

## 3.0 Affected Environment

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### **Introduction**

The purpose of this chapter is to describe park resources within and adjacent to the Spruce Railroad Trail (SRRT) Lake Crescent and Sol Duc project areas that would be affected by the alternatives described in Chapter 2. This provides a baseline for evaluating environment consequences in Chapter 4.

This chapter is organized as follows:

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## Physical Environment



Figure 1. Lake Crescent, Olympic National Park

### **Geologic features, Topography and Soils**

Olympic National Park lies on the western edge of the North American continental plate, in a zone of mountain building and glaciation. Surface features that contribute to the scenic beauty of the Olympic Peninsula are the result of forces that elevated the Olympic Mountains. Glaciation, earthquakes, subsidence, and erosion have further shaped the topography. Alpine glaciers have scoured the peninsula, creating characteristic U-shaped valleys and leaving behind glacial deposits. The park's landscapes are continually being modified by landslides, river erosion, deposition, and uplift.

The Lake Crescent watershed is situated within a unique geologic formation called the Crescent Formation, so named because of the horseshoe-shaped band of marine basalt that comprises the northern and eastern perimeters of the Olympic mountain range. Inside the configuration, the predominant geologic materials are sedimentary in origin. The northwestern portion of the watershed is comprised mainly of basalt, with the southwestern portion comprised of sandstone, shale, and conglomerate.

There are three major assemblages of rock in the Lake Crescent area: argillite and greywacke along the south shore of the lake, Crescent Basalt on the north shore, and marine sedimentary



rocks of the Aldwell, Lyre, and Twin Rivers Formation north of the Crescent Formation outcrop. The Spruce Railroad grade and tunnels are within the Crescent Basalt and the Aldwell Formation of marine sedimentary rocks (PanGEO, Incorporated 2011).



Figure 2. West Tunnel (short tunnel)

Lake Crescent was originally covered by glaciers during the late Wisconsin Glaciation. Glacial retreat left a typical U-shaped valley with steep sides. Eocene basalt occurs along the northeast shore of the lake while the rest of the basin is comprised of sandstone, shale, and conglomerate. After glaciers retreated from the area, modern day lakes Crescent and Sutherland were connected. Both lakes emptied into Indian Creek and then into the Elwha River. A large landslide separated the two lakes, causing Lake Crescent to rise until it formed a new outlet via the Lyre River. The slide occurred near the northeast corner of Lake Crescent and originated from the north valley wall where Highway 101 now crosses from the Elwha to the Lyre watershed.

The topography of the watershed is one of extremes. Lake Crescent is enclosed by steep ridges on all sides. Elevations range from approximately 575 feet at lake level to roughly 1,500 feet on the northern ridge, and 4,500 feet on southerly ridges. Evidence of the underlying rock formations can be seen in the depth of the stream channels on the major north and south slopes and in the lake. Streams on the north side of the watershed are underlain by harder basalt which

is resilient to down cutting. Over time, this resistance to erosion has produced a fairly even slope with relatively shallow stream valleys. The south slope, which is formed in a softer sandstone base typically has much deeper and more numerous stream channels.

Soils have formed from a variety of geologic materials. No official soil classification or mapping has been conducted within Olympic National Park, however, some generalizations about soil characteristics can be made based upon mapping and classification conducted by the Washington State Department of Natural Resources and the U.S. Department of Agriculture's Natural Resources Conservation Service for areas adjacent to Olympic National Park that contain the same parent material.

In general, soils tend to be thin and poorly developed due to glacial scouring of the bedrock of the northern foothills belt (Brown and Grower 1960). Subsoils strongly resemble original bedrock material. Upland soils are typically well drained, with low to moderate water retention and very high infiltration rates. Soils along the lakeshore contain greater amounts of clay and are poorly drained. Sensitive soils are associated with steep slopes, incised stream channels, unstable bedrock, and water seepage areas. There is evidence of mass slope failure within the watershed; four areas of landslide deposits have been mapped by the U.S. Geological Survey. Additionally, rockfall along U.S. 101 is not uncommon during the wetter months. During the fall of 1995, a bridge on Camp David Junior Road (North Shore Road) was washed out when a landslide occurred during a period of heavy rain. Based on this history, the potential for on-going mass-wasting (slope failures) is high.

The National Park Service mapped Lake Crescent's landforms in 2006. The project area occurs on four types of landform: valley wall – comprising steep forested slopes between 20° and 60° from the ridge top to the lake surface; debris aprons – a zone of debris accumulation at the base of a mountain slope comprised of colluvium and till; debris cones – sloped, conical debris deposits usually associated with small drainages; and terraces – level surfaces comprised of glacial till, which are remnants of a previous outwash flood plain. Nearly the entire eastern portion of the current Spruce Railroad Trail occurs on valley wall. Beyond the point defined as USGS Benchmark 581, just west of the railroad tunnels, the trail travels across a debris apron, occasionally split by large debris cones. On the western portion of the ODT (Phase 1 of the project within Olympic National Park), the old railroad grade travels across several sections of remnant terrace, comprised of glacial outwash materials.

There are several areas along the existing Spruce Railroad Trail and Phase 1 of the ODT where rock slide and debris flow activity is ongoing. In some sections of the trail vegetation has become established on materials deposited by slide activity.



Figure 3. Lake Crescent sunset (NPS)

## **Water and Hydrology**

Lake Crescent is a pristine deep-water lake of glacial origin located 15 miles west of Port Angeles in the northern portion of Olympic National Park. Situated between the Strait of Juan de Fuca's coastal foothills and the main range of the Olympic Mountains, the lake is 11 miles long, with a surface area of 8 square miles that comprises 17% of the total area of the watershed. The lake elevation is approximately 579 feet, with a mean depth of 332 feet and a maximum depth of 624 feet off of La Poel Point.

Surface water temperatures between June and September typically range from 57° F to 68° F, with the lowest temperatures recorded off La Poel Point. About 50% of the surface area overlays waters deeper than 312 feet. The watershed is 39 square miles, excluding the lake area, with 32 streams feeding the lake. Of these, 22 are intermittent. Only one stream, the Lyre River, drains the lake.

Barnes Creek is the largest tributary to the lake, with significant inflow also provided by La Poel and Piedmont creeks plus approximately 15 smaller perennial streams. These streams are high gradient but stable with no glacial influence. The Lyre River exits the lake at its northeast corner. The Lyre River flows north 5¼ miles to the Strait of Juan de Fuca. A major roadway, Highway 101 is located along the south shore and the historic Spruce Railroad grade runs along the north shore of the lake. Both of these transportation corridors cut through riparian areas.



**Water Quality** - several water quality studies (Lake Crescent Water Quality Status Report 1984-1989 and Trophic Status and Assessment of Non-Point Nutrient Enrichment of Lake Crescent, 1991) were conducted for the purpose of establishing a baseline for further water quality testing within Lake Crescent watershed. Conclusions derived from these studies indicate that the lake is in extraordinary condition. Lake Crescent has been characterized as an oligotrophic lake with no problems requiring any form of mitigation (NPS 1991a). Oligotrophic lakes are low in nutrients, thereby limiting the growth of algae. The Washington State Department of Ecology uses Lake Crescent as a reference lake in its ongoing study of freshwater lakes in Washington, due to its pristine water quality.

Drain fields and septic tanks close to the shoreline are at risk of exposure as a result of erosive forces associated with extreme winter storms. However, studies completed in the late 1980s found no indication of pollution from septic systems. No water quality information is available for streams and remote lakes in the watershed.

Potential sources of water pollution include unburned fuel released from two-cycle engines, spills or leaks from gas pumps, and gas tanks on motorized watercraft. Runoff from parking lots is also a potential source of non-point pollution. Expansion or construction of parking facilities, unless adequately designed to treat and store surface runoff, may result in increased amounts of these pollutants into Lake Crescent. Unexpected events such as hazardous material spills from vehicles along U.S. 101 are a significant concern of Olympic National Park.

**Limnology** - despite its popularity and prominence, little limnological work has been conducted on Lake Crescent. Most of the studies to date have been of a limited nature, focusing largely on fish. Only recently has attention begun to be turned towards long-term monitoring of water quality and acquisition of basic limnological data such as seasonal physical/chemical profiles in the deep basins, seasonal and inter-annual nutrient dynamics, and plankton and algal dynamics (Meyer and Fradkin 2002).

## **Air Quality**

The 1963 Clean Air Act, as amended (42 USC 7401 et seq.) requires land managers to protect air quality. Section 118 of the Clean Air Act requires national parks to meet all federal, state, and local air pollution standards. Olympic National Park is designated as a Class I area as defined by the Clean Air Act, as amended. All areas immediately surrounding the park are considered Class II areas. Class I areas are afforded the highest degree of protection under the Clean Air Act. This designation allows very little additional deterioration of air quality. Protecting the overall park visibility and impacts on the views that are most important to park visitors is a management concern. Pristine air quality is important to the visitor experience because it allows the long-range scenic views of the Olympic Mountains. Air quality is also important for human health and the preservation of natural and cultural resources.

## Biological Environment

### Vegetation and Wetlands

**Vegetation** - On the Olympic Peninsula, vegetation patterns reflect environmental gradients of moisture and temperature. Moisture increases from east to west and from lower to higher elevations. Temperature decreases from lower to higher elevations. The direction the slope faces affects these variables as well.

