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COBBLE

Landscape Assessment

Cover Photo: Sal Creek estuary, showing a typical mix of open and closed roads, riparian alder composition, aquatic habitat, deer winter range, beach fringe, and regenerating forests.

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Executive Summary

Landscape assessments are tools that allow managers to consolidate historical and current information about a distinct area, from multiple resources, and are guided by the predominant issues related to natural resource management and ecosystem sustainability in that area. The outcome of a landscape assessment should lead to project-specific rehabilitation, enhancement, or use of natural resources, as outlined by the forest plan. Finally, they incorporate the best available and most current information about that landscape in order to make sound, scientifically justifiable decisions that lead to the desired future condition of that landscape.

The Cobble area is located immediately north of the community of Thorne Bay, stretching to Ratz Pass. It is bordered to the east by Clarence Strait, and to the west by a high ridge separating it from the North Fork of the Thorne River. It was used primarily for subsistence purposes prior to European settlement, mostly along the coast.

In 1959, the Cobble area became an important producer of natural resources, primarily timber, under management by the USDA Forest Service. With the rapid increase in timber harvest came logging camps establishing in Ratz Harbor, Thorne Bay, and Coffman Cove. Today, it continues to provide both important subsistence and natural resources to local communities, though the harvest of timber is only one of many uses by people in the Cobble area.

Recently, the USDA Forest Service determined that the Cobble area is vital to not only the region's economy, but to the subsistence, recreation, and ecosystem integrity of the area. Much of the Cobble landscape and its components have changed significantly since 1959, and as a result, the USDA Forest Service has identified several predominant issues affecting the current and future landscape and its uses. The issues described in this analysis serve as the basis for recommending actions to rehabilitate many of those ecosystem components in accordance with the Forest Plan, as well as identifying future opportunities for economic growth, recreation, and subsistence use.

Today, 34 percent of the Cobble area is in a second-growth, even-aged forest structure, while 46 percent of the productive old-growth habitat which previously served as valuable deer winter habitat now is in a second-growth condition. It is recognized that much of that forest structure will continue to be even-aged until commercial thinning or harvest can begin in approximately 30 years. Pre-commercial thinning treatments to emulate wind-throw patterns and enhance deer winter range are recommended in this analysis.

Timber production from the Cobble area has declined in the last 30 years, peaking in the 1960s. However, 7,611 acres of suitable and available land exist near roads that could be utilized in small timber sales. In addition, red alder is present in large quantities along road beds and riparian areas that have been recommended for rehabilitation. Recently, red alder has become a valuable resource to some local processors, despite its non-commercial status.

Hydrologic connectivity and wetlands are integral parts of watershed function in the Cobble area. Landslides and soil erosion from roads have been identified as a major source of resource damage to downstream ecosystems. Currently, 101 miles of road cross Mass Movement Index (MMI) 3 and 4 soils, 227 landslides have been identified, roads cross approximately 352 known high gradient streams, and 25 percent of the overall wetland area has been harvested. As a result, many of the most unstable landslides are recommended for stabilization projects; nine miles of road built across unstable soils have been identified for removal of material or maintenance; and 0.62 miles of road affecting wetland function are recommended for complete obliteration.

Finally, fisheries habitat and aquatic ecosystem function has been impaired in several watersheds due to riparian harvest and the conversion from conifer-dominated riparian areas to red alder-dominated riparian areas, as well as road construction over and along unstable stream channels. In addition, accessibility to spawning and rearing habitat has declined by the improper construction of road-stream crossings, but has improved in one watershed by the construction of a fish pass. Approximately 234 acres of riparian area is recommended for thinning, and 30 miles of road containing inadequate drainage structures is recommended for complete closure. In addition, remote fishing access sites are recommended in concurrence with road closures, and rehabilitation of fisheries habitat and other aquatic ecosystem components have been identified.

The use of the Cobble area has always been valued by people for its important subsistence, and more recently, recreation opportunities. An upgrade to the Sandy Beach road will almost certainly bring greater recreational, subsistence, and economic importance to the area. Many projects to both enhance and/or limit those opportunities are recommended including several recreational opportunities and limitations to further developments based on visual quality standards and archeological preservation.

Introduction

Landscape assessments are a tool that allows managers to consolidate historical and current information about a distinct area and recommend projects that would contribute to the rehabilitation, enhancement, or use of natural resources as outlined by the Tongass Land Management and Resource Plan (Forest Plan). It is, in a sense, a mid-level planning procedure, encompassing far-less area than the Forest Plan. A Landscape Assessment identifies the predominant issues associated with an area that is larger than those normally considered in project-specific planning. It is not a decision notice, and therefore does not lead directly into project-specific implementation, which includes following the guidelines of the National Environmental Policy Act (NEPA). It should, however, recommend projects guided by issues leading toward a desired future condition of that area. These recommendations should be founded upon scientifically reliable information rather than on perceptions of the area, and meet the objectives outlined by the Tongass Land and Resource Management Plan (1997).

The Cobble area was identified for this type of assessment because of its historic and intended use by people in the region and its recent wide-scale alteration of landscape processes. Its close proximity to the communities of Thorne Bay and Coffman Cove and its natural resources and processes have been, and continue to be, highly valuable to both the local economy and the ecosystem components within it. However, many landscape processes have changed substantially in the Cobble area in recent years, and require some level of rehabilitation to at least partially restore their function.

It is recognized that many sections within the Cobble area may not adequately sustain habitat, suitable vegetative regeneration, timber harvest, hydrologic connectivity, aquatic integrity, or recreation and subsistence opportunities. As a result, the predominant issues developed for the Cobble area are associated with wildlife habitat viability; second-growth management and regeneration; future timber harvest; landslides and soil erosion; un-maintained roads; fisheries habitat and aquatic ecosystem rehabilitation; and impacts by recreation development on other resources. The development of these issues may lead to projects that restore, rehabilitate, or sustain those features that make the Cobble area important to the surrounding region.

Finally, this document is the summation of the best available information about developments, uses, and degradation of the landscape. It recommends a series of projects designed to meet the desired future condition of that landscape within the objectives of the Forest Plan. It does not, however, prioritize those projects. The prioritization of these projects is at the discretion of the user, and the decision to pursue a project or group of projects should include: the relative environmental or functional degradation of the site; its impacts to other resources; the actual probability of improvement, public opinion, funding availability; and local economy.

Issue Development

Many issues were developed for the Cobble area as a result of its historic and intended use. Many of these encompass the wide-scale changes that timber harvest and road construction have had on landscape processes and functions (i.e. loss of deer winter range or diversion of streams through culverts). Several issues include the foreseeable use of the Cobble area, in terms of its importance to the economic, recreational and subsistence use of nearby communities.

- Much of the forested landscape has been converted from an unmanaged, spatially and temporally diverse forest structure, to a more contiguous even-aged forest. The effects of converting such a large land base to a single aged forest structure on deer winter range habitat is the predominant issue associated with both wildlife and silviculture management in the Cobble area. This section focuses on the current state of important wildlife habitat, and assesses how the current vegetation conditions meet the desired future conditions. The vegetation conditions include a balanced mix of age classes, forest structure, and species composition of the Cobble area. This section also explores opportunities to reshape the spatial and temporal distribution of young growth forest to meet resource objectives, including commodity flow.

- The availability of suitable and commercial timber volume has decreased substantially in recent years, leading to a transition from large to small volume sales and the potential for developing non-commercial product markets. Available commercial timber resources have been of particular concern in the Cobble area as they correspond to the development and well-being of much of the local economy. These issues focus on the volume of timber that is currently suitable and accessible, and introduces the potential for non-commercial market development of red alder.

- Hydrologic connectivity and natural watershed processes have been altered by road construction and timber harvest. The heavily dissected slopes of the Cobble area are a result of high rainfall and erosional processes, which are partly responsible for the high level of biological productivity of streams. This section's issues focus on areas where roads and timber harvest have altered the maintenance and storage of water in forested wetlands; how these changes have influenced the sediment regime in streams; and where stream crossing structures across roads degrade downstream resources.

- Watershed erosion shapes the landscape and influences other resources. Increased erosion at many scales (from single-event landslides to chronic streambank erosion) has resulted in long-term impairment of other resources. The Cobble area is highly susceptible to both large and small-scale erosion due in part to its inherent geology, as well as its rapid transition into developed land. Landslides in harvested areas and increased soil erosion into stream channels have become a major concern to resource managers in recent years. This section focuses on the historic frequency, distribution, and magnitude of landslides in the Cobble area, as well as their impact on other resources and those areas at risk for future landslides. In particular, these issues focus on roads and timber harvest that exist on unstable slopes that are susceptible to future landslide activity.

- Sustaining or increasing human use (resource extraction, recreational, subsistence, and user groups) must be accomplished without creating unacceptable damage to resources. Recently more emphasis towards recreation in the Cobble area has become a key issue for people throughout the region and across Prince of Wales Island. Recreation resources serve as a means to diversify the economy and support subsistence lifestyles, but can also lead to increased resource use and degradation. This section focuses on the resources that could be affected by increasing use; the level of use and acceptable changes to resources; important motorized and non-motorized routes; the effect of increasing development on scenic resources; and the contribution of increasing use on local economy.

- Stream structure, function, and aquatic species have been altered by past commercial timber harvest practices. The alteration of streams by timber harvest and road construction, and associated influences, is the focus of this section. In particular, it details the effects of converting conifer dominated riparian forests to deciduous forests; locations where fish access to habitat is limited by roads; erosion from roads that cause habitat degradation; the loss of fish rearing habitat; the effects of increased recreation or subsistence accessibility on fish populations; and the effects of increased fishing pressure at potential fishing access sites.

The following chapters outline these issues, incorporating historical knowledge and evidence; patterns of use; economic and subsistence importance; and ecological condition. Much of the information used in the figures and tables for these analyses was developed from the USDA Forest Service Geographic Information Systems database, and may be subject to some variation.

Chapter 1

Characterization of the Area

Location and Use

The Cobble area lies directly north of Thorne Bay, along the eastern shoreline of Prince of Wales Island, Alaska. It is bordered to the east by Clarence Strait; to the west by an alpine ridge separating it from drainages of the North Fork of the Thorne River; and to the north by a low pass dividing the Ratz Creek drainage from the Luck Lake drainage (Figure 1-1). Eighteen watersheds are encompassed by its boundary, modified from the original U.S. Geological Survey 5th field hydrologic unit code (HUC) watersheds. The area has a total of 45,989 acres, of which the Forest Service, U.S. Dept. of Agriculture (USDA Forest Service) manages 43,322 acres. The State of Alaska manages 3,602 acres; the City of Thorne Bay manages 63 acres; and an unknown entity manages two acres (data from USDA Forest Service GIS database). Only the land under management by the USDA Forest Service is included in this analysis.

The Cobble area receives the majority of its precipitation during the fall and winter months, which typically translates into high flows in streams. The region typically receives between 90-150 inches of precipitation annually. Annual average high and low temperatures of 51°F and 37°F respectively, are typical of the area, while the monthly average high temperature of 66°F usually occurs in July and low of 27°F occurs in January (data provided by Alaska State Climate Center, University of Alaska, for Hollis, Alaska).

The USDA Forest Service divides its land into Land Use Designations (LUD), which are outlined by the 1997 Tongass Land Management Plan (TLMP). Each LUD has a primary management objective that are met by management prescriptions, and regulated by certain standards and guides, also outlined in TLMP.

The Cobble area consists of four LUDS, Old Growth Habitat, Timber Production, Modified Landscape, and Recreational River, not including non-national forest (Table 1-1, Figure 1-2). Briefly, the Old Growth Habitat LUD should maintain viable populations of native and desired non-native fish and wildlife species and subspecies that may be closely associated with old-growth forests. The Timber Production LUD should promote and provide a continuous and sustainable supply of timber to meet society’s needs. The Modified Landscape LUD should supply a sustained yield of timber to meet society’s needs while recognizing scenic values of those lands and minimizing the visibility of developments from

Figure 1-1. Location of the Cobble Area

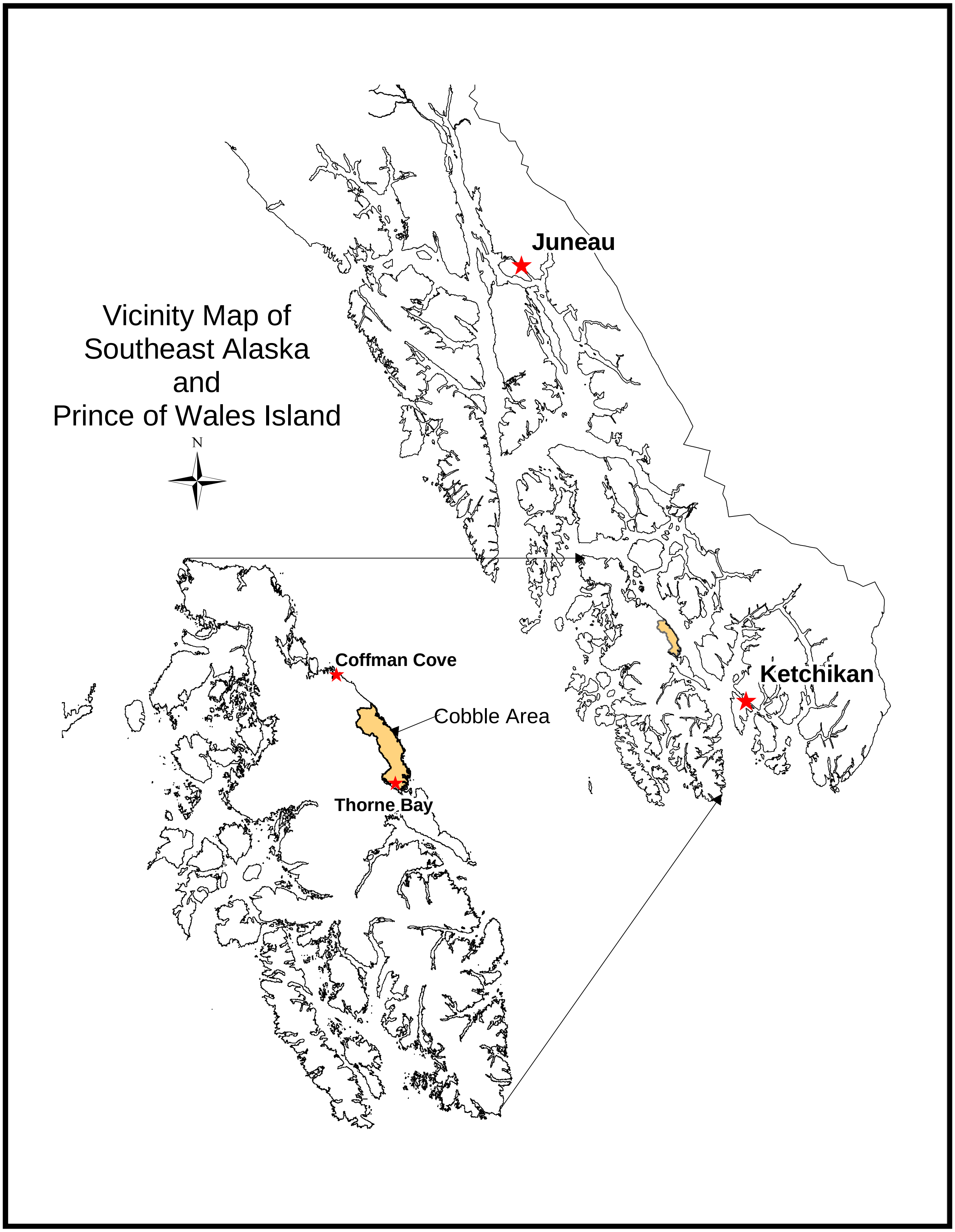


Table 1-1. Acres of land, by Land Use Designation (LUD), within USDA Forest Service owned land in the Cobble area

LUD	Timber Production	Modified Landscape	Recreational River	Old Growth	Non-National Forest
Acres	8,594	25,904	357	7,368	3,679
Percent of Area	19%	56%	1%	16%	8%

popular scenic areas. The Recreational River LUD should seek to maintain, improve, and protect the free-flowing character and outstandingly remarkable values of river segments included in the National Wild and Scenic Rivers System.

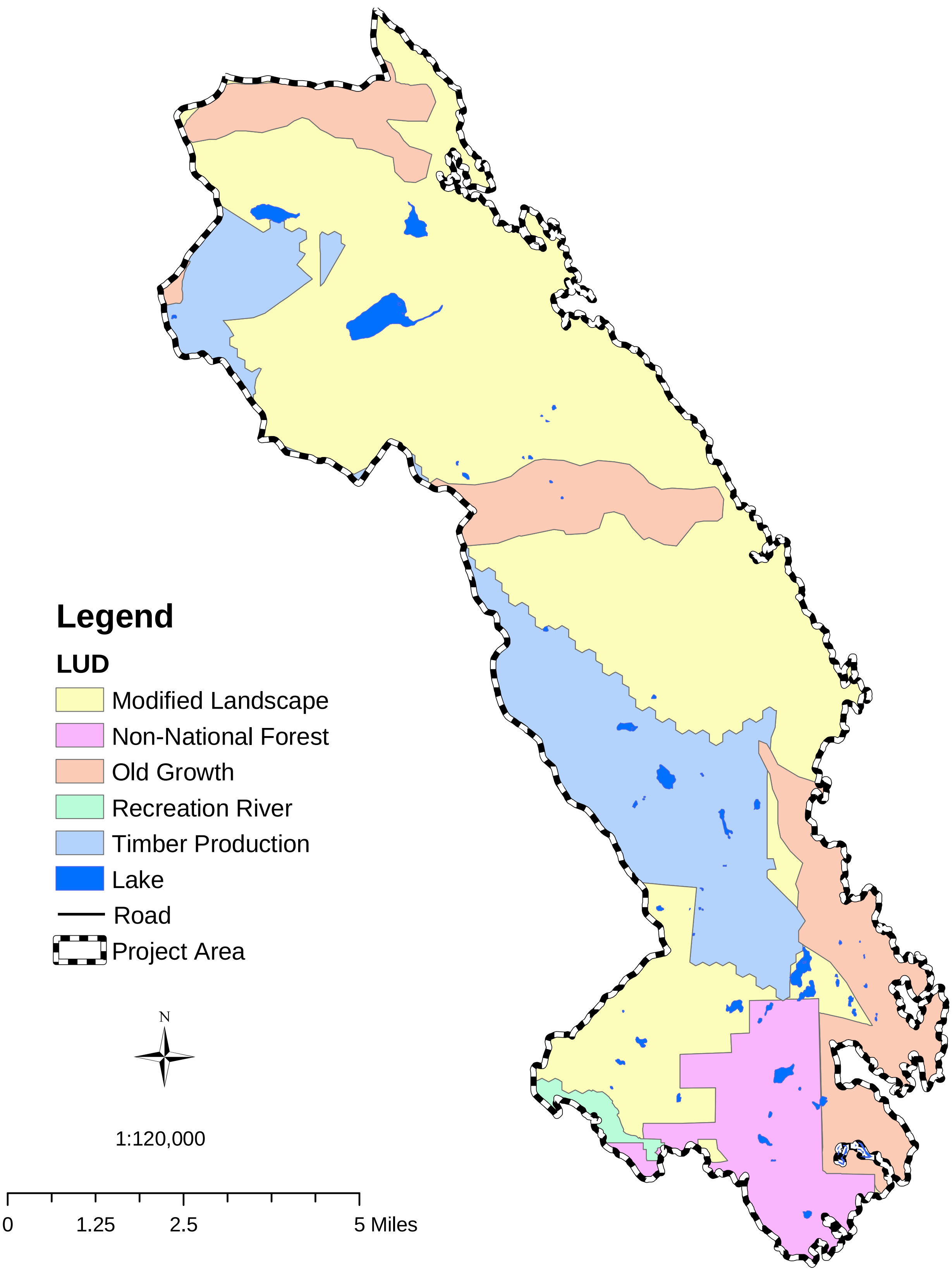
The area has always been important to the people that have utilized its natural resources, though its significance to people during pre-European settlement has been difficult to determine. Today, the Cobble area lies between the communities of Thorne Bay and Coffman Cove, and many residents of Prince of Wales Island and surrounding areas recreate, subsist, and make their livelihood from the natural resources in this area.

Landscape Patterns and Processes

The Cobble area is shaped by processes not necessarily unique to the Cobble area, but unique to much of Prince of Wales Island and southeast Alaska. Geologically, the Cobble area is dominated by numerous small, steep dissected valleys surrounded by shallow volcanic mountains, and is largely underlain by heavily weathered granitic bedrock. Glacial tills soils are dominant at the low elevations, while shallow less productive organic soils are dominant at the higher elevations (Nowacki et al 2001). Much of the lower elevation landscape is composed of a heavily forested structure that is shaped by aspect, elevation, soil composition, and wind. Wetland complexes dominate the upper elevations. As a result, landslides and wind are the dominant landscape-structuring components, creating small, homogenous patches of young trees amongst an otherwise relatively heterogeneous forest structure.

Today, those processes in much of the Cobble area are subject to different factors than just wind-throw and landslides, though both continue to influence the landscape. Beginning in the mid-1950s, wide-scale harvest of its forests became a dominant influence of the area, and with it grew the communities of Thorne Bay and Coffman Cove. Since then, the Cobble area has served as a vital source of natural resources and recreation for local communities. With greater demand for those resources came more changes to those ecological processes than had occurred on the landscape for a millennium.

Figure 1-2. Land Use Designations (LUD) in the Cobble area.



Legend
LUD
Modified Landscape
Non-National Forest
Old Growth
Recreation River
Timber Production
Lake
Road
Project Area
N
1:120,000
0
1.25
2.5
5 Miles

Today, the Cobble area remains vital to local economies and people's well-being. However, many ecosystem components have changed significantly in the last 50-years. For instance, much of the suitable and accessible timber volume has been harvested, converting large areas of forest to single-age, dense stands of second-growth trees. These stands are less productive to important subsistence species like deer. Many roads were built along streams or across steep, unstable, slopes resulting in impaired aquatic resources. Additionally, public recreation and use of limited natural resources is expected to increase, enhancing the need for a thorough, detailed analysis of the Cobble area.

Chapter 2 – Vegetation and Wildlife

Reference Condition

Forest Vegetation
The historic forest vegetation condition of the Cobble Landscape Assessment area was a mosaic of coniferous forest of various ages with old-growth dominating. Old-growth forests typically contain some proportion of trees greater than 250 years old and include trees of other ages, sizes, and conditions; including dead standing trees (snags) and trees with dead tops. Schoen and others (1988) define old-growth forest as a mosaic of older and younger trees, dynamically changing yet remaining stable as a forested ecosystem. In the Cobble area, old-growth forest was intermixed with alpine tundra, muskeg, riparian, and shrubland plant communities. The project area historically contained about 33,919 acres of old-growth.

Natural Disturbance and Forest Vegetation
Prior to European settlement the Cobble area was primarily influenced by natural disturbance processes. Forests in Southeast Alaska are shaped primarily by periodic windthrow events. Natural disturbance typically creates small widely dispersed openings (1 to 20 acres) across the landscape, but infrequent large-scale windthrow events can occur. Many trees often remain standing or partially standing within these openings. Windthrow events most frequently occur on ridges that are exposed to the prevailing southeastern winds. Western hemlock and western hemlock-Sitka spruce forests are the least windfirm in southeast Alaska. They are most susceptible to blowdown due to their large, top-heavy canopies and tall tree heights (Foster 1988, Foster and Boose 1992, Lohmander and Helles 1987). Cedar dominated forests that include western redcedar and yellow-cedar growing on forested wetland sites, tend to be the most windfirm (Harris 1989).

No historical data or detailed descriptions are available for vegetation within the Cobble area prior to European settlement. Current undeveloped land within the project area could be used to represent “reference” conditions. Undeveloped areas are most representative of pre-European settlement conditions, or those conditions that have developed as a result of natural disturbance processes (i.e. windthrow).

Sitka Black-tailed Deer Winter Range
In general, deer winter range is a mix of forested and non-forested areas that provide adequate thermal cover and forage for body maintenance for deer during the winter months. The size of available winter range can vary from year to year depending on factors such as snow depth and persistence. No quantitative data on the historic distribution of high-value deer winter range is available for the

Cobble area. The amount of high-value winter range can be estimated by reconstructing the timber volume strata and identifying high-value areas using the interagency deer model.

The deer model is a GIS based model that assigns habitat capability scores for winter habitat based on slope, aspect, snow level, and volume of forest stands. Habitat Suitability Index scores (HSI) range from 0.0 to 1.3, with 1.3 representing the very highest value habitat. High-value winter habitat generally has an HSI greater than 0.40.

High-value deer winter range in Southeast Alaska typically consists of productive old-growth stands (timber volume greater than 8,000 board feet per acre) below 1,500' elevation on south facing slopes or POG stands directly exposed to maritime influence. This would have primarily included all ridges facing the ocean, the south side of Baird Peak, and larger watersheds including; Big Ratz, Sal Creek, Little Ratz, Slide Creek, and Deer Creek (Figure 2-1). The Cobble area historically contained about 15,847 acres of high-value deer winter range (HSI greater than 0.40).

Current Condition – Vegetation and Wildlife

Forest Vegetation

Age/Size Class - The vegetation condition of the Cobble Landscape Assessment area is a mosaic of coniferous forest of various ages intermixed with alpine tundra, muskeg, riparian, and shrubland plant communities. A large portion of the old-growth forest has been converted to even-aged second-growth. This has resulted in stands with homogenous structure and poorly developed understories.

Large-scale timber harvest has converted 15,573 acres of old-growth into second-growth. Forty six percent of the historic productive old-growth (POG) and 34 percent of the project area have been converted. The bulk of this conversion has occurred during a relatively short time period (Figure 2-2). Timber harvest peaked in the 1960s and again in the 1990s.

The previously harvested areas are currently young, even aged stands, which often provide very little wildlife habitat if left untreated. The typical development of an even-aged stand without intermediate treatment includes a seedling sapling stand initiation stage (1-25 years after harvest), a stem exclusion stage (26-150 years), and an understory re-initiation stage (150-250 years) (Alaback 1984. pages 5-8). Understory development occurs only during the first and third stages without intermediate treatment. The understory is largely absent during the stem exclusion stage.

Figure 2-1. Map of historic high-value deer winter range in the Cobble area

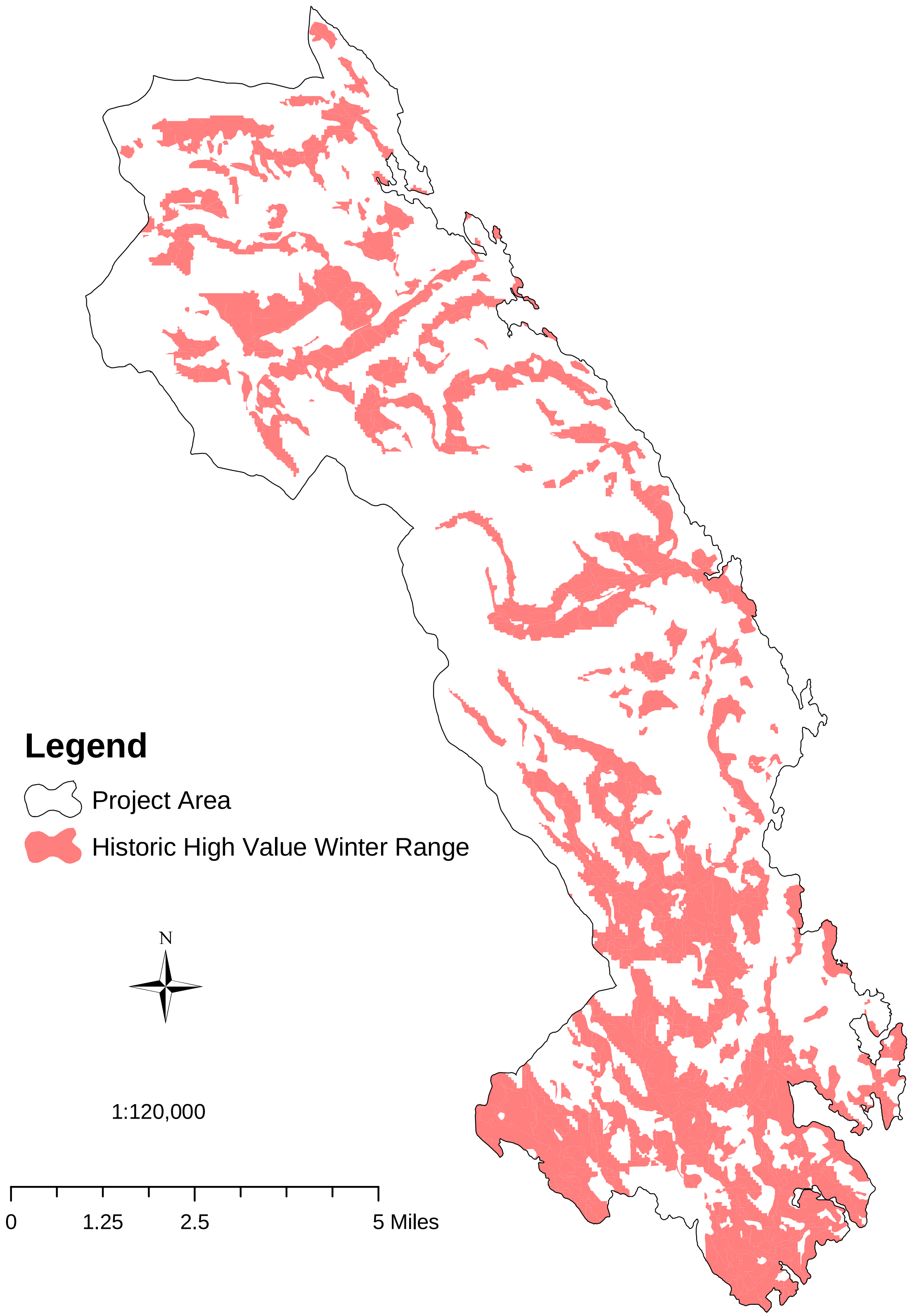
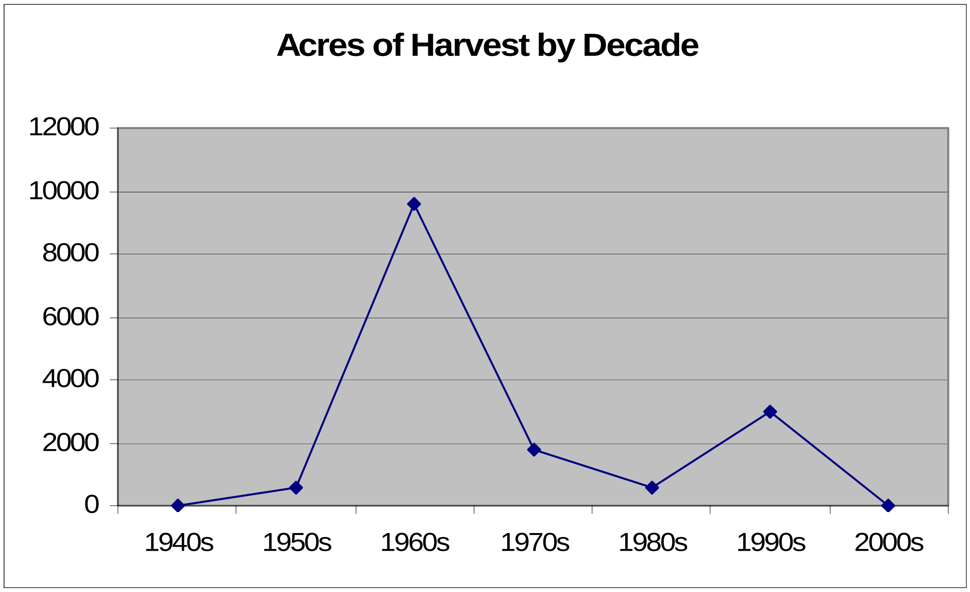


Figure 2-2. Timber harvest by decade in the Cobble area

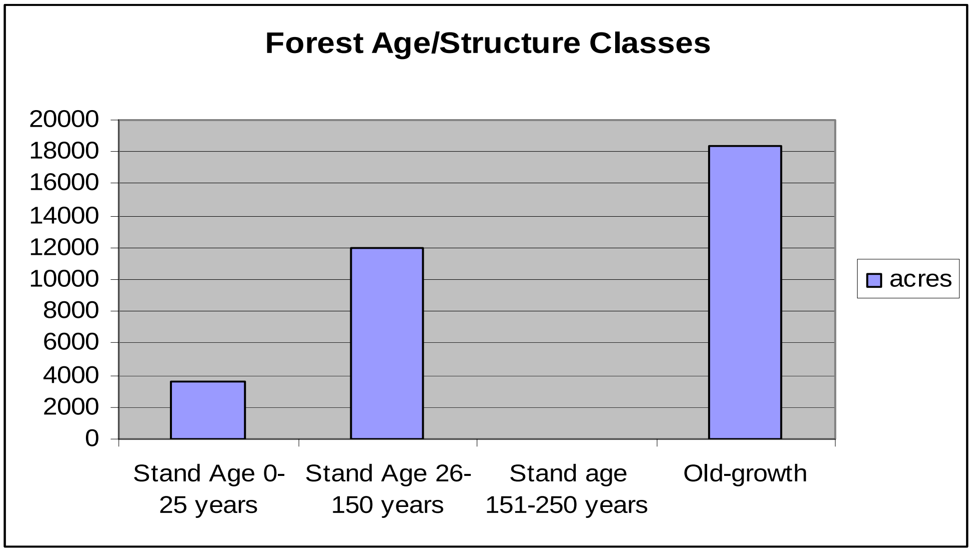


The current forest age class distribution in the project area is represented in Figure 2-3. Stand ages were broken out to represent the three stages of stand development after harvest and include unharvested forest (old-growth). Currently, 3,573 acres of 0-25 year old second-growth; 11,992 acres of 26-150 year old second-growth; and 18,325 acres of old-growth are found in the area. These figures include private land. No known 151-250 year old second-growth is found in the area.

Harvest dates in the project area range from 1940 to 1999 with an average harvest date of 1978. A large portion of the second-growth (11,992 acres) is in the stem exclusion stage of stand development. This stage is considered poor wildlife habitat for a variety of reasons. The almost complete loss of understory forage, for example, greatly reduces deer habitat capability. Slightly more than 1/3 (4,414 acres) of this class of second-growth has been previously thinned. Many of the thinned stands have again entered stem exclusion. The acres thinned may not be entirely accurate due to past mapping procedures.

Some of these young stands are approaching a size class, which may allow commercial treatments to successfully take place. Several trials and studies are currently underway in other parts of the Forest that are testing the viability of commercial treatments in young second-growth forests.

Figure 2-3. Forest age structure/classes in the Cobble area



Patch Size - Large-scale timber harvest began in the 1950s resulting in large areas of even aged second-growth. These stands are primarily concentrated in valley bottoms (less than 1,500 feet in elevation). As a result, large portions of historic deer winter range in these valleys have been converted to second-growth.

Second-growth represents 39 percent of the Cobble project area (Figure 2-4). It is distributed in patch sizes ranging from 0.59 acres to 2,248 acres with an average size of 79 acres. The frequency of second-growth in the Cobble project area is 227 acres of second-growth/mile^2.

Species Composition - The old-growth forest species composition in the Cobble area typically averages 60 percent western hemlock, 15 percent Sitka spruce, and 25 percent cedar (western redcedar and yellow-cedar). Red alder and shore pine are minor components of most productive old-growth forests in the area.

The regeneration after harvest is dominated by hemlock, spruce and redcedar. Past thinning efforts have favored Sitka spruce resulting in thinned stands that are dominated by spruce, with cedars and hemlock also present. This has resulted in an increase in the overstory canopy spruce component over the original old-growth vegetation that occupied most upland sites.

Red alder currently dominates the overstory on hill slopes where logs were yarded using high-lead systems with insufficient suspension. Using this system, trees were felled and dragged on the ground with a cable to the landing. This system produced extensive soil scarification, exposing mineral soils and promoting the invasion of red alder. Past harvest also occurred in several riparian areas shifting species composition to red alder as a dominant. Most red alder dominated sites have sufficient conifer understory to reasonably expect a species shift in the overstory over time. The stiff erect leaders of Sitka spruce give this species an advantage in the alder understory, allowing spruce to survive where other species (hemlock and cedars) can be buried in litter while still small seedlings.

Second-growth within Land Use Designations - Five Land Use Designations (LUD) are present within the Cobble landscape assessment area. The five LUDs are:

- The Modified Landscape LUD - contains 9,878 acres of second-growth.
- The Timber LUD - contains 4,063 acres of second-growth.
- The non-National Forest LUD - contains 1,012 acres of second-growth.
- The Old-growth LUD - contains 380 acres of second-growth.
- The Recreational River LUD - contains 232 acres of second-growth.

Both the Modified Landscape and the Timber LUD are considered timber production land use designations, which hold timber production among the primary uses.

