of retarding sediment, providing habitat and biodiversity. Functions are not static: they change in response to succession, climate, and human-induced changes. Wetlands functions may be grouped into three general categories: aquatic use support, terrestrial use support, and human use support.

Aquatic Use Support

This category identifies functions that have direct contribution of wetland areas to the aquatic environment and its biological resources, including hydrologic functions such as flood control and water quality. Little is actually known about the hydrologic behavior of wetlands in Southeast Alaska. These functions include:

- Hydrologic connection
- Water regime/flood control
- Extent of Open Water
- Water quality: sediment retention
- Water quality: erosion and stability
- Fish habitat

Terrestrial Use Support
This category identifies those functions where there is a contribution of wetland areas to the terrestrial environment and its biological resources, including cover, food and reproduction habitat for wildlife, habitat complexity and corridor integrity. These functions include:

- Vegetation
- Wildlife habitat
- Edge

Human Use Support
This category identifies those functions that reflect recreational and other human use values, both extractive (hunting, fishing, berry picking, plant collecting) and aesthetic. These functions include:

- Recreation
- Aesthetics

It should also be recognized that the level of disturbance might affect the wetland's functions. Neither a site-specific nor a landscape-level functional assessment was performed in the Assessment Area. The above general functions, however, may be linked to general wetland types identified in the Area. In general, the Estuarine, Riverine, and the emergent classes of the Palustrine system have the most functional attributes associated with them, particularly in the aquatic use support functions. The forested wetlands and forested non-wetlands have the least amount of functional attributes, according to the literature (National Wetlands Working Group 1988), but do have attributes in sediment retention, erosion and stability, and recreation. It should be noted that forested non-wetlands also have important functions, particularity undisturbed habitats which rate high in sediment retention, erosion and stability, wildlife habitat, recreation and aesthetics.

Wetland Values

Biological Significance
Assessing the biological significance of wetlands is important when making a judgment on the value of the wetland. Understanding the value of the wetland, relative to wetlands both within and outside the Assessment Area, is an important consideration coupled with knowledge of general wetland functions. It is important for two reasons: 1) to understand the impacts to the wetlands affected by the any proposed action(s), and 2) to make informed decisions on mitigation and monitoring requirements, if necessary, due to any filling or dredging in waters of the U.S, including wetlands. According to the Code of Federal Regulations (33CFR 320.4(b)), biologically significant wetland functions are defined as the following:

- Wetlands which serve as nesting, spawning, rearing and resting sites for aquatic and land species;
- Wetlands set aside for the study of the aquatic environment;
- Wetlands where alterations will trigger detrimental natural drainage characteristics such as sedimentation patterns, current patterns, etc;
- Those that shield other areas from wave action, erosion, or storm damage;
- Those that serve as valuable storage areas for storm of flood waters;
- Those which are discharge areas that maintain minimum base flows to aquatic resources and those that are prime aquifer recharge areas;
- Those that purify water; and
- Wetlands that are unique in nature or scarce in quantity to the region or local area.

Wetland Scarcity

Wetland scarcity is another factor needing consideration when determining the relative value of wetlands. Scarcity can be determined based on the wetland's unique characteristics, and its aerial extent, both locally and regionally. To determine the latter, the wetland aerial extent, a calculation of total acres by wetland type is necessary, both within and outside the Assessment Area. Scarcity is sometimes determined at the watershed scale (1^{st} to 4^{th} order) and sometimes at broader landscape scales, such as whole islands. Because of the overall size of the Assessment Area and due to time constraints, a scarcity analysis was not performed on wetland types. Such an analysis is recommended for any future management activities that are proposed within the SSLA Area for projects that may affect wetlands.

Appendix F—Recreation Opportunity Spectrum Classes

ROS Class
Primitive

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Retention Visual Quality Objective. An Existing Visual Condition of Preservation is fully compatible and encouraged.
Access	Cross-country travel and travel on non-motorized trails and on waterways is typical. Use of airplanes, helicopters, motorboats and snowmachines for traditional activities, subsistence, emergency search and rescue, and other authorized resource management activities may occur but is rare.
Remoteness	No or infrequent sights and sounds of human activity are present. Setting is located more than 1.5 hours walking or paddling distance, or 3 miles, from any human developments other than infrequently-traveled marine travelways. Areas are generally greater than 5,000 acres, but may be smaller if contiguous with a Semi-primitive class.
Visitor Management	On-site regimentation and controls are very rare. Signing is limited to directional information and safety. There are no on-site interpretive facilities. There is great opportunity for discovery on the part of the users.
On-site Recreation Development	Structures do not exceed Development Scale I, except for public recreation cabins, and are maintained for appropriate levels of use.
Social Encounters	User meets less than 3 parties per day during trip. No other parties are within sight or sound of dispersed campsites or cabins. Maximum party size is generally 12 people.
Visitor Impacts	Visitor-caused impacts to resources are slight and usually not noticeable the following year. Site hardening is limited to boardwalk trails and necessary boat moorings or bearproof food caches and rustic public recreation cabins.