Vegetation within the Lake Crescent watershed is influenced by many factors including precipitation, topography, bedrock material, soils, slope, aspect, wind, landslides, fire, and human use. Vegetation can be classified within three major zones: the western hemlock, silver fir, and mountain hemlock zones (Henderson et al. 1989). The entire project area is located within the western hemlock zone. This is the most widespread zone in the park. Located inland and at higher elevations than the Sitka spruce zone, climatic extremes are somewhat greater here.

Dominant tree species are western hemlock, Douglas-fir, and western red cedar; very old stands may lack Douglas fir because it is less shade-tolerant than the other two species and more dependent on fire or other disturbance for regeneration. Madrone is also found within the project area. Common shrubs include salal, vine maple, Oregon grape, red huckleberry, Alaska huckleberry, salmonberry, and rhododendron. The understory also contains a variety of ferns and mosses.

Some botanists describe Lake Crescent as the place where “east meets west” in terms of vegetation of the Olympic Peninsula. Species common to the western peninsula, such as Sitka spruce and Oregon oxalis are relatively uncommon east of Fairholme. Conversely, grand fir, which is common on the eastern side of the Olympics, is not known west of Fairholme. Similarly, madrone is found at Lake Crescent and farther east on the Olympic Peninsula, usually on dry sites at low elevations (Franklin and Dyrness 1988, Buckingham et al. 1995). It is not found further west on the peninsula.



Figure 4. Oregon oxalis (NPS)

Several disjunct populations of plants are found within the watershed. Disjunct populations are relatively small populations of plants that are separated, often by hundreds of miles, from the

main population. Poison oak (*Toxicodendron diversilobum*) is found along the northern and eastern shores of Lake Crescent, the only known locations for it on the north Olympic peninsula. Yerba de selva (*Whipplea modesta*), known mainly as a plant of the Oregon and California coast, is found at only two locations on the Olympic Peninsula, one of them Lake Crescent. The seaside juniper (*Juniperus maritima*), found only in southwestern British Columbia and northwestern Washington, was previously considered a disjunct population of Rocky Mountain juniper (*Juniperus scopulorum*) (Adams 2007, Adams et al. 2010). It occurs at several locations on the north Olympic Peninsula, including Lake Crescent (Adams et al. 2010).

**Rare and Sensitive Plants** - The list of threatened or sensitive plant species in the park is reviewed and revised as necessary to maintain an up-to-date database. Based on information provided by the U.S. Fish and Wildlife Service, there are no federally listed, proposed, or candidate plant species likely to occur within the project area. However, there is one vascular plant species of special status as listed by the Washington State Natural Heritage Program within the project area: water lobelia (*Lobelia dortmanna*), which is listed as “threatened.” Branching montia (*Montia diffusa*) has been found within a few miles of the Lake Crescent watershed (outside of the park). This species is listed as “sensitive” (i.e., vulnerable or declining with the potential to become endangered or threatened). Areas where soil and/or vegetation may be disturbed should be surveyed for branching montia.

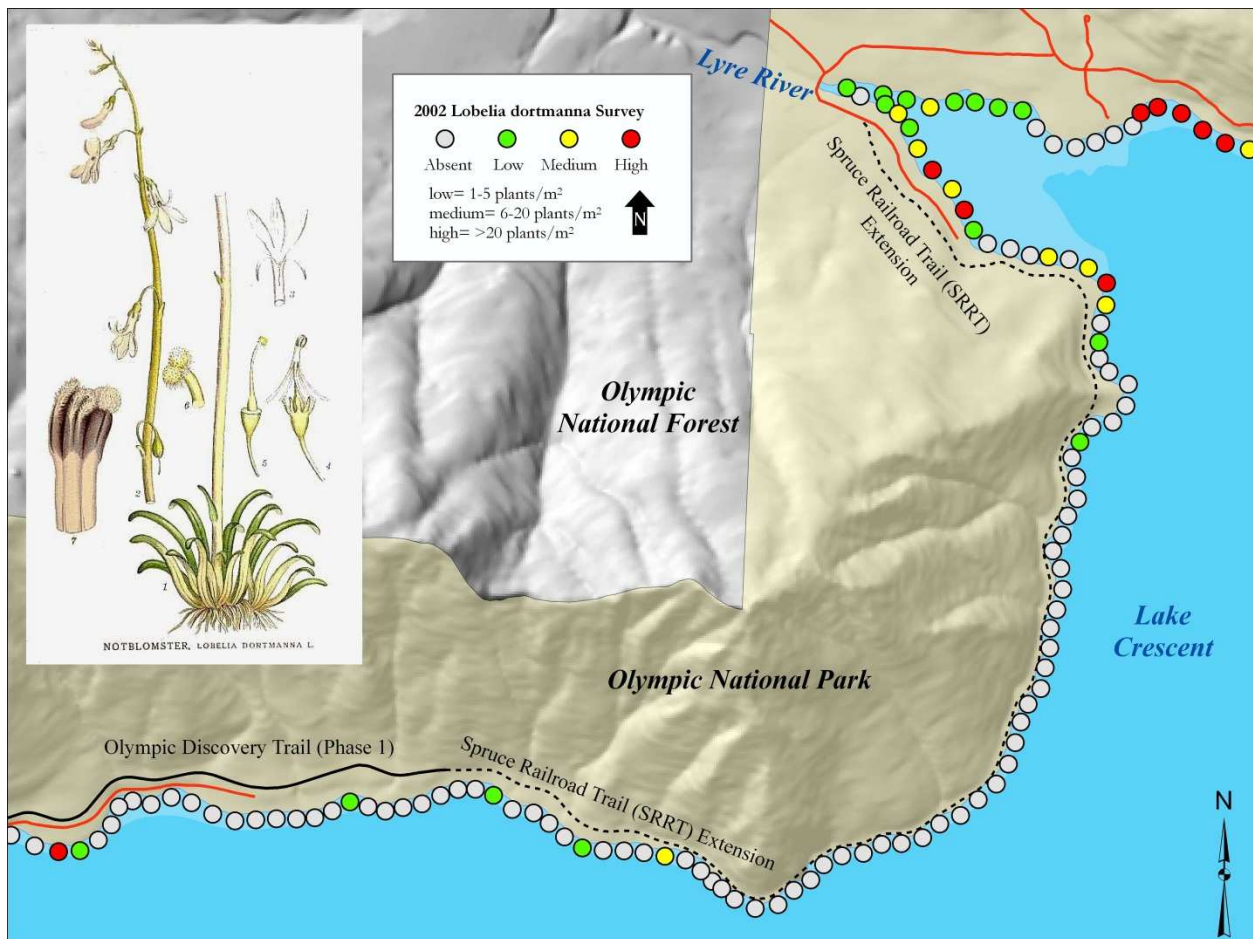


Figure 5. Map showing locations where water lobelia was found during a 2002 survey.



Water lobelia is an evergreen, perennial aquatic plant which is usually submerged except for some flowering stalks. The leaves consist almost entirely of a basal rosette. The plant is found in shallow water on the edges of lakes and ponds. The species occurs in nutrient-poor water bodies with exceptionally clear water. The basal leaves of the *Lobelia* are harmed by sediment, which can't photosynthesize if they are covered. It is susceptible to damage from application of herbicides to control aquatic weeds, shoreline development, water pollution from recreational equipment, and trampling (Washington Natural Heritage Program Field Guide to Selected Rare Plants, <http://www1.dnr.wa.gov/nhp/refdesk/fguide/htm/fgmain.htm>, viewed June 22, 2011).



Figure 6. Water lobelia (*Lobelia dortmanna*) “with peduncles raising flowers towards the water surface. *Lobelia dortmanna* grows in low-alkaline lakes and is one out of several submerged plants that takes up CO<sub>2</sub> for photosynthesis from the sediment” (USGS)

**Forest Stand Disturbances** - Forest stands within the watershed have experienced a great deal of disturbance at various times, including fire, wind, and logging. Fire plays a major role in altering the forest structure, and available information indicates significant fire activity within the Lake Crescent watershed. Major fires have moved through the watershed during periods of drier climactic conditions. The most notable was in 1701, when much of the Olympic Peninsula, from the Hood Canal to the northwest tip of the peninsula, was burned (Agee 1993).

Other major fires moved through the watershed during the late 1800s into the early 1900s. One of these fires, which occurred sometime between 1850 and 1890, burned a large portion of the Barnes Creek drainage. The Sol Duc burn of 1907 is pictured below. In 1914, a large area on the north side of the watershed west of Pyramid Peak was burned. Two fires in July of 1919, started by a defective flue on the Spruce Production engine, burned over 300 acres near Muller summit and the other, a crown fire on the north side of the lake (Rixon 1919). Fires in the more recent

past have been relatively small (a few acres) and caused by escaped campfires or lightning strikes along surrounding ridge tops.



Figure 7. Sol Duc burn 1907 (OLYM1840093)

Prior to the creation of Olympic National Park in 1938, the Lake Crescent area was under the management of the U.S. Forest Service, which may have allowed timber harvesting within the watershed. Trees were also removed for the construction of homes and summer cabins around the lake, and during World War I, along the Spruce Railroad. In the mid-1950s the park utilized timber salvage and exchange operations to fund the purchase of private land. Olympic National Park records from 1953 to 1957 indicate that approximately seven million board feet of timber were removed from the township (T30N R9W) within this area.

Because the Lake Crescent watershed has experienced a good deal of disturbance, there is considerable diversity of forest stand structure. The majority of the watershed is in old-growth forest (52%), followed by mature stands (39%). The remaining nine percent is in young forest, shrubs, meadows, and rocks.