Sitka Black-tailed Deer Winter Range

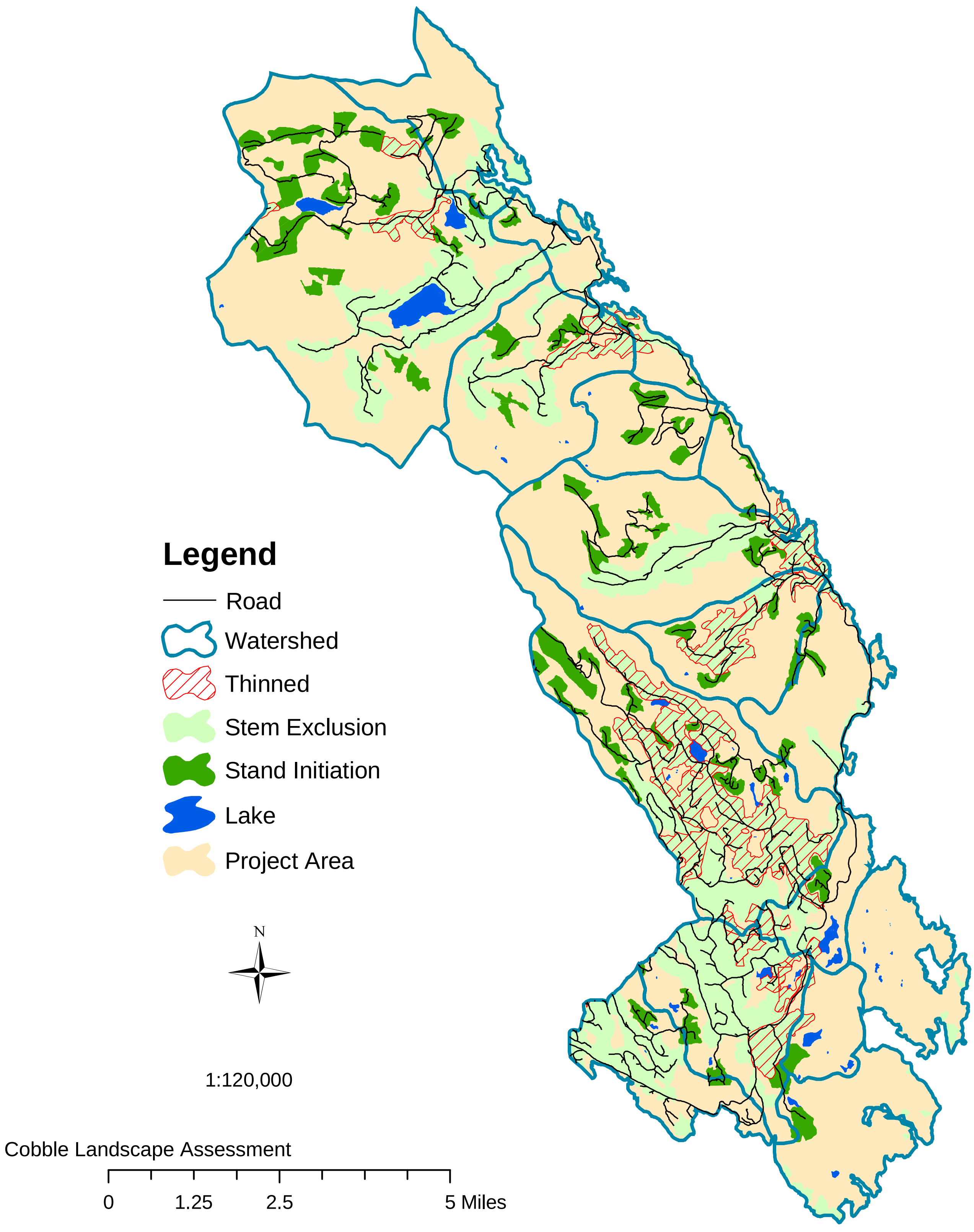
Critical deer winter range consists of habitat that is of great importance for deer survival and is in relatively short supply during severe winter weather. Severe winter weather in southeastern Alaska includes periods of deep snow accumulation, (Hanley 1984, page 13). During heavy snow years, deer are likely to concentrate in low-elevation old-growth (less than 1,500 feet in elevation) on south facing slopes and/or near the coastline. Critical winter range is not required during average winters. Other habitats can be utilized and become important for relieving browsing pressure on critical winter range during average winters, dispersing browsing effects on overall winter habitat.

The interagency deer model was used to identify existing high-value deer winter range in the Cobble project area. 6,177 acres of high-value winter range with a Habitat Suitability Index greater than 0.40 are widely scattered in the project area (Figure 2-5). The largest patch of existing high-value deer winter range is located in the southeastern portion of the project area, which includes the old-growth surrounding Thorne Head and Snug Anchorage. Other large patches are found along the Thorne River Estuary, lower Sal Creek, lower Noname Creek, and on the south side of Baird Peak.

Female deer on Prince of Wales Island have an average annual home range of about 78 hectares (180 acres) with an average core area of only 9.1 hectares (23 acres). Winter home ranges are slightly smaller than summer, but can get much more restricted with heavy snowfall. Winter ranges average between 40 and 50 hectares (100-125 acres), but they may only use 5-10 hectares (13-25 acres) in

Figure 2-4. Map of second-growth in the Cobble project area

heavy snow years (Person, Personal Comm. 2004). Deer have a large portion of second-growth within their home ranges given their small home range and the frequency of second-growth in the project area. Some deer in the project area may actually have home ranges dominated by second-growth.



Synthesis and Interpretation – Vegetation and Wildlife

Forest Vegetation

A major shift has occurred in stand age and patch size distribution in the project area from historic levels. The amount of old-growth has been reduced by 46 percent from historic levels. The main cause of this loss of old-growth was timber harvest. A major portion of the forested landscape has been converted to second-growth that is currently in the stand-initiation (3,573 acres) and stem exclusion (11,992 acres) stages of stand development.

Past large-scale clearcutting rarely emulated prevailing wind disturbance patterns and processes in southeast Alaska. Naturally occurring disturbance patches were widely dispersed across the landscape whereas existing clearcuts are highly concentrated in valley bottoms. This has resulted in large, continuous, homogenous stands of second-growth in these areas. Valley bottoms are normally protected from severe storm winds and were typically influenced by small-scale gap processes. The current average size of clearcuts in the project area is 79 acres. Patches created by windthrow events in the project area were typically 20 acres or less and often times had some retention of standing trees and snags within the blow down patches. Existing clearcuts in the project area have very little overstory retention within them. Clearcuts tend to be geometric in shape while openings created by wind disturbance have erratic shapes.

Forest Vegetation Condition in Land Use Designations

Four Land Use Designations (LUDs) are present within the Cobble landscape assessment under USDA Forest Service ownership. These LUDs have been heavily impacted by past timber harvest (Table 2-1). The four LUDs are:

- The Modified Landscape LUD - currently contains 50 percent of the historic old-growth forest once found within this LUD.
- The Timber LUD - currently contains 32 percent of the historic old-growth forest once found within this LUD.
- The Old-growth LUD - currently contains 92 percent of the historic old-growth forest once found within this LUD.
- The Recreational River LUD - contains only 26 percent of the historic old-growth forest that was within this LUD.

Currently, the LUDs do not meet the desired future condition under the Tongass Land and Resource Management Plan (Forest Plan). Stands of trees that are healthy and in a balanced mix of age classes from very young to harvestable age are a key part of the desired future condition for lands within the Timber Production Land Use Designation. The desired future condition within the Modified Landscape LUD is a variety of successional stages, with less evidence of harvest in foreground areas viewed by forest visitors. Forest land within the Old-growth LUD will be managed for old-growth habitat. The Recreational River

LUD should have a variety of visual conditions and the river should remain outstanding and remarkable.

Table 2-1. Historic and current old-growth forest

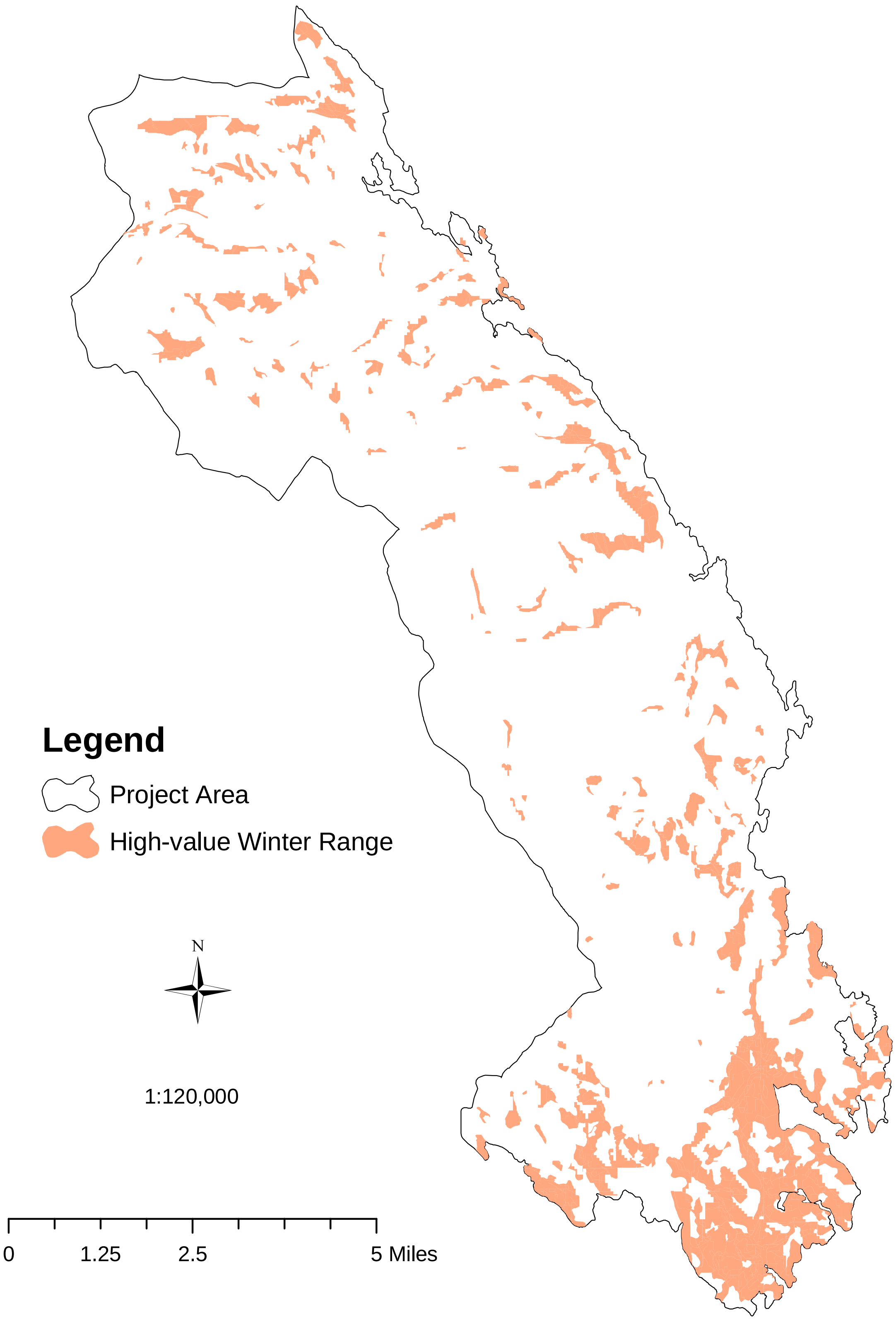
Old-growth Acres	Timber Production LUD	Modified Landscape LUD	Old-growth LUD	Recreational River LUD
Historic Acreage	6,002	19,616	4,758	315
Current Acreage	1,939	9,738	4,378	83
Percent Change	-68 %	-50 %	-8 %	-74 %

Little opportunity presents itself to redistribute existing young-growth age classes until these stands begin to reach commercial size in about 20 years. However, silvicultural treatments are available to enhance stand conditions for timber, wildlife and a host of other resource values. Consideration is being given to multiple treatments to enhance or maintain resource values over time. Treatment costs have limited application of intermediate treatments to a single entry in the past. This treatment is normally pre-commercial thinning. Some past treatments such as artificial canopy gaps for wildlife objectives are now receiving a second treatment of pre-commercial thinning for timber objectives. Presently, multiple treatments are relatively rare due to cost concerns but do hold the promise of increasing or extending values for other resources, especially wildlife.

Sitka Black-tailed Deer Winter Range

A major reduction in the amount of high-value deer winter range has occurred in the project area. Past timber harvest was primarily concentrated in valley bottoms and coastal areas that contained large tracts of historic high-value deer winter range. Harvested stands are currently even-aged homogenous stands that provide very little wildlife habitat when left untreated. Their value as deer winter range is especially low. The project area currently contains about 6,177 acres of high-value deer winter range. This is a 61 percent reduction from historic levels (15,847 acres).

Figure 2-5. Map of existing high value deer winter range.



Recommendations - Vegetation and Wildlife

Forest Vegetation

Management of second-growth forests is warranted due to the effects of past large-scale timber harvest on the structure and age class distribution of forest vegetation. Management of second-growth forests should focus on treatment of these stands to better emulate the natural range of variability in canopy condition and resulting understory forage production. Currently, the forest vegetation condition is outside the historic range of variability regarding understory forage conditions for forests in Southeast Alaska. Overall forest vegetation should be managed in a more balanced mix of stand structure classes. Vegetation management needs to balance the costs, benefits, and risks, including fish and wildlife habitat, water quality, future timber resource, subsistence uses, and recreational uses.

Optimal vegetation management would break-up large continuous second-growth stands; diversify stand structure and age class distribution; increase understory vegetation; and move the project area towards its desired future condition. Management actions that could be implemented to meet these objectives include a combination of silvicultural approaches and prescribed fire. Each of these vegetation treatment approaches have various pros and cons that need to be considered in any decision analysis.

Silvicultural treatments will be prescribed on a site-specific basis. Vegetation treatments will vary from site to site depending on LUD, slope, soils, aspect, elevation, stand age, and resource objectives. Potential vegetation treatments include pre-commercial thinning, commercial thinning, girdling, pruning, artificial gap creation, and small scale prescribed fire in patches of one acre or less.

Little understanding exists about the use of prescribed fire in Southeast Alaska. Past prescribed burning on Prince of Wales Island shows promise for improving wildlife habitat. Prescribed fire appears to stall conifer regeneration while increasing shrub and forb (broadleaf plant) production. Tappeiner and Alaback (1989, page 324-325) found that the vigor of Alaska blueberry (*Vaccinium alaskensis*) and several other species increased on sites in Southeast Alaska that were clearcut and burned. They found that within four years the number of Alaska blueberry aerial stems sprouting from rhizomes in burned clearcuts was twice the number found in undisturbed old stands. Bunchberry (*Cornus canadensis*), fern-leaved goldthread (*Coptis asplenifolia*), and five-leaved bramble (*Rubus pedatus*) showed increased growth three to seven times greater than in undisturbed old stands. This suggests that limited fire disturbance of one acre or less could be a tool for maintaining understory vegetation.

Ideally, nearly all past harvest would receive treatment with varying resource objectives as a focus, based on site specific circumstances. Limited funds, access issues and other concerns will direct treatment toward stands yielding multiple resource benefits. Treated acreage may be further reduced by factors such as slope and soil concerns. Specific vegetation treatment areas should hold a timber production emphasis where appropriate, and be tiered towards historic Sitka black-tailed deer winter range. Suggested treatment acres and stands were chosen based on these criteria.

Sitka Black-tailed Deer Winter Range

Past large-scale timber harvest has reduced the habitat capability of deer winter habitat in the project area. Most timber harvest has been concentrated in low-elevation stands that were historically high-value deer winter range. Restoration of historic high-value winter range is needed.

Vegetation treatment types similar to those described in the vegetation section would be used to restore deer winter range. Treatments would primarily be concentrated in high-value winter range areas, which include low-elevation (less than 1,500 feet in elevation) south facing slopes and second-growth stands directly influenced by maritime weather.

Vegetation Treatment Areas

Vegetation treatment is recommended on 6,249 acres of second-growth in the Cobble Landscape Assessment project area (Figure 2-6). This is about 41 percent of the available second-growth. With some vegetation treatment types, such as artificial canopy gaps, not all acres of a unit will be treated. Treatment areas were divided by watershed.

Big Ratz Creek Watershed

The Big Ratz Creek watershed currently contains about 3,566 acres of second-growth. This includes 1,173 acres of second-growth in the stand initiation stage and 2,393 acres in the stem exclusion stage of stand development. About 67 percent of the historic high-value winter range in this watershed has been converted to second-growth based on deer model results. Primary winter range areas within this watershed are the south face of Baird Peak, the Little Lake area, the Trumpeter Lake area, and the Big Lake area.

Recommended vegetation treatment consists of 14 units totaling 2,018 acres (Table 2-2). Of these units, 603 acres are in stand initiation and 1,415 acres are in stem exclusion.

Little Ratz Creek Watershed

The Little Ratz Creek watershed currently contains 1,191 acres of second-growth. This includes 241 acres in the stand initiation stage and 950 acres in the stem exclusion stage. About 78 percent of the high-value deer winter range in this watershed has been converted to second-growth.

Recommended vegetation treatment consists of two units totaling 210 acres (Table 2-3). One unit is in stand initiation and the other is in stem exclusion.

Figure 2-6. Vegetation treatment areas in the Cobble project area

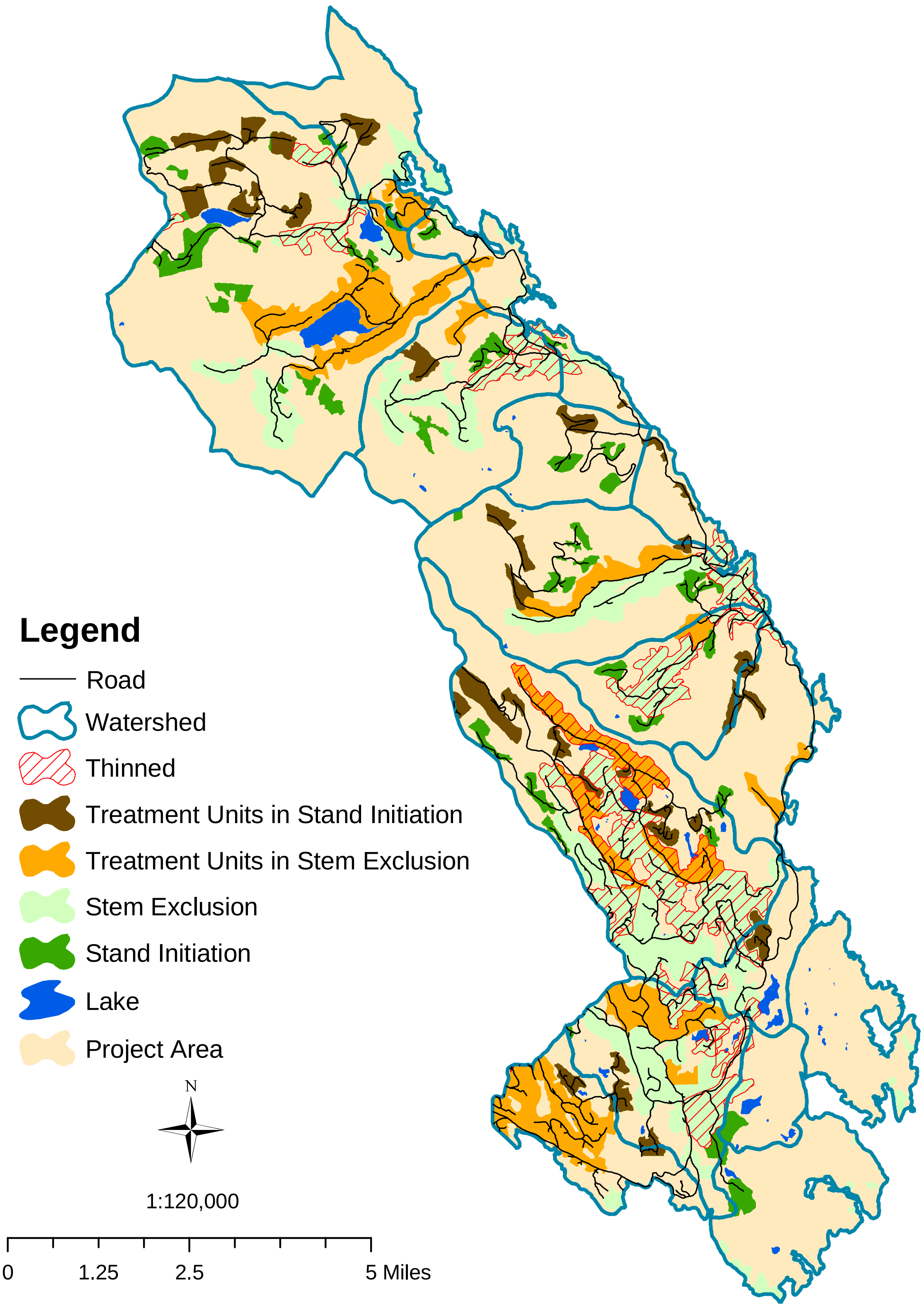


Table 2-2. Vegetation treatment units in the Big Ratz Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
583010598	1994	84	Stand Initiation
583010534	1989	59	Stand Initiation
583010516	1989	97	Stand Initiation
583010541	1993	64	Stand Initiation
583010538	1990	73	Stand Initiation
583010531	1990	75	Stand Initiation
583010537	1991	81	Stand Initiation
583010530	1990	70	Stand Initiation
583020567	1959	542	Stem Exclusion
583030577	1963	336	Stem Exclusion
583030569	1960	82	Stem Exclusion
583030572	1960	79	Stem Exclusion
583030577	1963	114	Stem Exclusion
583020551	1960	262	Stem Exclusion
Total Acres		2018	

Table 2-3. Vegetation treatment units in the Little Ratz Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
584010106	1999	93	Stand Initiation
584010524	1965	117	Stem Exclusion
Total Acres		210	

No Name Creek Watershed

The No Name Creek watershed currently contains 205 acres of second-growth. This includes 205 acres in the stand initiation stage and no acres in the stem exclusion stage. This watershed still contains a major portion (89 percent) of its high-value deer winter range.

Recommended vegetation treatment consists of one unit (Table 2-4) totaling 81 acres. This unit is in the stand initiation stage.

Table 2-4. Vegetation treatment unit in the No Name Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
584010528	1993	81	Stand Initiation

Sal Creek Watershed
The Sal Creek watershed currently contains 1,415 acres of second-growth. This includes 387 acres in the stand initiation stage and 1,028 acres in the stem exclusion stage. About 78 percent of the high-value deer winter range in this watershed has been converted to second-growth.

Recommended vegetation treatment consists of five units (Table 2-5) totaling 523 acres. One large unit is currently in stem exclusion and the remaining units are still in the stand initiation stage. About ½ of the stem excluded unit will be treated in 2004.

Table 2-5. Vegetation treatment units in the Sal Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
584020579	1993	54	Stand Initiation
584020597	1992	25	Stand Initiation
584020584	1993	40	Stand Initiation
584020583	1993	59	Stand Initiation
584020574	1966	345	Stem Exclusion
Total Acres		523	

Cobble Creek Watershed
The Cobble Creek watershed currently contains 760 acres of second-growth. This includes 197 acres in the stand initiation stage and 563 acres in the stem exclusion stage. About 77 percent of the high-value deer winter range in this watershed has been converted to second-growth.

Recommended vegetation treatment consists of three units (Table 2-6) totaling 245 acres. Two units are in stand initiation and the other is currently in stem exclusion.

Table 2-6. Vegetation treatment units in the Cobble Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
584030596	1992	57	Stand Initiation
584030595	1992	96	Stand Initiation
584030576	1966	92	Stem Exclusion
Total Acres		245	

Slide Creek Watershed
The Slide Creek watershed currently contains 3,772 acres of second-growth. This includes 645 acres in the stand initiation stage and 3,127 acres in the stem exclusion stage. About 91 percent of the high-value deer winter range in this watershed has been converted to second-growth.

Recommended vegetation treatment units within this watershed consist of 14 units (Table 2-7) totaling 1,376 acres. 444 acres of these units are in stand initiation and 932 acres are in stem exclusion. The stem excluded treatment areas are south aspect portions of a much larger unit that was harvested in 1965.

Table 2-7. Vegetation treatment units in the Slide Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
585010542	1993	168	Stand Initiation
585010540	1993	34	Stand Initiation
585010543	1993	37	Stand Initiation
585010538	1992	48	Stand Initiation
585019506	1995	27	Stand Initiation
585019505	1995	14	Stand Initiation
585019501	1995	32	Stand Initiation
585019604	1995	4	Stand Initiation
585019504	1995	22	Stand Initiation
585019502	1995	26	Stand Initiation
585019503	1995	32	Stand Initiation
585010501	1965	453	Stem Exclusion
585010501	1965	225	Stem Exclusion
585010501	1965	254	Stem Exclusion
Total Acres		1376	

Deer Creek
The Deer Creek watershed currently contains 2,014 acres of second-growth. This includes 186 acres in the stand initiation stage and 1,828 acres in the stem exclusion stage. About 83 percent of the high-value deer winter range in this watershed has been converted to second-growth.

Recommended vegetation treatment units within this watershed consist of seven units (Table 2-8) totaling 655 acres. 154 acres of these units are in stand initiation and 501 acres are in stem exclusion.

Table 2-8. Vegetation treatment units in the Deek Creek watershed

Stand ID #	Harvest Year	Acres	Stand Condition Class
586010077	1999	28	Stand Initiation
586010078	1999	13	Stand Initiation
586010076	1999	57	Stand Initiation
586010006	1997	56	Stand Initiation
586010510	1970	26	Stem Exclusion
586010509	1963	412	Stem Exclusion
586010509	1963	63	Stem Exclusion
Total Acres		655	

Coastal Areas

Coastal second-growth stands within historic high-value deer winter range are widely scattered along the eastern project boundary and along the Thorne River estuary.

Recommended vegetation treatment units within these areas consist of 13 units (Table 2-9) totaling 1,141 acres. 198 acres of these units are in stand initiation and 943 acres are in stem exclusion.

Table 2.9. Vegetation treatment units in coastal areas.

Stand ID #	Harvest Year	Acres	Stand Condition Class
584010530	1993	7	Stand Initiation
584020585	1993	23	Stand Initiation
584021585	1993	6	Stand Initiation
584020577	1993	21	Stand Initiation
585010537	1991	86	Stand Initiation
586010075	1999	55	Stand Initiation
585010512	1970	37	Stem Exclusion
585010511	1966	88	Stem Exclusion
586010501	1963	602	Stem Exclusion
586010502	1972	22	Stem Exclusion
586010504	1972	89	Stem Exclusion
586010505	1978	36	Stem Exclusion
586010506	1973	69	Stem Exclusion
Total Acres		1141	

These recommendations are focused on restoring high-value deer winter range, although they should benefit other wildlife species as well. Vegetation treatments should increase understory production; diversify the treated stands; improve connectivity; and excel the time it takes for these stands to take on old-growth characteristics.

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Chapter 3 – Timber Resources

Reference Conditions

Introduction
This section examines the conditions of the timber resource in the Cobble area prior to the 1950s. Management of timber resources in the Cobble area today began in the late 1950s. Reference conditions will be compared with the current conditions in the Synthesis and Interpretation section.

Reference Conditions
Commercial Forest Land - Commercial forest land must be capable of producing 20 cubic feet of tree growth annually. The Cobble project area contains 33,976 acres that qualify as commercial forest land. Prior to the 1950s, commercial forest land in the project area consisted of a matrix of coniferous forest. The majority of commercial forest land contained high volume, late-successsional stands comprised of western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), western redcedar (*Thuja plicata*) and Alaska-cedar (*Chamaecyparis nootkatensis*). Log-quality is high in these late-successional forests; however, significant defect is also present. These late-successional stands are also past the culmination of mean annual increment. Mean annual increment is the average amount of substance (volume for an example) accumulated each year over the lifetime of the stand (Smith et al. 1997). In many cases, late-successional stands lose more merchantable volume to decay and mortality than is produced by growth in a year. Major causes of defect include dwarf mistletoe and stem decay fungi (Holsten et al. 1980).

This late-successional forest is sustained through single tree mortality and small scale windthrow maintaining a multi aged forest (Nowacki and Kramer 1998). Larger scale disturbances included landslides and stand replacement windthrow. Landslides expose bare mineral soil. The affected area reverts to an early-successional forest condition dominated by red alder (*Alnus rubra*). Stand replacement windthrow can create a single cohort young-growth coniferous stand or a multi-cohort stand of diverse structure (Nowacki and Kramer 1998).

Access to Commercial Forest Land - No roads existed in the Cobble project area prior to the late 1950s. The only access to commercial forest land was from salt water. Harvesting trees from salt water, known as beach logging, was accomplished using a floating A-frame yarder. An A-frame yarder consisted of either steam or diesel powered winches mounted atop a float. The cable from the winches ran through a wooden A-frame mounted to the front of the float. The A-frame leaned over the water in front of the float, allowing a place to land the logs. Logs on land would be attached to the yarder's cable using chokers and pulled down to the salt water. Ground disturbance was common because A-frame yarders provided little log suspension.

Human Use of Commercial Forest Land - Historical uses of commercial forest land were limited in scale and confined to areas near salt water. Impact to commercial forest land in the project area by Native Alaskans was limited (Fifield 2003). Commercial harvesting operations were limited to the north shoreline of Thorne Bay and began in the 1940s. Early commercial harvesting in the Cobble project area utilized A-frame logging.

Summary

The Cobble project area consisted of un-roaded, mostly un-harvested landscapes prior to the 1950s. These landscapes contained stands of high volume, high quality, yet decadent timber. Any impacts to the timber resource were limited to areas near salt water.

Current Conditions – Timber Resources

Introduction

This section describes the current condition of the timber resource for the Cobble project area. It tiers to information found in the Forest Plan for the timber resource.

Timber Management History

Previous timber harvest occurred on approximately 15,573 acres in the project area. The first timber harvest occurred around 1940 along the shoreline of Thorne Bay. Large scale harvesting operations began in 1959 near Big Lake utilizing the Ratz Harbor log transfer facility (LTF) and continued until Ketchikan Pulp Company's operations ceased in 1999. One thousand acres of non-National Forest land have been harvested to date. Various small and salvage sales continue to be offered in the project area. Table 3-1 summarizes acres harvested by decade.

Table 3-1. Acres Harvested by Decade in the Cobble Project Area

Decade	1940s	1950s	1960s	1970s	1980s	1990s
Acres	18	581	9,543	1,822	570	2,994

Land Suitability

National Forest Service lands are defined by vegetative cover; soil type; and administratively or congressionally designated land use. This classification scheme is intended to show the amount of land that is covered by forest vegetation with further divisions to show the amount of land capable of or available for timber production. Appendix A of the Forest Plan provides a detailed discussion of timber resource land suitability. Lands must be determined tentatively suitable for timber management, and must be within a land use designation that allows timber harvest to be considered both suitable and available for harvest, (Timber Production, Modified Landscape, and Recreational River in the project area). Forest Plan Standards and Guidelines also apply within these designations, making additional areas (riparian management areas, wildlife nest or den buffers) unsuitable or unavailable for timber harvest.

Forest Land - Forested land comprises about 96 percent of the land in the Cobble project area. Forested land must be at least 10 percent occupied by forest trees of any size or has formerly had a 10 percent tree cover. Forest land has not been developed for non-forest use (Forest Plan, Appendix A-4).

Suitable Forest Land - Forested lands must be capable of producing crops of industrial wood to be considered tentatively suitable for timber management. These are termed Commercial Forest Lands (CFL). CFL within the project area totals about 39,572 acres.   7,637 of these acres are classified as tentatively unsuitable and unavailable for timber management. They are classified either through riparian management areas (including Tongass Timber Reform Act buffers) or by exceeding irreversible damage criteria. Areas exceeding irreversible damage criteria cannot be harvested using available technology without causing permanent resource damage to soil productivity or watershed condition (Forest Plan, Appendix A-6). This leaves 31,935 acres currently tentatively suitable for timber harvest.

Suitable forest land, as defined by the Forest Plan, is productive forestland physically suitable for timber harvest that can be adequately restocked in five years and has not been administratively withdrawn from timber production or within a Land Use Designation that prohibits timber management (Forest Plan, Appendix A-10). Timber Production, Modified Landscape, and Recreational River are land use designations within the Cobble area where timber harvest is considered suitable. Suitable forest land in the project area comprises 26,811 acres.

Suitable and Available Forest Land - The final step is to subtract the acres of currently non-commercial young-growth remaining in the suitable land base. This results in 7,611 acres in the project area currently suitable and available for timber harvest. Table 3-2 displays the steps used to determine currently suitable and available forest land for the project area.

Forest Classification

Historically, the Tongass National Forest forested lands have been stratified by volume class derived from aerial photo interpretation, and by volume strata in the latest Forest Plan. The accuracy of the volume classes has been

Table 3-2. Timber Resource Land Suitability for the Cobble Project Area

Classification	Acres
1. Total Land in the Project Area	**45,903**
2. Non National Forest Lands	3,665
3. National Forest Land (line 1 minus line 2)	**42,238**
4. Non-forested Land	1,328
5. Non-commercial Forest Land	9,813
6. Commercial Forest Land (line 3 minus lines 4 and 5)	**31,097**
7. Administratively Withdrawn Lands (Wilderness, LUD II)	0
8. Areas Exceeding Irreversible Damage Criteria (See Text)	4,167
9. Riparian Management Areas (Including TTRA Buffers)	3,659
10. Tentatively Suitable Forest Land (Line 6 minus lines 7,8 and 9)	**23,271**
11. LUDs Unsuitable for Timber Management	3,336
12. Beach and Eagle Tree Buffers	1,849
13. Suitable Forest Land (Line 10 minus lines 11 and 12)	**18,086**
14. Suitable Currently Non-commercial Young-growth	10,475
15. Suitable and Available Forest Land (Line 13 minus line 14)	**7,611**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

controversial because of misinterpretation of the aerial photos, and volume classes did not define structure. Volume strata went a step further than volume classes by considering soil type in the classification.

Volume Strata - Volume Classes were replaced with volume strata during the revision of the Forest Plan. Volume strata incorporates volume classes with soils and slopes. The three strata are:

- High Volume Strata - Areas within timber inventory volume classes 5, 6, and 7 on non-hydric soils, and on hydric (wet, poorly drained) soils with greater than 55 percent slope.
- Medium Volume Strata - Areas within timber inventory volume classes 5, 6, and 7 on hydric soils with slopes less than or equal to 55 percent; and areas within timber inventory volume class 4 that are either on non-hydric soils, or are on hydric soils with slopes greater than 55 percent.
- Low Volume Strata - Areas within timber inventory volume class 4 that are on hydric soils with slopes less than or equal to 55 percent.

These strata were determined by using the volume class GIS layer and combining it with the soils GIS layer to determine hydric soils (Table 3-3). Forest stands on slopes exceeding 72% were also not considered as suitable for timber harvest.

Red Alder
Past harvesting practices increased the red alder component in the project area. Landslide occurrence in the project area increased following harvesting. These landslides resulted from a combination of clearcut harvesting on unstable slopes

Table 3-3. Available Tentatively Suitable Volume/Acre by Volume Strata and Acres of Tentatively Suitable Acres for the Project Area

Volume Strata	MBF/Acre	Tentatively Suitable Acres
Low	12.8	2,063
Medium	15.8	3,001
High	20.5	2,423

Volume/Acre is from legacy stand exam data in the project area.
All data is derived from USDA Forest Service Geographic Information Systems (GIS).

and poor log suspension further destabilizing the slopes. Bare mineral soil exposed by landslides facilitated the establishment of red alder and eventually will be out-competed by conifer regeneration. Harvesting in riparian areas also contributed to the increased red alder component in the project area. Compaction and scarification from poor log suspension provided conditions necessary for the red alder dominance on these sites.

Transportation System
Currently, 168 miles of road exist in the project area. Every road was built to facilitate timber harvest. Most roads lie in the bottom of drainages and downhill cable yarding was used to harvest timber. Many of the roads suffer from deferred maintenance and are unusable without reconstruction. Ratz Harbor was used as a log transfer facility (LTF) in the past but is no longer suitable to use. Either the Coffman Cove LTF or Thorne Bay LTF would currently be utilized for management activities in the project area.

Management Direction
Tongass National Forest lands are managed according to management prescriptions which are assigned for each Land Use Designation (LUD). The Cobble Project area contains five LUDs (Table 3-4). The desired future conditions described by the Forest Plan provide a basis for the management of LUDs. Management activities will adhere to Forest Plan standards and guidelines, and best management practices will be applied.

<u>Timber Production Desired Future Condition</u> - Suitable timberlands are managed for the production of saw timber and other wood products on an even-flow, long-term sustained yield basis. The timber yield produced contributes to a Forest-wide sustained yield. An extensive road system provides access for timber management activities; recreation uses; hunting and fishing; and other public and administrative uses. Some roads may be closed, either seasonally or year-long,

to address resource concerns. Tree stands are healthy and in a balanced mix of age classes from young stands to trees of harvestable age, usually in 40 to 100-acre stands. Roaded settings from Semi-primitive to Roaded Modified provide recreation opportunities. A variety of wildlife habitats are present, predominantly in the early and middle successional stages.

