

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 NATURAL RESOURCES

3.1.1 Geology and Soils

Geology of the Lake Development

The Lake Hotel, Fishing Bridge Museum, Bridge Bay Marina, both campgrounds, and other buildings generally rest upon sediments deposited by glaciers and the paleo Yellowstone River or formed in a near-shore environment. The various sediments include (1) buff to gray sandy gravel or gravelly sand, (2) gray to blue-gray varved silt, (3) wind-blown silts, (4) and buff to gray cobble and gravels with sand. These sediments overlie various rhyolitic lava flows and tuffs. These sediments and rocks are disrupted by ongoing seismic activity. Active faulting breaks rocks and produces offsets in post-glacial terraces. An active fault that offsets a post-glacial terrace occurs near the Fishing Bridge Museum. In general, sediments around Yellowstone Lake amplify seismic signals.

Seismicity

The Lake area is seismically active as indicated by the 2008-2009 Yellowstone Lake earthquake swarm. The swarm began on December 27, 2008 and lasted until January 07, 2009. The Yellowstone Lake swarm consisted of 811 earthquakes with the largest magnitude, 4.1, occurring at the initiation of the swarm. The swarm contained 21 events of *MC* (magnitude coda) greater than or equal to 3.0 with over 20 events felt in Yellowstone National Park. In contrast, for the previous year there were only two earthquakes of *MC* greater than or equal to 3.0 in Yellowstone. Swarm hypocenters (locations on the Earth's surface) were located in the central Yellowstone Lake area where the earthquake sequence began and rapidly migrated north at a rate of ~1 km /day. Maximum focal depths shallowed markedly from ~10 km to ~2 km from south to north.

Water Availability/ Hydrogeologic Resources

Numerous small springs and seeps exist in the Lake Area. Water from the springs and seeps is of variable quality and quantity. Wells drilled in the area have been highly variable in both the quality and quantity of water encountered. The variability in water quality and quantity directly relates to the various sediments, fractured rhyolitic lava flows and permeable volcanic tuffs.

Armoring of the Yellowstone Lake Shoreline

Winds blowing across the high-elevation Yellowstone Lake generate waves and erosion of the shore line. Initial studies along the northern, western, and northeastern shores of Yellowstone Lake documented the effect of shore protection structures (rip-rap and seawall) along the lakeshore. Detrimental effects include (1) narrowing of beach width and (2) enhanced erosion and (3) shore degradation at engineered sites. Using historical maps and photographs, continued study further documented that the slope of protected beaches increased while unprotected beaches showed little change.

3.1.2 Wetlands

Wetland resource surveys conducted July-September of 2010-2011 in the 655.6 acre Lake development area planning boundary found 244 wetlands or streams, fourteen of which were ditches. Five of the ditches were wetlands and the remaining nine were ditches that did not support

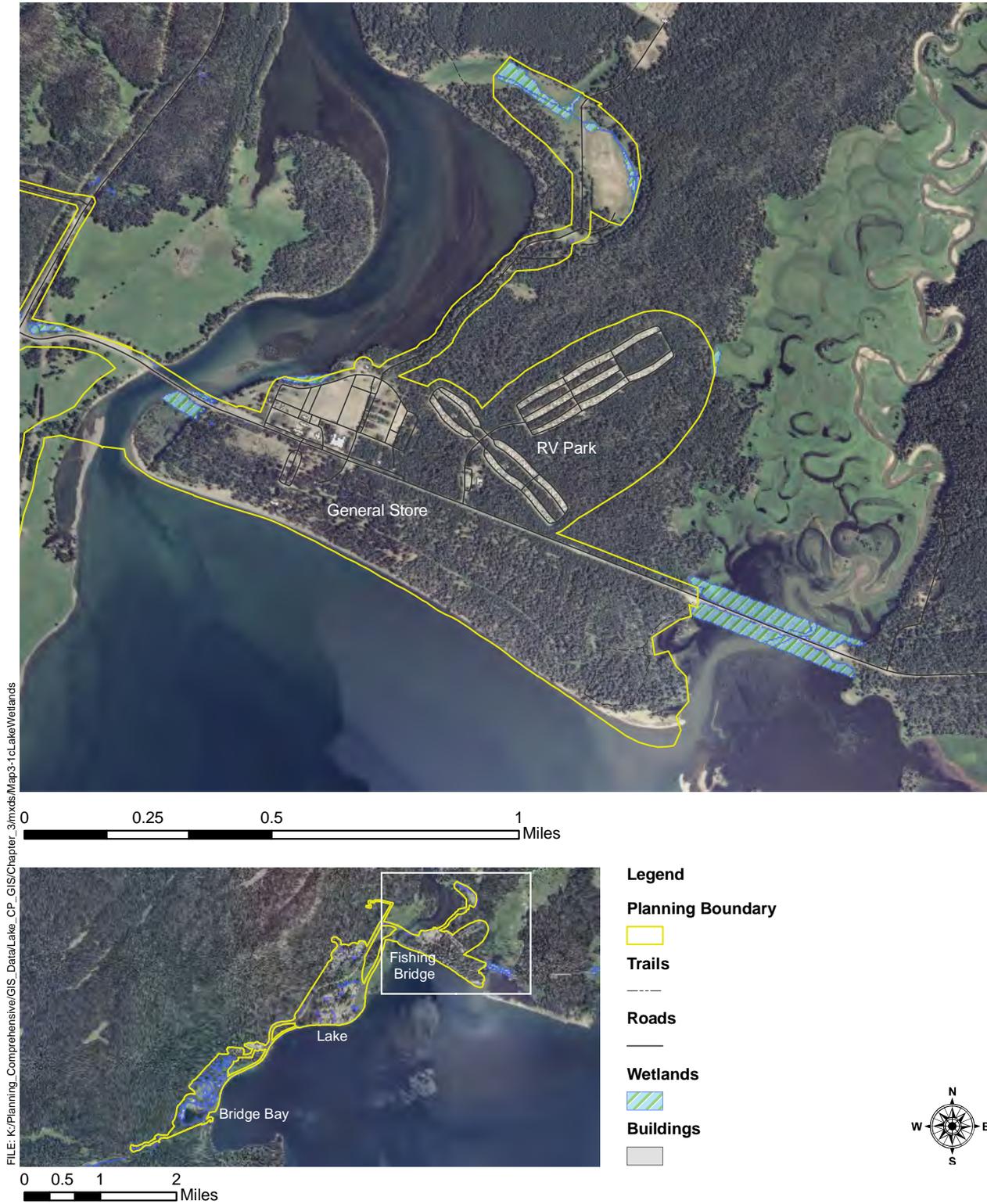
wetland vegetation. The wetlands covered a total of 54.4 acres or 8.3% of the total area surveyed. Of these, wetlands in the form of man-made ditches covered a total of 0.084 acres. Wetland delineations followed the guidelines in the April 2008 *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region*.