**Nonnative Species** - Over 200 nonnative plant species are found in the park. Some of the most commonly found nonnative plants include Scot's broom (*Cytisus scoparius*), English holly (*Ilex aquifolium*), English ivy (*Hedera helix*), reed canarygrass (*Phalaris arundinacea*), Canada thistle (*Cirsium arvense*), herb Robert (*Geranium robertianum*), giant knotweed and close relatives (*Polygonum cuspidatum*, *Polygonum sachalinense*, and *Polygonum x bohemicum*), and Jerusalem star (*Hypericum calycinum*). Most park nonnative plants are perennials, which are the most persistent and difficult plants to control or eradicate. Attempts to limit species invasion by hand pulling, use of select herbicides, and other techniques on known sites has had some success

in certain areas of the park. Most nonnative plants are found in disturbed frontcountry areas and near park roads, however, nonnative plants occur in both wilderness and the frontcountry of the park, including within the Spruce Railroad Trail project area.

**Wetlands** - The presence of certain soil types, plant species, and water define wetlands. Wetlands are found in the interior of the park and along the coast and serve important functions including flood protection, erosion protection, sediment filtration, and water storage for release during droughts. Wetlands provide habitat and food for a variety of animals including mammals, fish, birds, insects, and microscopic organisms. Wetlands also provide other benefits such as recreation and opportunities for learning and research. Freshwater wetland ecosystems in the park include ponds, marshes, seasonally flooded meadows, and riparian areas.

Lakes and wetlands are catalogued as waterbodies in the park's geographic information system (GIS) database. According to this database, there are about 650 lakes and wetlands, including more than 300 high mountain lakes, totaling 13,978 acres in Olympic National Park. This number is derived from the National Wetlands Inventory, and is likely an underestimate because mapping did not include many of the forested wetland areas of the park.

The Lake Crescent watershed contains 22 wetlands identified on National Wetlands Inventory maps (Fish and Wildlife Service National Wetlands Inventory maps, 1987). Most of these wetlands are located in the upper reaches of the watershed and are classified as palustrine or riverine wetlands.

An initial assessment of the Spruce Railroad Trail (SRRT) project area found several areas with wetland characteristics. These areas include lands adjacent to the SRRT parking lot, several small areas along the existing SRRT that are currently spanned by small trail bridges, a wetland of undetermined size to the east of the rail grade in the Sol Duc area, and the shoreline at the outlet to the lake.

## **Wildlife and Wildlife Habitat**

Large native mammals found within the project area include Roosevelt elk, Columbia black-tailed deer, black bear, and cougar. Nonnative mountain goats, which were introduced into the park in 1925 and 1929, are commonly observed at higher elevations within the watershed. Columbia black-tailed deer are frequently seen in clearings and forest margins around the lake, while Roosevelt elk are rarely seen, and then only on the western and southern portions of the watershed. Black bear are common throughout the area. Cougar are occasionally seen near Lake Crescent, as they are throughout the park. River otters inhabit the lake and can sometimes be seen swimming and playing along the shore. Fishers were recently reintroduced in the park, and several have established home ranges around Lake Crescent.

Douglas squirrels and chipmunks are frequently-seen residents along the lake, and Pacific Townsend's big-eared bats occupy the two Spruce Railroad tunnels. A variety of other smaller mammals, such as snowshoe hares, mountain beaver, flying squirrels, spotted skunks, raccoons,



voles, and mice are less readily noticed by visitors. Several species of amphibians and reptiles occur in the area, including the rarely seen rubber boa and alligator lizard.

Resident bird species found in lake and riparian habitats of the Lake Crescent area include pied-billed and western grebes; great blue and green heron; wood duck; green-winged teal; mallard; northern shoveler; northern pintail; hooded, common, and red-breasted mergansers; American coot; osprey; and belted kingfisher.

Expected year-round woodland residents include sharp-shinned, Cooper's, and red-tailed hawks; northern goshawk; merlin; sooty and ruffed grouse; killdeer; band-tailed pigeon; western screech, barred, great horned, northern pygmy, and northern saw-whet owl; red-breasted sapsucker; downy, hairy, and pileated woodpecker; northern flicker; gray and Steller's jay; American crow; common raven; black-capped and chestnut-backed chickadee; bushtit; red-breasted nuthatch; brown creeper; Bewick's and winter wrens; American dipper; golden-crowned, savannah, and fox sparrows; red crossbill; pine siskin; and evening grosbeak. The European starling and house sparrow are introduced species, found in developed areas throughout the watershed, and domestic turkeys have been released near the area and are occasionally seen in or near the park.

Migratory birds breeding in the Olympic lowlands, including Lake Crescent, include common nighthawk; rufous hummingbird; western wood-pewee; willow, Hammond's, Pacific-slope, and olive-sided flycatcher; tree, violet-green, northern rough-winged, cliff, and barn swallow; Swainson's thrush; solitary and warbling vireo; yellow, orange-crowned, yellow-rumped, Townsend's, black-throated gray, MacGillivray's, and Wilson's warbler; western tanager; black-headed grosbeak; white-crowned sparrow; brown-headed cowbird; and American goldfinch. Non-breeding migrants coming through the Lake Crescent area include trumpeter swan; turkey vulture; solitary and spotted sandpipers; glaucous-winged gull; ruby-crowned kinglet; Townsend's solitaire; and hermit thrush.

Species of special concern include a pair of bald eagles which have been observed nesting within the watershed for many years; there may be more bald eagle activity in the area, but without an active monitoring program this cannot be confirmed. Various park research studies have documented northern spotted owl and Vaux's swift, both dependent on old-growth forests, nesting within the Lake Crescent watershed. Park biologists have observed marbled murrelets, also dependent on old-growth forests, and harlequin ducks, both believed to nest in the area.

### **Unique or Important Fish or Fish Habitat**

Lake Crescent supports a unique assemblage of fish populations that evolved in response to the distinctive geologic history of the region. The lake was historically connected to the Elwha River basin through an outlet draining to the east, through the Indian Creek valley. Anadromous fish occupied the area after the retreat of the Cordilleran ice sheet but a massive landslide within the last 10,000 years isolated the lake from the Elwha basin (Tabor 1987). As the water level rose, a new outlet formed down the Lyre River drainage. A waterfall a short distance downstream from the new outlet left the fish landlocked.

Two endemic trout species - the Beardslee trout (*Oncorhynchus mykiss*) and the Crescenti trout (*O. clarkii*) - evolved in Lake Crescent. Both Beardslee and Crescenti trout were originally identified as distinct species, though subsequently each was reclassified as a variety of rainbow and cutthroat trout respectively. Other fish species present in the lake are kokanee salmon (*O. nerka*), prickly sculpin (*Cottus asper*), pygmy whitefish (*Prosopium coulteri*), and perhaps Pacific lamprey (*Lampetra tridentata*) (Meyer and Fradkin, 2002).



Figure 8. Crescenti trout (*O. clarkia*) ([forum.varalicar.com](http://forum.varalicar.com))



Figure 9. Beardslee trout (*Oncorhynchus mykiss*) (USFWS)

Kokanee salmon are believed to be the most abundant fish species in Lake Crescent and have been identified as the primary food source for the adult Beardslee and Crescenti trout (Scheffer 1935; Garlick 1949; Pierce 1984; Meyer and Fradkin 2002). Kokanee eggs are also a significant food source for the juvenile trout (Pierce 1984). Stomach content analyses of larger trout in the lake have found that nearly all prey items were kokanee (Garlick 1949). Little information exists on the status of pygmy whitefish, prickly sculpin, or Pacific lamprey, although whitefish spawning has been video documented at depths in excess of 100 feet.

In the early 1990s, both Beardslee trout and Crescenti trout appeared to be at risk of extirpation. Annual spawning ground surveys accounted for less than 100 individuals of each species (Meyer and Fradkin 2002). Beardslee trout in particular were at risk, as they are known to spawn solely in a 1-acre section of gravel at the outlet of Lake Crescent. Crescenti trout, also in very low abundance, have developed a number of unique life history traits - including multiple spawning locations that include tributaries to the lake, the lakeshore, and downstream in the Lyre River

lake outlet. These several locations buffer the potential for a catastrophic event to decimate the population.



Figure 10. Beardslee Trout at La Poel ca. 1925. Right - Ed Brooks and Jack Riedel - left (POL.009.005).

Included within the Olympic National Park boundaries at the park's inception in 1938, Lake Crescent has always been one of park's most popular visitor attractions, now drawing more than half of the park's annual visitors (National Park Service 1998). The large body size and fighting strength of the lake's trout populations have long made Lake Crescent a popular destination for angling (Jordon 1896; Webster 1923; Garlick 1949).

From 1913 to 1975, approximately 14,000,000 hatchery origin fish were released into Lake Crescent in an attempt to support the lake's popular fishery (Meyer and Fradkin 2002). Nearly 8,000,000 of these releases were of kokanee salmon, intended to provide a food source for the larger trout species. Other releases included Beardslee and Crescenti trout collected from the lake and raised in a hatchery located on Barnes Creek. Kamloops trout, Westslope cutthroat trout, Yellowstone cutthroat trout, lake trout, Eastern brook trout, and other non-native rainbow trout populations had been released as well. The extent to which these hatchery releases affected the native trout population is unclear, but it does not appear that any non-native trout populations of Kamloops Trout, Westslope or Yellowstone cutthroat trout, or Eastern brook trout have become established.