Table 3-4. Project Area Land Use Designations

LUD	Timber Production	Modified Landscape	Recreational River	Old Growth	Non-National Forest
Acres	8,594	25,904	357	7,368	3,679
Percent of Acreage in the Project Area	19	56	1	16	8
Suitable Acres	3,425	6,973	77	0	0
Suitable and Available Acres	1,309	6,302	15	0	0

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Modified Landscape Desired Future Condition - Forest visitors, recreationists, and others using popular travel routes will view a somewhat modified landscape in areas managed under the Modified Landscape LUD. Management activities in the visual foreground will be subordinate to the characteristic landscape, but may dominate the landscape in the middle and backgrounds. Timber harvest units in the foreground are typically small and affect only a small percentage of the seen area at any one point in time. Roads, facilities, and other structures are also subordinate to the foreground landscape. Recreation opportunities associated with natural-appearing to modified settings are available. A variety of successional stages provide a range of wildlife habitat conditions. A yield of timber is produced which contributes to Forest-wide sustained yield.

Recreation River Desired Future Condition - Recreation Rivers and river segments are in a generally unmodified to modified, essentially free-flowing condition. Ecological processes and changes may be affected by human uses. The values for which the river was designated remain outstanding and remarkable. Recreation users have the opportunity for a variety and range of experiences in a modified but pleasing setting. Resource activities and developments may be present within the river corridor, and may dominate some areas. A variety of visual conditions occur. Interactions between users may be moderate to high. A yield of timber may be produced which contributes to Forest-wide sustained yield.

Synthesis and Interpretation – Timber Resources

Introduction

This report examines the changes in the Cobble project area to the Timber resource from reference conditions to current conditions. The Cobble area has undergone tremendous change during the past 60 years. Changes affecting the timber resource include:

- Harvesting of late-successional commercial forest land
- Increased amount of red alder in the project area
- Increased economic importance of the project area to the forest products industry
- Creation of a transportation system in the project area

Harvesting of Late-Successional Commercial Forest Land

Approximately 15,573 acres of late-seral forest in the project area have been harvested to date. 10,475 acres (67 percent) of the 15,573 acres are suitable for management under the current forest plan. The remaining 5,098 acres lie in areas where timber management is not allowed under the current forest plan. Examples of these areas include the Old-growth LUD, the 1000-foot beach buffer, and slopes over 72 percent.

Of the 18,086 acres of land available for timber management, 10,475 acres (58 percent) have been harvested. Most of the easily accessible land was put under timber management during harvesting. The remaining suitable and available land constitutes the more inaccessible land in the project area. These lands require road construction on steep, unstable slopes or helicopter yarding to facilitate harvesting. These factors adversely affect the economics of harvesting the remaining late-successional forestland in the project area.

Commercial thinning of previously harvested stands should occur about 60-70 years following stand initiation. The first commercial thinning within the Cobble project area should occur around 2020, in the Ratz harbor area. Most of the commercial thinning should occur between 2030 and 2040. The Cobble project area will produce an uneven flow of timber similar to the harvesting of late-successional stands in the 20^{th} century if the 60-70 year timeframe is strictly followed for scheduling first entry commercial thinning.

Increased Amount of Red Alder in the Project Area

The increase of red alder in the Cobble project area is the result of past harvesting practices. Landslide occurrence in the project area increased following the commencement of harvesting. These landslides resulted from a combination of clearcut harvesting on unstable slopes and poor log suspension further destabilizing the slopes. The bare mineral soil exposed by landslides facilitates the establishment of red alder. Red alder will eventually be out-competed by conifer regeneration. Harvesting in riparian areas also contributed to the increased red alder component in the project area. Compaction and scarification from poor log suspension provided conditions necessary for the red alder dominance on these sites.

The increase of red alder in riparian areas has little impact on timber resource. Most of the riparian areas have been withdrawn from timber management under the current forest plan.

Many areas where landslides occurred are now unsuitable under the current forest plan. In the remaining suitable areas, the presence of red alder has slowed conifer growth and increased rotation times. Additionally, under the current forest plan, red alder is considered a non-industrial species. Areas dominated by red alder will not be considered commercial forest land until conifers regain the site. This will result in less land available for timber management until red alder is considered an industrial species in Region 10 or sufficient conifer regeneration occurs.

The value of red alder in Southeast Alaska has risen during the past years. Red alder is used in furniture making and has an established market in the Pacific Northwest. The market for red alder in Alaska is still in its infantile stage, but it may develop into an important part of the regional wood products industry.

Increased Economic Importance of the Project Area to the Forest Products Industry

Prior to 1959, the Cobble project area did not play a great role in the regional forest products industry. Between 1959 and the present day, the importance of the area grew considerably with the harvesting of over 15,000 acres. Despite the passing of the pulp era, the Cobble project area continues to play an important role in Prince of Wales Island's economy. The area's geographic location places it within easy reach of remaining medium-sized sawmills. Additionally, the establishment of several small mills in the nearby Goose Creek Industrial Subdivision of Thorne Bay has elevated the economic importance of the Cobble area. These smaller sawmills rely on nearby, road accessible timber for their wood supply. Several salvage sales in the project area have been purchased by Goose Creek based operators in recent years.

The Cobble area's economic importance will remain high in the future. Its close location to Goose Creek and developed road system makes it an ideal location for small sales. Additionally, almost 10,500 acres of previously harvested lands suitable for timber management will require commercial thinning during this century.

Creation of a transportation system in the project area

Prior to 1959, no transportation system existed in the Cobble project area. Timber was only accessible utilizing a floating A-frame yarder to harvest areas adjacent to saltwater. As large scale harvesting operations started up in the late 1950s a transportation system germinated and grew near Ratz Harbor. More timber became accessible as this system continued to grow. Eventually this road system connected to both the Thorne Bay and Coffman Cove road systems. The project area currently contains about 168 miles of roads providing forestland access. The Thorne Bay and Coffman Cove LTFs are accessible using the present road system. The Ratz Harbor LTF is no longer suitable to use.

The Cobble area is of great economic importance to the small mills situated in the Goose Creek Industrial Subdivision because of the presence of the current road system. Smaller operators cannot absorb the high cost involved with road construction. The connectivity of the road system to Goose Creek also helps small operators that are too small to economically utilize water transportation. Small operators rely on timber offerings connected to the Thorne Bay road system.

Unfortunately, the current road system poses problems to commercial thinning in the project area. Many roads today are suffering from deferred maintenance and are unusable without major reconstruction. Some roads in the project area lie on unstable soils and have subsequently washed out or have been damaged by landslides. The placement of many of the roads in the project area also hinders commercial thinning because many roads lie near the bottom of drainages and require downhill cable yarding. Downhill cable yarding a partial-cut prescription is much more difficult than a clearcut prescription because logs being yarded are much more difficult to control. This increases the costs of harvesting and the amount of damage done to residual trees in the stand. Uphill yarding works much better in partial-cuts such as commercial thinning. Moving the roads upslope to facilitate uphill yarding is not presently a realistic option due to the high cost of road construction and instability of the slopes in the project area.

Recommendations – Timber Resources

Introduction

This report recommends actions to sustain and improve the timber resource in the Cobble project area. The synthesis and interpretation report for the timber resource identified four key changes from the reference conditions to the present time. These key changes to the timber resource in the Cobble project area consist of:

- Harvesting of late-successional commercial forest land
- Increased amount of red alder in the project area
- Increased economic importance of the project area to the forest products industry
- Creation of a transportation system in the project area

Recommendations

<u>1) Stagger commercial thinning to achieve an even-flow of wood products - </u>The harvest of late-successional stands in the project area peaked in the 1960s. The

1990's saw a rise in harvest activity as well. Currently, 10,475 acres of young-growth exists in the project area that is suitable for timber management. Approximately 60 percent of the young-growth will be ready to commercial thin around 2020. Scheduling commercial thinning strictly by stand age will lead to an uneven flow of wood products from the project area similar to the harvesting of the late-successional stands. Thinning approximately 262 acres per year in the project area starting in 2020 would provide an even flow of wood products from the project area for 40 years.

2) Work with fisheries/watershed to capture economic value of red alder in riparian areas - Red alder dominance in previously harvested riparian areas may cause problems for fisheries and watershed resources. One solution is the removal of red alder from the Cobble project area to promote conifer growth. An opportunity to capture economic value from the removed stems exists due to an emerging market for red alder in Southeast Alaska. It is in the best interest of the local wood products industry for the USDA Forest Service to offer wood removed by riparian thinning although harvesting of merchantable alder in riparian management areas cannot contribute to volume targets. A forester should help design alder removal projects and recommend the proper harvest system, to mitigate damages to the site by operations due to the sensitivity of the areas treated.

3) Offer small, simple sales targeted for operators in Goose Creek - The small operators based in Goose Creek would greatly benefit from volume being offered in the project area. Small sales provide lower investment projects suitable for the smaller size business entities of Goose Creek. The design of sales must take into account the thin economic margin area sawmill owners operate on. Shovel yarding is the preferred harvest system due to the high cost and complexity of cable and helicopter systems. Units should be small (5-20 harvest acres) to limit start up costs. Road construction should be limited to temporary road needing less than an eighth of a mile to access the unit. One-to-one retention (reserving an acre uncut for every acre clearcut) should be used to meet marten and goshawk standards and guidelines while limiting the sale's complexity.

Utilizing the above criteria, a preliminary GIS query identified 916 suitable acres (Figure 3-1). Meeting marten and goshawk standards and guidelines using one-to-one deferral leaves 458 potential harvest acres in the project area (Table 3-5).

Field experience has shown that many of the acres in the low and medium volume strata are uneconomical to harvest due to poor quality or species composition. A more realistic volume expectation is two to three million board feet. Limited cable units should be considered as long as they require temporary road construction and one-to-one retention.

Table 3-5. Potential Harvest Volume by Volume Strata

Volume Strata	High	Medium	Low	All Strata
Acres	2	280	176	458
Volume Per Acre (MBF)*	20.5	15.8	12.8	14.7
Total Volume (MBF)*	41	4,424	2,253	6,718

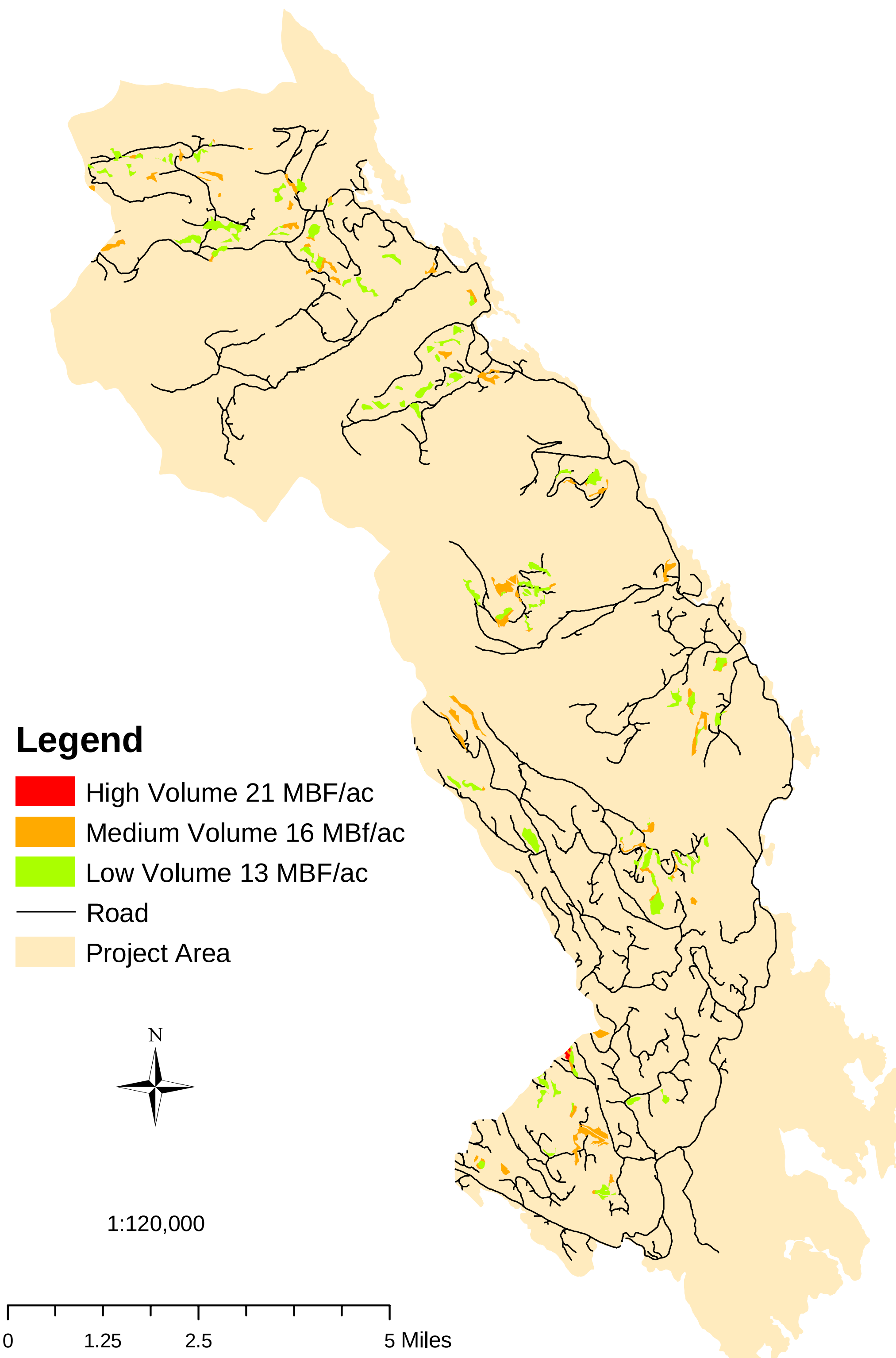
**Volume per acre calculated using legacy stand exam data in the Cobble project area. MBF=Thousand board feet.*

4) Identify and maintain "core" road system for present and future management - The Cobble project area contains about 168 miles of road. All of the roads were constructed to provide access for forest management. Not all of the roads in the project area can be properly maintained due to budget constraints. A "core" road system must be identified to best serve different resources and forest visitors. All main classified spur roads in the project area should be maintained open to provide access for forest management (Table 2). These main spurs will provide access for small sales, salvage opportunities and pre-commercial thinning. In addition, these roads will serve as the starting point for the reconstruction of secondary spurs needed for commercial thinning and other future forest management activities, reducing project costs. The designation of the "core" road system should be done by the interdisciplinary team during the environmental analysis process.

Suggested "Core" Secondary Spur Roads for the Timber Resource

- **3000120**
- **3000200**
- **3000300**
- **3018**
- **3018200**
- **3020**
- **3023**
- **3023500**
- **3026**

Figure 3-1. Potential Small Timber Sale Opportunities



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Chapter 4 – Hydrology

Reference Conditions

Watershed Functions
Watersheds function to collect, store, and deliver water to stream systems. Vegetation within a watershed intercepts, collects, and stores precipitation inputs. Vegetation and soils then release these inputs to the atmosphere through evapotranspiration (ET). Evapotranspiration is defined as the combined loss of water from a watershed by evaporation from the soil surface and transpiration from plants (Brady and Weil, 2002).

Soils collect, store, and transport water that is not intercepted. Groundwater and soil water in the unsaturated zone can be lost through ET processes. Stored soil water not removed by ET is often delivered into streams via vertical and horizontal subsurface flows. In cases of complete soil saturation, water may pool on the surface and cause sheet flow that leads to downslope rills and/or channels. Soils also act as a filter for water, removing chemicals and regulating temperatures, therefore having a positive impact on water quality (Brooks et al., 2003). Disturbances altering these interactions have detrimental affects on watershed functions.

Watersheds in the Cobble area, like much of Southeast Alaska, have steep, unstable slopes. This combined with high rainfall and little soil development make the systems responsive to rainfall events and susceptible to sediment transportation (Swanston, 1969). Soil mass movements (landslides) are dominant processes of soil erosion and sediment transport from hillslopes to stream channels in southeast Alaska (Swanston, 1989). These sediment loads create channel scour and stream bank erosion, altering channel morphology.

Mass soil movements (landslides) and surface erosion are the main sources of sediments entering streams (Swanston, 1991). Chronic surface erosion may not be as dramatic as mass soil movements but fine sediments delivered to streams can be just as damaging and spread over longer periods of time. Surface erosion can be the major source of sediment in streams from sensitive terrain such as granitic-derived soils and highly fractured sedimentary rocks (Furniss et al., 1991). In most cases, isolated pockets of windthrow provide essential soil mixing and cause relatively minimal erosion; however, windthrow along stream systems can lead to sedimentation.

Riparian Management Areas
Riparian management areas (RMA) are an important component of watersheds. They make up only a small percentage of the watershed area but their hydrologic and biologic functions need to be considered when determining water and other

resource management goals for the entire watershed. Riparian areas are represented by the interface between aquatic and adjacent terrestrial ecosystems and are made up of distinct plant and animal communities that require the presence of water (Gregory et al., 1991).

These areas support plants and animals that are not found elsewhere. They play less obvious roles relating to enhanced water quality, flood peak attenuation, stream bank stability, large woody debris (LWD) recruitment, stream temperature regulation, and reduced erosion and sediment transport (Brooks et al., 2003).

Large woody debris refers to any piece of relatively stable woody material that is at least one meter long, and 10 cm in diameter (Dolloff, 1996). Large woody debris is produced when trees die and fall to the soil surface in a RMA and also directly into the stream channel (Brooks et al., 2003).

Large woody debris maintains a diverse physical habitat by (1) anchoring and stabilizing the position of pools in the direction of streamflow, (2) creating backwater along the stream margin, (3) causing lateral migration of the channel and forming secondary channel systems in alluvial valley floors, and (4) increasing depth variability. These physical functions in turn enhance fish habitat (Brooks et al., 2003).

Table 4-1 contains total watershed acres, RMA acres and percent of the watershed that is RMA for all watersheds in the Cobble area. Riparian management area was calculated by assuming a 100-foot zone on either side of each stream channel. The smallest watershed is Tiny at 511 acres and the largest is Big Ratz with 10,313 acres. Big Ratz and Slide Creek have the most RMA acreage with 1,396 acres and 906 acres, respectively while No Name and Pin have the highest densities of RMA with 22 percent and 21 percent, respectively (Table 4-1).

Cobble Watersheds

Watersheds in the Cobble area were delineated in GIS using Hydrologic Unit Codes (HUC) for Southeast Alaska (USDA Forest Service, 2002). Seventeen watersheds were mapped at the 5^{th} HUC field in the Cobble area. Five are coastal polygons, five are grouped single independent polygons, and the remaining seven are composite watersheds. Composite watersheds have defined topographical boundaries while single independent and coastal watersheds have multiple streams flowing into salt water (US Forest Service, 2002). Figure 4-1 is a map of Cobble watersheds along with their names.

Table 4-1. Watershed acreage and Riparian Management Area (RMA) Data

Watershed	Acres	RMA acres	Percent RMA
Barren	1,983	175	9
Big Ratz	10,314	1,396	14
Cobble	2,120	331	16
Deer Creek	2,925	522	18
Doughnut	1,858	254	14
Little Ratz	3,519	601	17
No Name	1,553	347	22
North	1,973	238	12
North Sal	690	121	18
Pin	968	200	21
Ratz Harbor	852	84	10
Sal Creek	4,626	859	19
Salamander	1,176	175	15
Slide Creek	6,563	906	14
Thorne	2,377	335	14
Tiny	511	104	20
Torrent	1,876	182	10
Entire Cobble Area	**45,884**	**6,830**	**15**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Watershed Attributes

Watersheds in the Cobble area have predominantly granitic-derived soils with an overlying heterogeneous layer of glacial till. These soil types are prone to erosion processes and mass soil movements. Cobble watersheds have steep slopes that are heavily dissected by stream channels and U-shaped glaciated valleys.

Table 4-2 includes stream data by watershed for the Cobble area including type of watershed, total stream miles, and stream density (miles/squared mile). Stream density is calculated as stream miles per squared mile of area. A higher stream density indicates a more highly developed drainage network and hence higher drainage efficiency in a watershed. This in turn suggests a greater sediment risk due to increased transportation of water and alluvial materials downstream (Geier, 1998). The Cobble area has 282 miles of streams (class I, II, and III) and a stream density of 3.9 (Table 4-2).

Among watersheds, Big Ratz, Slide, and Sal have the most stream miles with 57.6, 37.3, and 35.4, respectively. Tiny, Pin, and No Name have the highest stream densities with 5.3, 5.4, and 5.9 (Table 4-2). This suggests that Slide, Sal, Big Ratz, and No Name have more highly developed drainage networks, making them a higher risk for sediment transport into their individual main channels.

Figure 4-1. Map of watersheds in the Cobble area

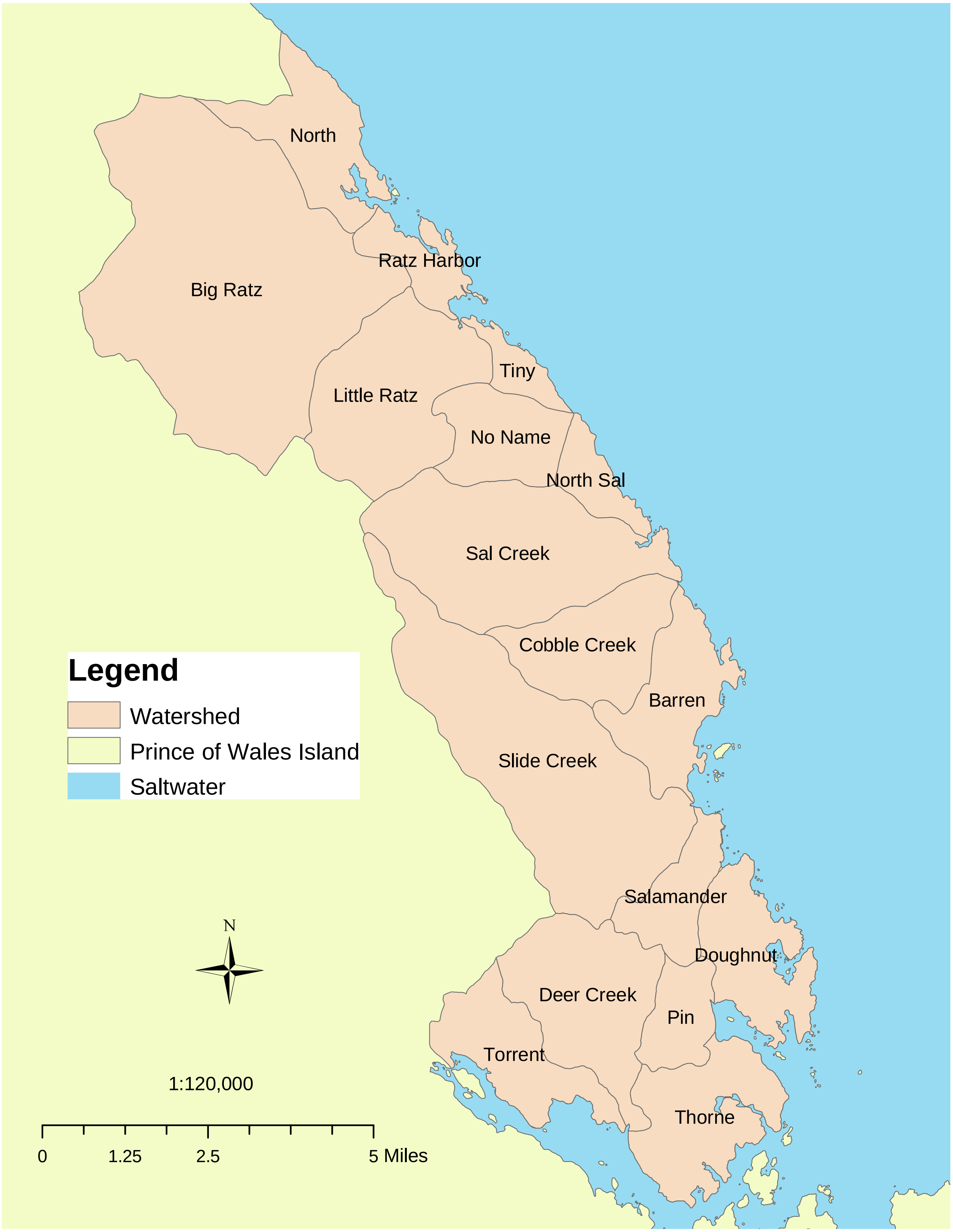


Table 4-2. Stream Data by Watershed

Watershed	Watershed Type	Depositional Streams (mi)	Transitional Streams (mi)	Transport Streams(mi)	Total Stream Miles	Stream Density
Barren	Coastal	0.0	0.8	6.4	7.2	2.3
Big Ratz	Composite	4.1	5.4	48.1	57.6	3.6
Cobble	Composite	0.5	2.5	10.7	13.7	4.1
Deer Creek	Sin Ind	2.7	4.6	14.2	21.5	4.7
Doughnut	Sin Ind	0.7	1.1	8.7	10.5	3.6
Little Ratz	Composite	1.7	5.7	17.4	24.8	4.5
No Name	Composite	0.0	0.6	13.7	14.3	5.9
North	Coastal	0.9	0.0	9.0	9.9	3.2
North Sal	Coastal	0.0	0.0	5.0	5.0	4.6
Pin	Sin Ind	0.9	0.0	7.3	8.2	5.4
Ratz Harbor	Coastal	0.3	0.6	2.6	3.5	2.6
Sal Creek	Composite	2.8	2.6	30.0	35.4	4.9
Salamander	Composite	0.4	1.8	5.1	7.3	3.9
Slide Creek	Composite	5.1	7.1	25.1	37.3	3.6
Thorne	Sin Ind	0.9	1.5	11.4	13.8	4.0
Tiny	Coastal	0.0	0.0	4.3	4.3	5.3
Torrent	Sin Ind	0.5	1.1	6.0	7.6	2.6
Entire Cobble Area		**21.5**	**35.4**	**225**	**281.9**	**3.9**

All data is derived from USDA Forest Service Geographic Information Systems (GIS). Sin Ind = Single Independent

Depositional, transitional, and transport stream miles are also included in Table 4-2. Depositional streams are low gradient (less than 2 percent) and have a high sediment retention capacity. These streams include the Palustrine (PA) and Floodplain (FP) process groups as well as Estuarine (ES) channel types ES1, ES2, ES4, and ES8, and Alluvial Fan (AF) channel type AF1 (Geier, 1998).

Transitional streams have gradients of 2-4 percent and moderate sediment retention capacity. These include Moderate gradient, Mixed control (MM) process groups, Estuarine channel type ES3, and Alluvial Fan channel type AF2 (Geier, 1998). The remaining stream channels are all considered transport streams, having gradients greater than 4 percent and high sediment moving capacity (Geier, 1998).

Big Ratz, Sal, and Slide have the most miles of transport streams with 48.1 miles, 30 miles, and 25.1 miles, respectively (Table 4-2). This suggests that these three watersheds are the most prone to sediment movement.

Using GIS stream data to characterize watersheds is useful to compare watersheds. It should be recognized that the actual stream miles and density is higher and would need to be field-verified in order to calculate accurate values.

Wetlands
The Cobble area contains over 65 percent wetlands (Table 4-3). More than 70 percent of all wetlands in the Cobble area are forested wetlands and associated complexes. The remaining 30 percent of wetlands have hydrological and/or biological significance and are considered to be high value wetlands. High value wetlands include:

- Alpine Muskeg (AM)
- Emergent Short Sedge (EM)
- Emergent Tall Sedge (MT)
- Estuarine (E)
- Muskeg/shrub-scrub (MP)

Table 4-3. Acres of Wetland Type, Percent of Wetland Type, and Percent Coverage

Wetland Type	Total (acres)	Percent of Wetland Type	Percent Coverage of the Cobble Area
Forested (FW)	18,725	70.55	46.36
Emergent Short Sedge (EM)	2,292	8.63	5.67
Emergent Tall Sedge (MT)	87	0.33	0.21
Muskeg (MP)	513	1.93	1.27
Alpine Muskeg (AM)	4,920	18.54	12.18
Estuarine (E)	5	0.02	0.01
Total	**26,542**	**100**	**65.70**

Data derived from USDA Forest Service GIS databases.

Forested wetlands occur on poorly or very poorly drained hydric mineral and organic soils. These wetlands occur frequently on the landscape and are scattered throughout the Cobble area. Forested wetlands can be found across lowlands, benches, depressions, drainage areas, and on steep slopes in micro-topography such as saturated hollows.

Emergent short sedge wetlands are found along foot slopes and in floodplain zones of the project area. They include poor fens and rich bogs on moderately deep and very poorly drained organic soils. These areas often contain shrub-scrub timber.

Emergent tall sedge fens are rare (87 acres). These fens have a diverse community of sedges, dominated by tall sedges such as Sitka sedge, and a variety of forbs and occasional stunted trees, usually spruce or hemlock. Soils in MT wetlands have deep organic muck, frequently with thin layers of alluvial mineral material. They occur in landscape positions where they receive runoff from adjacent slopes, resulting in richer nutrient status than emergent short sedge wetlands. These wetlands provide habitat for waterfowl and terrestrial wildlife, including black bear, mink, river otter, and beaver.

Muskegs and AMs are dominated by sphagnum moss and a variety of other plants adapted to very wet, acidic, organic soils. Muskegs are located in small pockets on gentle slopes in lower topography in the southern portion of the Cobble area. Small, isolated areas of muskeg are also found throughout the northern half of the Cobble area.

Alpine muskegs cover large areas along high elevation ridgetops and mountain summits in the northern half of the Cobble area. Alpine muskegs are an important source of snowmelt runoff in the spring and early summer months. These wetlands are also summer habitat for terrestrial wildlife.

Estuarine wetlands are found at the stream outlets in Ratz Harbor. These wetlands have high wildlife habitat value and plant diversity. Estuarine wetlands are rare in the Cobble area, with less than five acres present.

Current Conditions - Hydrology

Timber Harvests and Watersheds
The Cobble area has a history of timber harvesting. Thirty-four percent of the total project area has been harvested with eight percent harvested in the past 30 years (Table 4-4). The Forest Plan recognizes a 20 percent harvest level in 30 years as a threshold (USDA Forest Service, 1997).

Removal of vegetation through timber harvests is one of the more severe man-made disturbances to watersheds. Unlike the static geology, slope angle, watershed size and aspect, the soil-plant system and the stream system are dynamic forces which when altered, can affect stream-flow responses to precipitation. Removal of vegetation and subsequent alteration of ET processes often leads to increased water yields in the stream system (Jones & Post, 2004).

Increased water yield tends to be a controversial subject, with some authors finding no significant increases in water yield after clearcutting (Harris, 1977) and some finding a reduction in peak flows after clearcutting (Cheng et al., 1975). Post-harvest water yield results can vary depending on the amount of area harvested within a watershed, the type of harvest (clear- versus partial-cut), climatic factors such as amount of precipitation, and habitat type (deciduous forests have less increase than coniferous) (Brooks et al., 2003).

The loss of vegetation can also cause increased mass movement soil events such as landslides and debris torrents. This increased sedimentation can have several effects. Increased sedimentation of gravels, cobbles, and boulders can reduce channel capacity. Channel storage becomes diminished, and flows that would have remained within the stream banks can now flood. Decreased channel capacity also creates channel scour and stream bank erosion which alters channel morphology (Brooks et al., 2003). Removal of vegetation also causes scarification of the soil surface resulting in surface erosion and increased fine sediment in streams.

Among watersheds, Slide, Big Ratz, No Name and Cobble all have harvest levels over 10 percent in the past 30 years. No Name has the highest of these with 13 percent while no watersheds exceed 20 percent in the past 30 years. Big Ratz and Slide have the most acres harvested with 3,127 and 3,772 acres respectively. Slide and Deer have the highest percentages harvested with 57 percent and 69 percent respectively (Table 4-4).

Table 4-4 includes management attributes of watersheds within the Cobble area including harvested acreage, percent harvest, 30-year harvested acreage, percent 30-year harvest, riparian management area (RMA) acres harvested, and percent RMA harvested.

Table 4-4. Management attributes of watersheds

Watershed	Harvested Acres	Percent Harvest	30 year Harvested Acres	Percent 30 Year Harvest	Harvested RMA Acres	Percent RMA Harvested
Barren	271	14	143	7	29	17
Big Ratz	3,127	30	1,060	10	439	31
Cobble	756	36	205	10	160	48
Deer Creek	2,014	69	186	6	360	69
Doughnut	54	3	0	0	0	0
Little Ratz	1,191	34	241	7	254	42
No Name	205	13	205	13	50	14
North	488	25	112	6	59	25
North Sal	103	15	53	8	3	2
Pin	104	11	63	7	20	10
Ratz Harbor	184	22	31	4	18	21
Sal Creek	1,541	33	387	8	274	32
Salamander	442	38	70	6	101	58
Slide Creek	3,772	57	645	10	515	57
Thorne	210	9	96	4	30	9
Tiny	143	28	24	5	25	24
Torrent	957	51	127	7	105	58
Entire Cobble Area	**15,562**	**34**	**3,648**	**8**	**2,442**	**36**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Riparian Management Area (RMA) Harvests

In the Cobble area, some of the first harvests were in RMAs. This is due mainly to the high site productivity and the ease of access to these areas. The entire Cobble area has 2,444 acres of RMA harvested in the past, or 36 percent of the RMA acres (Table 4-4).

Harvest of RMAs can have the most detrimental affects to watershed health, especially in streams with fish habitat. This is one of the main reasons the Tongass Timber Reform Act of 1990 was passed, requiring RMA buffers on timber harvests. Harvest of these areas causes reduced streambank stability with associated erosion through bank scour. Stream temperature will also increase initially when RMAs are harvested, returning to background levels once vegetation has grown back to provide stream shade (Bartholow, 2000). Johnson and Jones (2000) found that stream temperatures in the western Cascades of Oregon rose by an average of 7° Celsius after clearcutting, slowly returning to background levels within 15 years.

The longest lasting effect of RMA harvests is the lack of LWD recruitment into stream systems. One of the compounding impacts on LWD recruitment is that alder often dominates the overstory, especially in floodplain areas. Conifer species that historically added LWD to streams are suppressed, lengthening the recovery time. Harvest of these areas has the longest lasting watershed effects because of the time involved (50-100 years) for LWD to grow, die, and fall into stream channels.

Among watersheds in the Cobble area, Slide and Big Ratz have the most acres of RMA harvested with 515 acres and 439 acres, respectively. Deer, Salamander, and Torrent have the highest percentage of RMA harvested with 69 percent, 58 percent, and 58 percent, respectively (Table 4-4). The effects of this will be altered stream morphology and fish habitat for a long period of time.

Roads and Watersheds

Road construction is another watershed disturbance that accompanies timber harvests. Roads cause soil compaction and interception of subsurface flow. The compaction causes a loss of water storage. When paired with interception by ditches, an overall change in timing of peak flows will be the result, with peaks occurring earlier than they would have historically (Furniss et al., 1991). King and Tennyson (1984) found that the hydrologic behaviors of small-forested watersheds were altered when as little as 3.9 percent of the watershed was affected by roads.

Roads accelerate erosion processes in addition to modifying natural drainage networks. A majority of eroded sediment entering streams originates from mass soil movements and surface erosion. Surface erosion takes place when vegetation is removed, exposing bare soil. The bare soil is then lodged free by water movement and transported into stream systems (Swanston, 1991). Mass soil movements take place primarily as a result of cut-and-fill road construction techniques, loading preexisting unstable slopes with fill material and altering subsurface hydrologic properties on unstable slopes (Swanston, 1991). Failure of stream crossings, diversion of streams by roads, washout of road fills, and accelerated scour at culvert outlets are also important sources of sedimentation (Furniss et al., 1991).

The sediment contribution per unit area from roads is often greater than that from all other land management activities combined, including log skidding and yarding (Gibbons and Salo, 1973). Several studies have shown that in the Western Cascades mass soil movements associated with roads are 30 to 300 times greater than in undisturbed forests (Sidle et al., 1985). Mass soil movements triggered by roads can continue for decades after the roads are built (Furniss et al., 1991). Cederholm et al. (1981) found that on the Clearwater River in Washington the percentage of fine sediment in spawning gravels increased above natural levels when more than 2.5 percent of the basin area was covered with roads.

One technique to quantify the affects of roads is by calculating the road density. Road density is calculated by determining the miles of roads per square mile of area. A higher road density indicates poor watershed health due to modification of drainage networks and increased sedimentation. Another important indicator of road effects on a watershed is road-stream crossings. Proper installation and maintenance of culverts and other water diverting structures influences sedimentation and runoff. Proper culvert installation decreases the chances that culverts will plug and potentially destroy the road base or decrease fish passage.

Table 4-5 shows attributes of roads in the Cobble area by watershed including road miles, road acres, percentage area covered by roads, road density (miles per squared mile watershed), number of road-stream crossings, and crossing density (number per squared mile of watershed).