Within the Cowardin hierarchical classification, two systems were found: palustrine (P) and riverine (R), with some variation in classes and water regime within the systems. The palustrine wetlands consisted of seeps, snowmelt-fed wet meadows, depressions, forested wetlands, riparian area wetlands, and shrub wetlands. The riparian areas were adjacent to the Wells Creek, Bridge Creek, Lodge Creek, Hatchery Creek, Hotel Creek, and unnamed tributaries. Most of the areas were tributaries of Yellowstone Lake, while a few did not have an obvious surface water connection to Yellowstone Lake. Streams classified in the riverine system were found to be both perennial and intermittent. A few wetlands were adjacent to Yellowstone Lake.

As the Lake Area has been a popular destination since the park's existence, often wetland sites had been noticeably impacted by human activities. Wetland impacts included ditches, culverts, fill, old piping, berms, nonnative species, compaction from vehicles, and social trails. Disturbance impacts from nonnative species, reflected in the vegetation, was usually dependent on hydrology but often times timothy, redtop, creeping bentgrass, Kentucky bluegrass, and meadow foxtail would be found growing in wetlands saturated with water at least 6 inches below the soil surface. Wetland meadows were more likely to be impacted by nonnative species than forested wetlands. Wetlands with relatively little obvious impacts from humans still had low levels of nonnative species. Although these species are low priority for treatment in Yellowstone, it is because they are relatively ubiquitous throughout the park, not because of their benign nature.



Lake Wetlands - Fishing Bridge

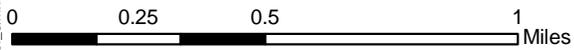
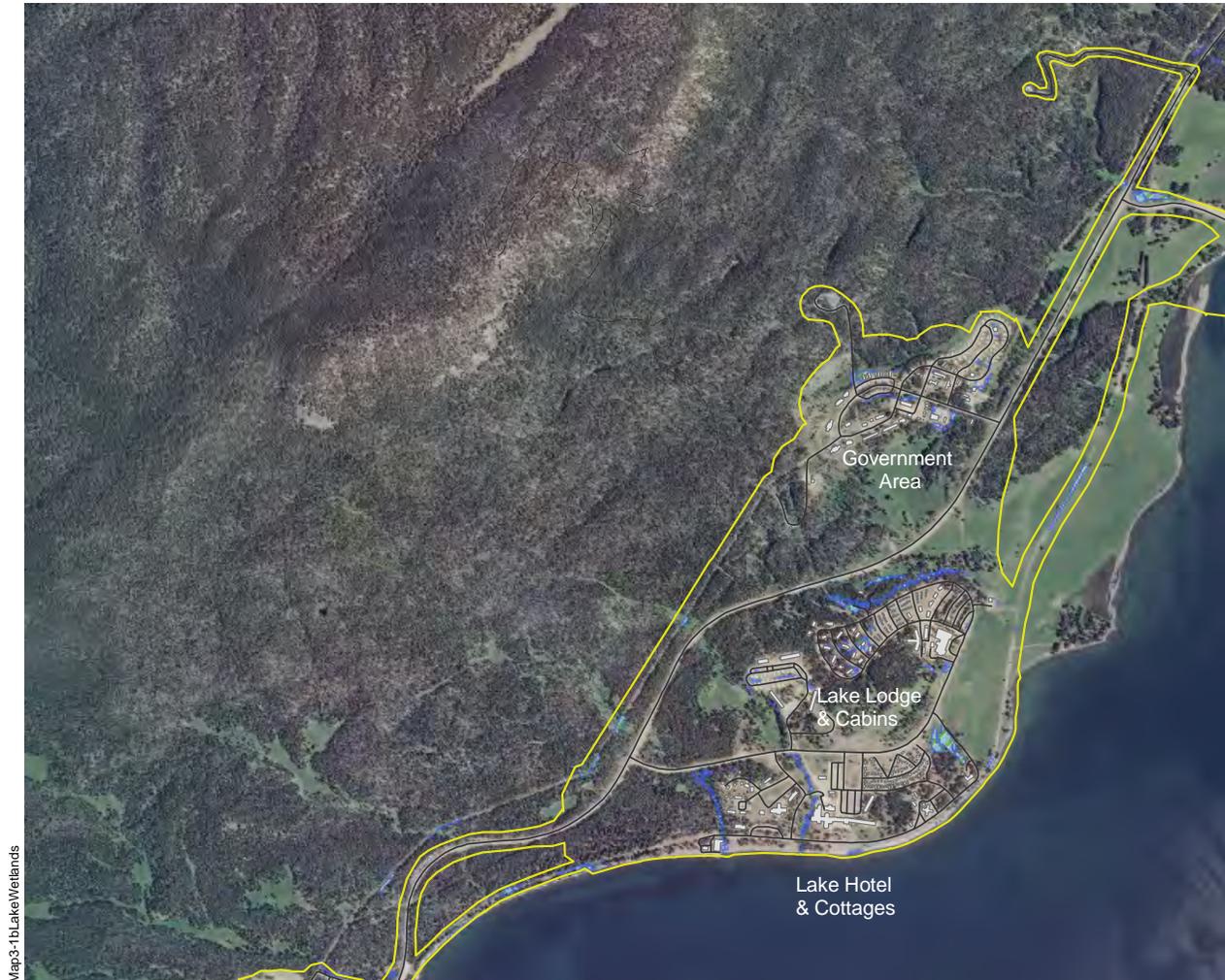