Resource management actions taken to date in an effort to preserve the lake's unique fish populations have focused on harvest regulations intended to minimize direct fishing mortality, stock assessment surveys targeting the Beardslee and Crescenti trout, and land and water use



practices intended to ensure critical habitat for the Beardslee and Crescenti trout remains intact. Since 2001 catch-and-release fishing regulations have been implemented on the lake. The abundance of both Beardslee and Crescenti trout has slowly grown, though annual spawning escapement estimates for both species remain well under 500 fish. The status of the kokanee population is less well understood, but recent work by the park's fisheries program is providing insight into the population's relative abundance and spawning distribution.



Figure 11. Map showing Beardslee Trout spawning area.

## **Threatened and Endangered Species**

Under the Endangered Species Act (ESA) of 1973, as amended, an endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. No critical habitat has been formally designated within Olympic National Park for marbled murrelet and northern spotted owl, although much of the park contains high quality habitat that is considered important for the recovery of the species. Critical habitat was not designated because habitat in the park is not thought to require special management consideration or protection by virtue of its national park status.

Section 7 of the ESA mandates all federal agencies to determine how to use their existing authorities to further the purposes of the ESA to aid in recovering listed species, and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

The U.S. Fish and Wildlife Service has identified two listed T and E (threatened or endangered) avian species that are known to occur in the Lake Crescent watershed and likely nest here; the marbled murrelet and northern spotted owl, both classified as threatened.

**Marbled Murrelet (*Brachyramphus marmoratus*)** - The marbled murrelet is a pigeon-sized seabird that lives primarily in the near-shore marine environment but nests in old-growth forests up to 50 or more miles inland. Suitable nesting habitat for murrelets consists of old-growth coniferous stands that are multilayered with moderate to high canopy closure. Potential habitat of this type occurs along the major drainages in lower elevations in the park, overlapping most of the suitable habitat for the northern spotted owls. Murrelets will occasionally nest in younger stands if remnant large trees or deformities provide large enough limbs.



Figure 12. Marbled Murrelet winter plumage (NPS)

Murrelets occur within all the major drainages within the park. Habitat considered suitable for murrelet occupation includes forested areas to 3,500 feet on the east side of the park, and to 3,000 feet on the west side of the park, including the Sol Duc and Lake Crescent watersheds.

Approximately 327,000 acres of forested area within the park is considered suitable marbled murrelet habitat. The park represents the largest contiguous block of suitable nesting habitat remaining within the listed range of marbled murrelets in the lower 48 states. Inland surveys have been conducted according to Pacific Seabird Group protocols in all developed areas and in a sampling of backcountry valleys. Murrelet presence was documented at every site surveyed. Approximately 83% of sites surveyed in the park were occupied.

The park is located in two different murrelet recovery zones (Zone 1: Puget Sound and Zone 2: Western Washington Coast Range). The line of demarcation between the two zones essentially bisects the park on a northwestern to southeastern diagonal. Murrelet populations in both zones

have declined over the last decade, including an estimated 50% decline in Zone 1 (USFWS 2011).

For purposes of analysis, the murrelet breeding season in Washington is broken into two periods: early breeding season is April 1 through August 5, and late breeding season is August 6 to September 15.

**Northern Spotted Owls (*Strix occidentaliscaurina*).** Northern spotted owls have large home ranges containing extensive acreage of old-growth forest to meet their habitat needs. There is extensive suitable habitat for spotted owls in the park, primarily in lower elevations of major drainages. Spotted owl habitat is similar to that for marbled murrelets but extends to higher elevations in the park. The park's interior (exclusive of the Pacific coastal section and the Queets River corridor) contains about 494,000 acres of forested areas that are considered potential spotted owl habitat. The park represents the largest contiguous block of suitable nesting habitat remaining within the listed range of northern spotted owls. One concern is the trend of lower elevation areas increasingly being used by barred owls rather than spotted owls. Northern spotted owls formerly occurred along the north shore of Lake Crescent in the project area but none have been detected since 2002, despite regular monitoring of both known territories. The lakeshore area is heavily used by barred owls and as a result it is unlikely that spotted owls will use this area for nesting or roosting.

For purposes of analysis, spotted owl breeding season in Washington is broken into two periods: early breeding season is March 1 through July 15, and late breeding season is July 16 to September 30.

One candidate species for listing under the Endangered Species Act that occurs at Lake Crescent is the Pacific fisher, which is found in forested habitats along the lake, including in the project area.



Figure 13. Pacific Fisher (NPS)

Federal species of concern that occur in Clallam County and may be found near Lake Crescent include four bird species: bald eagle (which nests and forages on the lake), northern goshawk, peregrine falcon, and olive-sided flycatcher; three bat species: Pacific Townsend's big-eared bat (have been detected in the area during a survey of mine sites at the lake), long-eared myotis, and



long-legged myotis; four amphibian species: Olympic torrent salamander, tailed frog, Van Dykes salamander, and western toad. Olympic torrent salamander and tailed frogs can be found in swift and cool streams which feed into the lake. Van Dykes are terrestrial salamanders that are most often associated with moist areas such as streams and seeps. Western toads can be found in shallow lakes and ponds.



Pacific Townsend's  
Big-Eared Bat



Van Dykes Salamander



olive-sided flycatcher



western toad

Water lobelia (*Lobelia dortmana*) is not a federally listed T and E species, but it is listed as a rare plant within Washington State. It grows in shallow areas along the edge of Lake Crescent. Further information about this plant is provided in the vegetation section.

## Cultural Environment

The Lake Crescent basin contains a rich cultural history. The lake's earliest residents have left physical remnants of the past, as well as descriptions of past events as stories that describe the landscape. The natural beauty of the area attracted people to Lake Crescent and many resorts were built to support early recreational use of the lake.

The area's logging history begins with the U.S. Army's Spruce Production Division Railroad #1 in World War I, continuing with use of the railroad line and additional spurs for post-war logging. Manganese mining took place on the lake in the early 1900s and transportation of manganese was also facilitated by the logging line.

Transportation through the area, beginning with the first Indian canoes, and followed by steamboats, and side-wheeler ferries, was primarily by water over Lake Crescent. The *Lady of the Lake*, a small steamboat began trips from Piedmont to Fairholme as early as 1891. In 1914-1915 Clallam County began operating the ferries *Marjory* and *Storm King*, which were capable of carrying cars and wagons, as well as passengers to each end of the highway before it was built around the lake. The *Betty Earles* was a small gasoline-powered vessel built in 1913 on Lake Crescent and was probably one of two ferries used by the Spruce Production Division while building the railroad. A few submerged pilings from old docks and moorings can still be found from by-gone days where resorts and homes were located.



Figure 14. Spruce Railroad officer and the *Betty Earles* (FUL.001.006)

The Spruce Railroad, constructed during World War I, is described in detail later in this chapter. Construction of U.S. Highway 101 began in 1922, providing greater access to and around the Lake Crescent area.

## Cultural Resources

“Cultural resources” is a term used in reference to aspects of a cultural system that are valued by or significantly representative of a culture or that contain significant information about a culture, but may, or may not yet evaluated for eligibility to the National Register of Historic Places. A cultural resource may be a physical object or a cultural practice.

NPS manages five different types of cultural resources based on disciplines. The five types are:

- **Archeological Resources.** The remains of past human activity recorded and documented through scientific analysis of archeological features and artifacts. Archeological resources can be found above and below ground and may date back thousands of years or to more recent historic archeology (50 years or older).
- **Historic Structures.** A building or other structure (such as a bridge, mine, canal, ship, highway, railroad, or locomotive) that is significant because of its link to an important period in the past. Areas with a large number of historic structures may be designated as historic districts.
- **Cultural Landscapes.** Settings that humans have created in the natural world. They reveal fundamental ties between people and the land, a pattern of things both natural and constructed.
- **Ethnographic Resources.** Park sites, structures, objects, landscapes, and natural resources that traditionally associated people define as significant to their present way of life.
- **Museum Objects.** The objects, specimens, archival, and manuscript collections that are valuable for the information they provide about processes, events, and interactions among people and the environment. Museum objects can be cultural or natural.

## Archeological Resources

Due to the long history of human use on the north Olympic Peninsula, both prehistoric and historic sites are found at Lake Crescent and in the Sol Duc area. There are six recorded archeological sites along the north shore of Lake Crescent that are potentially eligible for listing on the National Register of Historic Places: Crescent Mine, Log Cabin Creek, Spruce Railroad Dump, and three submerged archeological resources from early shipwrecks.





Figure 15. Ovington's Resort and small marina began operations circa 1895, (HPC-001.337)

Resorts on the lake served as destinations and stopping places for those traveling by ferry to the west end. In addition to Rosemary Inn (1914) and Lake Crescent Lodge (Singer's Tavern 1915) on the south shore, early lodging facilities were established in the vicinity of today's Log Cabin Resort. These were Hotel Piedmont (1895), Hotel Crescent (1906), and on the north shore Ovington's Resort (1895), Delebarre's Lodge (1910s), and Sunshine Lodge (1910s). These locations may yield information about the early resort period as archeological resources or cultural landscapes. One of the resorts was reportedly quarters for the Spruce Production Division.