Table 4-5. Road Attributes of watersheds within the Cobble area

Watershed	Road Miles	Acres Roads	Percent Roads	Road Density	Number of Crossings	Crossing Density
Barren	6	29	1.5	1.9	9	2.9
Big Ratz	30	145	1.4	1.9	62	3.8
Cobble	7	34	1.6	2.3	21	6.3
Deer Creek	18	87	3.0	4.0	42	9.2
Doughnut	0	0	0.0	0.0	0	0.0
Little Ratz	10	48	1.4	1.8	33	6.0
No Name	6	29	1.9	2.3	24	9.9
North	6	29	1.5	1.9	13	4.2
North Sal	2	12	1.7	2.2	7	6.5
Pin	0	0	0.0	0.0	0	0.0
Ratz Harbor	5	24	2.8	3.7	9	6.8
Sal Creek	15	73	1.6	2.1	36	5.0
Salamander	6	29	2.5	3.4	14	7.6
Slide Creek	38	184	2.8	3.7	52	5.1
Thorne	1	5	0.2	0.3	0	0.0
Tiny	2	10	2.0	2.4	10	12.5
Torrent	15	73	3.9	5.0	20	6.8
Entire Cobble Area	**167**	**811**	**1.8**	**2.3**	**352**	**4.9**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

The Cobble area has a history of extensive road building. Five watersheds, Deer, Ratz Harbor, Salamander, Slide, and Torrent exceed the 2.5 percent threshold suggested by Cederholm et al. (1981). The watersheds with the most road acreage are Slide and Big Ratz with 184 acres and 145 acres, respectively (Table 4-5). Road acreage was calculated assuming a 40-foot wide road prism.

The Cobble area has a total of 167 miles of roads with a road density of 2.3 miles of road per squared mile area. Among watersheds, Slide and Big Ratz have the most roads with 38 miles and 30 miles, respectively while Doughnut and Pin have no roads. Torrent has the highest road density with 5.0 and Deer has a road density of 4.0 (Table 4-5). These high densities result in increased sedimentation in streams through erosion processes.

Stream crossings as well as crossing density (crossings per squared mile watershed) were calculated and appear in Table 4-5. According to GIS, the entire project area has 352 stream crossings and a crossing density of 4.9 crossings per squared mile. Among watersheds, Big Ratz and Slide Creek have the highest amounts of stream crossings with 62 and 52, respectively. Deer, No Name, and Tiny have the highest crossing densities at 9.2, 9.9, and 12.5 crossings per squared mile, respectively (Table 4-5).

Figure 4-2 compares density indices including crossing density, stream density, and road density in the Cobble area. Figure 4-3 is a graphical display of the percent managed area in each watershed including harvested area, 30 year harvest area, and area of roads.

Wetlands

Wetlands in the Cobble area have also been impacted by harvests and road construction activities. Table 4-6 displays the total acres of wetland types, acres harvested, and acres affected by roads.

Table 4-6. Acres of Wetland Types, Acres Harvested, and Acres Affected by Roads

Wetland Type	Total (acres)	Harvested (acres)	Percent Harvested	Roads (miles)	Acres Affected by Roads	Percent Affected by Roads
Forested (FW)	18,725	6,245	33.4	88.5	429.2	2.3
Emergent Short Sedge (EM)	2,292	138	6.0	8.5	41.3	1.8
Emergent Tall Sedge (MT)	87	32	36.9	0.4	2.1	2.4
Muskeg (MP)	513	95	18.5	3.0	14.3	2.8
Alpine Muskeg (AM)	4,920	22	0.4	0.8	4.0	0.1
Estuarine (E)	5	0	0.0	0	0.0	0.0
Total	**26542**	**6,532**	**24.6**	**101.2**	**490.9**	**1.8**

Data derived from USDA Forest Service GIS. Acres affected by roads is calculated based upon a 40 foot wide road base.

Figure 4-2. Density Indices in the Cobble area

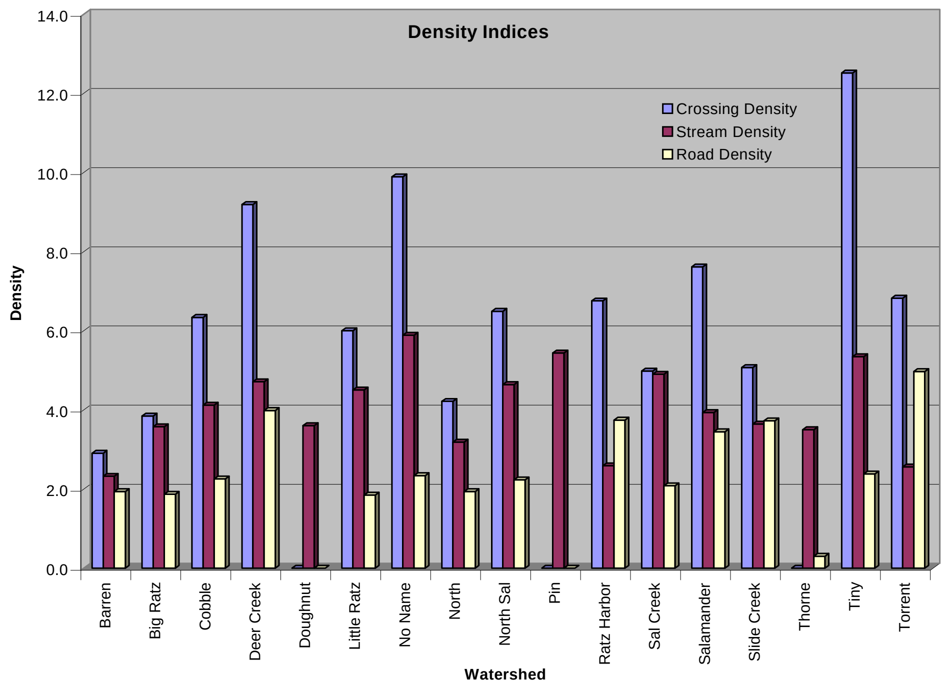
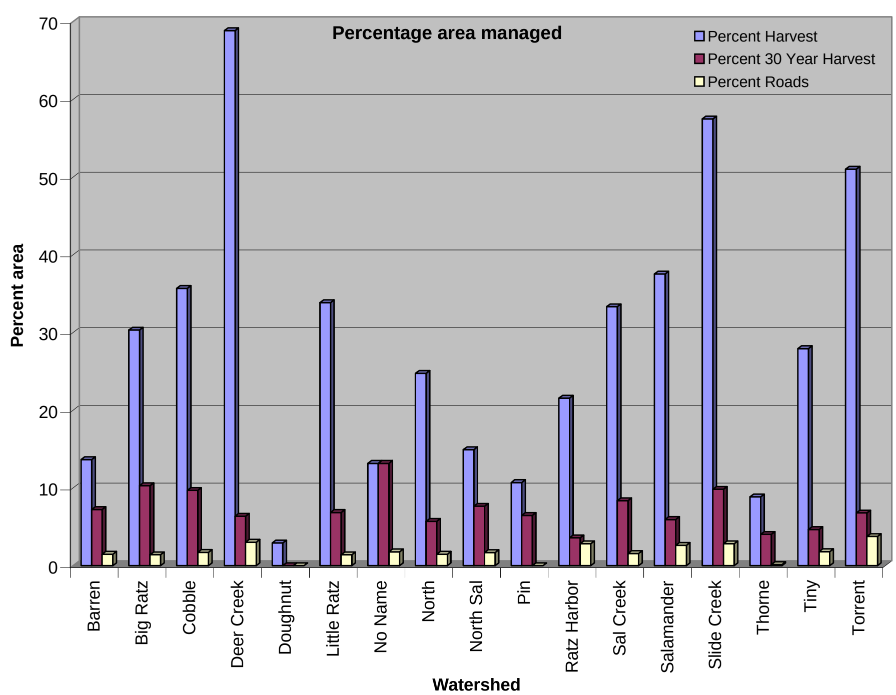


Figure 4-3. Management attributes in the Cobble area



All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Approximately 25 percent of wetlands in the Cobble area have been harvested (Table 4-6). Forested wetlands have the highest amount of harvest. The impacts to these wetlands are minimal due to their abundance. Timber harvests increase soil saturation in FWs. The hydrological effects are short lived as vegetation quickly regenerates providing interception and transpiration.

A total of 1.8 percent of wetlands have been affected by roads (Table 4-6). Road construction has occurred on nearly 430 acres of FWs. Forested wetland areas are permanently displaced and/or covered by road fill material. However, drainage through the road fill and drainage structures adequately maintains hydrologic connectivity of FWs.

Harvests are less frequent on high value wetlands in the Cobble area, with 287 acres harvested. Emergent short sedge and MP wetlands have the most harvests with 138 and 95 acres, respectively. Due to their scarcity, MT wetlands have been the most impacted by harvests with 37 percent harvested (Table 4-6). Harvest affects on these sensitive wetlands are minimal and temporary. Hydrologic properties are slightly altered until vegetative regeneration occurs. However, wetland function is not affected.

Sixty-two acres of high-value wetlands have been affected by roads. Again EM and MP have the highest impact from roads with 41.3 acres and 14.3 acres, respectively. Road construction alters wetland function and biological habitat when hydrologic connectivity is lost due to dredging or filling.

The impacts to wetland function from road construction are permanent in specific locations. Emergent tall sedge wetlands are 2.4 percent affected by roads, making them the most affected by management when total acreage (87 acres) and harvest percentage (37 percent) are considered (Table 4-6).

Synthesis and Interpretation

Vegetative Regeneration
As harvested stands in the Cobble area regenerate and return to their natural functions, watersheds will approach their background hydrologic conditions. Water yields altered by harvest will return to pre-harvest conditions as interception, soil storage, and ET move toward normal functions. The harvests that occurred more then ten years ago will likely have regained their background ET processes due to regeneration. Areas where alder dominates stands that were historically conifer dominated should remain a concern.

Sediment delivery to streams will stabilize and return to background levels. This again is due to vegetative regeneration and stabilization of exposed soil. Management-induced landslides will become less likely as root strength returns, adding to the resisting shear strength of unstable slopes. These slopes will stabilize 10-15 years after timber harvests (Ziemer and Swanston, 1977).

Riparian Management Areas

Previously harvested riparian management areas will continue to grow back and approach background functions. Stream banks will stabilize as vegetation establishes. This vegetation will also act to attenuate flood peaks, reducing the effects of catastrophic floods. The affects of RMA harvesting on stream temperature will gradually diminish 15 years after harvests (Johnson & Jones, 2000).

Large woody debris recruitment in RMAs will take the longest time to recover. Under ideal situations, it would take a conifer dominated riparian area 50-100 years to grow trees sizeable to add beneficial complexity to stream channels when they die and fall. The situation in many RMAs, especially disturbance-prone floodplains is an overstory of red alder suppressing recruitment of conifer into the overstory. This lengthens the recovery time of LWD recruitment.

Deteriorating Roads

Without proper maintenance of roads that are currently deteriorating, erosion will continue from plugged drainage structures and redirection of stream channels. This will also cause stream morphological changes to take place in areas such as alluvial fans and floodplains where streams are constricted to a single channel. These changes, as well as decreased fish passage, will all significantly degrade fish habitat.

Recommendations

Thinning Opportunities

Restoration activities in the Cobble area will accelerate the recovery of watershed hydrology. One restoration activity is thinning stands that have been harvested in the past to facilitate recovery of natural ET processes and aid in stabilizing streambanks and hillslopes. Figure 4-4 is a map of the Cobble Area that identifies harvested stands that have not been thinned. These stands should be thinned in the near future to aid in recovery of watershed functions. A total of 4,126 harvested acres have not been thinned in the Cobble area. The data for thinned stands was acquired by assuming that an entire harvested unit was thinned even if only part was. No accurately mapped data layer for exact acreage of thinned stands exists.

Riparian Management Area Thinning

Use of unique thinning prescriptions for the RMAs is often necessary. Riparian management areas will frequently need thinning prescriptions other than the standard 14-foot spacing required for pre-commercial thinning. The most common is removing red alder from the overstory in order to release suppressed conifers, accelerating LWD recruitment.

Figure 4-4. Proposed riparian thinning and stand thinning in the Cobble area

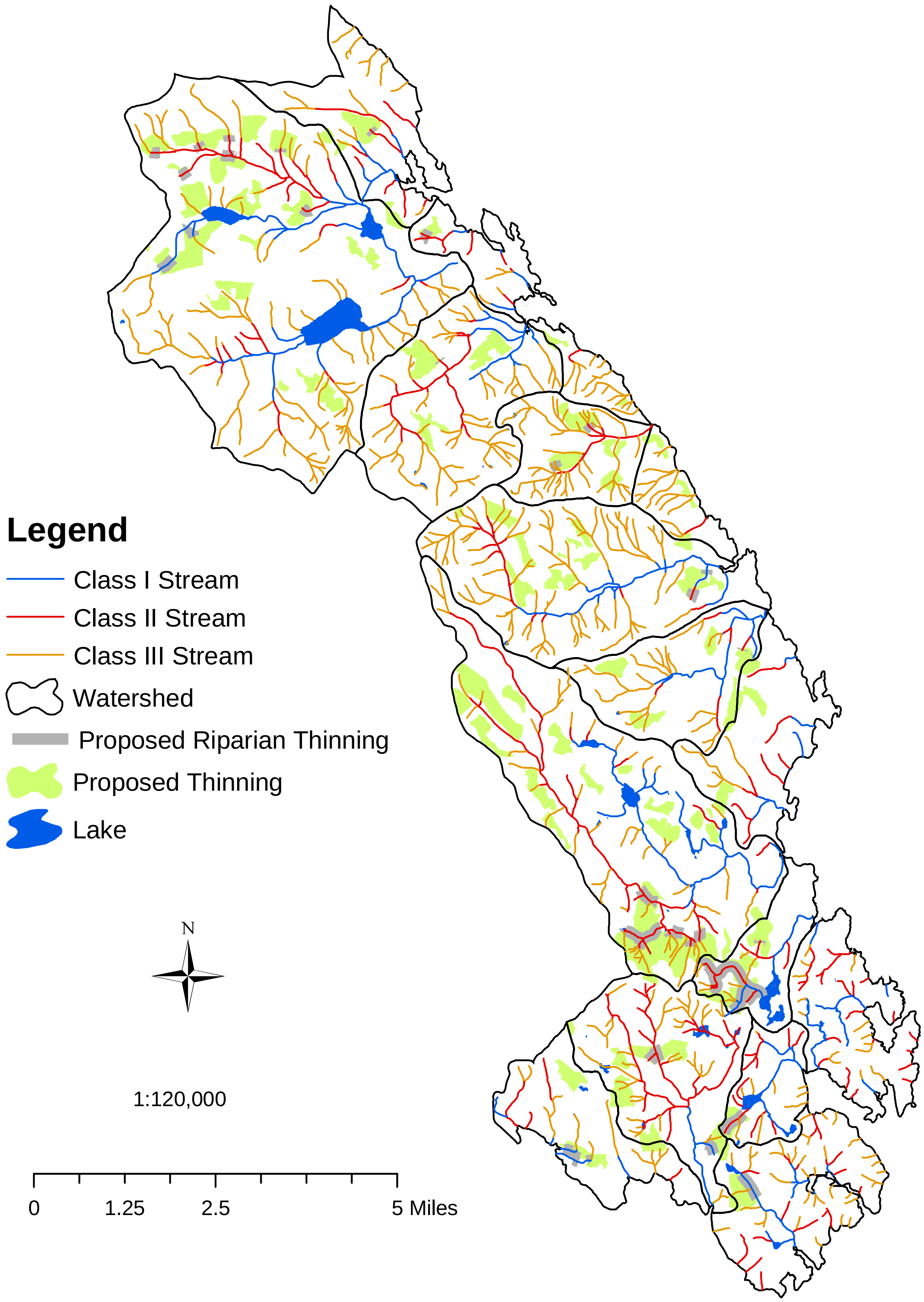


Figure 4-4 includes Aquatic Habitat Management Unit Class I and II stream stretches that have not had RMAs thinned. The stream stretches not included are those that were harvested after the 1990 congressional decision on the Tongass Timber Reform Act, requiring one hundred foot buffers on either side of all fish streams. A total of 6.9 miles of stream have not been thinned. This amounts to 166 acres of Riparian Management Area. This again is based upon the thinning layer, which is not completely accurate. Further field verification is needed to ensure accurate riparian thinning needs. Also, riparian thinning projects are in the planning stage. Refer to Chapter 7 (aquatics) of this report for more information.

Road Concerns

Several stretches of road in the Cobble area need to be addressed due to issues such as blocked pipes, failed drainage structures, inadequate drainage structures, and non-maintained roads with structures in place. Site-specific road segments are included in the Erosion Processes (Chapter 5) and Aquatics (Chapter 7) sections of this report.

Before any additional road building occurs in Big Ratz, Slide, or Sal watersheds, site-specific analysis should take place due to the high density of pre-existing roads.

Watershed Concerns

From a GIS perspective, the three watersheds with the most sediment movement potential and detrimental affects from past management activities are Sal, Slide, and Big Ratz. This is because of their high stream density and miles of transport streams.

Of these three watersheds, Sal has relatively low amounts of harvest acres, harvested RMA acres, road miles, and stream crossings. However, from field reconnaissance, it is clear that the affects of past management have been more detrimental to Sal than Big Ratz or Slide. This is due mainly to the geomorphology of these watersheds.

While Slide has more landslides than Sal (see Chapter 5, Erosion Processes), Slide has broader depositional zones with little impact to the main channel of Slide Creek. Sal however, has little depositional zone and immediate connectivity exists between the headwater streams and main stem of Sal Creek. This has caused landslides that have occurred in Sal to reach the main channel, plug road culverts, and have detrimental affects to fish habitat.

When future management activity takes place, site-specific considerations should be made for Sal, Slide, and Big Ratz. Also, future restoration activities should focus on these watersheds.

Wetlands
As previously stated, roads pose the largest impacts to high value wetlands due to a potential loss of hydrologic connectivity and habitat. The highest density of road construction on high value wetlands has occurred EM, MT, and MP wetlands. Many of these roads are specified roads and are planned to remain open for future use.

Temporary roads were also constructed in the Cobble area. Typically, temporary roads are closed to travel and drainage structures are removed following harvest activities, leaving the roadbed in place. A total of 0.36 miles (1.8 acres) of temporary road has been constructed in EM wetlands and 0.26 miles (1.3 acres) in MP wetlands.

Proposed wetland restoration projects involve removing the entire road prism from these high value wetlands. The road subgrade would be removed to the depth of the native soils. In most cases, subgrade materials consisting of boulders and cobbles sink into the native organic soils. This sunken subgrade material should be removed to the greatest extent feasible. Complete removal of the subgrade will be difficult without excavating large volumes of organic soil and rock. The roadbed will likely be removed to depth slightly below the surrounding undisturbed soil surface in the adjacent wetland (approximately 1 – 2 feet).

Organic soil types matching the adjacent wetlands should then be backfilled and graded to match the existing topography. Wetland vegetation may also be transplanted if revegetation does not establish naturally. Temporary roads that are candidates for wetland restoration are listed in Table 4-6.

Table 4-7. Temporary Roads Recommended for Wetland Restoration

Temporary Road Location	Road Length (miles)	Wetland Affected (acres)	Wetland Type
Located off of 3000000 road	0.03	0.15	EM
Located off of 3000270 road	0.01	0.03	EM
Located off of 3000100 road	0.16	0.77	EM
Located off of 3000250 road	0.07	0.36	EM
Located off of 3000522 road	0.00	0.01	EM
Located off of 3000500 road	0.07	0.33	EM
Located off of 3000200 road	0.02	0.11	EM
Located off of 3000280 road	0.01	0.07	MP
Located off of 3000180 road	0.01	0.03	MP
Located off of 3000153 road	0.09	0.46	MP
Located off of 3018130 road	0.14	0.70	MP
Totals	**0.62**	**3.03**	**---**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

The data shown in Table 4-6 was derived from information in the USDA Forest Service GIS database. Actual miles of road and specific locations may vary slightly from field observations. Additional areas of temporary roads suitable for wetland restoration may be discovered during field reconnaissance. Additional wetland restoration may also be performed on specified roads located in EM, MT, AM, and MP wetlands that are scheduled to be decommissioned.

An annual monitoring plan should be developed to document the success of the wetland restoration on these proposed roads. Vegetation establishment, hydrological changes, and biological improvements should be the emphasis for annual monitoring.

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Chapter 5 – Erosion Processes

Reference Conditions

Introduction
The geomorphology of the Cobble area is dominated by steep slopes and U-shaped valleys. The lowlands are predominately compacted glacial till material with sporadic glacial till on steep granite slopes. This combined with high rainfall intensity (93-150 inches annually) (Nowacki et al., 2001) and unstable soils makes landslides the dominant landscape forming and soil disturbing process (Swanston, 1969).

Landslides
Sediments from landslides cause aggradation of stream channels and degradation of fish habitat (Swanston, 1991). An analysis of landslides in the Cobble area shows that landslides were common before any management activities took place. One hundred of the 227 landslides that have been mapped in the Cobble area were formed outside of management influences. This implies that landslides have always influenced watershed and stream morphological conditions.

Mass Movement Index (MMI) Soils
Mass movement index (MMI) hazard classes are used to group soils according to their slope stability. Slope gradient is the primary site factor determining the stability of natural slopes; however, soil physical properties and drainage are also used in this classification. The four categories of MMI are MMI1 (most stable) through MMI4 (least stable).

For the purpose of this document, only the unstable MMI3 and MMI4 soils will be discussed. Mass movement index 4 soils have a very high probability of slope failure and are usually found on slopes greater than 72 percent. However, some are found on poorly drained soils on slopes greater than 60 percent. Nearly all naturally occurring landslides initiate in MMI4 soils (USFS, 2001).

Mass movement index 3 soils have a high probability of slope failure, but less than MMI4 soils. The gradients of these soils are generally over 60 percent but may include poorly drained soils on slopes greater than 50 percent. Some natural occurring landslides initiate on MMI3 soils (USFS, 2001).

Figure 5-1 is a map of MMI3 and MMI4 soils, roads, and landslides. The majority of the MMI4 soils are located in the northern end of the Cobble area while the MMI3 soils are uniformly distributed throughout. Most non-management caused landslides have occurred in MMI4 soils (Figure 5-1).

Figure 5-1 – Landslides and MMI3 and MMI4 soils

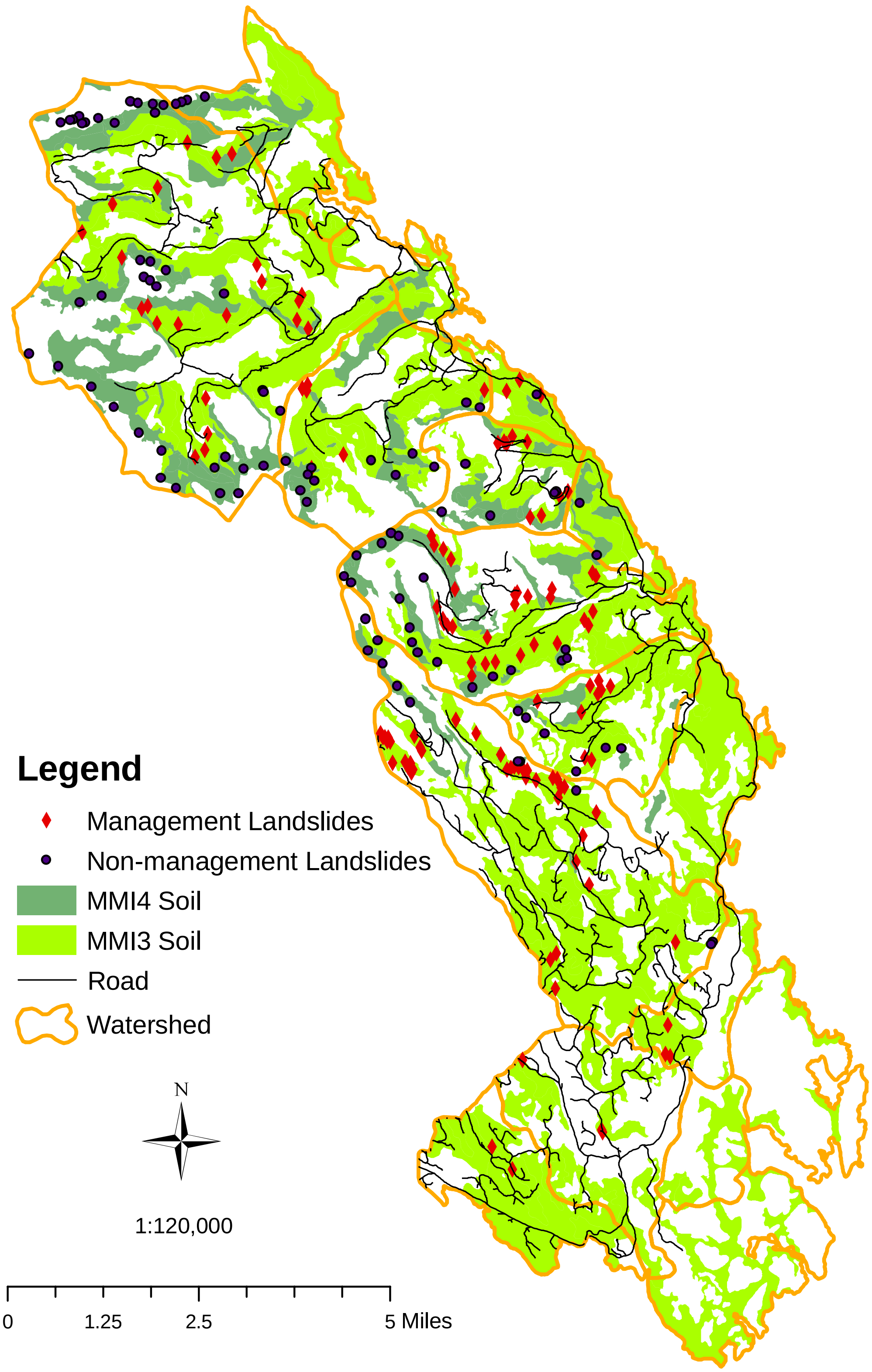

Table 5-1 contains the total acres, MMI3 soil acres, MMI4 soil acres, percentage area MMI3 soils, and percentage area MMI4 soils by watershed. Ten percent of the Cobble area is covered by MMI4 soils. Big Ratz and No Name watersheds have the highest percentages of MMI4 soils with 21 percent and 22 percent, respectively. Forty-three percent of the Cobble area contains MMI3 soils. Torrent and Tiny watersheds have the highest percent of MMI3 soils with 76 percent and 77 percent, respectively (Table 5-1).

Table 5-1. Mass Movement Index 3 and 4 soils.

Watershed	Total Acres	MMI3 Acres	MMI4 Acres	Percent MMI3 Soils	Percent MMI4 Soils
Barren Creek	1,983	1,194	41	60	2
Big Ratz	10,314	3,545	2,177	34	21
Cobble	2,120	1,090	144	51	7
Deer Creek	2,925	1,089	0	37	0
Doughnut	1,858	245	0	13	0
Little Ratz	3,519	1,430	535	41	15
No Name	1,553	518	344	33	22
North	1,973	1,001	316	51	16
North Sal	690	471	138	68	20
Pin	968	363	0	37	0
Ratz Harbor	852	352	98	41	12
Sal Creek	4,626	1,783	723	39	16
Salamander	1,176	474	0	40	0
Slide Creek	6,563	3,375	203	51	3
Thorne	2,377	957	0	40	0
Tiny	511	387	27	76	5
Torrent	1,876	1,436	0	77	0
Entire Cobble Area	**45,884**	**19,710**	**4,746**	**43**	**10**

All data is from Forest Service Geographic Information Systems (GIS) database.

Current Conditions – Erosion Processes

Existing Soil Disturbances

Landslides - Landslides have been a historic part of landscape formation in the Cobble area. However, they have increased due to management activities such as forest harvesting and construction of roads. Previous studies in southeast Alaska have indicated a two- to four- fold increase in landslide frequency associated with timber harvest (Sidle, 1985 and Swanston, 1991).
Table 5-2 displays number of landslides in the Cobble area including harvest related landslides, road related landslides, landslides impacting streams, non-management landslides, total landslides, and landslide density (number per squared mile).

There have been 227 landslides (1,968 acres) in the Cobble area. Throughout the entire Cobble area, 127 landslides (234 acres) are management related, 15 landslides (15 acres) originate from roads, 112 landslides (219 acres) originate in harvested stands, and 64 landslides (1,355 acres) impact streams. The total landslide density is 3.2 (Table 5-2 and Table 5-3).

Table 5-2. Landslides

Watershed	Harvest Related	Road Related	Stream Impacted	Non-management	Total Landslides	Landslide Density
Barren Creek	0	0	0	0	0	0.0
Big Ratz	21	1	17	40	62	3.8
Cobble	7	2	7	6	15	4.5
Deer Creek	1	2	2	1	4	0.9
Doughnut	0	0	0	0	0	0.0
Little Ratz	6	0	12	11	17	3.1
No Name	6	3	2	5	14	5.8
North	0	0	0	4	4	1.3
North Sal	0	0	0	2	2	1.9
Pin	0	0	0	0	0	0.0
Ratz Harbor	0	0	0	0	0	0.0
Sal Creek	29	1	12	19	49	6.8
Salamander	3	0	0	0	3	1.6
Slide Creek	35	4	10	11	50	4.9
Thorne	0	0	0	0	0	0.0
Tiny	2	1	1	1	4	5.0
Torrent	2	1	1	0	3	1.0
Entire Cobble Area	**112**	**15**	**64**	**100**	**227**	**3.2**

All data is from USDA Forest Service Geographic Information Systems (GIS) database.

Sal, Big Ratz, and Slide watersheds are the most affected by landslides. Sal has 49 total landslides, 12 of which directly affect streams, and a landslide density of 6.8. Big Ratz has 62 total landslides, 17 of which affect streams, and a landslide density of 3.8. Slide has 50 total landslides, 10 of which affect streams, and a landslide density of 4.9 (Table 5-2).

Table 5-3 contains landslide acreage in the Cobble area including: harvest-related landslide acreage, road-related landslide acreage, landslide acres impacting streams, non-management-related landslide acreage, total landslide acreage, and percentage of area affected by landslides. Among watersheds, Big Ratz, Sal, and Little Ratz are the most affected by landslide acreage. Big Ratz has 1,313 landslide acres, 987 acres impacting streams, and 12.7 percent of the watershed is landslide affected. Sal Creek has 220 landslide acres, 91 acres impacting streams, and 4.8 percent of the watershed is landslide affected. Little Ratz has 147 landslide acres, 140 acres impacting streams, and 4.2 percent of the watershed is landslide affected (Table 5-3).

<u>Timber Harvests</u> - Timber harvests have occurred since the 1940's in the Cobble area. A total of 15,562 acres, or 34 percent of the project area, has been subjected to timber harvests (Table 4-4). See Chapter 4 for a distribution of timber harvests by watershed.

Table 5-3. Landslide Acreage

Watershed	Total Watershed Acres	Harvest Related Landslide Acres	Road Related Landslide Acres	Landslide Acres Impacting Streams	Non-management Landslide Acres	Total Landslide Acres	Percent of area Landslide affected
Barren Creek	1,983	0	0	0	0	0	0.0
Big Ratz	10,314	72	2	987	1,239	1,313	12.7
Cobble	2,120	6	2	31	36	44	2.1
Deer Creek	2,925	1	2	2	2	5	0.2
Doughnut	1,858	0	0	0	0	0	0.0
Little Ratz	3,519	15	0	140	132	147	4.2
No Name	1,553	11	4	77	79	94	6.0
North	1,973	0	0	0	5	5	0.3
North Sal	690	0	0	0	3	3	0.4
Pin	968	0	0	0	0	0	0.0
Ratz Harbor	852	0	0	0	0	0	0.0
Sal Creek	4,626	54	1	91	165	220	4.8
Salamander	1,176	6	0	0	0	6	0.5
Slide Creek	6,563	50	2	26	72	124	1.9
Thorne	2,377	0	0	0	0	0	0.0
Tiny	511	3	1	1	1	5	0.9
Torrent	1,876	1	1	0	0	2	0.1
Entire Cobble Area	**45,884**	**219**	**15**	**1,355**	**1,734**	**1,968**	**4.3**

All data is from USDA Forest Service Geographic Information Systems (GIS) database

Timber Harvests on Unstable Soils - Since the Tongass Land Management Plan, MMI4 soils have been generally precluded from road construction and timber harvests due to the risk of slope failures. Mass movement index 3 soils are not precluded from management activities although the risk of slope failure is still high (USFS, 1997).

Standards and guidelines for MMI3 and MMI4 soils were implemented in 1997. It is therefore important to identify MMI3 and MMI4 soils that have been harvested to assess where landslides may occur in the future.

Table 5-4 includes harvested acres of MMI3 soils, harvested acres of MMI4 soils, percentage of MMI3 soils harvested, and percentage of MMI4 soils harvested.

Throughout the Cobble area, 10,020 acres (51 percent) of MMI3 soils and 918 acres (19 percent) of MMI4 soils have been harvested (Table 5-4). Slide and Deer watersheds have the highest percent harvest on MMI3 soils with 81 percent and 64 percent, respectively. Cobble Creek and Little Ratz have the highest percent harvest on MMI4 soils with 52 percent and 32 percent, respectively (Table 5-4).

Table 5-4. Harvests on MMI3 and MMI4 soils

Watershed	MMI3 acres Harvested	MMI4 acres Harvested	Percent MMI3 Harvested	Percent MMI4 Harvested
Barren Creek	211	3	18	6
Big Ratz	2,103	370	59	17
Cobble	563	74	52	52
Deer Creek	701	0	64	0
Doughnut	7	0	3	0
Little Ratz	758	170	53	32
No Name	70	33	14	9
North	321	36	32	12
North Sal	85	10	18	7
Pin	34	0	9	0
Ratz Harbor	97	21	27	21
Sal Creek	1,031	150	58	21
Salamander	287	0	61	0
Slide Creek	2,745	51	81	25
Thorne	119	0	12	0
Tiny	123	0	32	0
Torrent	765	0	53	0
Entire Cobble Area	**10,020**	**918**	**51**	**19**

All data is from Forest Service Geographic Information Systems (GIS) database.

Roads - Road construction impacts soils and mass movement events by cut-and-fill construction techniques, loading preexisting unstable slopes with fill material, redirecting streams, and altering subsurface hydrologic properties on unstable slopes (Waters, 1995). Roads have accompanied timber harvests in the Cobble area since the 1950's as a primary means of accessing harvested areas. The Cobble area has a total of 167 miles of roads, or 811 acres based on a 40-foot road prism (Table 4-5). See Table 4-5 in Chapter 4 for a distribution of road area by watershed.

Roads on Unstable Soils - Roads located on unstable soils can potentially affect other resources through landslide initiation. When roads do not directly initiate landslides, they can act as sediment deposit zones for landslides. Sediment deposits will block drainage structures and road ditches, redirect streams across roads, cause erosion, and eventually supply sediments to stream channels. Table 5-5 displays miles of road on MMI3 soils, miles of road on MMI4 soils, acres of road on MMI3 soils, and acres of road on MMI4 soils by watershed.

The Cobble area has a total of 96 miles of road (463 acres) on MMI3 soils and 6 miles of roads (29 acres) on MMI4 soils. The watersheds with the most road miles on MMI3 soils are Slide and Big Ratz with 22 miles (107 acres) and 17 miles (84 acres), respectively. Big Ratz and Sal have the most roads on MMI4 soils with 2 miles (9 acres) and 1 mile (6 acres), respectively (Table 5-5).

Table 5-5. Road mileage and acreage on MMI3 and MMI4 soils

Watershed	Road Miles MMI3	Road Miles MMI4	Road Acres MMI3	Road Acres MMI4
Barren Creek	4	0	21	0
Big Ratz	17	2	84	9
Cobble	6	0	30	1
Deer Creek	6	0	30	0
Doughnut	0	0	0	1
Little Ratz	6	1	30	4
No Name	3	0	13	1
North	3	1	14	4
North Sal	2	0	9	0
Pin	0	0	0	0
Ratz Harbor	2	1	8	2
Sal Creek	8	1	40	6
Salamander	3	0	13	0
Slide Creek	22	0	107	0
Thorne	0	0	0	0
Tiny	2	0	8	1
Torrent	12	0	56	0
Entire Cobble Area	**96**	**6**	**463**	**29**

All data is from Forest Service Geographic Information Systems (GIS) database. Road acreage is based on a 40-foot road base.

Synthesis and Interpretation – Erosion Processes

Future Landslide Potential

Landslide events usually occur 10-15 years after harvests on landslide-prone soils (Ziemer and Swanston, 1977). This general timeframe can be used to predict areas where landslides may occur in the near future. Figure 5-2 is a map of all MMI3 and MMI4 soils, MMI3 and MMI4 soils harvested in the past 15 years, roads, lakes, and landslide initiation points in the Cobble area. As the map shows, there are concentrations of recent harvests on unstable soils in the Big Ratz and North watersheds in the northern end of the project area and also in Slide and Sal.

Table 5-6 contains acreage of MMI3 soils harvested in the past 15 years, MMI4 soils harvested in the past 15 years, and total MMI3 and MMI4 soils harvested in the past 15 years. Big Ratz and Slide have the most combined acreage of recent harvest on MMI3 and MMI4 soils with 774 acres and 278 acres, respectively. Sal also has 196 acres of unstable soils harvested in the past 15 years. Areas within these watersheds and clusters of recent unstable soil harvests elsewhere should be considered as well as areas for potential future landslides.

The northern part of the Cobble area near the 3000000- and 3026000-roads contains 401 acres of unstable soils harvested in the past 15 years (Figure 5-2). This area has previous landslide initiation points, giving it potential for future landslides.

The north central portion of Sal watershed has 87 acres of recently harvested unstable soils the watershed with a landslide history (Figure 5-2). This area will likely have future landslides.

The northern area of Slide has 157 acres of unstable soils harvested in the past 15 years with a landslide history. This area has potential for future landslides (Figure 5-2).