ROS Class
Semi-Primitive Non-Motorized

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Retention Visual Quality Objective. An Existing Visual Condition of Preservation is fully compatible and encouraged.
Access	Cross-country travel and travel on non-motorized trails is typical. Use of airplanes, helicopters, motorboats and snowmachines for traditional activities, subsistence, emergency search and rescue, and other authorized resource management activities may occur unless specifically restricted for safety and/or resource protection purposes.
Remoteness	Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur. Setting is located more than ½ hour walk or paddle, or approximately ½ mile (greater or less depending on terrain and vegetation, but no less than ¼ mile) from: 1) infrequently traveled waterways; 2) roads and trails open to motorized recreation use, and 3) clearcut harvest areas. Aircraft access is only occasional. Areas are generally greater than 2,500 acres but may be smaller if contiguous with Primitive or Semi-primitive motorized classes.
Visitor Management	On-site regimentation and controls are rare. Visitor information facilities may be used to interpret cultural and natural resource features, but are not elaborate and harmonize with the setting.
On-site Recreation Development	Facilities and structures generally do not exceed Development Scale II and are maintained to accommodate the types and levels of use anticipated for the site. Forest Service recreation cabins are fully compatible.
Social Encounters	User meets less than 10 parties per day (6 parties per day in wilderness) on trails and waterways during 80% of the primary use season. No other parties are within sight or sound of dispersed campsites during 80% of the primary use season. Maximum party size is generally 12-20 people. Outside of wilderness, larger party sizes may occur during less than 15% of the primary use season in limited locations.
Visitor Impacts	Visitor-caused impacts to resources are rare and usually not long-lasting. Site hardening is limited to boardwalk trails, boat tramways, moorings and docks, bearproof food cache facilities and rustic public recreation cabins.

ROS Class
Semi-Primitive Motorized

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Partial retention Visual Quality Objective. Existing Visual Conditions ranging from Preservation through Retention are fully compatible and encouraged.
Access	Travel on motorized and non-motorized trails and Traffic Service Level D roads, although some Traffic Service Level C roads provide access to and through the area. Use by high clearance vehicles and motorized water travel is common. Road density is less than one mile per square mile. Off-road snowmachine travel on snow may occur.
Remoteness	Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur. Setting is located within ½ hour walk or paddle or within ½ mile (greater or less depending on terrain and vegetation but no less than ¼ mile) of infrequently traveled waterways or small aircraft access points and/or roads which are open and maintained for passage by high clearance and four-wheel drive vehicles (Maintenance Level 2) and provide access to recreation opportunities and facilities. Areas are generally greater than 2,500 acres but may be smaller if contiguous with Primitive or Semi-Primitive Non-Motorized classes.
Visitor Management	On-site regimentation and controls are few. Control facilities consist primarily of informational signs and site-specific road closures. Visitor information facilities may be used to interpret cultural and natural resource features, but are not elaborate and harmonize with the setting.
On-site Recreation Development	Facilities and structures generally do not exceed Development Scale II and are maintained to accommodate the types and levels of use anticipated for the site and area. Forest Service recreation cabins are fully compatible.
Social Encounters	User meets less than 10 parties per day (6 parties per day in wilderness) on trails, roads, and shorelines during 80% of the primary use season. During 80% of the primary use season no other parties are visible from campsites. Maximum party size is generally 12-20 people. Outside of wilderness, larger party sizes may occur during less than 15% of the primary use season in limited locations.
Visitor Impacts	Visitor-caused impacts may be noticeable, but not degrading to basic resource elements. Site hardening is very infrequent, but, when it occurs, is in harmony with, and appropriate for, the natural-appearing backcountry setting.