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Figure 3-1a Lake Wetlands - Fishing Bridge



Lake Wetlands - Lake Village & Gov't Area



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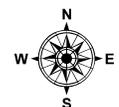
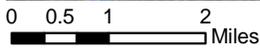
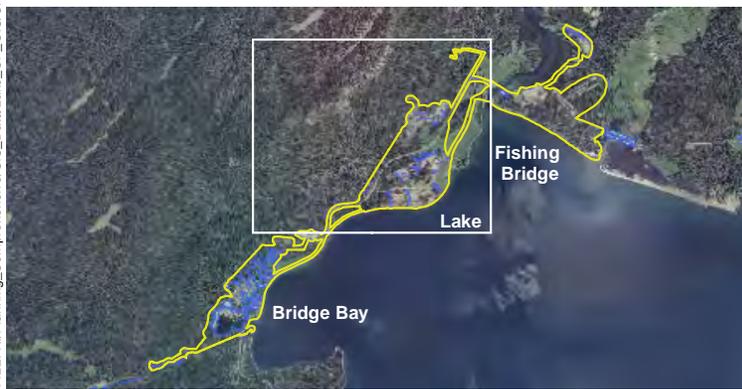


Figure 3-1b Lake Wetlands - Lake Village & Gov't Area



Lake Wetlands - Bridge Bay



Figure 3-1c Lake Wetlands - Bridge Bay

3.1.3 Vegetation and Rare Plants

Vegetation:

As well as being the focal point in the Lake area, Yellowstone Lake also impacts the vegetation in the area due to the more equitable summer temperature regime. Forest stands are interlaced with meadows, sagebrush steppe, and wetlands with the outlet of the Yellowstone River creating a natural barrier through the area. The most commonly encountered forest is mature lodgepole pine with a mesic understory of bluejoint reedgrass, elk sedge, and grouse whortleberry. Along the river and various wetlands are patches of forest dominated by Engelmann spruce and subalpine fir with a more diverse understory that additionally can contain arnicas, monkshood, pussytoes, honeysuckles, and many other species. Extensive wetlands punctuate the area, including sedge bottoms, seeps, stream sides, and forested wetlands. Open meadows and sagebrush steppe can have showy wildflower displays in July and August with many species such as asters, yampah, camass, buttercups, lupines, penstemons, and geraniums present. This area has some representation of most of the subalpine plant communities that occur within the Yellowstone caldera.

Rare Plants

Each of the adjacent states of Wyoming, Montana, and Idaho currently maintain lists of rare plant species, or "plant species of special concern". These lists differ in organization and also, of course, in the species that are of concern within the particular state boundaries. Some of these variations are due to the limited distribution of some species which only occur within the boundaries of a particular state, but many taxa are on the peripheral edge of their range or disjunct (separate from the main population which can be hundreds of miles away) which causes dissimilarity in the level of concern between states. The primary list used for this survey was the Wyoming Natural Diversity Database since the Lake Area occurs totally within the boundaries of Wyoming. The Montana and Idaho lists were also consulted especially for species that appear to be rare within the park boundaries.

Even though there are no plant species protected by state law in Wyoming, and only four federally listed taxa occur in the state, there are many species that are quite rare. The Wyoming Natural Diversity Database (WYNDD), a part of the nationwide heritage program initiated by The Nature Conservancy which is now coordinated by NatureServe, maintains a list of plant species of concern within the state of Wyoming. The increasing knowledge and collating of information necessitates continually updating the species of special concern lists to reflect the increase in knowledge. The field work during the summer of 2009 and 2010 used the March 2007 "Wyoming Plant Species of Concern List".