No Name watershed is one of the smaller watersheds at 1,553 acres (Table 5-1) but has one of the higher landslide densities with 5.8 (Table 5-2). No Name has 63 acres of unstable soils harvested in the past 15 years with a landslide history (Figure 5-2). No Name watershed has the potential for future landslide activity.

Road and Landslide Concerns

Roads built on MMI3 and MMI4 soils are shown in Figure 5-3 along with landslide initiation points. From this map and ground reconnaissance, stretches of road with landslide concerns have been selected.

A 2.62-mile stretch of the 302600-road in northern Big Ratz watershed was built on unstable soils and the depositional zone of several landslides. This has resulted in plugged culverts and ditches, causing redirection of stream channels and erosion. The 3023500-road in Big Ratz functions the same way, with landslides above a 2.02-mile road segment, redirecting streams across the road (Table 5-7).

Figure 5-2 – Unstable Soil Harvests in the last 15 years

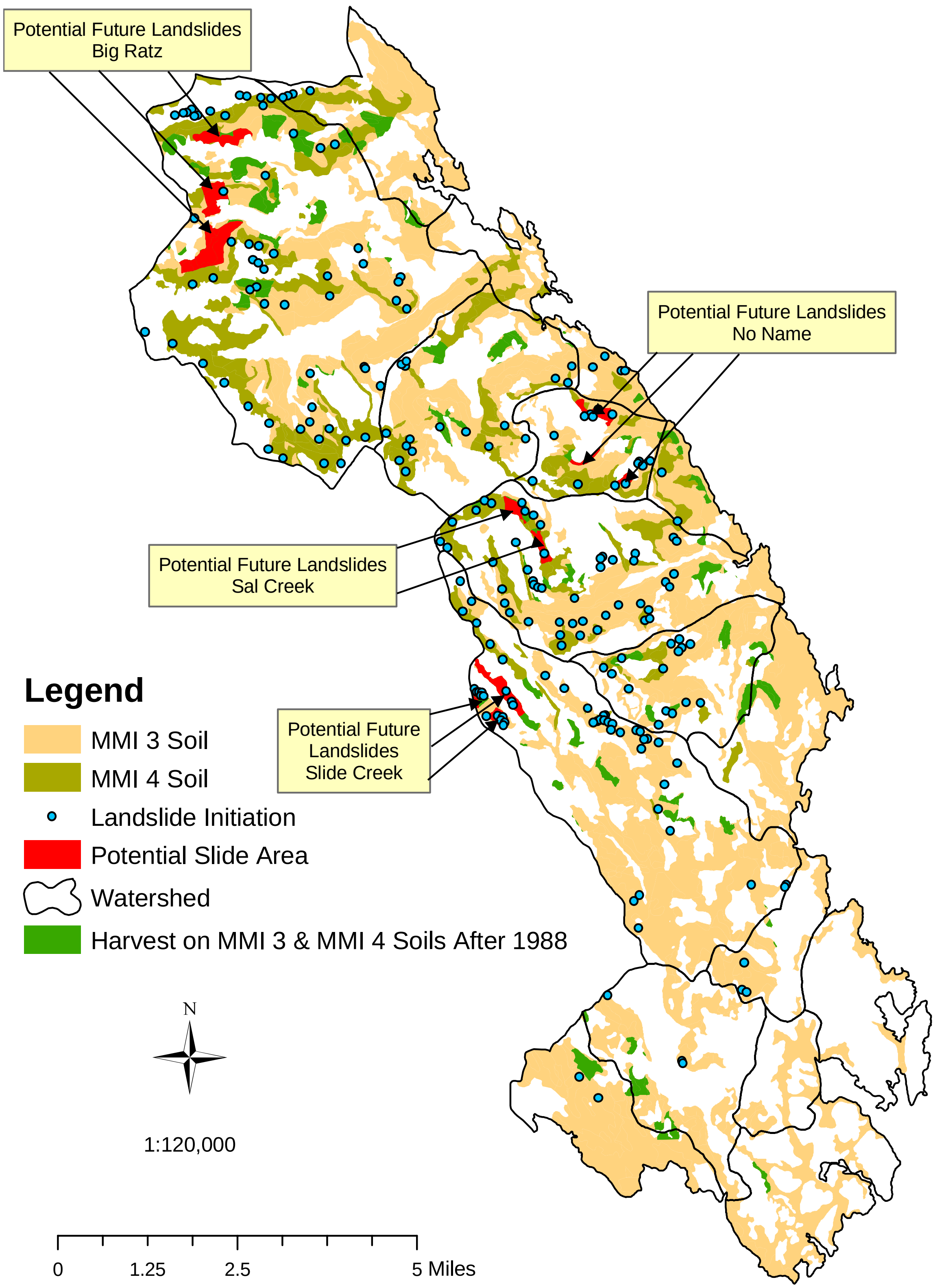

Figure 5-3 - Roads on unstable soils

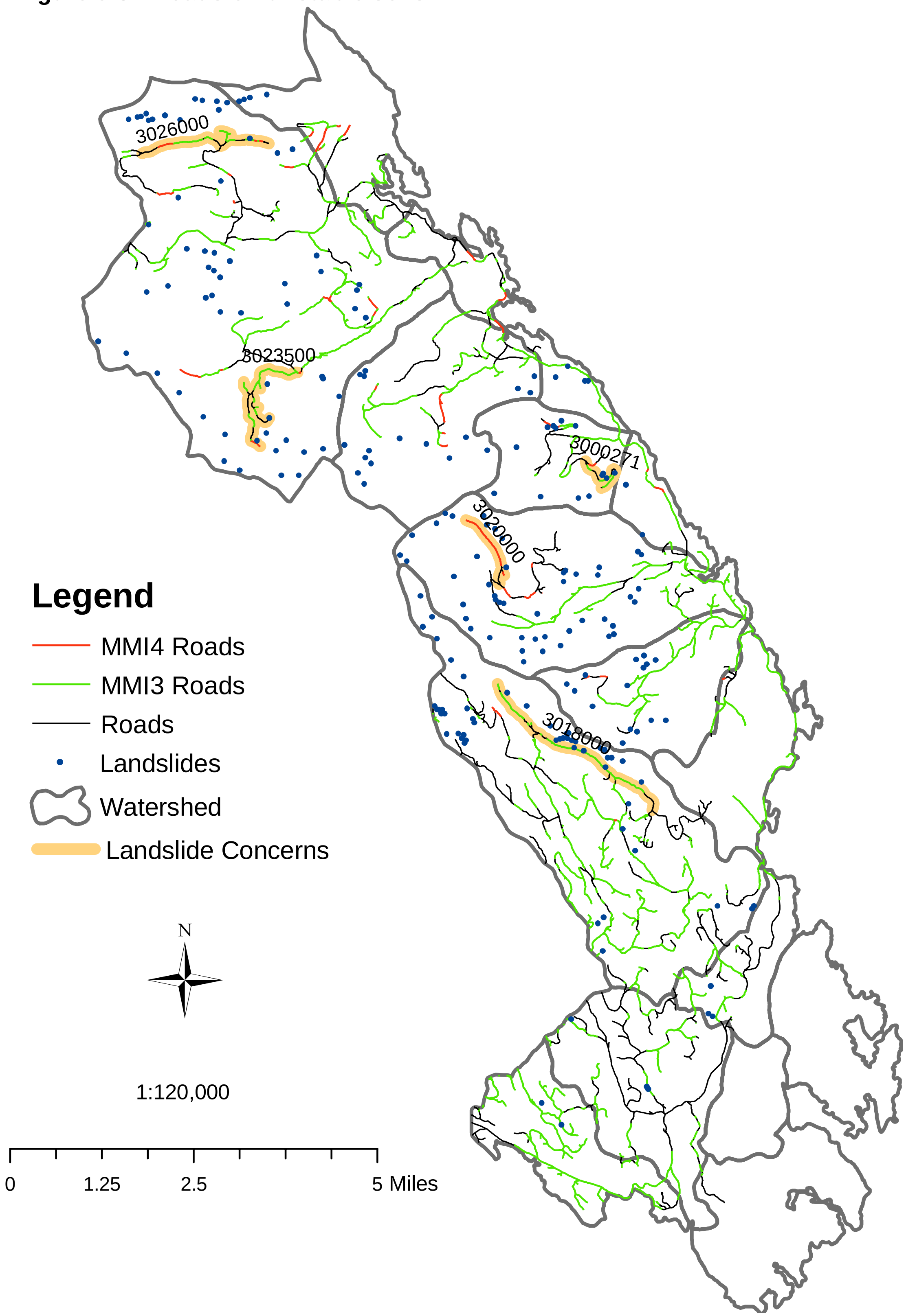

Table 5-6. Acres of MMI3 and MMI4 soils harvested in the last 15 years

Watershed	MMI3 soils harvested 15 yrs	MMI4 soils harvested 15 yrs	Total MMI 3&4 harvested 15 yrs
Barren Creek	51	0	51
Big Ratz	619	155	774
Cobble	108	27	135
Deer Creek	79	0	79
Doughnut	0	0	0
Little Ratz	121	25	146
No Name	70	33	103
North	58	30	88
North Sal	37	10	47
Pin	0	0	0
Ratz Harbor	18	0	18
Sal Creek	82	114	196
Salamander	5	0	5
Slide Creek	241	37	278
Thorne	16	0	16
Tiny	9	0	9
Torrent	81	0	81
Entire Cobble Area	**1,595**	**431**	**2,026**

All data is from Forest Service Geographic Information Systems (GIS) database.

Table 5-7 - Roads with landslide concerns

Road Number	Watershed	Miles	Concern
3026000	Big Ratz	2.62	Landslide depositional zone
3023500	Big Ratz	2.02	Landslide depositional zone
3020000	Sal Creek	1.05	Landslide depositional zone
3018000	Slide Creek	2.73	Landslide depositional zone
3000271	No Name	0.67	Fillslope overload and landslides

All data is from USDA Forest Service Geographic Information Systems (GIS) database.

The final 1.05-mile of the 3020000-road in Sal Creek is built on MMI4 soils with past landslides. Future landslides will likely occur in this area, affecting this road. Another road segment on MMI3 soils with similar landslide concerns is a 2.73-mile stretch of 3018000-road in the northern portion of Slide Creek (Table 5-7).

Fill-Slope Overload

Another soil concern associated with road construction is fill-slope overload. During road construction, material is “cut” away from the upslope side of the road and placed or “filled” in on the down slope side of the road. This causes overload of material on the fill-slope and mass soil movements.

The final 0.67-mile of the 3000271-road in the southeast portion of No Name watershed was built on MMI3 soils with fill-slope overload (Table 5-7). This has caused several mass soil movements. Additional roads probably exist with similar concerns. Future reconnaissance is needed to locate these roads.

Recommendations-Erosion Processes

The main soils recommendations for the Cobble area are aimed at reducing the chances of future landslides and minimizing sources for sediment transport. New landslides should be seeded during the growing season with native vegetation. The installation of waddles and other erosion controlling devices may be necessary to enhance seedling establishment and erosion minimization. Additionally, cutslope failures along roads should be seeded upon discovery.

The roads identified in the synthesis and interpretation section should be maintained to address the resource concerns associated with them. Drainage concerns will need to be addressed on roads built in depositional zones. Roads with fillslope overload will require some removal of the fill material to lessen the overburden on the slope. The removed fill material should be end-hauled to an appropriate disposal location, or may be used to recontour the benched road prism if the road is scheduled for closure.

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Chapter 6 – Human Uses

Reference Conditions

The Cobble Study Area is defined loosely in its coastal extent as the area between the outlet of Eagle Creek on the North and the entrance into Thorne Bay on the South. The area contains evidence of a variety of human uses throughout a broad expanse of prehistory and history. This evidence takes the form of ethnographic and historic studies as well as archaeological surveys conducted in support of past USDA Forest Service planning efforts.

The earliest known human occupation of Prince of Wales Island is seen at On Your Knees Cave (49-PET-408) on northwestern Prince of Wales Island. This occupation has been dated at 9,200 radiocarbon years before present (10,300 calendar years). Sites of this age are rare in southeast Alaska and seem to indicate a small and mobile fisher/hunter/gatherer population exploiting the marine environment. Only four archaeological sites dating to the period prior to 5,000 years before present are known on the island. One of these is located in the Cobble Study Area on non-Forest Service Land.

Between 5,500 years ago and the time of European contact, in the mid 1700s, the frequency and types of human occupations changed dramatically. Evidence of systematic and large-scale harvest of anadromous fish is one indicator of a change in the life ways of the Native people. Construction, use, and maintenance of the fishing traps and weirs suggest increasing populations; development of an organized workforce; and social stratification. In this same time period we see the first shell middens; accumulations of shell, fish bone, charcoal, and fire cracked rock; and evidence of sustained and repeated use of sites for cooking and group activities. Basic tool technology also undergoes a change after 6,000 years ago. The chipped stone industry of the Paleomarine tradition is replaced by a groundstone industry. Many examples of tools constructed of bone, ivory, and wood have been seen in more recent times. All of these developments culminate in the complex, stratified societies of the Tlingit and Haida peoples seen at the time of contact.

Weirs formed of sharpened wooden stakes driven into the estuarine mud are seen throughout southeast Alaska. The earliest known example of a wooden stake weir is found on northern Mitkof Island. On Prince of Wales Island wooden stake weirs and other estuarine structures are first seen about 3,800 years ago in Whale Pass, on Prince of Wales Island. Within the Cobble Study Area one wooden stake weir has been recorded but not dated.

Significant Euro-American impact on Tlingit people's subsistence activities was not experienced until late 1870s. During this time school teachers, missionaries and cannery operations arrived on Prince of Wales Island.

Drastic changes in population density and distribution took place after European contact. Some villages relocated to take advantage of trade opportunities with newcomers. At the same time newly introduced diseases decimated the Native population.

Prince of Wales Island was formerly divided among several subgroups of Tlingit. The Stikine (Shax'heen) kwaan included the northeast coast of Prince of Wales Island in their territory. The Heenya kwaan inhabited the northern half of the western part of the island. The Klawock (Lawaak) kwaan resided along the west-central coast of Prince of Wales and were likely part of the Heenya kwaan. Finally, the Tongass (Taant'akwaan) kwaan held the southern third of the island before the Kaigani Haida displaced them in the early 18th century (Ardnt et al. 1987). A dispute existed over the ownership of the land around Thorne Bay. A traditional war was adverted due to the influx of miners and white settlers. Early in the 20th century the Kaigani Haida had fish camps in Thorne Bay and seasonally used the coast to the north. Native petroglyphs can be found across the bay from Davidson's Landing. All of the groups mentioned above made use of the territory within the Cobble Study Area. The area is lacking in protected harbors and good landing areas.

Table 6-1. Key Dates for the Cobble Study Area

Date	Event
1891	Captain Vancouver named Thorne Bay after Frank Manley Thorn. Frank Thorn was superintendent of US Coast and Geodetic Survey between 1885 and 1889.
1888	A Saltery was established at the entrance to Thorne Bay, but was moved in 1892 to the mouth of the Thorne River.
1907	The first logging took place in what is now Gravelly Creek picnic area. (Just outside of the boundary of the Cobble Anaylsis). The trees were logged by hand and floated down river to be used as trestles for a Saltery at the Salt Chuck mine.
1954	W.G. Davidson established the Thorne River Logging Company. Originally Davidson landing was used as a log transfer and storage facility. Today it is used as a marine for access into South Thorne Bay.
1961	The Louisiana Pacific Corporation came to Thorne Bay to harvest timber as part of a 50 year contract with the USDA Forest Service. Louisiana Pacific built the largest timber camp in the United States in what is now the city of Thorne Bay. The logging camp became incorporated into a city on August 2nd 1982.

Timber Industry

During the 1850s, Russian and American trading companies began to withdraw from Southeast Alaska. However, the US government had an interest in the timber areas of Prince of Wales Archipelago (Rakestraw p.15). President Roosevelt established the Tongass National Forest in 1907. Economic strategies were employed by incoming Europeans and Americans. The new strategies included fur trapping; fox farming; navigation; salteries and canneries; mining and mineral exploration; timber harvest; and recreation. Evidence of several of these economic strategies can be seen within the Cobble Study Area. Ratz Harbor has served as an anchorage for boats navigating the often-stormy Clarence Strait. At Narrow Point the remnants of a lighthouse lies behind a modern navigation beacon. The most apparent human use of the area is for timber harvesting. The Alexander Archipelago Forest Reserve was established by proclamation on August 20th 1902 by President Roosevelt for the abundance of timbered land. (Rakestraw p. 16)

The early timber industry in southeast Alaska consisted of two types of lumber mills. Town based lumber mills produced hewn wood for local use. Additional mills were associated with building salmon canneries and mines. Timber harvest for sale outside of Prince of Wales Island did not become a practical market until World War II. Clear spruce was needed for airplane construction during this time and the Alaska Spruce Log Program was initiated. After WWII, large scale pulp production became economically feasible and several long-term pulp timber contracts were finalized. Large scale timber harvesting operations were put into place.

The existing road system began separately in the vicinities of Thorne Bay, Ratz Harbor, and Coffman Cove in the mid 1950's, eventually expanded to connect all three locations by the mid 1990's. Today the logging road has been upgraded to provide public access between the communities of Thorne Bay and Coffman Cove.

As the roads have developed, recreation facilities have followed. The roads provide access to hunting and gathering opportunities for the modern residents of the island. Recreational facilities have been developed at Sandy Beach Picnic Area and Luck Lake. As the road system is upgraded and improved new recreation facilities are being planned.

Current Conditions – Human Uses

Introduction

Recreation and Human use on Prince of Wales' (POW) National Forest Land is dominated by activities associated with fishing and hunting. Primarily these activities occur from May through October. Few non-residents currently visit outside of this time frame, except for those visiting relatives or business travelers who might include recreation in their trip (North Prince of Wales Recreation Master Plan, 2003). Other unique island features that attract both residents and tourists include opportunities for kayaking, canoeing, camping, wildlife viewing, hiking, biking and cave exploration. No USDA Forest Service Cabins or Developed Campgrounds currently exist in the Cobble area. Dispersed camping exists in undeveloped areas near logging roads, rock pits, lakes and beaches. No current USDA Forest Service System Trails have been developed. A few non-Forest System trails exist in the Cobble area which may be developed in the future through federal highway funding or USDA Forest Service Capital Improvements. Both water and land based recreation occurs in the area. Access to the Cobble area is primarily by automobile, with a small percentage of users reaching this area by floatplane or boat. This area is extremely important to local residents for recreational and subsistence pursuits because the project area lies within close proximity to the communities of Thorne Bay and Coffman Cove. Planned highway and recreation enhancements associated with the Sandy Beach Road will further improve access and recreation opportunities in the Cobble area.

Recreation Places and Recreation Sites

Recreation sites are recorded in the Ketchikan Geographic Information System (GIS) recreation layer. The Tongass Land and Resource Management Plan defines the following:

Recreation place- is a geographic area having one or more physical characteristics attractive to people engaging in outdoor activities. A variety of activities may occur within any recreation place. They may be beaches; streamsides or roadside areas; trail corridors; hunting areas of the immediate area surrounding a lake; cabin sites; or campgrounds. A recreation place may contain any number of recreation sites.

Recreation site- is a specific location where a particular activity is known to occur, or is well suited for an activity to occur in the future. A site can be designated as existing or potential site and may not be developed by the USDA Forest Service. Examples of recreation sites include campsites; boat anchorages; public use cabins; scenic view points; or known hunting or fishing areas. Several recreation sites may be located within a recreation place.

Existing recreation sites and places in the Cobble area are described below and displayed in Figure 6-1. Other recreation sites may be found within the Cobble Area; however, more field work time is needed to locate, enter into a Global Positioning System (GPS), and input into the GIS recreation layer.

Nineteen inventoried existing recreational sites are located in the Cobble Project area. Twelve of these recreation sites are located along the Sandy Beach road (FDR 30), or along the shoreline of Clarence Strait north of the community of Thorne Bay. The 12 sites make up 63% of all recreation sites in the Cobble Area. Most of these sites are dispersed and undeveloped, but are recognized by the USDA Forest Service because of repeated public use.

Figure 6-1. Existing Recreation Sites.

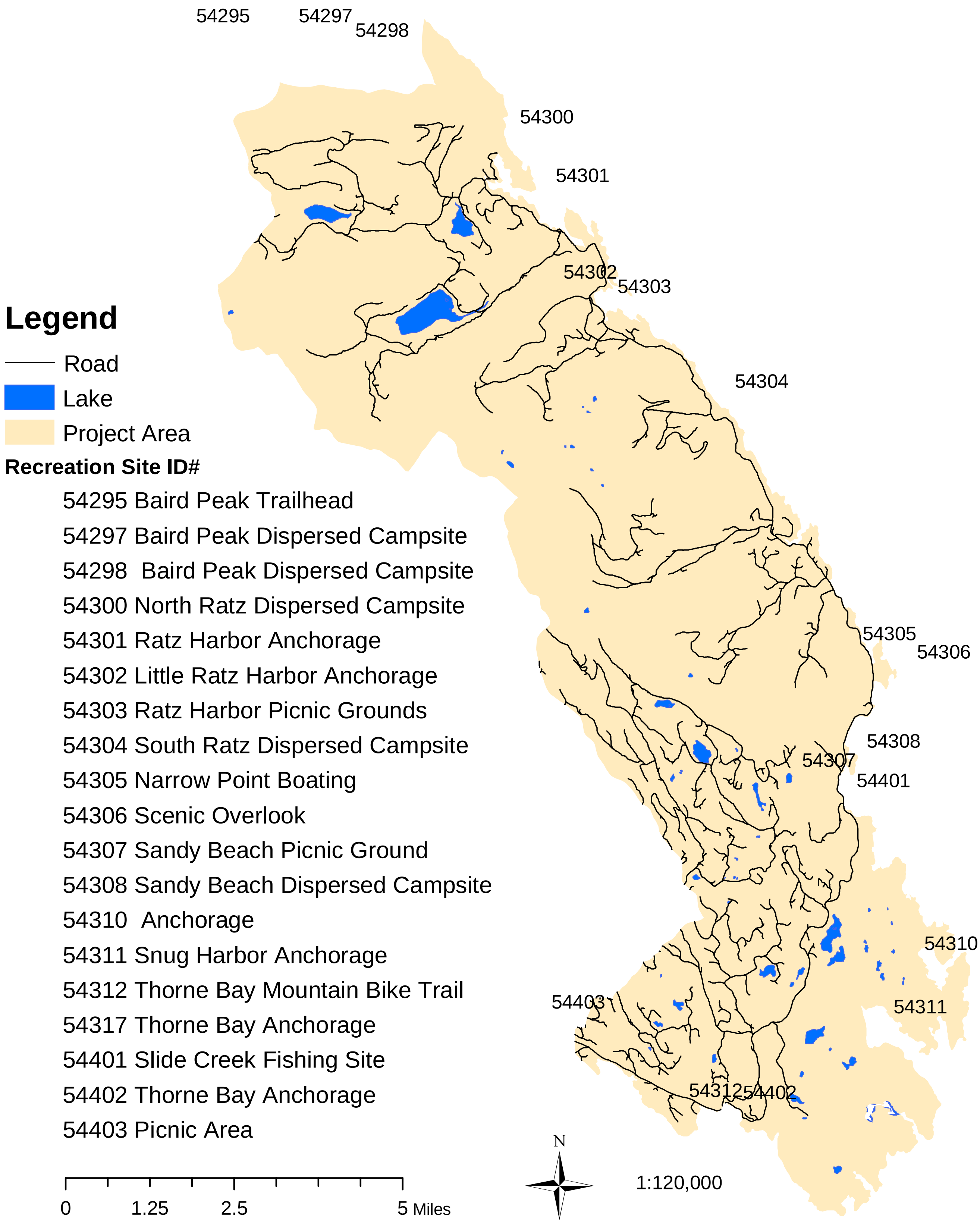


Table 6-2. Recreation Sites.

Site#	Recreation Site Description
54295	Baird Peak Trailhead
54297	Baird Peak Dispersed Campsite
54298	Baird Peak Dispersed Campsite
54300	Clarence Strait Dispersed Campsite (North of Ratz Harbor)
54301	Ratz Harbor Anchorage
54302	Little Ratz Harbor Anchorage
54303	Little Ratz Harbor Picnic Ground
54304	Clarence Strait dispersed campsite (south of Ratz Harbor)
54305	Narrow Point Boating Site
54306	Scenic-Observation Point
54307	Sandy Beach Picnic Ground
54308	Sandy Beach Dispersed Campsite
54310	Anchorage
54311	Snug Harbor Anchorage
54312	Thorne Bay Mountain Bike Trail
54317	Thorne Bay Anchorage
54401	Fishing Site at mouth of Slide Creek
54402	Thorne Bay Anchorage
54403	Picnic Area

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

USDA Forest Service Developed Facilities

The following facilities are maintained by the USDA Forest Service. Some of the facilities are updated in the national Infra database.

The Cobble Landscape Analysis Area consists of the following USDA Forest Service recreation developed facilities:

- **Sandy Beach Day Use Area**
  INFRA # 54P01
  Location: Clarence Strait on Prince of Wales Island, road accessible by Federal Developed Route (FDR 30) approximately 6 miles north of the community of Thorne Bay.
  Site Description: A large day use, picnic area consisting of five fire rings, five picnic tables, picnic shelter, double vault toilet, day use sign and two parking areas.
  Recreational Opportunity: The site is located along Sandy Beach road (FDR 30) and provides fantastic views of Clarence Strait from the picnic area. Access to Sandy Beach from the picnic area provides opportunities for beach combing, swimming, wildlife viewing, photography, and kayaking. Along the shoreline are primitive user-made features including benches and rope swings.

Terrain: Flat to easterly gently sloping terrain towards Clarence Strait. The site is among a stand of Sitka spruce and cedar trees. Skunk cabbage, devils club and assorted ferns and mosses provide for the typical Southeast Alaska groundcover. Drift logs are present on the beach, which creates difficult access for the less agile. Cleveland Peninsula and Etolin Island lie across the Clarence Strait to the East.

- **Big Lake Fish Pass Viewing Deck**
  INFRA # 54FV01
  Location: Near Trumpeter Lake off FDR road 30302.
  Site Description: Short access from primitive trailhead to a Yellow-Cedar viewing deck. Interpretative signs describe the Fish Pass.
  Terrain: The site is among a stand of Sitka spruce and cedar trees. Skunk cabbage, devil's club and assorted ferns and mosses provide for the typical Southeast Alaska groundcover.
  Recreation Opportunity: Fish Pass Viewing and Interpretative signs.

- **Ratz Harbor**
  INFRA # 54C05
  Location: Sandy Beach road (FDR 30)
  Site Description: Non-operational Logging Transfer Facility. Currently used for camping; and launching boats and kayaks.
  Terrain: Flat terrain with a protected Sea Harbor from Clarence Strait.
  Recreation Opportunity: Boat and kayak launching, fishing, wildlife viewing, photography, camping.

- **Thorne River Estuary** - Hunting Pullout Access.
  Location: FDR 20, 2 miles outside of Thorne Bay.
  Site Description: Paved pullout with short trail to estuary.
  Terrain: Estuary.
  Recreation Opportunity: Hunting access into Thorne River and the Thorne Bay Estuary.

- **Thorne Bay Interpretative/Administrative site**
  INFRA # 54I05
  Location: 1300 Federal Way Thorne Bay, Alaska.
  Site Description: Administrative offices and public Information.
  Recreational Opportunity: General information, hunting licenses, brochures, maps, reservations for campgrounds, cabins and cave tours.

Recreational User Developed Facilities (Non-USFS)

Non-system USDA Forest Service dispersed facilities are created by user developed trails and improvements including rustic shelters, benches, tables, and campfire rings.

A dispersed recreation site is a type of recreation use that requires few, if any, improvements and may occur over a wide area. This type of recreation involves activities related to roads, trails, and undeveloped waterways and beaches. The activities do not necessarily take place on or adjacent to road, trail, or waterway, only in conjunction with it. Activities are often day-use oriented and include hunting, fishing, boating, off-road vehicle use, hiking, and others (Tongass Land and Resource Management Plan 1997).

- **Sandy Beach Primitive Shelter/Campsite**

Recreation Site Point #: 54308
Location: Approximately ½ mile north from Sandy Beach day Use Area on FDR 30.
Site Description: A short primitive access trail leads from the road to a point overlooking Clarence Strait where a primitive small shelter and camp have been built along the beach . Use appears to be low to moderate. Most likely built and used by locals in the community of Thorne Bay.
Terrain: From road Gentle 8-10% grade up to a hill top point where terrain levels out above the beach.
Recreational Opportunity: Scenic Views, photography, solitude, beachcombing, camping, wildlife viewing, kayak access.

- **Little Ratz Harbor Primitive Campsite/picnic ground**

Recreation Site Point: 54303
Site Description: A primitive user trail leads from the pullout to Little Ratz. **Harbor Beach** - Nestled among the Sitka spruce and cedar trees in the beach fringe is a primitive dispersed campsite. The campsite consists of two hammocks, a fire pit, plywood table, and log stump benches. The site appears to have high use during the summer months.
Terrain: Low level terrain in a protected harbor that looks out into Clarence Strait.
Recreational Opportunity: Scenic Views, solitude, beach combing, camping, kayak access, photography, and wildlife viewing.

- **Shooting Range**

Location: Road # FDR 3018130 off the FDR 3018000 road (also called the "Boy Scout" road)
Site Description: Closed roadbed. Users have created a primitive shooting range. Users shoot along FDR 3018130 which is currently not accessible to vehicles, from its junction with FDR 3018000. Users are shooting over a Class II stream and up the closed road corridor that is lined with trees. Debris and shells litter the fish stream and road.
Terrain: Flat muskeg terrain
Recreational Opportunity: Target practice and gun skills. Shooting Range.

- **Mountain Bike and ATV trail use**

Location: This trail is composed of FDR 3018000 where it junctions with FDR 3018200 at mile-point 3.30, crosses Class I Slide Creek via an installed foot bridge, and continues until it junctions with FDR 3018500 at MP 7.69.

Currently, this section of FDR 3018000 is not drivable by high clearance vehicles, but can be accessed by all-terrain vehicles (ATV).
Site Description: Old roadbeds provide mountain bike and ATV use. Some sections of the road, culverts and bridges are failing. Beaver Dams have taken over sections of road that make travel very difficult.
Recreational Opportunity: Mountain biking, hiking, and off-highway vehicle (OHV) use.

- **Big Lake Area**

Location: Access to Big Lake from FDR 3023500.
Site Description: Lake and muskeg complex.
Terrain: Second-growth forested area.
Current Recreational Opportunity: Fishing, Camping, hiking, biking.

- **Trumpeter Lake**

Location: Access to Big Lake from FDR 3023 500.
Site Description: Lake and muskeg complex.
Terrain**:** Second-growth forested area.
Current Recreational Opportunity: Fishing, Camping, hiking, biking.

- **Little Lake**

Location: Near Big Lake North of the FDR 30 road and east of the FDR 3026 road.
Site Description: Second-growth forest area.
Terrain: Lake and muskeg complex.
Current Recreational Opportunity: Fishing, Camping, hiking, biking.

Recreation Access/Facilities on Non-National Forest Lands

- **Thorne Bay Harbor/Dock**

Location: Community of Thorne Bay.
Site Description: The boat harbor consists of a float plane dock, parking, boat grid, fish cleaning station, payphone and restrooms. Kayak access by boat ramps.

- **Thorne Bay Fair Grounds**

Location: Thorne Bay School grounds.
Site Description: Basketball courts, sports fields, dirt track. Site used for festivals, Logging Fair, and special events.

Current Road Access in the Cobble Area
Includes 168.74 miles of road in the Cobble area of which 56 miles are shoreline miles. The current moderate to heavy use roads that are used for recreational access are as follows:

- **Sandy Beach Road: High Importance**

Past: Timber harvest.

Present: Sandy Beach Road (FDR 30) provides a connection between Coffman Cove and Thorne Bay. Numerous recreation places and access points are located on this road.
Future: Proposed Scenic Byway.

- **3018 Boyscout Road: High Importance**

Past: Timber harvest.
Current: Numerous recreation places and access points located on this road.
Future: Main access road to other recreational areas.

- **3023500 Big Lake Access Road: High Importance**

Past: Timber harvest.
Current: High Importance. Provides access to fishing, hunting and camping.
Future: Parking and trail conversion for Big Lake and Trumpeter Recreation Complex.

- **3026000/3026100 Baird Peak Access: High Importance**

Past: Timber harvest.
Current: Provides access to alpine. Hunting and recreational hiking opportunities.
Future: Conversion from road to trail with alpine recreation access.

- **3023000 Little Ratz Road: Moderate Importance**

Past: Timber harvest.
Present: Hunting access. Vegetation has closed access to vehicle traffic.
Future: Provides hiking trail to alpine.

- **3000306/3000302 Trumpeter lake access: Moderate Importance**

Past: Timber harvest.
Present: Research needed.
Future: Possible conversion of roads to trail access.

- **3023520/3023530 Big lake-Trumpeter lake: Moderate Importance**

Past: Timber harvest.
Current: Closed. Difficult to find.
Future: Conversion from road to loop trail access around Big Lake and Trumpeter.

- **3018500: High Importance**

Past: Timber harvest.
Current: Provides access for hunting, fishing, biking.
Future: Use to complete a bike loop. Provide access to hunting and fishing.

Non-Forest Service Roads

- **Bypass road**

Past: Road for timber harvest (non-Forest Service road).
Current: 2-mile loop used as hiking and biking trail by Thorne Bay residents.
Future: Open road to vehicles. Bypass Thorne Bay to connect to FDR 30 road.

- **3000140 Water Lake road**

Past: Built for Timber Harvest and water access for community of Thorne Bay.
Current: closed (non-Forest Service road). Used as hiking and biking trail by Thorne Bay residents.
Future: Thorne Bay Trail Committee has some funding to begin development of trail connection on City land from town to water road (30140). Gated road access for Thorne Bay water.

Guided and Non Guided Recreation Users

The analysis area currently has Outfitter and Guides permitted at the following locations:

Table 6-3. 2004 Outfitter Guide Permits

Permit Number	Thorne River		Ratz Creek		Big Lake		Trumpeter Lake		Total Recreation Visitor Days
Permit Type	**N**	**S**	**N**	**S**	**N**	**S**	**N**	**S**	
THB233	45	90	25	25	20	20	0	30	255
THB242	5	5	5	3	0	0	0	0	18
THB4	15	15	0	0	0	0	0	0	30
THB232	15	34	6	10	0	3	0	10	78
CRG90	12	12	0	0	0	0	0	0	24
PET244	0	0	4	0	0	0	0	0	4
CRG89	4	10	0	10	0	0	0	0	24
SIT227	5	5	0	0	0	0	0	0	10
CRG43	12	10	0	10	0	10	0	10	52
CRG96	40	12	0	0	0	0	0	0	52
CRG86	10	16	0	0	0	0	0	0	26
								Total Authorized Days	**573**

S=Steelhead, N=Non-Steelhead

Recreation Visitor Day is a measure of recreation use of an area. One recreation visitor day consists of 12 hours of recreation use of a site or area. Recreation visitor days are used to measure recreation productivity or output capacity.

Other guided recreation opportunities exist for scenic viewing from boats, ferries, and ships in Clarence Strait looking into the Cobble Landscape. Alaska Marine Highway Ferries, numerous cruise ships, and fishing charters travel the waterways near the Cobble Analysis area. These outfitters are not required to obtain special use permits since they do not operate on USDA Forest Service Lands.

The vast majority of recreation use is non-guided with heavy local use from the communities of Thorne Bay and Coffman Cove. At this time the USDA Forest Service does not have statistical data to quantify the total recreation use in the Cobble area. However, the human use impacts that are found on the ground indicate that certain areas receive moderate to high use. These areas can be referenced in the Recreational User Developed Facilities/Areas List.

Recreational Opportunity Spectrum (ROS)

The USDA Forest Service uses the Recreation Opportunity Spectrum (ROS) to establish planning criteria, generate objectives for recreation, evaluate public issues, integrate management concerns, project recreation needs and demands, and coordinate management objectives (Recreation USDA Forest Service Manual 2310.3). The ROS guidelines also ensure that the proper scale and design criteria of development are met for each ROS class (USDA Forest Service Manual 2311).

The Tongass Land and Resource Management Plan defines the ROS as "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 seven classes are:

- **Primitive** - An unmodified environment generally greater than 5,000 acres in size and located generally at least three miles from all roads and other motorized travel routes. A very low interaction between users (generally less than three groups encounters per day) results in a high probability of experiencing solitude, freedom, and 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** - A natural or natural-appearing environment generally greater than 2,500 acres in size. It is generally located at least ¼ to ½-mile, but no further than three miles from all roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but evidence of other users is present. A high probability of experiencing solitude, freedom, and closeness of nature, tranquility, self-reliance, challenge, and risk exists. A minimum of subtle on-site controls exist. No roads are present in the area.

- **Semi-Primitive Motorized** - A natural or natural-appearing environment generally greater than 2,500 acres in size. It is generally located within ½-mile of primitive roads and other motorized travel routes used by motorized vehicles. It is not closer than ¼ to ½-mile from better-than-primitive roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), evidence of other users exists. A moderate probability of experiencing solitude, closeness to nature, and tranquility along with a high degree of self-reliance, challenge, and risk in using motorized equipment exists. Local roads may be present and extensive boat traffic may exist along saltwater shorelines.