The historic railroad includes 15 grade segments and one recorded archeological site within the park. There are also several unrecorded archeological sites associated with both the Spruce Railroad and later logging operations on the railroad, including Crescent Logging Company Camp No. 1, known as Sol Duc camp; and Crescent Logging Camp No. 3, known as Piedmont. Additionally, the Crescent Mine or Manganese Station played an important role in early mineral exploration on the Olympic Peninsula and potentially contributes to the significance of the Spruce Railroad. This site included a station and siding where train cars could pick up materials from the mine (Tonsfeldt 2005).

Early homesteading began around Lake Crescent in the 1880s. By the early 1890s there were several homesteads near the Lyre River that had been settled by Mary Hanson Anderson, Michael Carrigan (later misidentified as Harrigan), John Lutz, and Dave Gastman to name a few. By 1892 there were 15 homesteads around the lake. No historic homestead structures remain

today within the affected environment, however the Anderson Homestead has been surveyed and documented as an archeological site and is potentially eligible to the national register.

There is the potential to discover further archeological sites based on the location of these logging camps and railroad stations, the park's Archeological Overview and Research Design by Randall Schalk (1988); the Klallam tribes' knowledge of settlement sites near the Lyre River; and archeological sites consisting of lithic material already documented in the Lake Crescent watershed.



Figure 16. Hanson Anderson homestead east of Harrigan Point, courtesy of John Helpenstill



Figure 17. Crescent Logging Camp, courtesy of Dan Peacock

## Historic Structures

As noted above, historic structures can be a building or other type of structure. The Spruce Railroad was found eligible as a 36-mile long structure. The roadbed or grade being the structural foundation for the track and evaluated to the national register based on the integrity of its features. In the Sol Duc area of the project, a section of historic railroad grade has retained high integrity that demonstrates construction with falsework that has been backfilled (Figure 26).





Figure 18. Rock wall and steps from Ovington's Resort within the park's North Shore picnic area (NPS)

## Cultural Landscapes

The settings that humans have created in the natural world reveal fundamental ties between people and the land, a pattern of things both natural and constructed. Elements of a cultural landscape may be features, such as the dry-laid stone wall and concrete steps where Ovington's Resort was located; or ornamental plantings, orchard trees, fences, posts, or fence lines remaining at a homestead location.

## Ethnographic Resources

The Klallam name for Lake Crescent is *Cálmət*, and the Quileute word for the “moon-shaped” lake is *t @ocholo @okwa @at lokwol*. The Klallam Indians' territory encompasses Lake Crescent, while Quileute territory encompasses the Sol Duc drainage to the west of the lake. Mount Storm King is an ethnographic resource featured in the Klallam's history of the creation of Lake Crescent that ties directly to geological events that happened several thousand years ago. Mount Muller (*tsiya @ xalik wa yo a @axit*) appears in a Quileute story about the Quileute and Klallam (USFS 1995). Early Native American transportation across the lake was likely in hand-hewn canoe more often than walking along the steep lakeshore.





Figure 19. Train coming out of railroad tunnel, courtesy of Dan Peacock

### **The U.S. Army Spruce Production Division Railroad # 1**

The 36-mile Spruce Railroad from Disque to Lake Pleasant is eligible to the National Register of Historic Places as a historic district of national significance based on its association with the U.S. Army Spruce Production Division #1 and World War I (period of significance is 1918-1922), and its potential for industrial archeological knowledge (Tonsfeldt 2009a). This decision was concurred with by the Department of Archaeology and Historic Preservation on March 1, 2006.

The railroad's history was important in the larger context of the timber industry, in that the objective of producing aircraft-quality spruce surpassed labor problems of the time. In 1917 west coast lumbermen were on strike against unsafe working conditions, salary, and poor accommodations so no timber workers were available to harvest the Sitka spruce needed for World War I.

The U.S. Army was put in charge of the Spruce Production Division, utilizing enlisted men in January, 1918 (Tonsfeldt 2006). The Spruce Production Division #1 contracted to build the Spruce Railroad from an area west of Joyce, along the north shore of Lake Crescent to Tyee at Lake Pleasant, as well as 100 miles of logging spurs, and two new saw mills. They also bought the Olympic Hotel in Port Angeles and an unknown lodge on the lake for housing the men and took over operation of two Lake Crescent ferries to facilitate construction of the railroad. The goal was to harvest 2 million board feet of Sitka spruce located in the center of the Olympic Peninsula.

Construction of the railroad began in July 1918. The shoreline of Lake Crescent required stone revetments and timber half-bridges (cribbing) to support the rail bed on the steep bank. The national register nomination states that the “most important segment of the grade” in terms of engineering and features includes these revetments, the two tunnels, and two very large wooden drainage culverts (Tonsfeldt 2009:14,16).

The railroad was nearly complete by the fall of 1918, however, the Armistice on November 11 ended the operation and no Sitka spruce was ever hauled to the mills at Port Angeles or Lake Pleasant for processing. The Lyon, Hill Company of Portland, Oregon purchased the railroad from the government and utilized it as a common-carrier line and logging railroad after the war. The Crescent Logging Company also acquired an interest in the railroad (Rixon 1919). The railroad remained in use as the Port Angeles and Western Railroad until it went bankrupt in 1951 and was then salvaged.



Figure 20. “Log railroad bridge under construction, U. S. Army Signal Corps Railroad, Spruce Production Division, Lake Crescent area.” Asahel Curtis Photo Collection (PH Coll. 482,



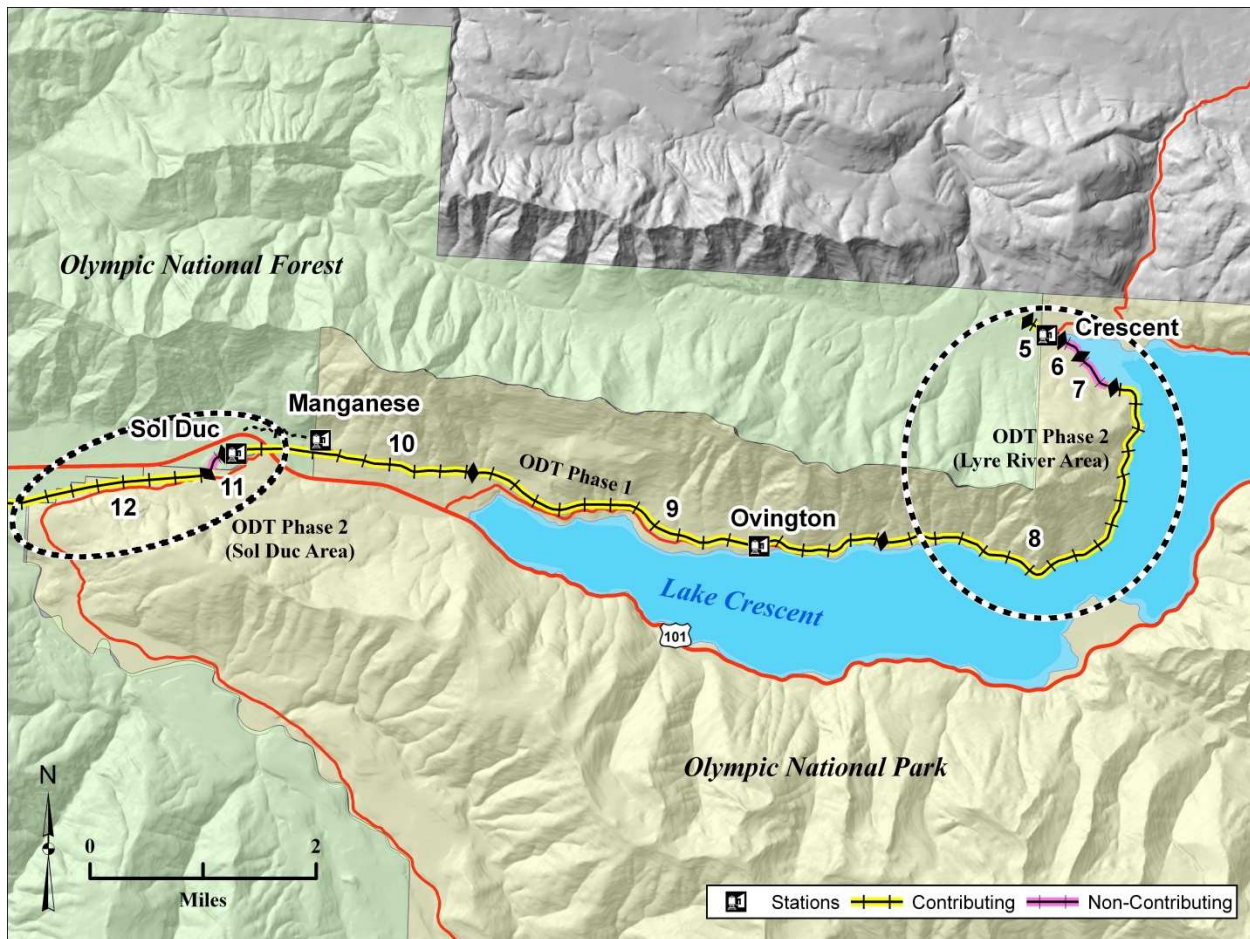


Figure 21. Project area showing National Register segments 5 – 12 and Crescent, Ovington, Manganese, and Sol Duc stations

Integrity is a critical element of a resource’s eligibility to the National Register of Historic Places. For historic railroads the integrity of the following character-defining elements are evaluated.