There is a standardized heritage ranking system to assess the global and state rarity of each species, subspecies and variety. G=global rank, based on the range wide probability of extinction for a species; T=trinomial rank, based on the range wide probability of extinction for a subspecific taxon; and S=state rank, based on the probability of extinction of a species or subspecific taxon within a particular state. Each taxon is ranked on a scale of 1-5, from rarest to most common with 1=critically imperiled because of extreme rarity (5 or fewer extant occurrences, or very few remaining individuals) or because of some factor of a species life history that makes it especially vulnerable to extinction; 2=imperiled because of rarity (6-20 occurrences), or because of factors demonstrably making a species vulnerable to extinction; 3=rare or local throughout its range or found locally in a restricted range (21-100 occurrences); 4=apparently secure, although it may be rare in parts of its range, especially at the periphery; and 5=demonstrably secure, although it may be rare in parts of its range, especially at the periphery. Additionally, Wyoming has initiated two

different lists, "species of concern" and "species of potential concern". "Species of concern" are taxa that WYNDD has determined to be of conservation concern within the state of Wyoming. These taxa exhibit a combination of biological factors that predispose them to decline or potential extirpation from the state (Keinath et al., 2003). "Species of Potential concern" are taxa for which there is some evidence suggesting a moderate degree of conservation concern, including species that are locally common but occupy a restricted range that is vulnerable to landscape changes (Keinath et al., 2003). The rare plant surveys focused on species of concern.

The survey was initiated in summer of 2009 and completed during the summer of 2010. The rare plant survey consisted of walking strips about 50 feet apart across the landscape, with much more extensive coverage when the habitat was suggestive of the possibility of a particular rare plant, or when rare plants were discovered. After finding a rare plant site, the area would be mapped using GPS technology. A total of 12 rare plant polygons representing 2 different species were located.

Only two plant species of concern were known to be in the area prior to beginning the rare plant surveys for the Lake Comprehensive Plan. Yellowstone sand verbena (*Abronia ammophila*) is restricted to the shoreline of Yellowstone Lake and historically occurred within the area of the survey, though those sites have been extirpated. Crimped stitchwort (*Stellaria crispa*) was known to be present near the spring boxes in the government administration area.

The only federally listed species that occurs near Yellowstone National Park is Ute ladies'-tresses, *Spiranthes diluvialis*, which is listed by the U. S. Fish and Wildlife Service as a threatened species. Even though Ute ladies'-tresses is known from Montana, Wyoming, and Idaho, it has not been located within the confines of Yellowstone National Park. The populations in the adjacent states are at lower elevations and somewhat different plant communities than are present within the park, making the occurrence of this species within Yellowstone unlikely. Wetlands were surveyed for this species in the Lake Area, but it was not located.

There are three endemic plant species that occur only in Yellowstone Park, Ross' bentgrass, *Agrostis rossiae*, which occurs in geothermal areas along the Firehole and in the Shoshone Geyser Basin, Yellowstone sand verbena, *Abronia ammophila*, which is restricted to sandy lakeshores around Yellowstone Lake, and Yellowstone sulfur buckwheat (*Eriogonum umbellatum* var. *cladophorum*) that is known from the Upper Geyser Basin to Madison on thermally influenced barren sites. Ross' bentgrass and Yellowstone sand verbena are currently undergoing a status review following a 90-day finding published on August 18, 2009, from the U. S. Fish and Wildlife Service to determine if listing is appropriate. Yellowstone sand verbena was not present within the survey boundaries at Lake, but historically occurred along the sandy shoreline near the Fishing Bridge Museum and perhaps near the Lake Hotel.

- Thread rush (*Juncus filiformis*): (Wyoming plant species of concern, G5S2; not tracked by either Idaho or Montana): Thread rush is a circumboreal species that is approaching the southern limit of its distribution in Wyoming, and is primarily in the Greater Yellowstone area within the state. In the Lake Area, it is only found along the edges of the Yellowstone River scattered amongst taller vegetation along the river's edge. Thread rush appears to be capable of colonizing disturbed sites, therefore re-establishment should be possible as long as there is appropriate substrate and hydrology present.
- Curled starwort (*Stellaria crispa*): (Wyoming plant species of concern, G5/S1; not tracked by Idaho or Montana) Crimped stichwort is a small diminutive herb that can be easily

overlooked in the wetlands and moist woods where it occurs. The distribution of the species is purely in western North America, with the easternmost sites in Alberta, Montana, and Wyoming spreading west to California and north to Alaska. The element occurrences are often composed of very few individuals, so even though there may be several sites in an area, the number of plants can be quite small. In Yellowstone, the species inhabits moist woods and wetlands, usually in areas that have at least some overstory component creating a somewhat shaded environment. The ability of this species to recolonize areas after disturbance is unknown, but there is at least one plant on the edge of the road prism, so apparently there is some ability to grow in disturbed sites.

3.1.4 Water Resources/Water Quality:

Yellowstone National Park encompasses a 3,500 square mile watershed that provides the surrounding area with high-quality water. The water resources within YNP cover 112,000 acres and consist of over 600 streams. Yellowstone Lake, the largest body of water above 7,500 feet elevation in North America, has a 110-mile shoreline, occupies 139 square miles, and has a maximum depth exceeding 390 feet. Fifteen tributaries flow into Yellowstone Lake from Fishing Bridge south to Sand Point.

The Yellowstone River, which flows into the lake at the southeast arm and out again at Fishing Bridge, is the longest major undammed river in the lower 48 states. It flows 671 miles from its source southeast of Yellowstone National Park to the Missouri River.

Streams and lakes in YNP are designated as Class I, Outstanding Waters, by the state of Wyoming as delegated by the EPA under the Clean Water Act (CWA), which means that long-term degradation of surface waters is prohibited and existing water quality must be maintained. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. The water quality and physical and biological integrity which existed on the water at the time of designation will be maintained and protected. Class I, Outstanding Water classification ensures that no permanent degradation of water quality can occur. This level of water quality protection is essential to the long-term health of the watersheds of the Northern Rocky Mountains.