- **Roaded Natural** - Resource modification and utilization are evident, in a predominately naturally appearing environment generally occurring within ¼ to ½-mile from better-than-primitive roads and other motorized routes. Interactions between users may be moderate to high (generally less than 20 group encounters per day), with prevalent evidence of other users. Opportunities to affiliate with other users in developed sites exist 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. Little on-site control of users exists except for graded roads. Evidence of other users on roads is moderate (generally less than 20 group encounters per day), with little evidence of others, but with easy access. Some self-reliance is required in building of 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 and convenience of facilities is important. Little opportunity for challenge and risk exists. 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. City parks and large resorts may serve as recreation sites. Opportunity to observe and affiliate with other users; convenience of facilities: and recreation opportunities are very important. Interaction between large numbers of users is high. Outdoors skills and risk are not important. Challenge is unimportant except in a competitive sports setting. Intensive on-site controls are numerous.

Recreational Opportunity Spectrum
The Cobble Analysis area has the following ROS classifications. The following Table 6-3 lists the 5 current ROS classes with total acres per class.

Table 6-4. Recreational Opportunity Spectrum.

ROS	Total Acres per Class	Total Percent per Class
Rural	984	2%
Roaded Modified	31,692	69%
Roaded Natural	3,007	7%
Semi-Primitive Motorized	2,528	6%
Semi-Primitive Non-Motorized	7,693	16%
Total	**45,904**	**100%**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Land Use Designation

Land Use Designation or LUD is a defined area of land specific to which management direction is applied.

The Cobble Analysis area has the following Land Use Designations (LUD) classifications. Table 6-4 lists the five current LUD classes with total acres per class:

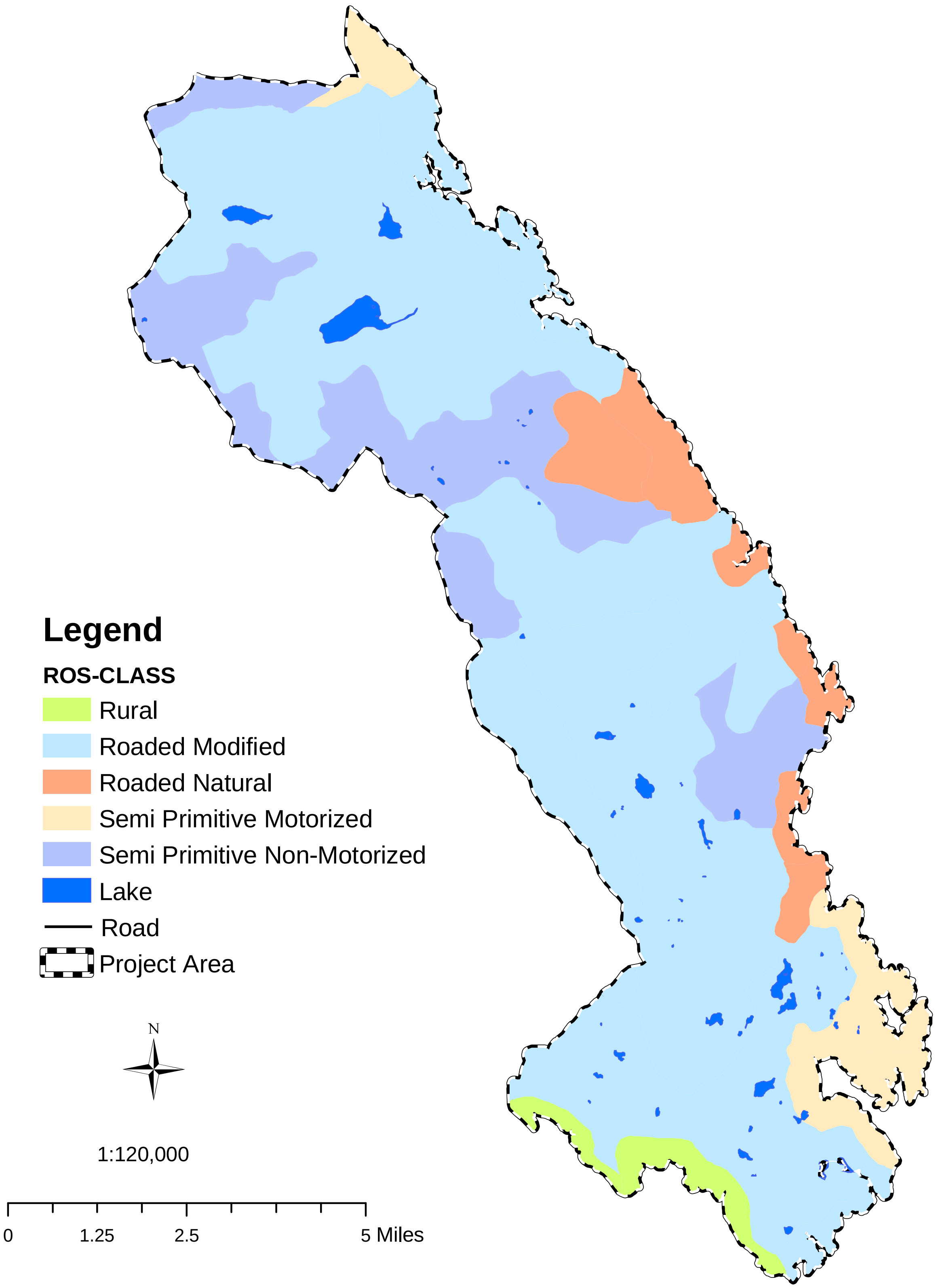
Table 6-5. Land Use Designation

LUD	Total Acres per Class	Total Percent per Class
Modified Landscape (ML)	25,904	56%
Non-National Forest (NNF)	3,679	8%
Old-growth (OG)	7,368	16%
Recreation River (RR)	357	1%
Timber Production (TM)	8,594	19%
Total	**45,902**	**100%**

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Current Visual Management
The USDA Forest Service Visual Management System is outlined in USDA Agriculture Handbook No. 462, Volume Two, Chapter One, The Visual Management System, USDA Forest Service Manual 2380; and USDA Forest Service Handbook 2309.22. "Visual landscape" has been established as a basic resource, to be "treated as an essential part of and receive equal consideration with other basic resources of the land" because of the public's concern about the quality of their visual environment.(FSM 2380). The Visual Management System provides measurable standards for general management prescriptions allowing for other uses to occur or continue while safe-guarding the scenic quality.

Figure 6-2. Recreation Opportunity Spectrum (ROS).



In order to understand the scenic resource inventory and management on the Forest, definitions for the following terms are useful.

The Existing Visual Condition (EVC) is an assessment of the level of visual quality that presently exists. The Existing Visual Condition may range from Type I, where little or no human modification is apparent, to Type VI, where human-made changes in the landscape are in glaring contrast to the natural landscape. All of the Existing Visual Condition types are further defined in the Tongass Land and Resource Management Plan glossary.

Visual Quality Objectives (VQOs) are visual resource management goals for National Forest System lands. They are based upon the variety in the landscape, the distance between the landscape and the people viewing it, and the importance of scenic quality to the people viewing the landscape. The Visual Quality Objectives include Preservation, Retention, Partial Retention, Modification, and Maximum Modification and are defined in the Tongass Land and Resource Management Plan glossary. Visual Quality Objectives provide a baseline from which to measure changes for use in managing National Forest Lands.

The following matrix illustrates the process of producing the Visual Quality Objectives for the Land Use Designations in the Cobble area:

LUD	**Foreground**	**Middleground**	**Background**	**Not Seen or Non-priority**
Old-growth	Retention	Retention	Retention	Retention
Recreational River	Partial Retention	Modification/ Partial Retention	Modification/ Partial Retention	Maximum Modification
Modified Landscape	Partial Retention	Modification	Modification	Maximum Modification
Timber Production	Modification	Maximum Modification	Maximum Modification	Maximum Modification

Based upon the above matrix the adopted visual quality objectives for the Cobble area are as follows:

LUD	Retention	Partial Retention	Modification	Maximum Modification
Old-growth	7,178	0	0	0
Recreational River	0	0	0	356
Modified Landscape	0	3,049	8,755	14,091
Timber Production	0	0	622	7,972

All data is derived from USDA Forest Service Geographic Information Systems (GIS).

Areas seen from Visual Priority Routes and Use Areas and their distances were used to establish management prescriptions sensitive to these concerns in order to mitigate possible adverse effects of management activities, i.e. timber harvest.

A key attraction of Southeast Alaska for the recreationist, occasional visitor, and those who live there is its beauty and splendor. The visual resources value is important to the enjoyment of the area as well as to its economy because of the impact of tourism.

Priority Travel Routes and Use Areas

Visual Priority Routes and Use Areas are the viewpoints from which scenic quality will be managed. They have been identified by the public as places and travel routes used where the scenic quality is an important part of the experience. They are determined for land areas, viewed by those who are traveling through the forest on developed roads and trails; using areas such as campgrounds and visitor centers; or recreating at lakes, streams, and other water bodies.

Visual Priority Routes & Use Areas of the Cobble Area: (Appendix F-17 TLRMP)

Travel Routes	Clarence Strait from Ketchikan to Stikine Strait
Public Use Roads	Thorne Bay to Sandy Beach Rd (#30)
Recommended Wild and Scenic Rivers	Thorne River
Saltwater Use Areas	Thorne Bay to Snug Anchorage
Communities	Thorne Bay
Developed Recreation Areas	Sandy Beach Picnic Area
Private Resorts	Boardwalk Wilderness Lodge (Thorne Bay)
Boat Anchorages	Big Ratz Harbor, Little Ratz Harbor

Synthesis and Interpretation - Human Uses

Before modern settlement of the island, human use activities were primarily centered around survival. No roads existed on the island during this time. Most settlement and activity occurred along shorelines, with very little use in the upland wilderness at the time. The primary activities were collection of forest products, hunting, gathering, and fishing. Access was by marine trade routes to other settlements.

Upon modern settlement of the island, people remained closely tied to survival activities. Timber harvest, mining, and fishing brought economic profits and an increase in the settlement to the area. More goods and services were offered with the increase in settlement and advancements in technology. The end of long term timber contracts has directed more emphasis toward recreation and other forest products as a means to diversify the economy. Local outfitter, guides and sporting good shops are some of the current businesses associated with the increase in recreation demands. Additionally, more promotion of recreation activities, along with hunting and fishing opportunities, has begun to attract people to the island. The recreation, tourism and nature based activities provide a new stimulus to the local economy. According to a report by the Department of Natural Resources in 1997, more than 1.3 million people visited Alaska, spending over $942 million directly in state. Tourism as a whole is the state's second largest private sector employer, providing one in every eight private sector jobs (DNR, SCORP 1997-2002).

The Cobble area is a significant area for recreation and human use activities. Currently, through the Sandy Beach Road Environmental Assessment (EA), opportunities for road enhancement and recreational projects are being planned to accommodate the growing number of visitors and increasing year round settlement in the communities of Thorne Bay and Coffman Cove. The recreation places and sites identified have all had past human use activities. These long trends show that people are inherently drawn to the same locations throughout history. Again, most are associated with shoreline activities and remain relatively the same activities to present day.

More opportunities currently exist for leisure based recreation activities instead of survival activities associated with the shoreline. Many people still rely heavily upon the harvest of meat and forest products from USDA Forest Service lands, however. The diverse lifestyles and demographic demands are changing from what once were total dependency and basic survival uses, to a mixture of subsistence, economic, and recreational uses. Preservation and cultural use of these primal necessities can still be found in the Cobble area.

The human use of the Cobble area will differ greatly depending on the user's motivation of the land. In the future, the need to hunt, fish, and rely on forest products as a means to supplement incomes and survival will continue.

Participation in leisure and recreational activities will continue to rise. The projections from the 1996 National Survey of Fishing, Hunting, and Nonconsumptive Wildlife-Associated Recreation show percentage increases in Alaska statewide are expected as follows: fishing +27%; hunting +20%; and wildlife viewing +26% by 2020 (Browker 2001). Even though these estimates are statewide, Prince of Wales Island (POW), and specifically the Cobble area, is known for great fishing and hunting. These projected figures can help anticipate the rising trend in wildlife associated recreation.

The changing forest uses, from prehistoric and historic subsistence fishing; hunting and gathering; historic to present timber harvest; and from the transitional timber economy to a more diversified economy, have all supported or sustained human use patterns. The USDA Forest Service has become increasingly interested in the new forms of tourism largely due to the decline in the timber harvest. Increasing recreation on Forest land directly results in a stimulation of the local economies. Alaskans rely heavily upon roads for access to recreational opportunities (SCORP, 1997). The Cobble area has numerous roads and provides opportunity for many people to spread out and create few user conflicts.

The Sandy Beach Road connection between Coffman Cove's Ferry terminal and Thorne Bay is expected to bring more tourism and visitation to the Cobble area. Expanded recreational options are needed to manage the visitation and allow diverse recreational experiences. Most people will continue to participate in activities associated with hunting, fishing, and gathering. Therefore, most of the recreational facilities should be designed with these activities in mind. Growth is expected in adventure-based recreation within Alaska. Some activities include hiking, mountain biking and kayaking. Locations for these activities within the Cobble area are listed in the Recommendations section.

It is important to recognize the diverse forest user's instinctive human needs of primitive survival traits, cultural preservation, resource extraction, need for solitude, physical challenge, relaxation and passive uses. The USDA Forest Service can keep these options available to all forest users through management of a diverse and healthy forest.

Today we are not so different from past users of the Cobble area. We still participate in the same subsistence activities, travel similar water routes, settle and use the same coastal and shoreline areas. The largest difference is our technological advancements, which has created more leisure time for recreational pursuits. With trends pointing toward increasing recreational activities, we need to be cautious and plan accordingly so that we do not overburden the resources in high use recreation areas.

Developments in these sites could present a loss to cultural history. Care must be taken to prevent loss of cultural resources. Other resource damages of scenic quality expectations must be considered when planning for timber harvest and recreation enhancements. The visual quality objectives of the landscape for each LUD should be considered to reference the degree of acceptable alteration to the characteristics of the landscape. These are defined as follows:

Preservation - Allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.

Retention - Provides for management activities which are not visually evident. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident. Mitigating measures used to meet this objective should be accomplished either during operation or immediately after. Measures may include seeding vegetative clearings and cut/fill slopes, hand planting of large stock, painting structures, etc.

Partial Retention - Provides for management activities to remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape. Mitigating measures should be accomplished within one year of project completion.

Modification - Management activities may visually dominate the characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type.

Maximum Modification - Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middleground they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences. Mitigating measures should be accomplished within five years of project completion.

The Rural ROS class making up 2% of the analysis area is located around the community of Thorne Bay. Thorne Bay is located within Non Forest Lands. A small percentage of National Forest Land has been designated as Recreational River on the Thorne River near Thorne Bay. These designations are not expected to change in the future. Activities associated around Thorne Bay have a high percentage of users. The major recreational and human use activities associated with these areas include water access, boating, fishing, hunting, and walking. These activities are expected to increase in the future with increased tourism. Sixty nine percent of the Cobble area is located in the ROS class of Roaded Modified. The ROS class exists mostly within the two LUD designations

Interpretation of ROS classifications for Cobble Area:

Figure 6-7. Percentage of ROS Class per Land Use Designation.

	Modified Landscape LUD	Old-growth LUD	Recreation River LUD	Timber Production LUD
Rural (ROS)	**.27%**	**0%**	**72.3%**	**0%**
Roaded Modified	**74.4%**	**38.5%**	**27.6%**	**76.7%**
Roaded Natural	**8.1%**	**12.1%**	**0%**	**.17%**
Semi Primitive Motorized	**1.4%**	**27.5%**	**0%**	**0%**
Semi Primitive Non Motorized	**15.8%**	**21.9%**	**0%**	**23.1%**

Sum Total Acres: 45,904. *All data is derived from USDA Forest Service Geographic Information Systems (GIS).*

of Timber Production and Modified Landscape. These two LUDs make up 75% of the analysis area. The vast majority of roads are associated with these classifications. Past and future timber harvest has been greatly associated with the Roaded Modified Class. Since the majority of the analysis area is in the Timber production and Modified Landscape LUDs with a ROS setting of Roaded Modified, it can be expected that within these areas additional roads could be created. It is likely these settings will not change much in the future with management plans. Recreational users can expect to encounter timber management activities within these areas.

The Roaded Natural ROS class can be found mostly in small isolated acreage along the shoreline of Clarence strait and the Sandy Beach road. This area is 7% of the total area. This area lies within the LUD designation of Modified Landscape. In national forest lands managed under the Modified Landscape LUD, forest visitors, recreationists, and others using popular travel routes and use areas will view a somewhat modified landscape. Recreation opportunities are available with natural-appearing to modified settings. A strong focus on coordination for future timber harvest, landscape views, and recreational opportunities should be considered during project planning for these areas.

The ROS class of Semi-Primitive Motorized makes up 6% of the area, and approximately 27.5% of this ROS is within the Old-growth LUD designation. Recreation consists largely of motorized access to shorelines. Recreation facilities should be designed to be compatible with habitat needs of old-growth associated species. A low concentration of users is expected in this area. Monitoring of shoreline activities in this area should be considered in the future to insure recreational opportunity expectations are preserved.

The remaining 16% of the analysis area is classified as Semi-Primitive Non-Motorized and are located within the LUDs Old-growth (21.9%), Timber(23.1%), and Modified Landscape(15.8%). The greatest chance for conflicting management decisions exist within this ROS designation. Expectations for Semi-Primitive Non-motorized recreation experiences include a high probability of experiencing solitude; freedom; closeness of nature; tranquility; self-reliance; challenge; and risk. A minimum of on-site controls (signs, facilities, etc.) are present, with little site modification. No roads are present in the area.

Currently, conflicts exist between the LUD designations and the current ROS class. Sections of the Semi-primitive ROS class are in Timber production and Modified landscape LUDs. The current ROS classification of Semi-primitive Non-Motorized has roads in these LUD sections. The conflict lies with the ROS classification of non motorized access according to the Tongass Land Management Plan, in this ROS class the roads should be no less than ¼ mile from roads and trails open to motorized recreation use, or clearcut harvest areas. Updates to the GIS layer should result during project planning and NEPA work for a more detailed analysis. It should be noted that the ROS classes can be altered depending upon the range of activities proposed. Management of the new ROS setting must be made in accordance with the appropriate ROS guidelines when activities such as the addition of roads; timber harvest; or LUD changes occur. A conscience effort must be made to maintain a wide range of recreational opportunities. If ROS classifications are changed an effort should be made to mitigate for the lost recreation experience in another area (TLRMP, 1997 4-36).
Proper design and planning according to ROS expectations should be implemented with developments of recreation facilities, trails, docks, campgrounds, etc. If careful planning and development of facilities is not made a priority to meet the ROS development scale, over design or exceeding the on-site recreation development scale of a site may occur and a recreational opportunity or resource value can be lost in the process.

Recommendations – Human Uses

Recreation Based Economic Considerations
The need for communities to embrace other economic alternatives is great with the recent end to 50-year high volume timber contracts. Timber harvest and extraction resource jobs are diminishing. Marketing scenery, fish, wildlife, outdoor recreation and cultural resources on Prince of Wales Island to visitors (including other Alaskans) is a major component of the economy. These same qualities can be marketed to the local communities near the Cobble area.

With this trend and increased tourism to Alaska, Prince of Wales Island should expect to see some of the economy switch to recreation related incomes. For instance, hunting and fishing related wildlife sports continues to be the top recreation choices for Americans according to the U.S. Fish and Wildlife Service Surveys. As a result of increased recreational related opportunities in the Cobble area, more opportunities for local recreation and tourism businesses could increase. With easier access to the island expected in the next few years, more visitors will be taking advantage of these recreation opportunities.

The Cobble area is in a potentially high visitation area and close to the communities of Thorne Bay and Coffman Cove. A need for contract work is anticipated to implement projects, such as paving roads; or constructing cabins and trails, creating an opportunity for local contractors to participate in building these projects.

Recreation supports many communities in southeast Alaska. Currently, 12 percent of Alaska's population lives in southeast Alaska (Statewide Comprehensive Outdoor Recreation Plan 1997). Prince of Wales Island has excellent fishing and hunting opportunities. Several businesses already cater to the local and tourist economy. With changing demographics and seasonal visitation, the need for a variety of recreational pursuits is needed including options for easier access to the alpine; conversion of old roads to hiking and biking trails; extended kayak routes; shelter and cabin facilities; greater access to fishing locations. Diversifying the recreational options in the Cobble area will cater to a wide range of user groups.

User Group Considerations

Going one step further when planning and scoping, it is wise to remember the off-site or passive user groups. People may find enjoyment, appreciation or contemplation of a site's resources or ecosystems and experiences without actually physically being at the site. As our information and technological systems advance, off-site values of the land are increasing. Information, photos, and documents brought through advanced technologies to local, state, national and world audiences have opened up a greater awareness of Alaskan resources. With this awareness people now hold values for the land in the form of off-site use values. The worth that one places on the fact that a resource or place exists can be very high. Many off-site users may value opportunities simply because they exist. Some values in the land area include cultural heritage, religious benefits, health, environment, wildness, wildlife, and many other reasons.

According to a survey conducted by Statewide Comprehensive Outdoor Recreation Plan 1997), 76.3% of the Southeast region said they support new recreation developments; however, they support maintaining existing facilities first. The most common reason for dissatisfaction among the rural region of Alaska was the need for recreation facilities within an hour drive of their community.

The southeast survey respondents said the barriers they see as not meeting their community or forest recreational needs are as follows: lack of maintenance; connecting trails; ranger or recreational authority; equipment; winter use of existing facilities; and lack of enthusiasm to develop recreation programs and facilities. Even though this survey takes into a wide range of views from local southeast Alaskans, further local surveys and scoping would help provide a comparison for the views found in the communities near the Cobble Area. This survey can provide a point of reference for local southeast Alaskan recreational needs and expectations.

Conflicting ideas among various user groups will exist on every recreation issue. It is important to recognize this and scope for all voices. Opposite points of view on how public land should be used for recreation and other human uses also exists. Following the land management plans (TLMP) and Recreation Opportunity Spectrums along with analysis documents is a place to begin.

Heritage Considerations

Culturally sensitive sites can be found in the Cobble Watershed. Cumulative impacts of greater human presence and logging activity in the area must be considered because of the presence of these sites. This is especially important as previous road construction, logging, and other disturbances may have destroyed unrecognized sites.

Visual Quality Considerations

Design Criteria

Visual Quality Objectives (VQO's) are applied to any activity that has the potential to affect the visual character of the landscape. Examples of activities affecting visual character:

- **Recreation and Interpretation** – recreation facilities, cabins, restrooms, interpretive displays, trail construction

- **Resource Use** – timber sales, harvest units, rock or gravel pits, mining or mineral development, fish enhancement projects, in-stream fish pass structures, stream erosion measures

- **Other Facilities and Structures** – roads, logging camps, sort yards, Log Transfer Facilities, electronic facilities, hydroelectric projects

A number of factors must be considered when designing activities to meet specific VQOs including size, shape, viewer orientation, color, or texture. These considerations are critical elements when determining whether or not an activity meets the assigned VQO. Consideration for scenery is essential early on in planning processes, particularly in areas seen from a Visual Priority Route (VPR). Each landscape setting is different and should be evaluated on a case-by-case basis. The VQO may be met in some instances while the proposed activity is greater than the guideline. Cases may also exist where the activity must be smaller than the guideline to meet the intent of the VQO.

Specific time frames are allowed for meeting the VQO following project completion. Long-term projects (those with no specific completion date) should be initially designed to meet the assigned VQO as the project progresses.

Retention
Design activities should not be visually evident to the casual observer. This objective should be accomplished within six months following project completion.

Facilities
a) Keep vegetation clearing to a minimum and within close proximity of the site.
b) Select materials and colors which blend with those found in the natural surroundings.
c) Screening should be used from viewpoints and travel routes if feasible.

Transportation
a) Rock Sources. Locate rock sources off the road when possible when a forest development road is a Visual Priority Route. Spur road access may be necessary to minimize the visual impact. Rock source development should not be apparent from the road, use area, or marine travel route to meet this visual objective.
b) Corridor Treatment. Provide for roadside cleanup of ground-disturbing activities. Depending on site conditions, cut stumps as low as possible and angled away from the viewer. Incorporate this treatment in the timber sale contract.
c) Log Transfer Facilities (LTFs). Generally, LTFs are not appropriate in this VQO setting.

Timber Harvest
Visual Abosorption Capacity (VAC) Setting, Typical Regeneration Method and Unit Size
a) Low: Single tree or group selection (less than 2 acres)
b) Intermediate: Single tree or clearcut (approx. 5 - 15 acres)
c) High: Clearcut (approx. 15 - 30 acres)

Partial Retention
Design activities to be subordinate to the landscape character of the area. This VQO should be accomplished within one year of project completion.

Facilities
a) Keep vegetation clearing to a minimum and within close proximity of the site.
b) Emphasize enhancement of views from recreational facilities.
c) Select materials and colors which blend with those found in the natural surroundings.

Transportation

a) Design rock sources to be minimally apparent as seen from Visual Priority Travel Routes and Use Areas. Rehabilitation is usually necessary following closure of rock source developments. It may be necessary to modify some ground-disturbing activities seen from the foreground of Visual Priority Travel Routes and Use Areas.
b) Corridor Treatment. Roadside cleanup of ground disturbance activities may be necessary. Depending on site conditions, cut stumps as low as possible and angled away from the viewer. Incorporate this treatment in the timber sale contract.
c) LTFs (temporary or permanent). Perform a visual quality analysis during LTF planning and design. Consider low profile designs to minimize visibility from Visual Priority Travel Routes and Use Areas. Incorporate rehabilitation measures into the project analysis and the contract package for temporary LTFs.

Timber Harvest

VAC Setting, Typical Regeneration Method and Unit Size
a) Low: Group selection or clearcut (approx. 5-10 acres).
b) Intermediate: Clearcut (approx. 15 - 40 acres).
c) High: Clearcut (approx. 40 - 60 acres).

Modification

Activities may visually dominate the characteristic landscape, but must have visual characteristics similar to those of natural occurrences within the surrounding area or character type. This VQO should be met within one year in the foreground distance zone and within five years in the middle and background distance zones following project completion. Use naturally established form, line, color and texture found in the landscape when planning activities.

Facilities

Setting and design should borrow from naturally occurring patterns in the landscape. Facilities should not be visually dominant when viewed in the background distance zone.

Transportation

a) Rock source operations and resulting landform modifications may be evident to the casual observer as seen from Visual Priority Travel Routes and Use Areas. Quarry location and design should mitigate, to the extent feasible, the apparent visual size and dominance of the activity (for example, shaping of backwalls, roadside screening and general orientation of the opening).
b) LTFs (temporary or permanent). Perform a visual quality analysis during LTF planning and design.

Timber Harvest

VAC Setting, Typical Regeneration Method and Unit Size
a) Low: Clearcut (approx. 15 - 40 acres).
b) Intermediate: Clearcut (approx. 40 - 60 acres).
c) High: Clearcut (approx. 60 - 100 acres).

Maximum Modification

Activities may dominate the characteristic landscape, yet when viewed as background, should appear to be a natural occurrence. Locate and design management activities to take advantage of existing (both natural and imposed) pattern and texture found in the landscape when viewed in the middleground from Visual Priority Travel Routes and Use Areas. Design activities to resemble natural occurrences as viewed in the background distance zone.

Timber Harvest - VAC Setting, Typical Regeneration Method and Unit Size
a) Low: Clearcut (approx. 50 - 75 acres)
b) Intermediate: Clearcut (approx. 80 - 100 acres)
c) High: Clearcut (approx. 80 - 100 acres)

In addition, as part of project development the existing visual character should be reviewed and an analysis of allowable disturbance completed. In the assessment of management activity impacts on the scenic resource, acres of activity (usually timber harvesting) which do not meet the VQOs are displayed as negative impacts. In the case of the Cobble Area proposed management activities will also occur adjacent to or near existing units harvested in previous entries. The term "disturbance-at-one-time" is a visual criterion which addresses how much Allowable Visual Disturbance can occur in a given area in a given time period.

In other words, even though individual actvities may meet the VQO assigned to an area, as a group they may impact too much area; they may disturb or change too much of the natural landscape during one period of time. Approximately 30 years is required for a regenerated clearcut to grow trees 30 feet tall, the minimum height required to return the area to a continuous textured landscape. The amount of disturbance allowed in any given area (shown as a percentage) over an approximate 30 year period is the maximum allowable change. Similar cumulative effects analyses developed in Region 6 of the Forest Service, Region 10 VRM EFFALT Analysis and included in Appendix B of the Revised Forest Plan.

Recommended Recreation Projects

The following is a list of proposed recreation projects for the Cobble Area. Some of the projects have been identified through public scoping for other projects, Recreation Master plans; Federal Highway Recreation projects; Sandy Beach Road EA; fish access projects; road enhancements and closures; as well as other recreation conceptual plans. Many of these projects can be implemented and achieve multiple disciplinary goals. During planning of these projects the previously mentioned considerations for user types, heritage, economics, and visual qualities should be incorporated.

- **Ratz Harbor Campground and Day Use Area**
  Construction of a small 4-unit campground and day use area at Little Ratz Harbor

P.3-18 Recreation Master Plan
ROS class is Roaded Modified
No current conflicts for ROS

- **Big Lake-Trumpeter Lake Trail Complex and Shelter**
  Construct a gravel trail along FDR 3023500 into Big Lake from Sandy Beach Road; building a boardwalk trail over muskeg from the Big Lake fish viewing area to Big Lake; building a trail from Big Lake to Trumpeter Lake using existing road beds; and constructing a shelter at Big Lake. Big lake is a moderate use fishing site. Reconnaissance, monitoring and design is needed. A trail around both Big Lake and Trumpeter Lake would create a recreation complex. Designing the complex as a single masterplan unit would create consistency in planning and could result in follow up funding and implementation of the project phases.
  P. 3-16 Recreation Master Plan
  Roads needed to implement project: USDA FDR 3023 500, 3023535, 3023520, 3000306, 30000302
  ROS class Roaded Modified
  No current conflicts

- **Sandy Beach Road/East Coast-Sea Mammal Interpretive Trails**
  Construct a number of short trails that spur from a longer 8-mile coastal trail, with interpretative signs along the route describing various marine mammals of the area. Design and plans for FS silverculture interpretative panels have been prepared on previous thinning activities in this area. Project funding will be sought through a partnership with FS silverculture. Roads needed to implement project, portions closed in reroute of road 30.
  P. 3-17 Recreation master plan and Sandy Beach EA

  ROS is Roaded Natural
  No current conflicts

- **Big Lake Accessible Cabin**
  Construct a fully accessible cabin on Big Lake. Reconnaissance is needed. Consideration that this cabin would be built in a Timber LUD is also needed. The future potential for timber harvest and visuals from cabin site must be kept in mind. Timber harvest allows maximum visuals. Possible partnership/stewardship project for Alder and other timber types for thinning in the Big Lake area with a cabin produced from this wood harvest. In addition, design cabin location with trail plans for the Big Lake and Trumpeter Lake recreation complex.
  ROS class is Roaded Modified
  Roads needed to implement project: 3023 500, 3023520
  Current conflicts: Associated with Timber harvest and recreation planning
  Mitigation efforts: Needed for visual quality in the Big Lake area

- **Mountain Bike/OHV Trail**

Propose to close portions of road 3018 to motorized vehicles (except OHV use). See Project Recommendation Map for route identification. Reconnaissance and scoping to include user groups, and types of access. Currently, plans would create a trail to allow bike and foot traffic access Slide Creek and other fish lakes.
Roads needed to implement project: 3018000, 3018200,3018271
ROS class is Roaded Modified
Current conflicts: No current conflicts in standards and guidelines

- **Boat Launches**
  Pleasure boat ramps and crushed rock surface parking for up to 20 vehicles at the existing, but-out-of service log transfer facility, at Ratz Harbor is recommended. This recommendation is also included in the Sandy Beach Environmental Assessment. This project is anticipated to be funded as a part of Federal Highway enhancements. A boat launch would provide access to salt water. Recreational opportunities of fishing, kayaking, sightseeing and emergency aircraft and boat dock options would be available (Ref p. 3-17 Recreation Master Plan 2003, Sandy Beach EA).
  The ROS class is Roaded Modified
  No current conflicts in standards and guidelines

  The Sandy Beach boat launch would be in the ROS class of Roaded Modified. No current conflicts have been identified in standards and guidelines. However, the Sandy Beach boat launch is not recommended due to recreational conflicts with beachcombers, swimmers, and picnickers. Additional user numbers and boating access would increase at this site and create conflicts among other user types. Reconnaissance is recommended to find a location separate from the picnic area. Locations may be available just north or south of Sandy Beach, along the shoreline, for boat launch access.

- **South End Ratz Harbor**
  Interpretation signs to discuss traditional fish use with wooden fish weirs. Co-partner with recreation, heritage and fish departments. (P. 3-18 Recreation Master Plan)
  ROS class is Roaded Modified
  No current conflicts with standards and guidelines

- **Big Lake Fish Pass**
  Currently, USDA Forest Service engineering is submitting a proposal for Capital Investment Program (CIP) funding to improve road access and trailhead parking to Big Lake Fish Pass. Trail options and links to Trumpeter and Big Lake complex from this trailhead may be expanded.
  Reconnaissance and design needed
  ROS class is Roaded Modified
  No current conflicts in standards and guidelines

- **Baird Peak Trail**
  A trail allowing access to Alpine terrain from FDR 30310 to Baird Peak with a connection to FDR 3026.
  Roads needed to implement project: 3026100, 3000310
  ROS class is Roaded Modified
  No current conflicts in standards and guidelines

- **Scenic Pullouts**
  Scenic pullouts are being designed under the Sandy Beach EA.
  Roadside recreation mitigation in progress for paving the road to Coffman Cove.
  Sandy Beach EA

- **Sandy Beach Day Use improvements**
  Redesign and rehabilitate current facilities. Design facilities to fit the ROS guidelines.
  The ROS class is Roaded modified
  No current conflicts in standards and guidelines

Schedules
The following list was developed from the North Prince of Wales Island Recreation Master Plan. The 5 and 10 year schedules help to prioritize opportunities in the Cobble Area.

Five-year schedule

<u>Hiking trails</u>
- Sandy Beach Road Trail
- Ratz Road Trail

<u>Campgrounds</u>
- Ratz Harbor campground
- Heritage Interpretative Opportunities
- Ratz Harbor Interpretive Signs

<u>Road-associated Parking, Picnic area, and restrooms</u>
- Sandy Beach Day Use Area
- Ratz Harbor Day Use Boat Launch

<u>Cabin/Shelters</u>
- Big Lake Shelter/Cabin

10-year Schedule

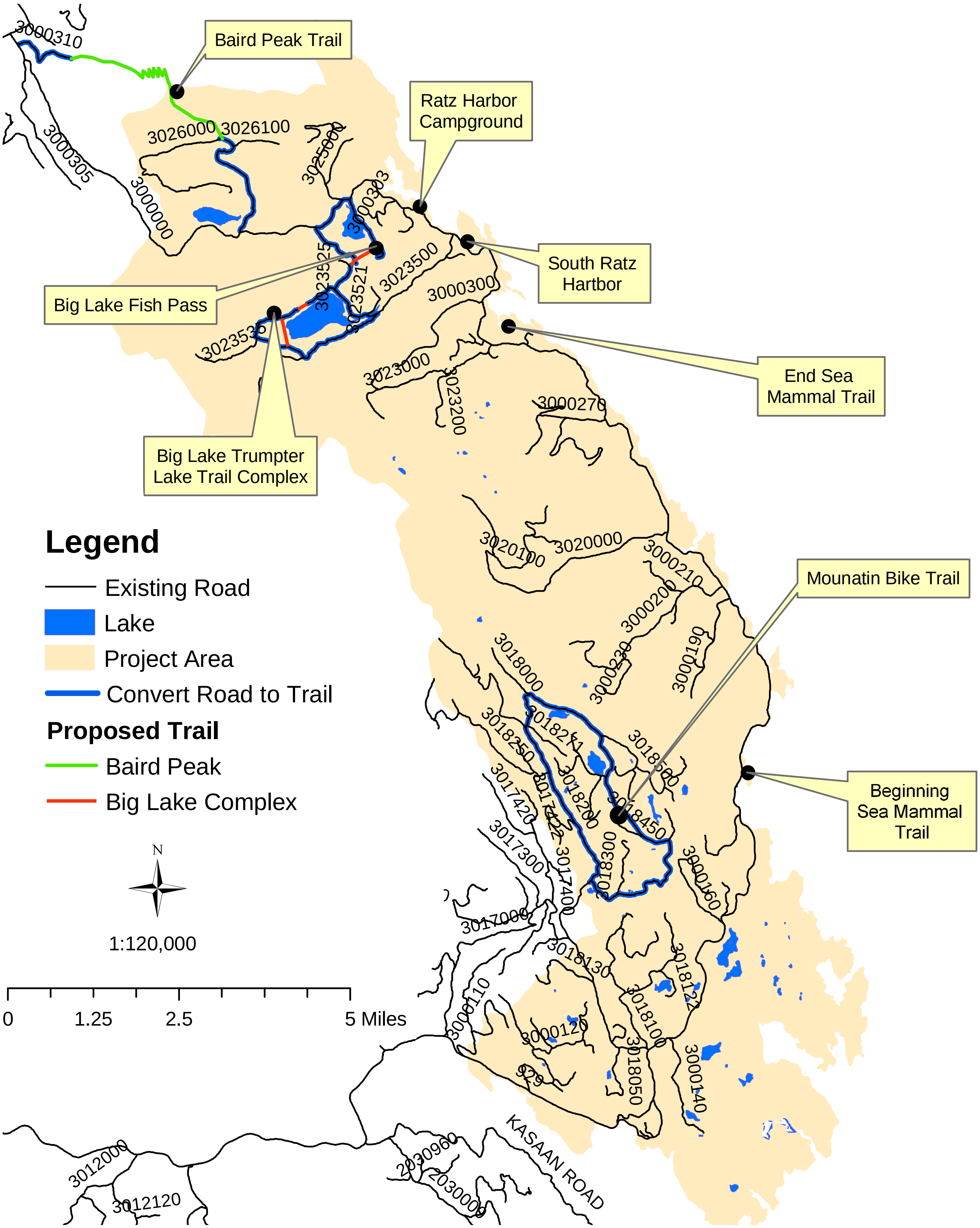
<u>Hiking Trails</u>
- Mountain Bike Trails
- East Coast Trail system Sea Mammal Interpretation trail
- Big Lake Trail

- Big Lake-Trumpeter Lake Trail and Shelter
- Baird Peak Trail
- Trumpeter Lake Trail

Cabin/Shelter

- Trumpeter Lake Shelter

Figure 6-3. Proposed Recreation Projects.