<b>Civil engineering design</b>	location and route
<b>Construction and earthwork</b>	gradient, curvature, and drainage (cuts and fills)
<b>Features</b>	trestles, bridges, culverts, revetments, tunnels, junctions, sidings, wyes, telegraph poles, wire
<b>Railroad Artifacts</b>	artifacts including track hardware, ties

There are seven important elements that are used to evaluate a national register property: location, design, setting, materials, workmanship, feeling, and association. An example of Spruce Railroad #1 workmanship includes leveling the grade and laying out maneuverable curves in the design. Association is a direct link between an important event or person and a historic property. In the case of the Spruce Railroad the association is with World War I. Some integrity of these elements has been lost on the Spruce Railroad, but enough of three important earthworks; gradient, curvature, and drainage remain to represent the railroad’s scope and scale.

The railroad was designed to carry 400 loaded cars every day, each train consisting of 40 cars. The railroad was significant for its tunnels, Howe truss bridges, and a drainage system built to accommodate streams feeding into Lake Crescent. The existing railroad orientation, ditches, culverts, grade, and sub-grade or ballast retain integrity. The railroad grade of as much as 4 feet or higher was created to allow for runoff and to maintain as level a gradient for the trains as possible. Some cuts and fills exceed 20 feet in order to make the railroad as straight and flat as possible to reduce derailments. The steepest gradient was westbound over the Muller summit between Lake Crescent and Sol Duc divide. Westbound trains were empty so this was an acceptable gradient, but loaded eastbound trains were limited to 1.25%.

There were three sidings designated along Lake Crescent, located about every five miles: Crescent (5.5) Ovington (11), and Sol Duc (17), and an additional siding at the Manganese mine site (15.5). These stations were not depots, but were used as stopping points for freight or railroad service. Sidings were tracks laid parallel to the main line to allow the eight trains that traveled on the railroad each day to pass each other. Sidings were also important day work sites for crews. During the construction period, workers lived in rail car quarters on the sidings. The sidings required a wider roadbed, so their evidence remains in the form of 16-20 foot roadbeds. There is also evidence of habitation above the siding at Ovington's (ODT milepost 1.38), which was probably the tent camp quarters of Palmer, Pearson, and Woods Spruce Production camp #3 who wrote of their recreation activity, diving off a spring board, at Ovington's Resort (Spruce 1918).



Figure 22. Spruce Railroad employee housing on siding (Tonsfeldt 4-38056)



The Commercial Salvage Company bought the railroad and began breaking up the equipment and taking up track for salvage in early 1954, leaving the earthwork design elements of curves, tangents, and gradients. Today evidence of earthwork from the railroad still exists in the form of elevated grade with characteristic cuts, fills, ditches, and borrows. Other railroad features that remain include trestle and bridge approaches, tunnels, wooden culverts, telephone or telegraph lines and poles, timber half-bridges, dry laid fieldstone wall revetment, and cleared areas where there were sidings or spurs.

In order to evaluate the railroad's integrity the railroad is divided into segments and the integrity is segregated into five classes for national register evaluation (Tonsfeldt 2009a). Segments are portions of the grade with uniform integrity. A segment ends when the integrity changes for more than 50 meters. Only small changes in integrity are acceptable within each segment to maintain eligibility.

The first criterion of integrity is the extent to which the features and artifacts remain for us to interpret. A segment in very good condition has ties remaining on the ground and clear evidence of features still visible. Surface artifacts are also visible, indicating that the segment has not been disturbed. At the other end of the condition scale, a very poor segment has only traces of the grade and features left and no surface artifacts remain. Segments in condition classes A and B were considered eligible for nomination. Those in condition class C-E were considered non-contributing.

Nearly half of the original grade is in class B (ties removed, grade retains original dimensions, curves and gradients may be blurred by overgrowth or damage, features can be deduced but may not be apparent, railroad artifacts on surface). Grades and engineering features remain in original condition, but the ties have been removed. Artifacts appear in much lower frequency on B grades than on A grades, and what features remain are less distinct, but could be discovered by excavating below ground.

The Spruce Railroad comprises a series of features tied together by railroad grade. Grade segments were evaluated and those that retained the earthwork and landscape features that can be easily interpreted as a historic railroad within the context of the entire railroad system were found to contribute to the railroad's eligibility. When engineering or landscape features are lost this affects the integrity that makes the railroad eligible. The segments that are included within the affected environment are segments 5-12, of which five segments contribute to the integrity of the railroad (5, 8-10, and 12). The most important segment is number 8, which includes the two tunnels, rail and track hardware, two wooden culverts, timber half-bridge and dry laid fieldstone revetment to provide grade and stabilize the slope along the narrow shore (Tonsfeldt 2009b).

Segments 10-12 lie within the Sol Duc portion of the project (south side of Highway 101). Land ownership of these segments includes DNR, USFS, private property, and Olympic National Park. Segments 10 and 12 are contributing segments. Some of the features that contribute to the eligibility within Olympic National Park include earthwork and railroad artifacts (Tonsfeldt 2005).

In accordance with Section 106 of the National Historic Preservation Act and the archeology scope of work (Conca 2005) park archeologists conducted a pedestrian survey of the grade along the north shore portion of this trail and the Sol Duc segments. The archeologists documented visible features including, cuts, fills, debris flows, ballasts, wooden culverts, rock revetments, timbers from half-bridges, telegraph poles, ditches, and berms. Metal detecting was conducted at 4 locations (Sol Duc and along the Lake Crescent trail). At the west end of Lake Crescent a 100 foot segment was metal detected and 99 hits were marked. 90% of these hits contained metal artifacts.

A detailed inventory has not been conducted at the former stations Sol Duc (private property), Manganese (Phase 1), Ovington (Phase 1), and Crescent (private, USFS, and NPS) where features associated with habitation and day-use could offer evidence of the railroad worker's lives. Timber workers of the later Crescent logging Company were mostly of Norwegian descent and some were local Elwha Klallam according to an interview with a man whose father ran the Crescent camp when he was a boy (Pearson 2010). The men lived in bunkhouses and had a central washroom, light plant, and wood stoves (Pearson 2010). Other items that might tell archeologists about these men's lives include cans for food, tobacco, old boots, ceramic and glass remains, and other ordinary items that were left in places where they live and work. Further work in this part of the railroad's history would contribute to the historic district's integrity and interest.

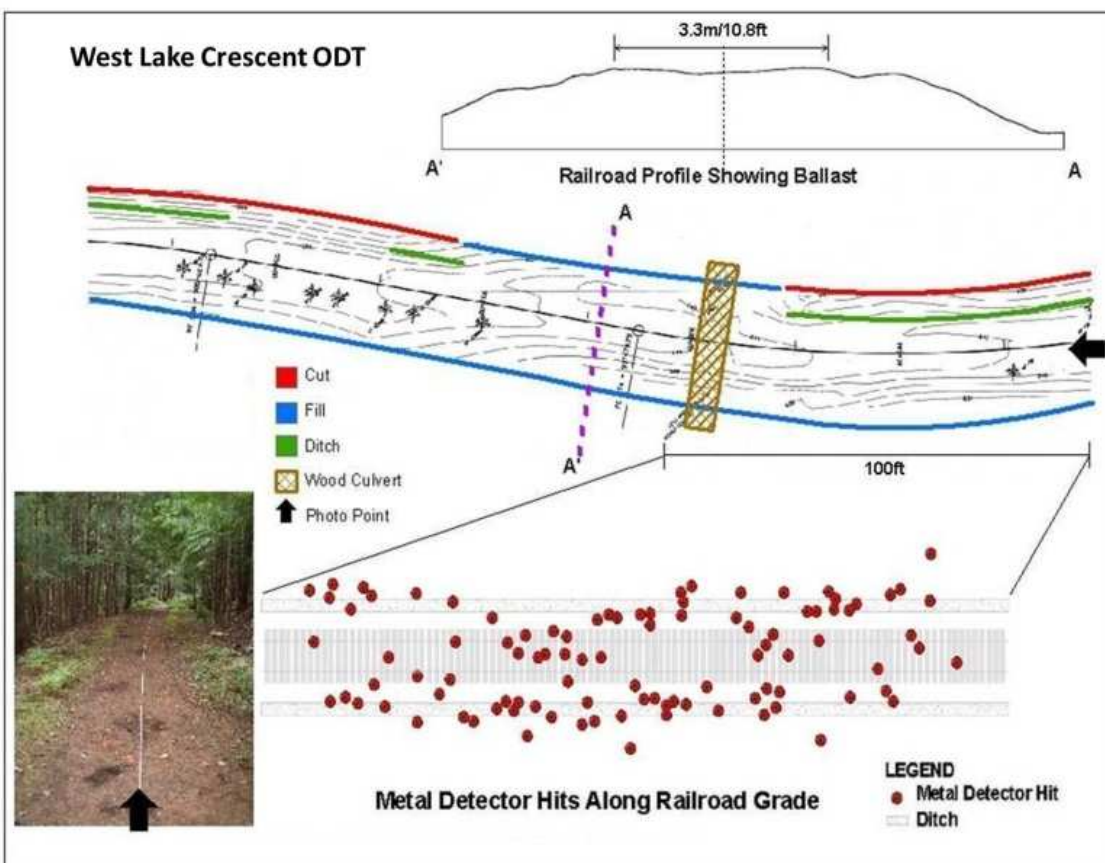


Figure 23. Figure showing area sampled with metal detector along railroad grade near Lake Crescent (Kwarsick)