Beginning in 2002, YCR Fisheries and Aquatic Sciences staff initiated a long-term water quality monitoring program that includes monthly sampling of 19 sites (12 at streams and 7 in Yellowstone Lake). Water quality information collected from these sites includes water temperature, dissolved oxygen, pH, specific conductance, turbidity, and total suspended solids. Several ions and nutrients metrics are also collected from stream locations.

Chemical, physical, and biological properties of the park's surface water vary considerably with season, location, elevation, geology, and proximity to thermal activity. Thermal areas affect water temperature, acidity, and dissolved chemicals. Generally, dissolved ion concentrations in Yellowstone waters are relatively low compared to other surface waters, especially in the spring during high runoff; higher concentrations are recorded in the fall and winter during low flow conditions. Distinct patterns of relative dissolved ion concentrations are observed in the Yellowstone and Madison River drainages. The most abundant ion in all watersheds is bicarbonate; concentrations of other major ions vary among watersheds. The Lamar River drainage has higher concentrations of calcium ions than the Yellowstone River mainstem, which has higher

concentrations of sulfate. In addition to bicarbonate ions, both sodium and chloride are present in approximately equal proportions in the Madison River basin. Both phosphorus and nitrogen concentrations are generally very low in most park waters. In 2009, nitrate concentrations in Yellowstone River at the lake outlet were below the analytical detection limit (0.05 µg/L) for all 10 samples; total phosphorus concentrations ranged from not detectable to 0.060 µg/L. Of the park's major rivers, the Madison River tends to have the highest nutrient concentrations. In 2009 total nitrate was not detectable for 10 samples; total phosphorus ranged from 0.131 to 0.242 µg/L).

3.1.5 Wildlife

Yellowstone has documented 67 species of mammals, more than 300 species of birds, 13 species and subspecies of native fish, five species of nonnative fish, six species of reptiles, and four species of amphibians (Yellowstone Resources and Issues Handbook 2011). The following section lists some of the most common animals in the Lake Area. Four additional mammal species (bison, grizzly bear, gray wolf, and Canada lynx) are discussed under "Special Status Species" in this chapter.

The Lake Area's abundant and diverse wildlife attracts many visitors. The lake is home to the largest population of Yellowstone cutthroat trout in North America, which are now threatened by non-native lake trout. The area around the lake is prime grizzly bear habitat. The Fishing Bridge area, including Pelican Valley to the north and east, is especially significant to bears and other wildlife because lake, river, and terrestrial ecosystems merge here to create a diverse natural complex. Grizzly bears frequent the area throughout the spring and summer to access food sources found in this rich habitat. Hayden Valley is known for herds of bison, and the Pelican Valley is frequented by bison in winter. While river otters are elusive, they are seen with some regularity at the Bridge Bay Marina during the summer. American white pelicans, bald eagles, and ospreys are commonly seen in the Lake Village area.

Mammals: Mammals that inhabit the lake area include the elk (*Cervus canadensis*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), river otter (*Lontra canadensis*), American beaver (*Castor canadensis*), common raccoon (*Procyon lotor*), American marten (*Martes americana*), long-tailed weasel (*Mustela frenata*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), snowshoe hare (*Lepus americanus*), and the little brown bat (*Myotis lucifugus*).

Fish: Yellowstone Lake and its tributaries support both native and introduced fish. Native Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) spawn in at least 10 of the 15 streams that flow into Yellowstone Lake from Fishing Bridge south to Sand Point. The only other native fish species in the lake is the longnose dace (*Rhinichthys cataractae*). Introduced species include the brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), lake chub (*Gila atratria*), longnose sucker (*Catostomus catostomus*), redbreasted sunfish (*Richardsonius balteatus*), and lake trout (*Salvelinus namaycush*). This mixture of native and nonnative species is a primary food source for birds, otters, and grizzly and black bears. The tributaries directly within and adjacent to the Lake Village and Bridge Bay locations are primarily used for spawning by native cutthroat trout.

Reptiles and Amphibians: The U.S. Geological Survey's Amphibian Research and Monitoring Initiative and the National Park Service's Inventory and Monitoring program conducted amphibian and reptile surveys from 2000 to 2003 (Patla and Peterson 2004). The four species of amphibians

found in the park are the Columbia spotted frog (*Rana luteiventris*), boreal chorus frog (*Pseudacris maculata*), boreal toad (*Bufo boreas*), and the blotched tiger salamander (*Ambystoma tigrinum melanostictum*). The six species of reptiles found in the park include the wandering garter snake (*Thamnophis elegans vagrans*), prairie rattlesnake (*Crotalis viridis viridis*), bull snake (*Pituophis catenifer sayi*), valley garter snake (*Thamnophis sirtalis fitchi*), rubber boa (*Charina bottae*), and northern sagebrush lizard (*Sceloporus graciosus graciosus*).