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Chapter 7- Fisheries and Aquatic Resources

Reference Conditions

Stream and Riparian Characteristics
Historically, streams in the Cobble area flowed short distances unimpeded, from steep headwater areas to the ocean. Streams are typically at their highest flows from October to March due to long periods of rainfall and periodic rain-on-snow events, and generally at baseflow (flow not derived from runoff, but rather produced from the outflow of groundwater or slow release from bogs, swamps, and snowfields) conditions during July and August. Drainage networks often consist of numerous steep, high gradient channels because: most streams in watersheds within the Cobble area flow less than eight miles from their alpine headwater areas at over 2,500 feet elevation to the ocean; and annual rainfall can exceed 11 feet.

Headwater streams (i.e. high gradient, fishless streams) typically comprise the majority of the total stream distance in any drainage network, and therefore are a significant contributor of inorganic and organic material to downstream ecosystems (Vannote et al. 1980). Cobble area headwater channels are prone to large mass wasting events due to the extensive distribution of highly-erodable granite bedrock, and deep glacial deposits that underlay shallow soils at mid-elevations. These channels are also highly influenced by large woody debris (LWD) that retain nutrients and regulate the transport of gravels to downstream systems (Gomi et al. 2002).

The transition from these short, high gradient, fishless streams, to less steep, valley bottom streams often results in an area of deposition, referred to as the alluvial fan. These areas are often also the transition between fish presence and fish absence. Alluvial fans tend to be especially important to the productivity of valley bottom streams. Alluvial fans are relatively common in the Cobble area because many of its larger watersheds are dominated by steep headwater streams. In addition, these stream channels are usually highly dynamic because they retain large amounts of deposited alluvial material. They are, however, stable over short periods of time (i.e. hundreds of years), and are usually well drained allowing trees to grow large and widely spaced. This type of forest structure introduced large trees into alluvial fan streams, increasing their stability by storing large quantities of sediment, while at the same time introducing organic material and dissolved nutrients from vegetation that grew within this constantly changing environment.

Downstream of these alluvial fans were generally lower gradient floodplain or bedrock controlled systems surrounded by heterogeneous forests of Sitka spruce, western hemlock, and western red and yellow cedar trees. Red Alder trees dominated small unstable or disturbed areas along stream banks, but they were relatively rare and patchily distributed. These streams also received large volumes of large woody debris (LWD), which in turn influenced morphological features like pools and riffles. All of these features, from the steep headwaters to the estuaries, combined with massive quantities of nutrients derived from the ocean in the form of returning salmon to sustain a wide variety of organisms in both the aquatic and terrestrial environment.

Biological Productivity
Most drainages in the Cobble area contained some or all of the aquatic species observed today including cutthroat (*Oncorhynchus clarkii*) and steelhead trout (*Oncorhynchus mykiss*); dolly varden (*Salvelinus malma*) and silver salmon (*Oncorhynchus kisutch*); chum salmon (*Oncorhynchus keta*); pink salmon (*Oncorhynchus gorbuscha*); and/or sockeye salmon (*Oncorhynchus nerka*); plus sculpin (*Cottus* spp.) and threespine stickleback (*Gasterosteus aculeatus*). Large runs of anadromous salmon through the summer and fall months typically introduced large but relatively short lived quantities of nutrients to these streams, and served as much of the nutrient base for juvenile salmonids as they entered the winter months. Nutrient retention (i.e. the length of time any given nutrient is held within the system, thus increasing its availability to be utilized by some organism) in these streams was probably high due to the vast amount of woody material held within the channel. At the same time, in-stream primary productivity (the growth of algae, bacteria, and fungus, forming the basis for the growth of fish and other aquatic organisms) was likely regulated by a dense riparian canopy, limited sunlight availability, and low water temperatures. In-stream habitat complexity from LWD complexes, off-channel stream habitat, and beaver ponds, added to the productivity of these streams by providing summer and winter rearing areas for juvenile fish.

Current Conditions - Fisheries and Aquatic Resources

Today, much of the aquatic environment in the Cobble area functions differently than it did historically. The dominant issue concerning changes to the aquatic environment in the Cobble area includes, but is not limited to, large-scale timber harvest and road building, and how the these environments might be affected by continued developments in the future.

This assessment is primarily concerned with how aquatic and riparian structure, function, and species have changed in recent history. This assessment will include recommendations for attaining a desired future condition that includes the restoration and rehabilitation of a properly functioning aquatic environment. Specifically, this assessment is concerned with how historic uses of the landscape have affected the aquatic environment, where future plans might further affect the current condition of the aquatic environment, and how managers can work to rehabilitate aquatic structure and function ultimately leading to the restoration of aquatic integrity.

Stream Class

The USDA Forest Service currently recognizes 58 miles of Class I; 70 miles of Class II; and 152 miles of Class III streams in the Cobble area (USFS 1997, Aquatic Habitat Management Handbook, 2001, Table 7-1). Class IV streams and non-streams as defined by the Tongass Land Management Plan (TLMP 1997) also exist, but are relatively new and have not yet been included in GIS databases.

- Class I streams typically contain an anadromous salmonid population.
- Class II streams typically contain a population of resident fish.
- Class III streams are defined as streams that do not contain fish, but flow directly into streams containing fish, or as streams that directly affect downstream water quality.
- Class IV streams were first formally recognized by the USDA Forest Service in 1997 and are defined as “intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to directly influence downstream water quality or fish habitat” (TLMP 1997).

Since Class III and IV streams have typically been identified only through development activities. The actual distances of these streams is generally underestimated in USDA Forest Service Geographic Information System (GIS) databases, and are not discussed in detail here.

Channel Types

The USDA Forest Service, Region 10 has separated stream sub-reaches based on unique geomorphic processes into individual channel types (see Paustian et al., 1992). Each channel type is described by an alphanumeric code, which consists of an alphabetic channel process group and a numeric descriptor that incorporates gradient, depth of incision (i.e. how deeply it has cut into the surrounding hillside), width to depth ratio, substrate size, meander pattern, and location within the watershed.

The Cobble area contains eight known channel process groups combined with a suite of morphologic descriptors (see Paustian et al., 1992) to form 24 known channel types (alphabetic process group plus numeric morphological descriptor). The process groups in the Cobble area include Floodplain (FP), Moderate Gradient Mixed Control (MM), Moderate Gradient Contained (MC), Alluvial Fan (AF), High Gradient Contained (HC), Large Contained (LC), Palustrine (PA), and Estuarine (ES). Channel process groups have likely remained the same despite past management actions. It is possible that the morphologic characteristics may

Table 7-1. Miles of Class 1, 2, and 3 streams within watersheds

	Stream Class (miles)			
Watershed	**1**	**2**	**3**	**Total**
Barren	1.80	3.20	2.20	7.20
Big Ratz	14.98	10.29	32.32	57.59
Cobble Creek	3.88	1.51	8.27	13.66
Deer Creek	1.94	10.08	9.50	21.52
Doughnut	3.55	4.30	2.61	10.46
Little Ratz	3.44	4.72	16.61	24.77
No Name		2.28	12.02	14.30
North	2.05	3.52	4.25	9.82
North Sal		0.41	4.60	5.01
Pin	3.10	3.20	1.92	8.22
Ratz Harbor	0.89	1.68	0.88	3.45
Sal Creek	5.68	3.30	26.46	35.44
Salamander	2.97	2.65	1.62	7.24
Slide Creek	9.62	13.22	14.52	37.36
Thorne	2.96	3.95	6.89	13.80
Tiny		0.32	3.96	4.28
Torrent	1.58	1.83	4.09	7.50
Total	**58.43**	**70.46**	**152.73**	**281.62**

Data is compiled from the USDA Forest Service GIS databases

change rapidly in the less stable process groups, such as the FP, MM, PA, AF, or ES due to naturally or human-induced events. For example, increases in beaver pond area could increase the amount of PA channel in a watershed, or could even change channel types from an FP to a PA. No historic record of channel type distribution in this area exists. It is only possible to estimate changes in channel types based on historic aerial photography and recent long-term monitoring records.

Only those channel types where disturbances or developments have potentially imposed negative effects on channel processes were considered in this analysis. These include the Moderate Gradient Mixed Control (MM), Alluvial Fan (AF), Floodplain (FP), Palustrine (PA), and Estuarine (ES) groups. The more stable Moderate Gradient Contained (MC), Large Contained (LC), and High Gradient Contained (HC) process groups were not considered because it is unlikely that they will change channel types due to road construction or timber harvest.

The Cobble area contains approximately 33 miles of MM, 4 miles of AF, 11 miles of FP, 8 miles of PA, and 1 mile of ES stream channels (Table 7-2).

- MM channels can be controlled by many features, usually rising to their bankfull level during high water events, but generally remain within the same stream corridor.
- AF channels are generally unstable, rapidly shifting, depositional streams that can move enormous amounts of bedload in short periods of time.

- FP channels are generally the most biologically productive, low gradient channels, subject to frequent flooding and lateral channel migration.
- PA channels are relatively stable, wetland streams ideal for rearing juvenile fish.
- ES channels are the transition between the freshwater and marine environments, and are especially productive for outmigrating and overwintering juvenile salmon.

Table 7-2. Distances of select stream channel type within each watershed.

	Channel Type (miles.)				
Watershed Name	**MM**	**AF**	**FP**	**PA**	**ES**
Barren	0.57	0	0	0	0.25
Big Ratz	5.41	0.80	1.69	1.60	0
Cobble	2.53	0	0.46	0	0
Deer	4.60	0	0	2.71	0
Doughnut	1.10	0	0	0.68	0
Little Ratz	4.88	0.94	1.44	0	0.12
No Name	0.36	0.21	0	0	0
North	0	0	0.80	0	0.06
North Sal	0	0	0	0	0
Pin	0.05	0	0.79	0.11	0
Ratz Harbor	0.64	0.20	0	0	0.05
Sal	2.31	1.12	1.99	0	0
Salamander	1.77	0.28	0	0.13	0
Slide	6.71	0.39	3.25	1.88	0
Thorne	1.42	0.15	0.36	0.36	0.06
Tiny	0	0	0	0	0
Torrent	1.07	0	0.18	0.18	0.10
Total Miles	**33.42**	**4.09**	**10.98**	**7.65**	**0.65**

Data compiled from USDA Forest Service GIS databases. MM= Moderate Gradient Mixed Control, AF= Alluvial Fan, FP= Floodplain, PA= Palustrine, ES= Estuarine.

Riparian Areas

Riparian ecosystems in the Cobble area have changed substantially in the last 50 years. While the effects of these changes on stream ecosystems have become more clear in recent years, it is well understood that they are also variable and wide ranging (see, Bryant 1983, Dolloff 1986, Bilby, 2003, Gomi et al. 2003).

Riparian areas influence streams in many ways. One way is to produce trees that fall into streams. Riparian vegetation entrains and recycles nutrients during flood events, and introduces a significant proportion of the organic material found in streams used by primary producing organisms such as bacteria and fungi. While LWD certainly plays an important role in influencing the geomorphic nature and development of fisheries habitat in streams, it also acts to retain nutrients from decaying organisms like plants and fish.

Increases in streamside logging practices saw a concurrent removal of in-stream LWD to facilitate log yarding and shovel movement along the stream in the Cobble area. At the same time, riparian areas, especially along productive, well-drained channels, were harvested because they often contained the largest volume of timber. As a result, riparian soils were often exposed and scarified enough that red alder (*Alnus rubra*) immediately began to grow.

Red alder grows more rapidly than conifers in southeast Alaska. Most riparian areas subject to intensive soil scarification by log yarding and shovel movement now include a canopy of almost exclusively red alder. While it is generally accepted that deciduous vegetation offers some additional productivity to stream ecosystems (Allan 2003), and may mimic some of the terrestrial structure of old growth conifer forests for wildlife (Wipfli et al. 2002), it provides less stable and smaller structural components to streams than the larger conifer forests.

Red alder is the dominant canopy species along many mainstem streams within some watersheds along the Cobble area. Much of the riparian area along the floodplains of Sal, Big Ratz, and Slide Creek is dominated by red alder although no quantitative data exists on the extent in these drainages. Red alder also grows rapidly along roads, and many closed or unmaintained roads now contain large quantities of red alder.

Today, nearly 66 percent of the vegetated riparian area along Class I and II streams (defined here as harvest along any length of Class I or II stream) within the Cobble area is less than 50 years old (Table 7-3). Additionally, recruitment of LWD to streams, especially pieces large enough to form habitat units such as pools or riffles, is not expected occur for another 50-100 years, depending on site characteristics and year of harvest.

In the Cobble area, road-building and timber harvest usually followed streams inland from the coast. Entire valley bottoms up to an elevation where harvesting became unfeasible, usually about approximately 800’, was cleared of timber in the late 1950’s through the 1980’s. Many of those areas that would otherwise be protected or avoided today were included in those harvests, including high-gradient, poorly-drained soils, and hillslope streams, resulting in immediate and chronic sediment additions to downslope streams through mass-movements and landslides. Additionally, red alder, which is a pioneer species of newly disturbed areas like landslides, now surrounds many headwater and lowland streams.

Finally, the removal of riparian vegetation and subsequent road building along stream corridors has lead to a substantial increase in non-native riparian vegetation in some watersheds. For instance, reed canary grass (*Phalaris arudinacea*) now grows extensively throughout many floodplain riparian areas, and is established in most beaver ponds that are located downstream of roads. Though no wide-scale survey of the distribution or effects of exotic species within

Table 7-3. Miles of stream Class I, II, and III within harvested areas of watersheds of the Cobble area. (Class IV streams and non-streams are not included)

	Stream Class			
Watershed	**I**	**II**	**III**	**Total**
Barren	0.76	0.32	0.10	1.18
Big Ratz	5.12	2.91	10.08	18.10
Cobble Creek	1.52	0.58	4.51	6.62
Deer Creek	1.14	7.37	6.34	14.85
Doughnut	0	0	0	0
Little Ratz	2.20	3.10	5.20	10.49
No Name	0	0.12	1.93	2.05
North	1.14	1.02	0.28	2.43
North Sal	0	0	0.14	0.14
Pin	0	0.68	0.16	0.84
Ratz Harbor	0.19	0.36	0.19	0.75
Sal Creek	4.98	0.58	5.73	11.29
Salamander	0.80	2.05	1.32	4.18
Slide Creek	4.71	6.43	10.10	21.25
Thorne	0.19	0.44	0.63	1.25
Tiny	0	0.32	0.74	1.05
Torrent	0.76	1.31	2.27	4.35
Total	**23.50**	**27.58**	**49.72**	**100.80**

Data compiled from USDA Forest Service GIS databases

the Cobble area has been done, reed canary grass may be the most prolific of any invasive species that do exist. More importantly, reed canary grass may also be inhibiting the growth and maintenance of native wetland and estuarine species due to its affinity for open areas that are subject water height fluctuations. In Sal Creek, for example, reed canary grass is well-established along the wetland margin of all the beaver ponds, where native sedges are limited to areas more-permanently inundated with water.

Biological Productivity

Fisheries populations are the only component of biological production to be evaluated in Cobble area streams, though aquatic invertebrates were evaluated in 1997 (Vinson 1997, unpublished report). While fisheries communities in the Cobble area have likely remained unchanged in the last 50 years, the populations within some drainages have changed substantially within only the last few years. For instance, no adult steelhead trout have been observed in Sal Creek since 2002 (USDA Forest Service data, 2004), and a fish pass constructed downstream of Big Lake in 1990 allowed populations of adult coho, sockeye, pink, and chum; as well as steelhead and cutthroat trout; and dolly varden to establish annual returns into Big Lake and its tributary streams. The immediate effects of the introduction of these species has never been evaluated, though some research on similar systems with fishpasses points to the potential reduction of zooplankton in the lake through predation by filter-feeding sockeye, and the predation of out-migrating salmonids by predatory trout. Regardless of this, the Big Lake drainage continues to produce a greater number of fish above the fishpass than was produced prior to its installation.

Road-stream interactions

Poorly or unmaintained Forest roads are known to produce fine sediment in streams. Currently, the USDA Forest Service is making a concerted effort to identify the most damaging roads and establish a course of action to limit further erosion. This includes abandoned temporary roads designed for a short service life that continue to retain their crossing structures. Two types of road exist in the Cobble area, Temporary and Classified. Classified roads are Forest System roads maintained to a certain standard. Temporary roads include unclassified roads, which are roads that were not properly closed after their intended use. Oftentimes these are roads that chronically degrade stream channels.

Some roads were constructed over certain unstable channels, and often were designed for short-term use. Their improper closure or maintenance often leads to increased erosion as well as damage to the road. Alluvial fans, for example are particularly unstable areas and often need additional construction or increased maintenance. In addition, abandoned roads that cross unstable channels can be chronic sediment producers to downstream channels, especially if they retain crossing structures.

Today, approximately 122 miles of Classified and 42 miles of Temporary road exist in the Cobble area (Table 7-4). Classified roads contain 2012 known stream crossings, including 1,433 metal culverts (Table 7-5). The number of crossings on temporary roads is currently unknown. Many temporary roads have been closed and their structures removed although several retain their structures.

Currently, the Cobble area also contains approximately 56.5 miles of classified, maintenance level 1 roads. Level 1 roads are closed to vehicle traffic (Table 7-6). These are generally roads that no longer contain crossing structures to reduce their required maintenance. However, it is difficult to determine the accessibility of these roads, though a substantial distance is accessible. For instance, the Big Ratz watershed has 11.3 miles of maintenance level 1 road, though approximately 3 miles is actually open to vehicles.

Table 7-4. Miles of classified and temporary roads. Data does not include State maintained roads (2.4 mi), or roads not associated with a watershed (1.3 mi)

	Road Class (miles)		
Watershed	**Classified**	**Temporary**	**Total**
Barren	4.4	1.7	6.1
Big Ratz	22.3	7.8	30.1
Cobble Creek	5.6	1.8	7.4
Deer Creek	14.1	3.6	17.7
Little Ratz	8.1	2.0	10.1
No Name	4.9	0.8	5.7
North	4.3	1.7	6.0
North Sal	1.9	0.5	2.4
Ratz Harbor	4.2	0.8	5.0
Sal Creek	9.1	6.0	15.1
Salamander	4.7	1.6	6.3
Slide Creek	29.5	8.6	38.1
Thorne	0.6	0	0.6
Tiny	1.8	0.1	1.9
Torrent	6.8	4.5	11.3
Total	**122.4**	**41.5**	**163.8**

Data compiled from USDA Forest Service GIS databases

Table 7-5. Estimated stream crossings, by crossing type, on roads within each watershed.

	RCS Feature										
Watershed	**CP**	**CP2**	**CPB**	**LB**	**LC**	**MI**	**PP**	**RM**	**WB**	**WC**	**Total**
Barren	60	2					6		1		69
Big Ratz	309			1	2	36	6	19	3	1	377
Cobble Creek	84					16	4	1	2		107
Deer Creek	96				3	6	25	5	16	3	154
Little Ratz	49				2	2	41	40	2		136
No Name	109					5		1	1		116
North	82					4			5		91
North Sal	46		5			1					52
Ratz Harbor	58		6			3	6				73
Sal Creek	165		3			3	49	1			221
Salamander	55					8			4	2	69
Slide Creek	236				16	22	90	32	24	11	431
Tiny	32					1	3				36
Torrent	52				2	2	23			1	80
Total	**1433**	**2**	**14**	**1**	**25**	**109**	**253**	**99**	**58**	**18**	**2012**

From Road Condition Survey (RCS) database, as of July 2004 - CP=Culvert Pipe, CPB=Culvert Pipe with Baffle, Log Stringer Bridge, LC= Log Culvert, MI= Missing Structure, PP=Plastic Pipe, RM=Removed Structure, WB=Waterbar, WC=Wooden Culvert.

Table 7-6. Miles of decommissioned and existing roads in the Cobble area including Operational and Objective Maintenance Level.

		Existing Roads (miles)										
		OPML1	OPML2			2	OPML3			3	Existing	
Watershed	DE	OBML1	OPML1	2	3	Total	OPML1	2	3	Total	Total	Total
Barren		1.34						0.27	2.75	3.02	4.35	4.35
Big Ratz		11.26	0.11	1.68	0.61	2.41	5.14		3.52	8.66	22.33	22.33
Cobble Creek		5.31	0.31			0.31			0.01	0.01	5.63	5.63
Deer Creek	0.93	5.62	2.81			2.81			4.78	4.78	13.21	14.14
Little Ratz		4.25	1.59	1.08		2.66			1.22	1.22	8.14	8.14
No Name		4.64							0.28	0.28	4.92	4.92
North		0.94	0.07	1.32	0.61	1.99			1.36	1.36	4.29	4.29
North Sal									1.87	1.87	1.87	1.87
Ratz Harbor		1.22	0.34			0.34			2.65	2.65	4.21	4.21
Sal Creek		0.67		2.43		2.43		4.58	1.40	5.99	9.08	9.08
Salamander	0.12	1.17	0.61			0.61			2.82	2.82	4.60	4.72
Slide Creek	0.03	18.30	1.34	2.45		3.79	5.10	2.04	0.29	7.42	29.51	29.53
Thorne		0.65									0.65	0.65
Tiny				0.17		0.17			1.63	1.63	1.80	1.80
Torrent	1.30	1.20	1.41	1.73		3.14			1.12	1.12	5.46	6.76
Total	**2.37**	**56.58**	**8.57**	**10.86**	**1.21**	**20.65**	**10.24**	**6.89**	**25.69**	**42.82**	**120.05**	**122.42**

Data compiled from the USDA Forest Service INFRA database. OPML=Operational Maintenance Level, OBML= Objective Maintenance Level, DE= Decommissioned; 1=Basic Custodial Care (Closed), 2=High Clearance Vehicles, 3=Suitable for Passenger Cars.

Approximately 55 classified road crossings, out of an estimated 2,012, are known to impede fish migration (Table 7-7). These figures include only USDA Forest Service classified roads and not non-classified, temporary, or non-national forest roads. These figures are conservative and under-estimate the true number of crossings that block fish passage. Roads that potentially block streams containing fish are recommended for closure in the Recommendations sections. Almost 10 miles of classified roads have not been completely surveyed for crossings that block fish migration, again potentially under estimating the true number of blocked streams. The majority of these crossings exist along Forest Road 300000, at the entrance to many of the Cobble area's watersheds (Figure 7-1). These will be repaired during the Sandy Beach road upgrade, identified in the Sandy Beach EA (2001).

According to USDA Forest Service GIS databases (Table 7-8.) USDA Forest Service roads intersect the following channel types:

- 14 alluvial fans
- 15 floodplains
- 64 moderate gradient mixed control channels
- 10 palustrine channels
- 3 estuarine stream channels

Table 7-7. Number of stream crossings on Forest Service Classified roads, by watershed, known to impede fish passage

	Road Number																
Watershed	**3000000**	**3000170**	**3000200**	**3000230**	**3000302**	**3018000**	**3018050**	**3018100**	**3018110**	**3018250**	**3020000**	**3023200**	**3023500**	**3023520**	**3023530**	**3025000**	**Total**
Barren	3																**3**
Big Ratz	5				3								1	1	1		**11**
Cobble Creek			4	1													**5**
Deer Creek	2					2	1	1	2								**8**
Little Ratz	1											2					**3**
North	4															1	**5**
North Sal																	**0**
Ratz Harbor	5												1				**6**
Sal Creek											4						**4**
Salamander	6																**6**
Slide Creek		2								1							**3**
Torrent	1																**1**
Total	**27**	**2**	**4**	**1**	**3**	**2**	**1**	**1**	**2**	**1**	**4**	**2**	**2**	**1**	**1**	**1**	**55**

Data compiled from the USDA Forest Service INFRA database.

Roads that cross some channel types are subject to more erosion and maintenance than others. The figures above serve as a relative indication of the degree of watershed disturbance. Additionally, the number of roads that cross potentially high-value fisheries streams such as MM, PA, or ES channels, also indicate a relative degree of impact to fish habitat and overall stream conditions in that watershed.

The possibility of degraded fish habitat or stream condition is relatively low along maintained, open roads, because maintenance is relatively frequent in most cases. Abandoned, unclassified temporary roads that cross high-value streams or unstable channels increase the potential for degraded fish habitat or blocked fish passage however. These roads are rarely noticed unless project-specific work requires their re-opening. In 2003, technicians used the current Road Condition Survey (RCS) database to identify abandoned roads with crossing structures, and visited each road to determine its overall impact to each watershed.

Physical Condition of Select Streams

Extensive fish habitat and stream geomorphological data has been collected from some larger streams within the Cobble area. For instance, extensive data exists for much of Sal Creek from 1994, 1996, 2003, and 2004, as well as from small portions of it from 1996-2000. In addition, similar data exists for the

Figure 7-1. Location of road-stream crossings that do not allow adequate migration of fish.

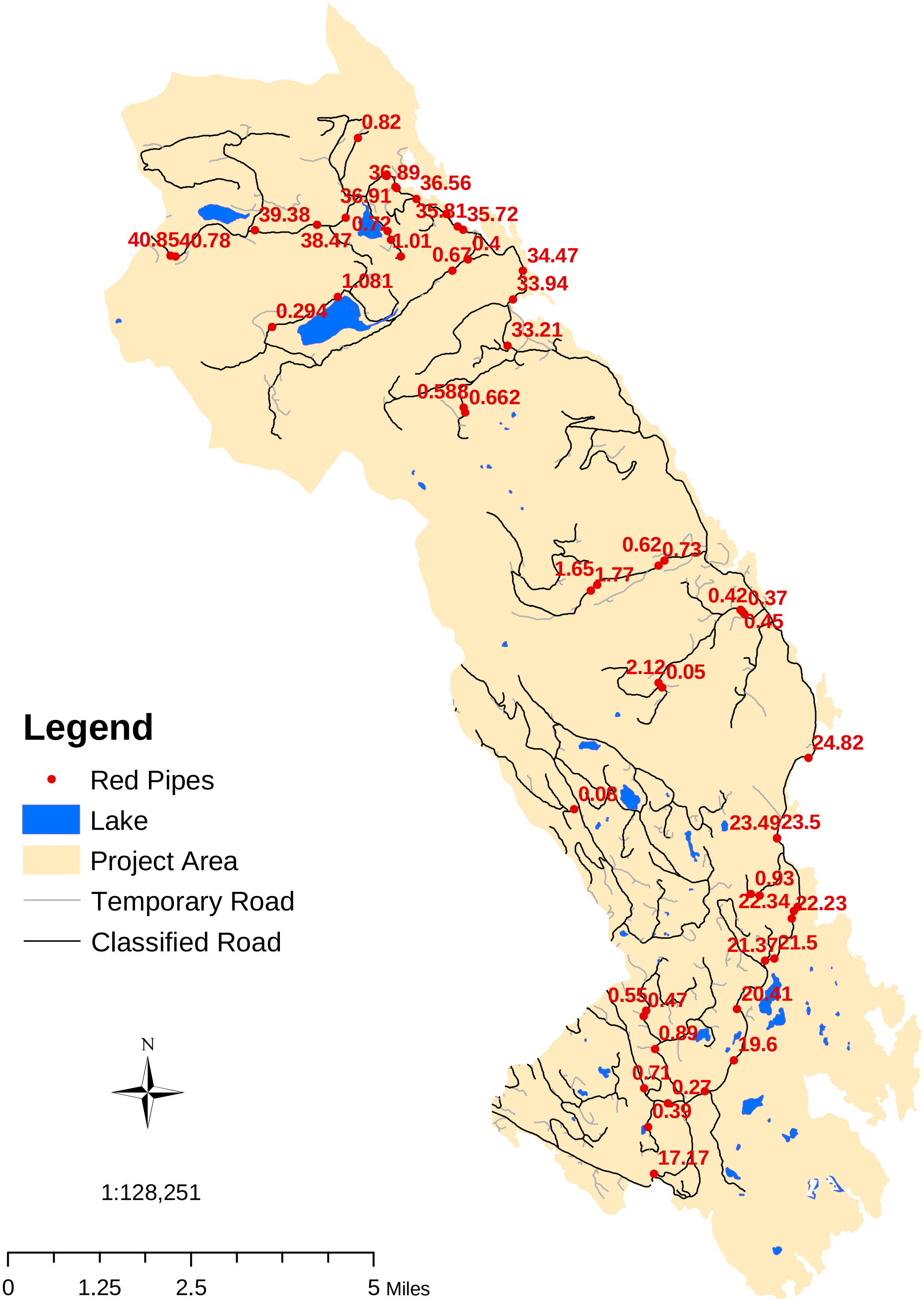


Table 7-8. Approximate number of streams, by selected channel types, crossed by roads.

Watershed	AF	ES	FP	PA	MM
Barren		1			3
Big Ratz	2		4	2	3
Cobble Creek					5
Deer Creek				5	11
Doughnut					
Little Ratz	2		1		17
No Name	1				
North		1	1		
North Sal					
Pin					
Ratz Harbor	1				5
Sal Creek	6		3		4
Salamander					5
Slide Creek	2		6	3	13
Thorne					
Tiny					
Torrent		1			2
Total	**14**	**3**	**15**	**10**	**68**

Data compiled from the USDA Forest Service INFRA database.

streams upstream of Big Lake from 2003. Much of this data is described briefly here, and is discussed in the Synthesis and Interpretation section below.

<u>Sal Creek</u> - The floodplain surrounding Sal Creek was entirely harvested around 1970, as were much of its surrounding hillslopes up to about 800' elevation. Currently, much of the riparian area is dominated by red alder, and several beaver ponds have subsequently developed in the floodplain. Prior to harvest, much of the anadromous section of stream formed a "figure-eight" pattern with side channels within the floodplain, evident in 1966 and 1971 aerial photographs. 1979 aerial photographs show the beginning of beaver pond development, within the main stream channel, while the former side channels then became the main stream channel. Beaver ponds were near their current extent by 1991, and today many of them show signs of filling in with fine sediment and debris.

Currently, the main stream of Sal Creek appears to be widening and much of the over-winter habitat for resident fish, including coho salmon, include the beaver ponds. Recent surveys, using USDA Forest Service Tier II and III methods, showed that the lower 2,400 m (almost the entire anadromous reach of stream) contained 1,574 pieces of large woody debris (LWD), and 63 pieces of key LWD. Key LWD is LWD proportional to the stream channel width and is generally large enough to influence the channel morphology. Approximately 33% of these key LWD pieces were between 0 and 45° to the stream flow and were no longer influencing habitat or providing cover for fish. Sal Creek also contains approximately 0.66 pieces of LWD/m, and 0.03 pieces of key LWD/m which are both below the 25th percentile for harvested floodplain streams in southeast Alaska (Bryant and others, in press). However, these values were as high as the 50th percentile in some shorter, individual reaches. Sal Creek also averages 15.3 m wide, (SD=3.04) and contains 53 pools/km, which is over the 75th percentile for streams throughout southeast Alaska.

The Sal Creek floodplain contains approximately 309 m of off-channel rearing habitat (Average =51, SD=30), averaging 7.5 m wide. These side channels contain 180 pools/km, 1.9 and 0.28 pieces of LWD/m and KLWD/m, respectively, and 100% of the LWD were between 0 and 45° to the flow of water.

Sal Creek appears to maintain much of its structural integrity in places, though overall it lacks LWD and available rearing habitat for fish. Much of its riparian area is dominated by alder, and large conifer may be available for in-stream function in another 50 years. Habitat and fish communities in Sal Creek will likely continue to decline before they improve. However, some rehabilitation efforts within the watershed may be attempted to minimize further habitat loss and maximize the utilization of existing resources and space. These efforts are discussed in the Recommendations section below.

Upper Big Ratz - The largest inlet stream to Big Lake, referred to as Upper Big Ratz, is an FP4 system, and is crossed several times by the 3023530 and 3023535 roads. In addition, the 3023500 and several temporary, unclassified roads also cross its two largest tributaries. Because of this, the inlet stream has eroded large sections of road, been subject to intense landslide activity, and a significant portion of its anadromous section has become braided due to the volumes of deposited bedload.

Six different reaches of Upper Big Ratz Creek totaling 927 meters in length were surveyed using USDA Forest Service Tier II methods in 2003, to quantify its overall in-stream physical condition. The survey results reflect the overall condition of this area, although each reach is notably different in width, depth, length, gradient, and sinuosity. An average of all the results is presented here.

Upper Big Ratz creek averages 8.7 m wide, and contains 0.62 pieces of LWD/m and 0.03 pieces of key LWD/m. Forty two percent of all the LWD in these reaches were between 0 and 45° to the flow of water, and it contains approximately 60 pools/km. No off-channel habitat exists in this area.

Aquatic Synthesis and Interpretation

The aquatic environment in the Cobble area has changed dramatically in the last 50 years. The majority of productive, fish-bearing streams in the Cobble area are recovering from pre-1997 TLMP forest practices that included road building on floodplains and alluvial fans; harvest and conversion of dominant riparian plant species; and the removal of in-stream large woody debris. In addition, increases in landslide activity, loss of streambank stability, inadequate maintenance and/or improper closure of roads, and installation of a fish pass, have all contributed to the alteration of historic aquatic conditions in the Cobble area. Despite this, all previously documented anadromous salmonids continue to exist in every stream in the Cobble area, except for steelhead trout in Sal Creek, and future management of the forest includes protection for these species and their habitats.

While the extent of larger Class I and II streams in the Cobble area has likely remained the same, construction or lack of maintenance of some roads has caused substantial decreases in fish habitat availability of smaller streams. At least 8.7 miles of Class I or II fish habitat is somehow inaccessible due to the 55 locations on USDA Forest Service Classified roads that block fish migration to upstream or downstream habitats. This does not included temporary, unclassified roads.

Currently, improperly closed temporary roads may impair watershed function more than properly built and maintained roads. It is well understood that even properly maintained forest roads in southeast Alaska produce fine sediment to streams, however, it is less understood how much sediment is produced from roads with failing culverts and blocked ditches. It is generally accepted that forest roads in poor condition, especially those on mid-slopes, floodplains, or alluvial fans, have a greater likelihood for overall failure leading to landslides, chronic erosion, or blocked fisheries access. It is not currently well understood how these roads affect the downstream flow of other materials such as nutrients or organic debris.

Diversion of water flow from downstream habitats by blocked crossings or poorly placed crossings has also been observed in several drainages, including Sal, Big Ratz, Little Ratz, and Slide. Many of these roads will require extensive brushing for access, which will initially increase surface erosion from the road, however, the benefits of reducing chronic erosion from these roads and restoring proper flow paths to downstream areas far outweighs the short term increase in surface erosion. In Sal Creek for instance, roads along the southern watershed divert water laterally along the roads, eliminating its ability to reach fish rearing areas directly downslope of the road. During especially warm and dry conditions, as were seen during 2004, these streams were not able to provide water to downslope beaver ponds and rearing channels. As a result, upper surface water temperatures in ponds exceeded 23° centigrade (C), and were in excess of 15° C for several days. The State of Alaska defines 15° C as detrimental to salmonids, though the temperatures at the bottom of the ponds were usually at or slightly below this.

In-stream biological production in the Cobble area has been affected by habitat change, riparian vegetation loss and species conversion, and loss of in-stream habitat. Fish biomass has likely not changed significantly within many of the Cobble area's streams, however, actual stream ecosystem function, including nutrient dynamics, primary production, and habitat quality has likely been altered in the previous 50 years. In addition, fish populations, as well as whole communities, have undoubtedly been altered in many streams. Though the cause for such change is highly debated, the loss of riparian vegetation and subsequent changes to the stream ecosystems has likely played a role. Today, the loss of structure and function provided by these areas is widely recognized and efforts are currently underway to restore riparian structure along many streams.