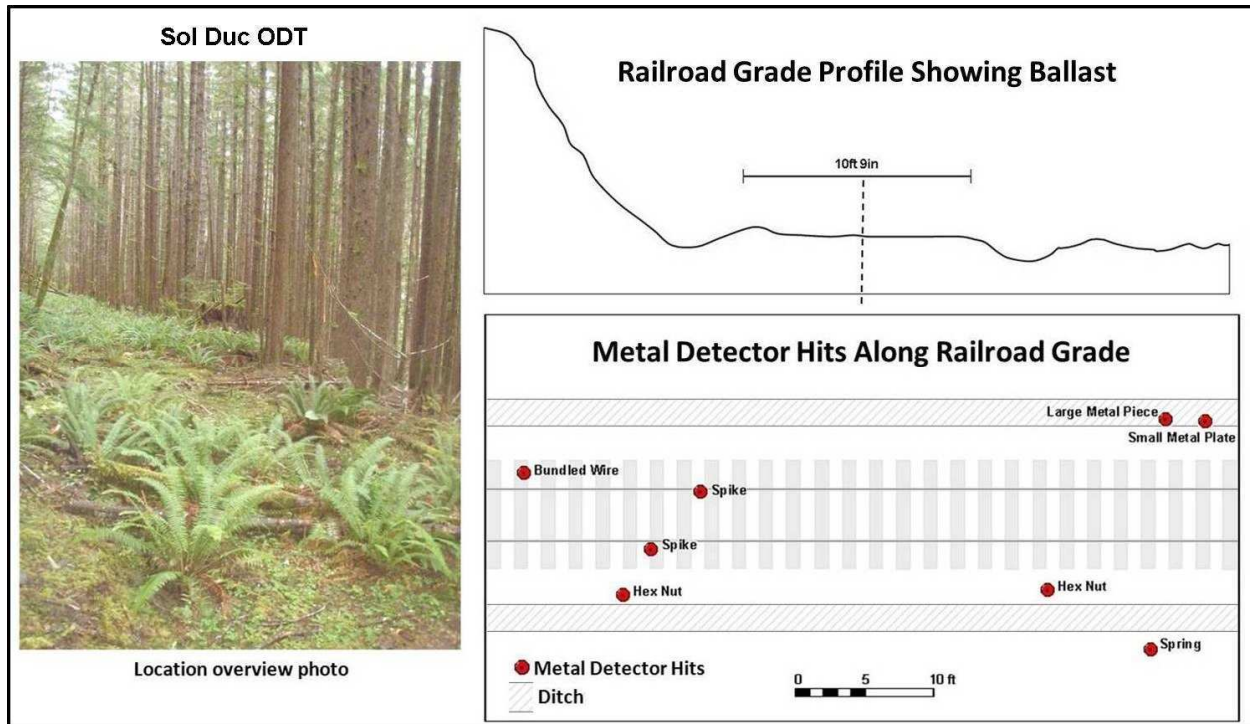


Figure 24. Figure showing area sampled with metal detector along railroad grade in the Sol Duc area (Kwarsick)

Much of the construction of the proposed trail work would involve adaptive reuse of this eligible National Register District. Associated character defining features that still exist include earthwork cuts, fills, and borrows that lowered or raised the grade; drainage systems and wooden culverts; retaining walls or revetments and timber half-bridges to create grade on the steep lakeshore. The latter two are visible from both the trail and the lake.





Figure 25. Historic image of timber half-bridge



Figure 26. Timber half-bridge remains, mile 1.98 (Wray 2011)





Figure 27. Sol Duc area (falsework)

## **Experiential Environment**

### **Visitor Use and Experience**

The Lake Crescent District of Olympic National Park, including the Sol Duc area, is the most highly visited district within Olympic National Park. Over two million visits were recorded in 2010, and nearly one million visits have been counted as of June 30, 2011. Both the Lake Crescent and Sol Duc areas offer a wide range of day use, overnight, front-country and wilderness experience opportunities.

The entire project area considered in this environmental assessment is located within an area that was zoned for day use under the 2008 General Management Plan for Olympic National Park. The day use zone is intended to accommodate high to moderate levels of day use with no campgrounds or overnight lodging. Road access may be via either paved or unpaved roads.

Three NPS concession-operated resorts provide nearby lodging in the district, including Lake Crescent Lodge, Log Cabin Resort, and the Sol Duc Hot Springs Resort. The NPS operates front-country campgrounds at both Lake Crescent and Sol Duc, and a concession campground at the Log Cabin Resort.

### **Visitor Opportunities**

Day use areas provide many opportunities to enjoy park scenery, have educational experiences, and participate in trail and water-based day use recreation. There is minor risk and challenge present in day use areas. There is some opportunity for solitude, remoteness, and the presence of natural sounds. Appropriate activities include scenic driving (providing opportunities for intermediate and distant views of lakes and mountains), motorized and non-motorized boating, hiking, swimming, fishing, and bicycling. Stock use is allowed in designated areas, but no grazing or stock camping is permitted. Day use areas are designed to reduce or avoid user conflicts.

Within day use areas the probability of meeting other visitors will be high to extremely high, crowded on occasion, and may vary seasonally. The likelihood of encountering NPS staff is moderate to high in day use areas.

Day-use within the project area occurs primarily along the existing Spruce Railroad Trail (SRRT), at the North Shore picnic area located off Camp David Jr. Road (CDJR), the Fairholme convenience store and boat rental area located at the intersection of CDJR and Highway 101 near the NPS campground on Lake Crescent, and the Devil's punchbowl, located along the SRRT and accessed via trail and by boat. The Sol Duc area proposed for trail development is not currently managed to provide day use activities, although numerous facilities and recreational opportunities are provided in other areas accessed via the Sol Duc road.

### **Trails**

The existing trail types defined for day use areas include: nature, all-purpose, multipurpose bicycle, secondary, foot, and primitive trails. Some trails are universally accessible. Numerous

trails provide access to the park's wilderness hiking and backpacking destinations in the Lake Crescent and Sol Duc areas. There are two park trails on the north side of the lake that provide access to destinations within the Lake Crescent watershed as well as access into the backcountry. These trails include the 7-mile long Pyramid Peak trail, with access from CDJR and the ODT Phase 1. This trail is currently closed because of a dangerous rock slide. The existing Spruce Railroad Trail (SRRT), which follows the historic railroad grade, begins at the Lyre River outlet or the east end of the North Shore Road (CDJR). A small gravel parking lot is located at the existing SRRT trailhead near the Lyre River. The existing parking lot has space for approximately 8 vehicles and provides a picnic table, bulletin board with trail information, and a vault toilet. There is no developed parking on CDJR at the current SRRT access point, although there is limited space at the end of the road for a few vehicles to park. Neither access point provides turnaround space for large vehicles or vehicles towing long trailers.

The SRRT is an unpaved, non-motorized, multiple use trail. This popular route is the only trail in the park that is currently open to bicycle use, and is a frequent destination for people using the existing ODT Adventure Route. The SRRT does not meet accessibility guidelines due to the uneven terrain, steep grades of some areas, and lack of a firm and stable surface. The trail is very popular with day hikers and trail runners, and is also popular with pet owners, as this is one of very few trails within the park that allow leashed dogs. The trail is also used by people riding on horseback, although the existing trail access points within the park are not suited to people hauling stock trailers. Some visitors access the SRRT near the Lyre River from adjacent private and state lands.

There is currently no trail developed on the historic railroad grade in the Sol Duc area within the park. There is currently a roadside pullout area located within the park just off Highway 101 with limited parking, a vehicle pull-through area, interpretive signs, and a vault toilet. No access to the historic railroad is currently provided.

### **Olympic Discovery Trail (ODT)**

There are approximately 40 miles of completed ODT segments in separate trail corridors. Of the 40 miles, 7.8 miles are a hard pack gravel surface, with the remaining 32 miles paved 8-10 feet wide with an additional 3-4 feet of packed gravel for horses. The Larry Scott Trail from Port Townsend to Blyn, is the 7.8 mile section that is hard pack gravel, which will be paved when funds are available. No horse trail exists on approximately 30% of the trail between Blyn and Port Angeles, either because horses are not allowed in the area or the trail passes through dense residential areas.

There are 13 designated access points for these trail corridors with facilities ranging from parking, toilets, and picnic tables to portable toilets. There are three other access points under construction between Port Angeles and the Elwha River, and construction is ongoing to connect the trail to the lower Elwha Bridge. Parking spaces vary from existing public parking to permission granted by private property owners. Discontinuous paved sections of the trail comprise 10.3 miles, including over six miles built in 2009 within Olympic National Park.

Clallam County received permission from the NPS to construct approximately 6½ miles of new trail on the historic Spruce Railroad grade above CDJR in 2009. This new trail segment, now

known as Phase 1 of the ODT, remains under construction at the time this environmental analysis is being completed.

The Phase 1 segment begins outside the boundary of Olympic National Park adjacent to Highway 101, to the west of Fairholme, and north of the NPS entrance road to Fairholme. The trail extends northeast from Highway 101 into the park. Within the park the 6½ mile trail varies between 12 and 16 feet in total width. This includes an asphalt paved section that is between 8 and 10 feet in width, and adjacent gravel shoulders that vary between ½ to 4 feet in width on each side. This new trail segment follows the Spruce Railroad grade east, paralleling CDJR and ending near the western terminus of the existing Spruce Railroad Trail.