Birds: Terrestrial birds in the Lake Area include Wilson's snipe (*Gallinago delicata*), cliff swallow (*Petrochelidon pyrrhonota*), mountain chickadee (*Poecile gambeli*), mountain bluebird (*Sialia currucoides*), ruby-crowned kinglet (*Regulus calendula*), American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), pine siskin (*Carduelis pinus*), and various warblers and sparrows. Aquatic species include the trumpeter swan (*Cygnus buccinator*), white pelican (*Pelecanus erythrorhynchos*), Canada goose (*Branta canadensis*), California gull (*Larus californicus*), sora (*Porzana carolina*), and a variety of ducks. Raptors include the osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), Swainson hawk (*Buteo swainsoni*), great horned owl (*Bubo virginianus*), and great gray owl (*Strix nebulosa*). The osprey, Canada goose, trumpeter swan, white pelican, California gull, Caspian tern, and double-crested cormorant require active management in the Yellowstone Lake area. Wintering trumpeter swans occasionally use the shoreline area between Fishing Bridge and Lake Village, primarily between October and December.

3.1.6 Special Status Species

The species listed below are either federally listed as endangered, threatened, or candidate species or are listed by the Park as a species of management concern. Only species that exist or have the potential to exist in the project area are listed.

Boreal toad (*Bufo boreas*): This toad typically breeds in park areas with water chemistry characteristics that include a pH >8.0, high conductivity, and high acid-neutralization capacity; many of the sites have a geothermal influence (Koch and Peterson 1995). Boreal toad breeding areas are common in the upper Geyser Basin and have been documented in the Swan Lake Flats area. Boreal toads can also be found in riparian and riverine areas where they feed if adequate cover is available. Although declining throughout much of their range, boreal toads remain widespread throughout the park. The last reported sighting of a Boreal toad was in the 1970s around Natural Bridge.

Bald Eagle (*Haliaeetus leucocephalus*): The United States Fish and Wildlife Service (USFWS) removed the bald eagle from the list of endangered and threatened wildlife on August 8, 2007. Current data indicate populations of bald eagles have recovered in the lower 48 states, with an estimated minimum of 9,789 breeding pairs now compared to 417 active nests in 1963 (USFWS 2006). Nesting and fledgling bald eagles in Yellowstone increased incrementally from 1987 to 2005 (McEneaney 2006). Resident and migrating bald eagles are now found throughout the park, with nesting sites located primarily along the margins of lakes and shorelines of larger rivers. The bald eagle management plan for the Greater Yellowstone Ecosystem achieved the goals set for establishing a stable bald eagle population in the park, with a total of 26 eaglets fledged from 34 active nests during 2007 (McEneaney 2007). This is the most fledged eaglets ever recorded in YNP and the increasing population trend indicates habitat is not presently limiting the growth of the population. Portions of Yellowstone Lake and River near the Lake planning area are used extensively by resident bald eagles for foraging.

American peregrine falcon (*Falco peregrines anatum*): The American peregrine falcon was removed from the list of endangered and threatened wildlife on August 25, 1999 due to its recovery following restrictions on organochlorine pesticides in the United States and Canada, and implementation of various management actions, including the release of approximately 6,000 captive-reared falcons (64 FR 46541). The USFWS has implemented a post-delisting monitoring plan pursuant to the Endangered Species Act that requires monitoring peregrine falcons at three-year intervals that began in 2003 and will end in 2015. Monitoring estimates from 2003 indicate territory occupancy, nest success, and productivity were above target values set in the monitoring plan and that the peregrine falcon population is secure and viable (71 FR 60563). Peregrine falcons reside in Yellowstone from April through October, nesting on large cliffs. The number of nesting pairs and fledglings in the park has steadily increased from zero in 1983 to 32 pairs and 47 fledglings in 2007 (Baril et al. 2010). Peregrines have historically nested on Elephant Back Mountain west of the Lake planning area and forage on waterfowl and other bird species in the Lake area.

Trumpeter swan (*Cygnus buccinator*): Trumpeter swans were nearly extinct by 1900, but a small group survived by remaining year round in the Greater Yellowstone Area. In 2010 there were approximately 46,000 trumpeter swans in North America (USFWS 2010). Yellowstone supports resident, non-migratory trumpeter swans throughout the year, and its areas of ice-free water that diminish as winter progresses provide limited, temporary habitat for migrants from the region, Canada, and elsewhere during the winter. The NPS is committed to the conservation of resident trumpeter swans and preserving habitat for winter migrants in Yellowstone because swans are part of the natural biota and a species with considerable historical significance. However, counts of resident, adult trumpeter swans in the park decreased from a high of 69 in 1961 to 6 in 2009. Causes of this decline are unknown, but may include decreased immigration, competition with migrants, and the effects of sustained drought, human disturbance, and predation on productivity (McEneaney 2006). The Rocky Mountain trumpeter swan population operates at a scale larger than Yellowstone, and the dynamics of resident swans in Yellowstone appear to be influenced by larger sub-populations and management actions in the Greater Yellowstone Area and elsewhere. The Yellowstone Lake and River area adjacent to the Lake planning area are important foraging areas for trumpeter swans.

Yellowstone Cutthroat Trout (*Oncorhynchus clarkii bouvieri*): A range-wide status review estimated that the conservation population (>90% genetic purity) of Yellowstone Cutthroat Trout (YCT) occupy over 6,300 km within their native range in Idaho, Montana, Nevada, Utah, and Wyoming. Yellowstone Lake, at over 84,000 surface acres, is home to the largest population of YCT in existence (Varley and Schullery 1998) and is an important food source for many animal species in the park. In Yellowstone Lake, recent threats such as lake trout introduction, drought, and whirling disease have severely diminished the ecological role of this fish. The eradication of Lake trout continues in Yellowstone Lake and over the past year the effort was increased, which should reduce predation on Yellowstone cutthroat trout.