Currently, little is known about how watersheds and their streams function after large-scale harvest. Even less is known about how future management, including rehabilitation, will further affect the recovery of these areas. The dominance of alder along both valley-bottom and hillside streams for example, has lead managers to remove alder in order to improve conifer growth, despite the lack of information about alder subsidies to surrounding vegetation and streams. Information concerning the most productive density of red alder in regards to surrounding forest and aquatic productivity would allow managers to prescribe more effective thinning treatments without reducing the benefits provided by alder forests. Furthermore, the compounding effects of additional watershed uses, such as timber harvest, road building, or recreation in these drainages may add additional uncertainty to how these watershed features will recover or respond to rehabilitation treatments.

The conversion of riparian vegetation to red alder has likely introduced more readily available resources to primary producers and thus to the ecosystem in general. However, red alder trees lack root structure to stabilize streambanks as well as the ability to form long-lasted stable debris jams in streams. As a result, recruitment of stable, non-alder LWD in streams such as Sal and Big Ratz is extremely low, despite the density of LWD in both streams. Much of the existing LWD in these streams remain from pre-harvest conditions or is alder, and is rapidly decaying. In addition, much of the existing LWD in Sal were cut trees near former off-channel streams. Since these reaches now constitute the main channel, any LWD remaining in the former main channel now lies in beaver ponds, or has been rendered ineffective through decay processes or high flows. Essentially, many of the low-gradient, floodplain streams in the Cobble area lack functional LWD and will not receive additional amounts before existing components are gone.

Finally, beaver ponds now function as the primary over-winter habitat for juvenile salmonids in many watersheds. In addition, beaver ponds are known to form near abandoned roads, where they utilize the existing road as part of their dams, oftentimes increasing erosion along the road. Though beaver ponds are recognized as extremely productive rearing areas for juvenile fish, their age and degree of access for fish may be important in their true ability to rear fish to smolt age. The majority of beaver ponds in Sal Creek are either not utilized by fish during the summer months, or do not allow fish to migrate downstream during the normal smoltification period, as was observed in 2004. It is unknown if the fish in Sal Creek will eventually migrate to the ocean during higher winter flow events, or if the remaining beaver ponds that do not hold fish during summer do in fact serve as winter rearing habitat. It is known, however, that the deep-water habitat within these ponds are rapidly filling in with fine sediment and organic detritus, and may further limit the production of juvenile salmonids from Sal Creek.

Recommendations

Roads

Roads constitute the overwhelming majority of damage to aquatic ecosystems in the Cobble area. A map of the roads within the Cobble area can be found in Appendix A. Currently, 41 miles of temporary roads exist in the Cobble area, although many have already been properly closed. This assessment identifies an additional 30.7 miles of road causing chronic damage to Class I or II streams (see Appendix B). This assessment does not necessarily differentiate between Classified and Temporary roads, since many are included in the same group of inaccessible roads. All miles of roads recommended here are either closed by vegetation, removed bridges, and gates or were built as temporary roads and should not contain any structures.

Riparian Thinning

Thinning in second growth riparian areas has been identified as one process through which long-term restoration of riparian and in-stream function can be accomplished. In the Cobble area, the riparian area along approximately 23 and 27 miles of Class I and Class II stream have been harvested, respectively. The riparian vegetation within nearly all of this distance is between 15 and 50 years old, and currently provides no long-lasted coniferous LWD to these streams. Proper thinning of dense stands of trees is one way in which long lasted LWD can enter streams more rapidly, restoring proper structure and function to those stream channels.

Eight sections of Class I and II stream were identified as being in poor functioning condition based on age of riparian vegetation, species composition, vegetation density, and expected age until recruitment of trees into the stream (Figure 7-2). Cursory field exams conducted by fisheries personnel in 2003 identified a total of 9.7 miles of Class I or II stream corridor, and 469 riparian acres based on 200’ width on both sides of the stream that could benefit from riparian thinning treatments (Table 7-9). For the purposes of this assessment, the 200’ width is an arbitrary distance, chosen to reflect the “average” riparian width of floodplain and alluvial fan streams. This value will likely change upon field verification.

Table 7-9. Length of stream and area of proposed riparian thinning along Class I and II streams in the Cobble area.

Name	Length (ft)	Estimated Acreage
North Ratz	7000	64.4
Trumpeter Lake Inlet	2000	18.2
Upper Big Lake	10000	92
Big Lake Alluvial Fan	2000	18.4
Upper Sal	5000	46
Lower Sal	10000	92
Middle Slide	12000	110.4
Lower Slide	3000	27.6
Total	51,000	469

Recreational Fishing Access

Very few recreational fishing sites exist in the Cobble area. The Big Lake fish pass is one popular site, although not officially recognized by the USDA Forest Service. Other areas include the inlet to Big Lake at the end of Forest Road 3023535, multiple locations along Big Ratz Creek, and the Slide Creek and Sal Creek estuaries along the Sandy Beach Road (Forest Road 300000). No wheelchair accessible fishing locations currently exist in the Cobble area.

Fisheries biologists and recreation planners recognize that public interest exists for more maintained trails and developed fishing access locations between the communities of Coffman Cove and Thorne Bay. However, these locations should also be low maintenance, utilizing already existing infrastructure such as forest roads, and be low profile sites to maintain a remote recreational quality.

One such location includes Forest Road (FR) 3018000, from its junction with Forest Road 3018200 at approximate milepost 3.30 (Figure 7-3). FR 3018000 travels through 30 year old alder and second growth conifer forest for approximately 3.4 miles where it junctions with Forest Road 3018500. The entire distance is inaccessible to vehicles, although it is wide enough for off-road vehicles the entire distance. The route crosses Slide Creek via half of a modular bridge modified for foot and all-terrain vehicle (ATV) traffic, and passes 34-acre

Figure 7-2. Potential riparian thinning locations along Class I and II streams in the Cobble area.

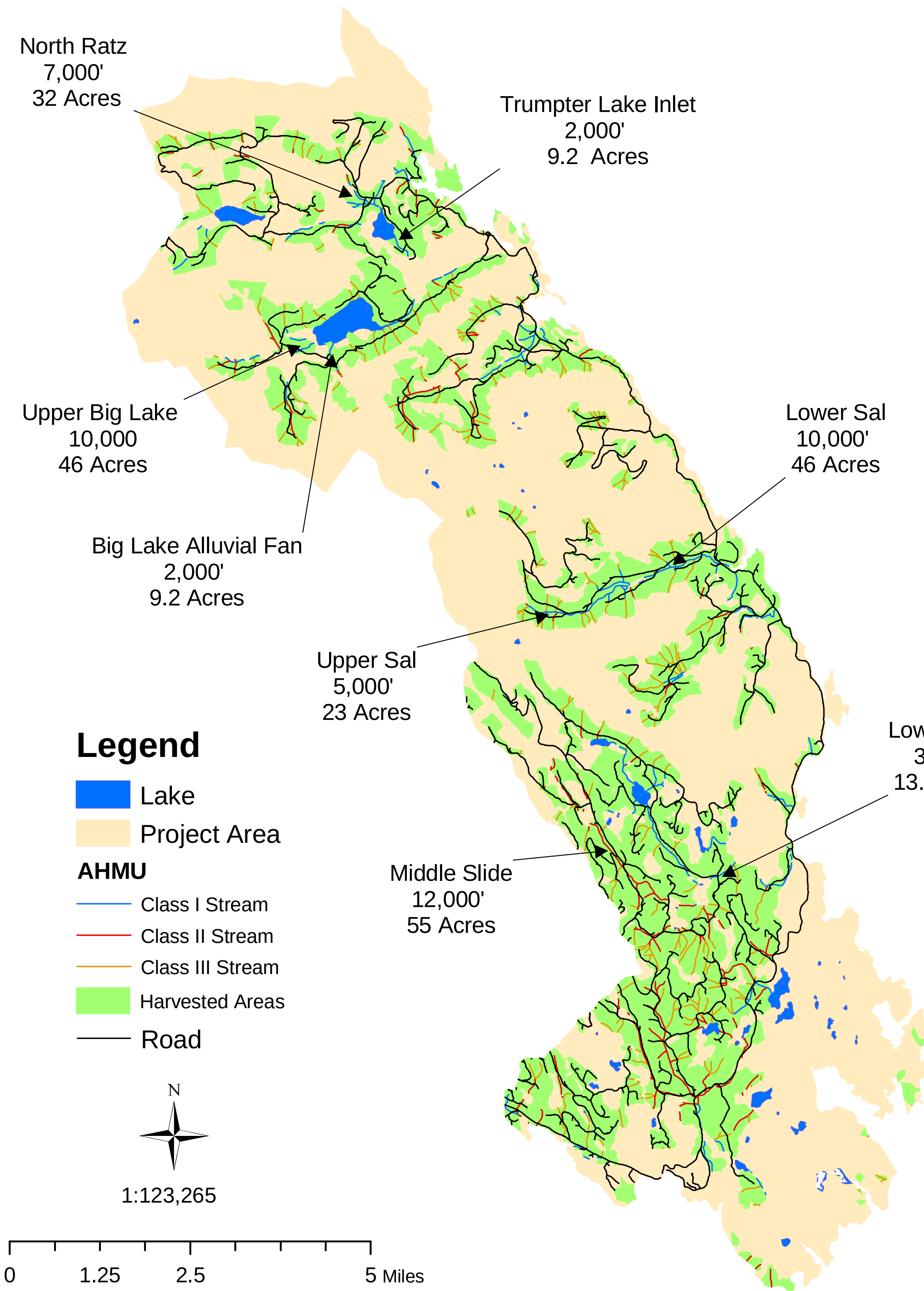
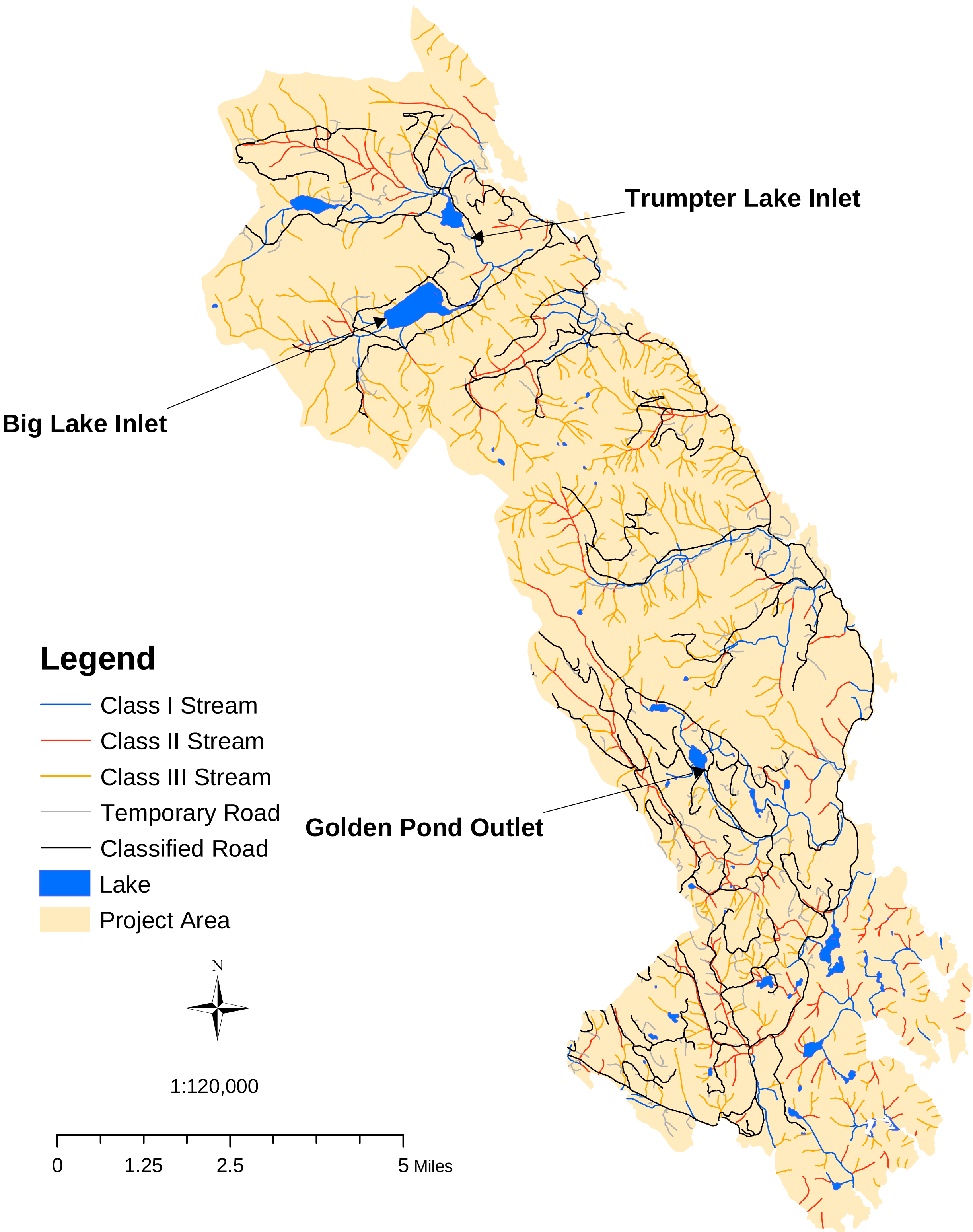


Figure 7-3. Potential recreational fishing access sites in the Cobble area.



“Golden Pond” via Forest Road 3018480, at approximately 2.5 miles. Users can currently access either end of the trail by automobile. The 3018200 road is maintained at level 3 standards (level 3 is suitable for passenger cars). The 3018000 section of road is maintained at level 1 standards, even though it currently retains all of its crossing structures.

Access to both Slide Creek and Golden Pond would provide users with a relatively remote experience, and development of this trail would reduce resource damage along these roads by replacing at least one blocked crossing structure. Golden Pond is approximately 100’ deep, and is at 550’ elevation. It contains coho salmon, cutthroat trout, and potentially sockeye salmon which exist a short distance downstream. Fisheries population sampling was completed during extremely warm and dry conditions of summer 2004 to determine if this site did in fact contain these species, and to determine if it would be a likely destination for anglers. Sampling of Golden Pond during summer of 2004 showed extensive use by coho salmon and cutthroat trout. Larger cutthroat trout were not found but were likely avoiding warmer surface water. Additional sampling is required during other periods of the year to determine the age structure of cutthroat trout in this system.

Construction of this trail would also require minimal effort and maintenance. The road is already in place and many of the culverts still function properly. However, additional crossing structures or waterbars would alleviate surface erosion from the road. One location at milepost 7.01 currently blocks fish access to several acres of beaver pond habitat. This location contains approximately 1000 cubic yards (yds^3) of fill material that has blocked the original crossing structure and water from the upstream beaver pond currently passes through the fill material. Approximately 10 yds^3 of road material has currently eroded away.
An additional fish access site includes upgrading the existing temporary Forest Service road at milepost 0.77 on road 3000302. This is a popular fishing destination site as it is approximately ¼ mile downstream of the Big Lake fish pass and accesses Trumpeter Lake. This road currently contains one removed structure and two existing log culverts. All crossings appear to function, though some reconstruction of the first stream crossing would restore water flow to original stream channels downstream of the road. Other modifications would include brushing of some alder to make access slightly easier.

Finally, the inlet of Big Lake, utilizing existing road 3023530, is a popular fishing and recreation destination. Adult fish spawn in the inlet stream, while juvenile fish move immediately downstream to the lake upon emergence from the gravel. Interestingly, juvenile fish were observed emerging from the gravel in late July, roughly two months after fish emerge in most streams in the Cobble area, due to its colder temperatures. Also, age-1 fish (fish that live over one winter) were not observed in the inlet stream during snorkeling, lending evidence that the lake is the primary rearing habitat for these fish.

The 3023530 road continues beyond the main lake tributary, but becomes unrecognizable due to extensive erosion by the stream. Also, several crossing structures along the 3023530 currently block fish passage or produce excessive sediment to downstream reaches, and the surrounding riparian area is dominated by alder. Providing access to Big Lake without limiting the remote nature of the area would eliminate further riparian and streambank damage by greater anticipated use of the area and could be done concurrently with streams and riparian restoration efforts.

Fish Passage Restoration
Of the 55 known stream-crossing structures that block fish migration across Classified roads in the Cobble area, 11 are located in the Big Ratz watershed, and five of those are located on Forest Road 300000 (Sandy Beach Road). The five culverts should be replaced with suitable crossings since FS300000 bisects the entrance to the watershed. Another three of those crossings are located on the 3000302 road, leading to the Big Lake fish pass, and at least one of those at mile-post (MP) 1.01 accesses 387 meters of suitable Class I rearing habitat.

The 3000302 road is currently proposed to be upgraded and the culverts replaced with appropriately sized and placed structures. In the future, these culverts should be maintained appropriately, or the road should be closed using a gate at its junction with the temporary road at MP 0.77. The structure at MP 1.01 should also be removed. This option would transfer the remaining section of road to trail, allowing maintenance personnel continued access beyond the gate to the removed culvert. Visitors would only have a short walk to the fish pass. In addition, this would afford the greatest long-term protection for rearing habitat in that stream without further degrading aquatic resources or limiting the public's opportunity to visit the Big Lake fish pass.

The Sal Creek watershed has an additional four crossings that block fish migration, all of which are along Forest Road 3020000. These crossings limit upstream migration to at least 580 meters of suitable spawning or rearing habitat. The Sal Creek watershed has limited rearing habitat for juvenile salmonids, especially during the winter months, and restoring these crossings would benefit fish that utilize side channels and tributaries during winter, including coho salmon and steelhead trout. Since steelhead in particular use tributary streams as over winter habitat, and have not been observed in Sal Creek since 2001 restoring these crossings might initiate the process of restoring runs of steelhead to Sal Creek.

The remaining high priority crossings are all located on the Sandy Beach Road, and their reconstruction is planned via the Sandy Beach Reconstruction (see the Sandy Beach EA, 2001). They are not included in this assessment because they have been prioritized and will be upgraded in the future.

The Deer Creek drainage contains 6 known "Red" crossings, all of which access Class II habitat. Three are located on Forest Roads 3018100 and 3018110, on roads closed by a locked gate. These three crossings limit access to approximately 700 meters of Class II habitat, and this road is proposed for further long-term storage and removal of those crossings. One crossing impedes fish migration to approximately 1195 m of habitat, including a pond, along Forest Road 3018050. This 48" culvert is perched by 0.42 m and should be set appropriately.

Finally, two additional crossings in the Little Ratz watershed impede Class II fish passage, near the end of Forest Road 3023200. These crossings were removed, but continue to block fish passage due to beaver activity. It is unknown how much habitat is inaccessible, but because they are in HC channels, habitat is likely limited. However, because much of this sub-drainage has been harvested, future reconstruction or riparian thinning projects should consider including these.

Fisheries Habitat Restoration

Several streams in the Cobble area limit rearing and spawning habitat, although overwinter habitat appears to be the greatest limiting factor. Whole-system stream restoration projects are typically expensive; time-consuming; and rarely monitored for success. For instance, alder bundles were anchored with cable in Sal Creek in 1989 to provide cover and suitable rearing habitat. Today, few of those bundles are noticeable, and none remain in the stream.

Much of the stream restoration in the Cobble area can be accomplished by restoring water flow to appropriate channels, limiting erosion from abandoned roads, ensuring unlimited access by fish to their respective year-round habitats, and eliminating further degradation to stream channels from future developments. All of these options should be pursued to limit further degradation to fisheries habitat in two drainages, Sal and Big Ratz. In addition, small in-stream restoration projects in these drainages might initiate the rehabilitation of some characteristics, including biological productivity. Ultimately, Sal Creek lacks large, stable, LWD, and well-designed placement of adequately sized logs might restore some properly functioning conditions within its mainstem. However, in-stream restoration in Sal Creek should focus first on restoring over-winter habitat in off-channel streams and tributaries.

Two tributaries add substantial amounts of bedload to a stream that no longer efficiently remove this material in Upper Ratz Creek, upstream of Big Lake. In addition, the remnants of Forest Road 3023500, 530, and 535 continue to erode, depositing sediment directly into spawning channels. As a result, this system is overwhelmed by bedload and has moved laterally, spreading across the floodplain in multiple channels. This stream would benefit by multiple efforts in addition to the ones outlined earlier, including riparian thinning and road removal. The addition of key LWD to this area, and design of multiple, stable, overflow channels, to accommodate high flows while efficiently transporting bedload and reducing further erosion of the nearby road, would undoubtedly benefit spawning salmon.

Fisheries populations in Sal Creek are limited by overwinter stream channel habitat and possibly by aged beaver pond habitat. Over 100 acres of the floodplain is now beaver ponds, created since timber harvest in the late 1960s. Beaver ponds normally provide exceptional rearing habitat for juvenile salmonids. Sampling in 2004 indicated very little summer use by juvenile coho, especially in ponds near the main channel, although individuals were much larger than their mainstem counterparts. Conversely, one pond farthest from the mainstem, and notably younger in age, held several hundred juvenile coho, indicating that these fish possibly move into the upper ponds as age 0-1 fish, but cannot escape downstream during normal smolting periods. Though these observations are not scientifically conclusive, they indicate that some of the larger, older ponds may not be functioning as such productive habitat as they once did. Furthermore, the proportion of off-channel flowing water habitat to beaver pond area is small, and may further limit the production and survival of juvenile fish in Sal Creek.

Since Sal Creek is notably larger than most streams, in-stream restoration should begin in tributaries, side channels, and beaver ponds. Currently, the temporary road at MP 0.88 is limiting several hundred meters of upstream habitat, and is being eroded by Sal Creek. However, it also bypasses two large beaver ponds that contained very few fish in 2004, and parallels a small side channel to the mainstem of Sal Creek.

Aside from removing all structures in the road, which will take place in summer of 2005, sizable LWD or root wads should be placed within the beaver ponds to increase cover for juvenile fish. The dam itself could also be partially breached in such a manner to allow water to flow out during higher flows, but still retain water throughout the summer months to provide adequate beaver habitat. Removing the blocked crossing structures in this temporary road will re-introduce tributary flows from adjacent hillsides to these beaver ponds, supplying more water through the summer months and keeping temperatures lower, while allowing fish to migrate into them in the winter months. In addition, part of the temporary road could be removed and a slackwater area could be constructed from part of the uphill ditch near the existing side channel. This would result in approximately 100 m of additional rearing habitat, and could be constructed while deconstruction of the existing road was occurring.

Reed canary grass aggressively competes with native vegetation in areas of frequent water fluctuations. Reducing the fluctuation in ponds might allow the establishment of native vegetation, including alder or conifer trees. Beaver populations continue to exist in the drainage and would likely re-colonize any pond that no longer held water, reducing their preferred sources of food (alder) from nearby. Encouraging the growth of less appealing trees such as spruce or cedar might limit their desire to re-colonize dams in these same areas, and at the same time limit the establishment of reed canary grass in these ponds.

Finally, very few fish apparently utilize the beaver ponds during the summer. Though the reasons for this are unknown, the pond with the most fish also had the most cover and deepest water. Ideally, restoring some flowing off-channel habitat would diversify the existing summer habitat and possible stabilize fisheries populations during abnormally dry conditions or exceedingly wet or cold winters. Rehabilitation options to explore further include: adding cover such as root wads to these ponds, partially breeching their dams to allow easier escapement, and reducing the spread of reed canary grass. All options, if pursued, should be done with minimal modification to the existing dam structure to retain sufficient beaver habitat.

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Conclusions

The recommendations outlined above are the first steps toward implementing projects whose goals are intended to meet the desired future condition of an area, based on the objectives of the Tongass Land Management Plan (Forest Plan). These recommendations are the summation of the most accurate information available, much of which comes from field verification and familiarity with the area. They are not static, and may change over time with changing priorities or the completion of some projects.

The key to this document lies in the user's ability to tie several pre-defined projects together to meet some desired future condition of an area. These recommendations are not prioritized because one is not necessarily more important than another. Many however, should be pursued in conjunction with others in order to maximize the use of limited funding and time during the NEPA (National Environmental Policy Act) phase of project development. For instance, projects that include thinning second-growth stands should consider incorporating nearby riparian thinning recommendations. At the same time, riparian thinning, road closures or improvements, potential small sales including red alder, and recreational trail development might be considered in similar projects.

Certainly, some prioritization of recommended projects should occur before deciding which actions to pursue first. Prioritizing these projects should include, but are not limited to; the current severity of degradation on other resources; the probability of success; the long-term effects and sustainability on local economies; the effects of an action on other resources or on future projects; public input; funding; and concurrence required by state and local governments. Prioritization of these projects has not been done here, and is left to the best judgment of the user. Obviously, any prioritization should be done in an interdisciplinary format.

Funding for many of these projects will likely come from a variety of sources, such as CIP (Capitol Improvement Projects) funding, partnerships, force-account, direct project funding, or some combination, and is entirely at the user's discretion. Most likely, weaving several of these projects into one large project will require funding from a variety of sources due to their combined costs. At the same time, including several projects in the same vicinity could reduce long term costs by sharing responsibility for actions such as NEPA development, contractor mobilization, inspection, and documentation.

Finally, this document should assist the user in the pre-planning phase of any project development because much of the project location, environmental analysis, project boundary delineation, and infrastructure have already been identified. For example, the development of a primitive recreational trail using currently inaccessible roads might include environmental impacts such as associated erosion from users; increased fishing pressure on native stocks; and access to hunting or trapping grounds. In this case, it might also include the replacement or removal of both blocked fish passage structures and roads that currently degrade water quality. Furthermore, removal of these structures; establishment of a primitive trail; the sale of red alder or nearby conifer trees included in a nearby riparian thinning project; and the removal of road material from nearby wetlands might be done concurrently to minimize costs and maximize rehabilitation efforts. This landscape assessment outlines several such examples, and nearly all cases, their combined efforts are crucial to the maintenance and integrity of the Cobble area.

Implementation Plan

Because several projects have been identified in the same general vicinity, this plan recommends pursuing multiple projects during the NEPA phase of planning. Most likely, these will individually be covered under the category of actions identified in Forest Service Handbook 1909.15, Chapter 30. Section 31.2, subsections 1-15.

Individual projects that should be implemented concurrently include:

1) Thinning along 55 acres of riparian habitat in upper Big Ratz Creek; road storage of NFR 3023530, 3023535, and the upper end of 3023500; removal and possible sale of red alder along those roads; thinning of 2500 acres of productive wildlife habitat in the Big Ratz watershed; and the construction of a fishing access trail to the western end of Big Lake using NFR 3023530.

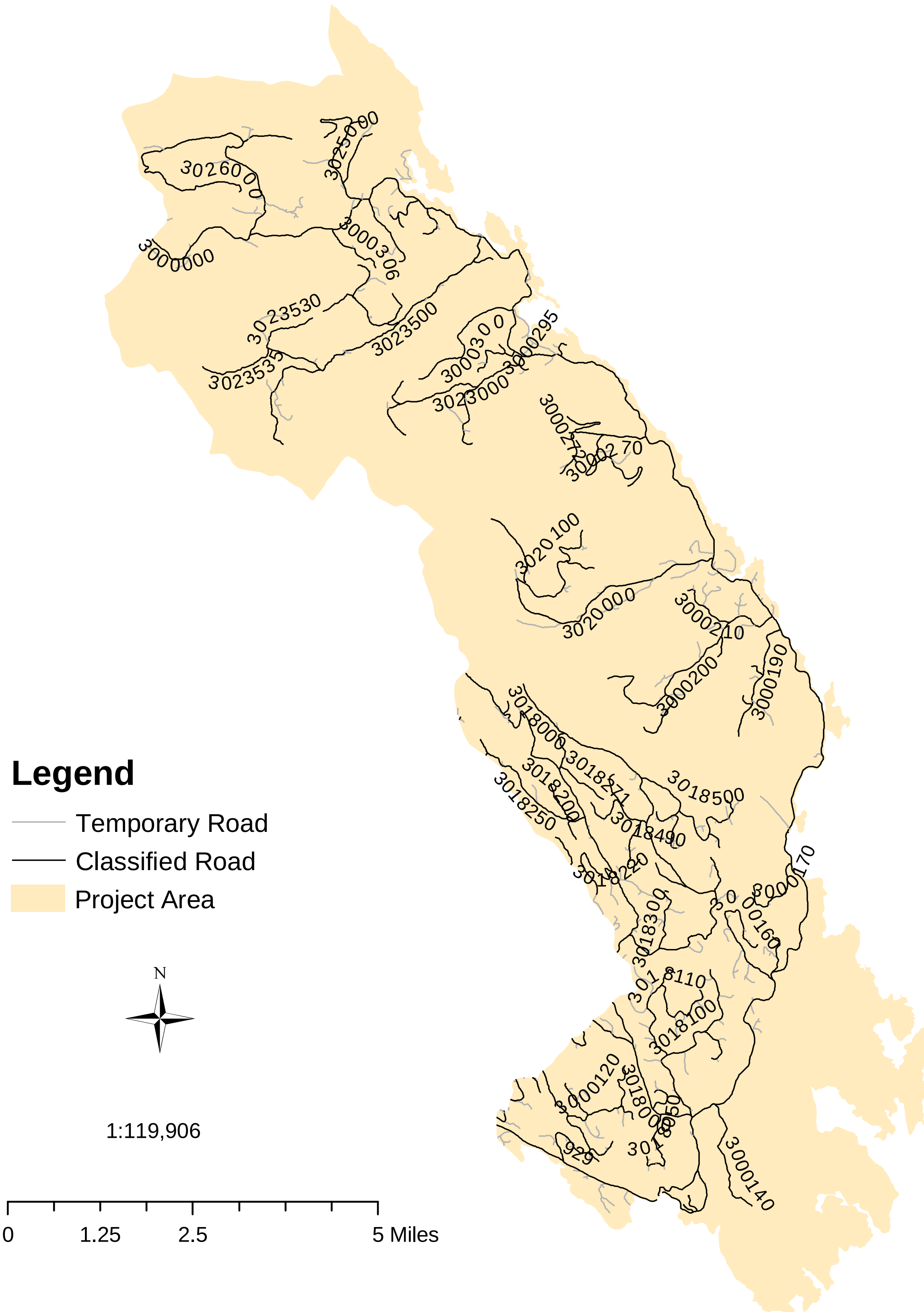
2) Thinning of 70 acres of riparian habitat and 523 acres of wildlife habitat in Sal Creek; removal of alder along roads; reconstruction and enhancement of up to 1 mile of fisheries habitat in Sal Creek; development of one or two small timber sales near roads in upper Sal Creek.

3) Thinning 1,400 acres of wildlife habitat and 140 acres of riparian habitat; replace 3 culverts that impede fish passage; construct Boy Scout Bike/OHV trail from existing roads; remove stream crossings from up to 13 miles of currently unmaintained, unused, classified roads; 0.2 miles of road obliteration to restore high-value wetland function; alder removal and sale from roadsides.

Additional projects to be covered separately under additional NEPA include:

1) The Baird Peak recreational alpine access trail.
2) Removal or storage of classified roads in Appendix B.
3) Riparian or wildlife thinning in other drainages.
4) Small timber sales.

Appendix A. Roads in the Cobble area



Appendix B. Roads recommended for storage or repair to reduce damage to aquatic resources

Road Number	Length (mi.)	Recommendation	Mileposts and Comments	Status
3000160	2.09	Remove crossings	First 0.621 miles near Class I stream. Many blocked culverts and erosion sites. Potential fisheries resource damage.	classified & open
3000170	1.13	Remove crossings, and restore fish passage	Two wooden culverts blocking fish passage, at MP 0.661 and 0.802. Must cross Class I stream to access.	classified & non-passable
3000302	NA	Replace culvert blocking fish passage at MP 1.01	Perched culvert blocking fish passage at MP 1.01. Additional culverts partially blocking passage at MP 0.59 and 0.72.	classified & open
3018000	4.39	From MP 3.30-5.42 (2.12 miles), fix surface erosion and drainage across road. Potentially remove up to 25 structures. Replace fish crossing at MP 7.01.	Several areas of surface from MP 3.30-5.42, including road damage and sediment inputs to Class II streams. From MP 5.42-7.69, very few problems. Fish crossing replacement needed at MP 7.01. This road is proposed as a loop trail, accessing Slide Creek via a footbridge, and Golden Pond at the intersection with 3018480.	classified and non-passable section
3018050		Restore fish access to pond	One 48" culvert blocks fish passage to upper pond.	Classified and non-passable
3018100	2.80	Remove crossings	At least 3 wooden culverts, 16 culverts, and multiple surface erosion location along road. Closed by locked gate, several culverts had been removed previously, but several remain, causing extensive erosion into Class II streams.	classified & non-passable
3018110	2.50	Remove crossings	Very extensive surface erosion, at least 2 wooden culverts and 8 culverts in place. Many structure are buried by debris or beaver dams, creating excessive erosion into Class II Deer Creek drainage. Road closed by gate at 3018100. Existing waterbars begin at MP 1.58. 1.6 miles of Classified, 1 mile of Temporary road.	classified & non-passable
3018200	1.00	Remove crossings from MP 4.39-5.19, prevent or harden initial access point at Slide Creek, clean plugged culverts at MP 3.65,3.73, and	Bridge is removed at beginning of road. Culverts at MP 3.65, 3.73, and 3.83 are plugged or missing. Remove 13 culverts, and approximately 5 missing structures.	classified, bridge removed

		3.83.		
3018250	**NA**	Remove blocked fish passage culvert at MP 0.08.	Blocked fish passage at MP 0.08. 58 culverts along mid-slope road to be removed as well.	Classified and bridge removed
3018300	0.10	Remove crossings	Erosion and watershed damage. Closed to vehicle traffic.	classified & non-passable
3018400	0.76	Remove crossings	0.535 Classified, 0.222 Temporary road miles. 1 known wooden culvert, 3 surface erosion. Near Class I stream, producing sediment to downstream fisheries streams.	classified & non-passable
3018450	0.58	Remove crossings	Road parallels Class I stream, blocking drainage and adding sediment to stream. Remove approximately 4 wooden culverts, and add approximately 3 waterbars. Must cross Class I stream to access.	classified & non-passable
3018490	0.91	Remove erosion potential from Class I and II streams.	Many beaver dams over road, surface erosion, high potential for sediment to Golden Pond, or Class I streams.	classified & non-passable
3020000	**NA**	Replace culvert at MP 0.53 with larger, or drivable waterbar. Replace red culverts with appropriate size and design.	Culvert at MP 0.53 100% plugged, upstream landslide producing sediment to ditch, eroding road. Culverts not passing fish (red) at MP 0.62, 0.73, 0.74, 1.65, 1.72.	classified & open
3023500	3.00	Remove crossings	Culverts in place from MP 3.0-3.803. Additional wooden culverts in place from 3.803 to end of road. No RCS data from 3.803 to end. Approximately 25 wooden culverts, and an additional 20 waterbars required on both Classified and Temporary roads. Multiple landslides on roads. Requires crossing Class I stream to access.	classified & non-passable
3023520	1.40	Remove crossings. Removal of culvert blocking fish passage at MP 1.08. Recontour stream at beginning of road.	At least 4 locations eroding road, one wooden culvert blocking fish passage. Erosion potential into Class I stream is high. Culvert from 3025500 at junction is eroding intersection, creating sediment erosion and deposition immediately into Class I stream.	classified & non-passable
3023521	0.50	Remove crossings	No RCS data available. Multiple wooden culverts, potentially blocking fish passage into Class I Ratz Creek. Parallels Big Ratz.	classified & non-passable

3023525	0.97	Remove crossings	Multiple blocked wooden culverts and filled ditches. Erosion of road into streams and nearby Big Ratz Creek. Classified road 0.7 miles, Temporary road 0.27 miles.	classified & non-passable
3023530	2.44	Removal of all crossings. Remove blocked fish passage culvert.	Road closed to traffic. Requires additional 13 drainage waterbars on both Classified (1.67 mi) and Temporary roads (3023530_0.90L, 0.77 mi). Might require crossing waterbars to access. Culvert at 0.294 blocking Class I stream. Beaver dam diverting water.	classified & non-passable
3023535	1.14	Eliminate road erosion at MP 0.034. Potentially obliterate section of road and recontour.	Stream is eroding entire road prism. Excessive sediment production, leading to sediment deposition in Class I stream.	classified & non-passable
3026000	**NA**	Replace culvert with appropriate size	Surface erosion and sediment damage.	classified & non-passable
3018220 +spur	2.91	Remove crossings	1.496 Classified, 1.41 Temporary. 5 known wooden culverts, at least 5 locations with surface erosion, at least 1 fill slope erosion. Located adjacent to Class II stream, producing sediment.	classified/temp& non-passable
3018300 _0.40L	0.24	Remove crossings	Several blocked or non-functioning wooden culverts near Class I stream.	temporary & non-passable
3018300 _0.60R	0.25	Remove crossings	Several blocked or non-functioning wooden culverts near Class I stream.	temporary & non-passable
3020000 _0.88L	1.05	Remove crossings	Temporary road parallels Class I stream. 19 wooden culverts and missing structures. Producing sediment to Class I stream, blocking fish passage at MP 0.081, 0.664, 0.716.	temporary & non-passable
3020000 _2.40L	0.59	Finish closure, additional crossings to be removed.	At least 5 stream crossings continue to erode road, producing sediment to Class I streams, and blocking fish passage at MP 0.009, 0.104.	temporary & non-passable
Total	30.73			