### **Accessibility**

All practicable efforts are made by the NPS to make facilities accessible and usable by all people. This policy reflects our commitment to provide access to the widest cross section of the public and ensure compliance with the Architectural Barriers Act (ABA) of 1968 and the Americans with Disabilities Act (ADA) of 1990, as appropriate.

In choosing methods for providing accessibility, higher priority will be given to methods that offer programs and activities in the most integrated setting appropriate. Special, separate, or alternative facilities, programs, or services will be provided only when existing ones cannot reasonably be made accessible (NPS 2006:1.9.3).

### **Accessibility Guidelines for Outdoor Developed Areas**

Achieving accessibility in outdoor environments has challenges and constraints posed by terrain, the degree of development, construction practices and materials, and other factors. New guidelines have been drafted for outdoor developed areas to clarify how, and to what extent, access can be achieved. These guidelines cover outdoor developed areas managed by the Federal government and are used to inform the development of all trail development alternatives considered in this planning document.

### **Soundscapes**

The natural sounds within national parks are an important natural and experiential resource that the National Park Service seeks to protect and restore. NPS *Management Policies* 2006 state that “the National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks.” Natural soundscapes encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those sounds and the interrelationships of the sounds. Management Policies require protection of natural soundscapes from unacceptable impacts and also restoration of soundscapes degraded from unnatural sounds (noise) whenever possible (NPS *Management Policies* 2006, sec. 4.9).

The NPS is specifically directed to “take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored” (NPS *Management*



*Policies* 2006, sec. 4.9). Superintendents, through management planning, identify what levels and types of unnatural sound constitute acceptable impacts on a park's natural soundscapes.

Olympic National Park is one of the best examples of a natural soundscape found anywhere in the national park system and includes natural sounds that are part of the biological or physical resources of the park (NPS 2008:174). Olympic provides not only one of the most pristine sets of natural sounds in the NPS but also a great diversity of natural soundscapes: crashing Pacific Ocean waves, pouring rain, dripping showers, trickling mist, the bugling of Roosevelt elk, and thunderous avalanches. Natural sounds generally predominate throughout most of the park.

The level of non-natural sounds within Olympic National Park varies by location and time of year, a result of the seasonal nature of visitor numbers and park operations. The majority of non-natural sounds in the park originates in developed areas and along major roads and is generated primarily by visitor use, NPS project activities, and over flights. A source of noise in the Lake Crescent area is traffic noise, including engine-assisted brakes used (illegally) by some commercial trucks on Highway 101, which runs along the lake's south shore.

Impacts to the park's natural soundscapes also originate in areas outside but adjacent to park boundaries such as noise from construction activities or logging operations occurring on nearby private lands. One of the most pervasive impacts to the natural soundscape arises in the airspace over and adjacent to the park. Commercial, military, and private sector aircraft as well as NPS project-related aircraft have a widespread impact on the natural soundscape. In certain areas, such as on the coast or beside a major river, the natural sound level has a volume great enough to override some human-caused sounds.

Sound-sensitive resources and values in the project area include wildlife, visitor experience, and adjacent property owners. Noise, sound that is negatively evaluated (undesired) or extraneous to an environment, can result in an adverse effect by modifying or intruding upon the natural soundscape. Functioning ecosystems depend on natural acoustical environments and wildlife can be adversely affected by sounds and sound characteristics that intrude on their habitats. Noise can interfere with sounds important for animal communication, navigation, mating, nurturing, predation, and foraging. Noise can also adversely affect park visitor and area resident experiences by intruding upon or disrupting experiences of solitude, serenity, tranquility, contemplation, or a completely natural or historical environment.

Maintenance of the existing SRRT and associated parking lots and access roads requires the use of motorized vehicles and equipment that alter the natural soundscape. Chainsaws are used to clear downed trees from the trail; construction equipment is used to maintain the grade of the existing gravel roads and parking lot. Vehicles are used to access the trailheads to service the existing vault toilets and remove trash.

## **Scenic Values**

The Lake Crescent watershed offers abundant scenic resources; from the lake itself to the surrounding mountains, forests, rocky outcrops, and clear-flowing streams. Nestled in the deep glacial valley beneath steep forested hillsides, Lake Crescent is a spectacular sight with dramatic

views of Mount Storm King, Pyramid Mountain, and forested ridgelines. From high on Mount Storm King and Pyramid Mountain visitors can find sweeping views of the watershed and Olympic Mountains. Perhaps the most significant scenic resource is the lake itself, with steep drop offs, it's turquoise hue and clarity is exceptional.

## **Park Operations and Safety**

The National Park Service is committed to providing a healthy and safe environment for visitors and employees; to protect human life and provide for injury-free visits and appropriate responses when accidents and injuries do occur. The goals of Olympic National Park include ensuring that basic visitor needs are met, while keeping with the park's purpose, and that visitor and employee safety and health are protected. To the extent feasible, facilities, programs, and services in the park are accessible to and usable by all people, including those with disabilities (1.9.3 NPS *Management Policies*, 2006). Park operations, for the purpose of this EA, refer to the quality and effectiveness of the infrastructure and the ability of park staff to maintain the resources and provide for a high quality visitor experience.

Park operations in the project area include providing infrastructure to support visitor use, on-going trail monitoring and maintenance, interpretive and educational opportunities, visitor and park resource protection, including responding to emergencies.

Access to SRRT trailheads via Camp David Jr. Road presents challenges for emergency response. The road is very narrow and winding at the base of a steep ridgeline that is frequently blocked by tree or rock fall and landslides. Cell coverage in the area is spotty and could prevent phone communication by people seeking assistance and emergency responders. Public health and safety refers to the ability of the NPS to provide for a healthy and safe environment for visitors and employees, and to provide for appropriate and adequate emergency response.

The current Spruce Railroad trailhead at the Lyre River is small with a limit of 8 cars. There is an accessible vault toilet at this trailhead. The Camp David Jr. Road trailhead does not have a parking lot, but 2-3 cars can use pullouts along the side of the road. The parking area in the nearby North Shore day use area can accommodate about 25 cars and it has an accessible vault toilet adjacent to the parking area. Neither parking area has designated accessible parking sites. The size and configuration of the sites present access issues for large RVs and vehicles with trailers.

Maintenance personnel maintain the facilities at Lake Crescent, including the Fairholme campground, Storm King visitor use area on the south shore, East Beach and North Shore day use areas, and Lyre River trailhead at least three times a week. Routine maintenance includes restroom cleaning and trash removal.

The park road crew use graders and other equipment to smooth and grade CDJR as needed, based on inspections by the area maintenance staff. Maintenance of the East Beach Road is conducted in partnership with Clallam County, including repairs to road failures and cyclic ditch cleaning and striping

Maintenance staff inspects the Spruce Railroad Trail, but most routine trail maintenance is done by park volunteers from the Olympic Chapter of the Backcountry Horsemen and other volunteer organizations.

### **Educational Programs**

Areas within the day use zone are intended to provide a full range of educational services on-site. This includes personal services (guided talks or trips), wayside exhibits, visitor centers, and ranger stations. Orientation and information may be provided at trailheads, along pedestrian and vehicle routes, and at parking lots. Way-finding to activities and facilities will be easy and may include elements such as temporary barriers, fencing, signs, and paving to direct use.

Educational programs offered in the Lake Crescent area include evening programs at the Fairholme campground and publication of a brochure used on both the “Moments in Time Trail” and the Spruce Railroad Trail titled, “Ever changing, ever green: the low-elevation forests.”

Olympic Park Institute, an education partner of the NPS, operates programs from the south shore of Lake Crescent and conducts private environmental science education hikes for grades K-12 on the Spruce Railroad Trail. Their hikes include biotic inventory, forest plant studies, and railroad history. These trips occur at least twice a week and up to a full day is spent on the trail.

### **Commercial Activities**

Adventures Through Kayaking, Inc., a private business, holds a commercial use authorization to conduct educational trips of up to 12 people by kayak and stand-up paddle board in the lake along the Spruce Railroad Trail. They also provide guided bicycling trips along the Spruce Railroad Trail, where the goal is appreciation of the railroad’s history. Their operating season is mainly April through October, but they will take people between November and March as well. The World Outdoors is also authorized to conduct a one day bike trip on the Spruce Railroad Trail in July and August.

### **Land Use**

There are numerous private property owners within the boundaries of Olympic National Park, including within the project area. Multiple year-round and seasonal residences are maintained along CDJR on the north shore of Lake Crescent and near the current SRRT parking lot near the Lyre River. The NPS policy and intent is to coordinate with, and be sensitive and respectful of private property owners and private property rights.

The existing SRRT bisects a corner of an existing private lot. A verbal agreement between the NPS and the landowner exists. Several private lands are immediately adjacent to the existing SRRT, particularly near the SRRT parking lot. Some residences are served by water sources or water delivery systems located within the project area.



## **Socioeconomic Values**

The Lake Crescent and Sol Duc areas are popular destinations within Olympic National Park that attract local, regional, national and international visitors. Tourism to the areas supports a wide range of businesses that include resorts, hotels, motels, bed & breakfasts, campgrounds, transportation providers, gasoline stations, restaurants, convenience stores, grocery stores, and a wide range of retail operations.

Tourism to the park generates revenue both within and outside of the park boundaries. The existing Spruce Railroad Trail is a destination for guided bicycle trips under a current commercial use authorization. Guided kayak trips on Lake Crescent take advantage of the existing environment, as do the lodges and campgrounds located along the shore of Lake Crescent, particularly those with views of the forested north shore where the SRRT is located and proposed for expansion.