Whitebark Pine (*Pinus albicaulis*): Whitebark pine is a major component of the forest community in areas above 8,400 feet and a major understory component of lodgepole-dominated forests from 7,000 to 8,400 feet. Seeds of the whitebark pine are important food for grizzly bears and a variety of other wildlife species. Whitebark pine populations in Yellowstone have been declining due to native mountain pine beetles (*Dendroctonus ponderosae*) and non-native blister rust, which is caused by a fungus, *Cronartium ribicola* (Schwandt 2006). In July 2011, the USFWS determined that whitebark pine warrants protection under the ESA, but that adding the species to the Federal List of Endangered and Threatened Wildlife and Plants is precluded by the need to address other listing

actions of a higher priority. This species is now added to the list of candidate species eligible for ESA protection and its status will be reviewed annually. Whitebark pine exists both as an overstory and understory component within the forest communities at Lake Village, Bridge Bay, and Fishing Bridge. In the predominant mature lodgepole forests in this area, whitebark pine comprise non-reproductive saplings and are common within the forest understory. Mature, seed producing whitebark pine also occurs in these areas as a minor component of the overstory and are predominate along the Yellowstone Lake shore habitats, especially found at Fishing Bridge from the Fishing Bridge Visitor Center to the mouth of Pelican Creek up to 500 meters inland.

Yellowstone Sand Verbena (*Abronia ammophila*): Yellowstone Lake's shore is the only place in the world where Yellowstone sand verbena grows. The presence of a sand verbena at 7,700 feet elevation in the northern Rockies is unexpected, as most members of this North American genus occur in the Southwest or along the Pacific Coast. Warmth provided by the geothermal activity in the area may be helping this species tolerate the long, cold winters followed by a brief summer in which they bloom and reproduce. Yellowstone sand verbena is restricted to the shoreline of Yellowstone Lake and historically occurred within the Lake planning area, though those sites have been extirpated. The location of nearly all of the plants on the lake's north shore places the species at risk of extinction due to random events affecting the population.

Bison (*Bison bison*): Plains bison at Yellowstone have been petitioned for listing as an endangered species twice in the past 15 years and both times the USFWS has declined to list the species. The Yellowstone bison population has been identified as a distinct population by USFWS definition. The population is comprised of plains bison that historically occupied about 20,000 square kilometers (km²) in the headwaters of the Yellowstone and Madison rivers of the western United States (Schullery and Whittlesey 2006). While nearly extirpated in the early 20th century, Yellowstone National Park provides sanctuary to the only wild and free-ranging bison population to continuously occupy historic range (Plumb and Sucec 2006). Intensive husbandry, protection, and relocation were used to bring back the population (Meagher 1973), and in summer 2011 there were about 3,700 bison in the park (1,300 on the central range that includes the Lake development area). Yellowstone bison are managed as a single population having two distinct breeding areas with individuals that move across an extensive landscape (220,000 acres). These bison are subject to natural selection factors such as competition for food and mates, predation, and survival under substantial environmental variability (Plumb et al. 2009). Thus, they have retained the adaptive capabilities of plains bison. Yellowstone bison contribute a unique genetic lineage to plains bison that is not represented elsewhere within populations managed by the Department of Interior (USFWS 2007, Dratch and Gogan 2010). They have high genetic diversity compared to other populations of plains bison, and are one of a few bison populations with no evidence or suggestion of potential cattle ancestry (Halbert 2003, Halbert and Derr 2007).

The central herd occupies the central plateau of Yellowstone National Park, extending from the Pelican and Hayden valleys in the east to the lower elevation and thermally influenced Madison headwaters area in the west. Central herd bison congregate in the Hayden Valley for breeding. Most bison move between the Madison, Firehole, Hayden, and Pelican valleys during the rest of the year. Some bison are likely to inhabit the analysis area at any time of year and range from groups of 1 to over 100 animals.

Canada Lynx (*Lynx canadensis*): The USFWS listed the Canada lynx as a threatened species in 2000. Lynx are considered rare in the Greater Yellowstone Area and are believed to use boreal or montane forests. Evidence of lynx in Yellowstone National Park comes from about 216 winter

tracking surveys (conducted during winters of 2001-2004 and covering 1,043 total miles), from 118 lynx hair-snare transects deployed parkwide during the summers of 2001-2004, and from historic sightings. Park wide, only four lynx sightings have been reported by visitors in the last 10 years. Surveys have documented one possible, two probable, and two definite cases of lynx presence, including a female accompanied by a kitten. Population numbers are unknown. Lynx prefer upper elevation coniferous forests in cool, moist vegetation types, particularly those that support abundant snowshoe hares, the primary food source for lynx. The best evidence of lynx presence is along the east shore of Yellowstone Lake, but no evidence exists within the boundary of the Lake planning area. The nearest critical habitat for the lynx is located approximately 1.3 miles northwest of the Fishing Bridge Area.