ROS Class
Roaded Natural

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Modification Visual Quality Objective and typically is Partial retention. Existing Visual Conditions ranging from Preservation through Retention are fully compatible and encouraged.
Access	All forms of access and travel modes may occur. Access to and through the area is typically by passenger vehicle, although motorized use may be restricted to provide for resource protection, user safety, or to provide a diversity of recreation opportunity.
Remoteness	Remoteness is of little importance, but low to moderate concentrations of human sights and sounds are preferred. Setting is located within ½ mile (greater or less depending on terrain and vegetation but no less than ¼ mile) of moderate to heavily-traveled waterways and/or roads which are maintained to Levels 3, 4, and 5 and open for use by the public or those areas that receive heavy small aircraft travel.
Visitor Management	On-site regimentation and controls are obvious. Control facilities such as parking areas, barriers and signs harmonize with the natural environment. Visitor information facilities are not elaborate or complex.
On-site Recreation Development	Facilities and structures generally do not exceed Development Scale III and are maintained to accommodate the types and levels of use anticipated for the site and area. Typical facilities include outdoor interpretive displays and rustic campgrounds and picnic areas.
Social Encounters	User meets less than 20 other parties per day on trails and in dispersed areas, during at least 80% of the primary use season. User may meet numerous other parties on roads and developed recreation sites. Developed sites often are at full capacity but do not exceed 80% of the design capacity over the season of operation.
Visitor Impacts	Visitor-caused impacts are noticeable, but not degrading to basic resource elements nor do they exceed established Visual Quality Objectives. Site hardening may be dominant, but is in harmony with natural-appearing landscape and appropriate for the site and setting.

ROS Class
Roaded Modified

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Maximum Modification Visual Quality Objective. Apply visual management techniques to soften effects of maximum modification conditions in the foreground of sensitive travel routes and recreation sites.
Access	All forms of access and travel modes may occur, although roads are generally not well suited to highway-type vehicles. OHV use on designated routes or areas is encouraged. Use by high clearance vehicles is common.
Remoteness	Remoteness from urban conditions and high concentrations of other people is important. Low concentrations of human sights and sounds in a backcountry roaded setting are preferred. These areas are accessed by Forest roads which are maintained to Levels 2, 3, and 4 and are available for public use. They generally involve areas with timber management activities.
Visitor Management	On-site regimentation and controls are few. Control facilities are appropriate for the predominating backcountry roaded setting. Visitor information facilities may be used to interpret management activities, but are not elaborate and are appropriate for the setting.
On-site Recreation Development	Facilities and structures generally do not exceed Development Scale II and are maintained to accommodate the types and levels of use anticipated for the site and area.
Social Encounters	User meets less than 20 other parties per day on trails and in dispersed areas during at least 80% of the primary use season. Numerous other parties may be encountered on roads. Few, if any, other parties are visible at dispersed campsites.
Visitor Impacts	Visitor-caused impacts are noticeable, but not degrading to basic resource elements. Site hardening may dominate at campsites and parking areas, but is in harmony with, and appropriate for, backcountry roaded setting.

ROS Class
Rural

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed Modification in the Foreground and Maximum Modification in middleground.
Access	All forms of access and travel modes may occur, although access to and through the area is primarily by passenger vehicle. Road and trail surfaces are often hardened.
Remoteness	Remoteness is of little importance, and moderate to high concentrations of people and sights and sounds of human activity are acceptable when not continuous. Setting is located within 1/2 mile of heavily traveled roads and state highways or areas that receive heavy aircraft travel.
Visitor Management	On-site regimentation and controls are obvious. Control facilities such as parking areas, medians, and barriers harmonize with natural/exotic landscaping. Information and interpretive facilities may be complex and dominant on developed sites.
On-site Recreation Development	All Development Scales (I-V) are appropriate and maintained at intended standards necessary to accommodate the types and levels of use anticipated for the site and area. Facilities typically include visitor centers, major campgrounds, and other facilities for concentrated use.
Social Encounters	User may meet many (more than 20) other parties per day on trails, in dispersed areas, on roads, and in developed facilities. Developed sites often are at full capacity, but do not exceed 80% of the design capacity over the operating season.
Visitor Impacts	Visitor-caused impacts are noticeable, but not degrading to basic resource elements nor do they exceed established Visual Quality Objectives. Site hardening may be dominant, but is in harmony with natural/exotic landscape and appropriate for the site and setting.

ROS Class
Urban

Setting Indicators	Standards and Guidelines
Visual Quality	Not to exceed the Modification Visual Quality Objective in the foreground and Maximum Modification in middle ground.
Access	Access and travel facilities are highly intense, motorized and often with mass transit supplements.
Remoteness	Remoteness is not important. High concentrations of people, and sights and sounds of human activity are acceptable.
Visitor Management	Intensive on-site controls are numerous and obvious. Information and interpretive facilities may be complex and dominant.
On-site Recreation Development	All Development Scales (I-V) are appropriate and maintained at intended standards necessary to accommodate the types and levels of use anticipated for the site and area. Synthetic materials are commonly used. Facility design may be highly complex and refined, but in harmony or complimentary to the site. Facilities typically include visitor centers, major campgrounds and other facilities for concentrated use.
Social Encounters	Interaction between large numbers of users is high. Sites often are at full capacity, but do not exceed 80% of the design capacity over the operating season.
Visitor Impacts	Visitor-caused impacts are noticeable, but not degrading to basic resource elements or exceed established Visual Quality Objectives. Site hardening may be dominant, but is in harmony with natural/exotic landscape and appropriate for the site and setting.