Gray Wolf (*Canis lupus*): Gray wolves were native to the Yellowstone area when the park was established in 1872. Historically hunted for their hides and as predators, they were eliminated from the ecosystem by the 1930s. The USFWS released an environmental impact statement on wolf reintroduction in May 1994. In 1995 and 1996, 31 gray wolves from Canada were released in the park. 14 wolves were released in the winter of 1994-1995; 17 additional wolves were released in 1996 (Phillips and Smith 1996). On May 5, 2011 the USFWS removed gray wolves in a portion of the Northern Rocky Mountain Distinct Population Segment (DPS) encompassing Idaho, Montana, and parts of Oregon, Washington, and Utah from the Federal List of Endangered and Threatened Wildlife. Gray wolves in Wyoming remain on the List of Endangered and Threatened Wildlife and continue to be subject to the provisions of our experimental population regulations codified at 50 CFR 17.84(i) and (n). Wolves reintroduced into YNP and central Idaho were classified “nonessential experimental” according to section 10(j) of the ESA of 1973, as amended (16 U.S.C. 1531). In national parks and wildlife refuges, nonessential experimental populations are treated as threatened species, and all provisions of Section 7 of the ESA apply (50 CFR 17.83(b)). The Service is working closely with that state to develop a wolf management plan that would allow wolves in Wyoming to be removed from the list in the future. This direct final rule implements legislative language in the recently enacted Fiscal Year 2011 appropriations bill. The Service and the states will monitor wolf populations in the Northern Rocky Mountain DPS and gather population data for at least five years.

At the end of 2010, at least 97 wolves (11 packs and 6 loners) occupied YNP. This is nearly the same size population as in 2009 (96 wolves). At the end of 2010, there were approximately 501 adult wolves consisting of 37 breeding pairs present in the Greater Yellowstone Area (GYA). At least one member of most packs is radio-collared, allowing park and USFWS personnel to monitor the movements of all packs. Wolf numbers in YNP have decreased since 2007, mainly due to intraspecific strife resulting from a smaller elk herd and disease outbreaks (canine distemper and sarcoptic mange). The wolf population in the interior of the Park has shown less decline, due in part to a reduced reliance on elk. The severity of mange declined in 2010 and there was no evidence of distemper being a mortality factor as it was in 1999, 2005 and 2008. Pack size ranged from 3 (Grayling Creek) to 16 (Mollie’s) and averaged 8.3, slightly higher than 2009 (7.1), but lower than the long-term average (10). Eight of 11 (73%) packs reproduced. The average number of pups/pack in early winter for packs that had pups was 4.8, higher than the 3.8/pack average in 2009. A total of 38 pups in YNP survived to year end (Jimenez et al 2011).

Although the wolf population has declined since 2003, interior wolves have fared better than their counterparts on the northern range. Northern range wolves have declined 60% since 2007 compared to only 23% for interior wolves. Northern range wolves are more dependent on elk as a food source and the elk population has declined 60% since 2007 (Jimenez 2011). Interior wolves

are more likely to use bison as a food source. Throughout the park there were 14 radio-collared wolves that died in 2011. Intraspecific strife was the leading cause of mortality, followed by natural/unknown, mortal wounds from prey, and disease/malnutrition.

The Mollie's wolf pack, currently the largest pack in the park at 19 individuals (as of late 2011), regularly uses the area adjacent to the Lake planning area for both travel and foraging. This is the only pack that is known to consistently use this area in recent years, although it is possible that dispersing wolves from other packs occasionally pass through. At the beginning of 2012, only two of the 19 Mollie's pack members wear radio-collars. Park staff plan to deploy 3-5 additional collars in the pack by end of March 2012. The core of this pack's territory (approximately 414 km² in size) is Pelican Valley to the east of the action area where they traditionally den each year.

A habituated member of the Mollie's pack believed to be conditioned to human foods was killed by park staff in October 2011. Beginning in July 2011, the 110-pound, 2-4 year old male wolf had approached staff and visitors at close range multiple times and had been unsuccessfully hazed each time from the Fishing Bridge developed areas. The decision to remove the wolf came following a history of fearless behavior in the presence of humans, repeated visitation to developed areas within the park, and numerous unsuccessful hazing attempts. Each of these factors was indicative of the wolf's potential habituation to human food, which posed an increased risk to park visitors and staff. Current management policies and requirements related to gray wolves include:

- Removal of carcasses from roads and roadsides.
- Enforce park regulations on visitors maintaining a minimum distance of 100-yards from wolves (or at greater distances if human presence alters natural behaviors).
- Park staff will enforce regulations and implement existing procedures to make anthropogenic foods unavailable to gray wolves along roads and in developed areas during and after construction. The park will follow its approved plan for managing habituated and food-conditioned wolves. Contractors will receive an orientation concerning proper vehicle speeds, food storage, and human behavior in the presence of wolves.
- YNP will limit contractor camps to existing facilities
- Control traffic, parking, and speed should visitation affect wolf activity.
- Close areas to public use if impacts to resources are evident.
- Close areas to the public should a wolf den occur in the future.
- YNP will reduce speed limits and post visitor warnings at road crossings near active den sites, and maintain a maximum speed limit of 45 mph on interior park roads.

Ongoing activities in the action area that may affect the gray wolf include management of vehicular traffic associated with park visitors or staff, including snowmobiles during the winter; road maintenance and reconstruction; operation, construction, and improvements to staff housing and visitor facilities in developed areas; hazardous fuels reduction in the wildland-urban interface of developed areas; wildland fire management; and management of light dispersed recreation and maintenance activities in the backcountry (e.g. visitor backpacking).

Grizzly Bear (*Ursus arctos horribilis*): The park is responsible for protecting grizzly bear populations and habitat as mandated by the Yellowstone Park Act (1872) creating the park, the National Park Service Organic Act (1916), the National Environmental Policy Act (1969), the Endangered Species Act (1973), and the National Parks Omnibus Management Act (1998). National Park Service policy mandates that the park perpetuate native animal populations as part of the natural ecosystem and protect native animal populations against destruction, removal,

harassment, or harm through human actions (NPS 1998, 1991). A recovery plan for grizzly bear populations in the lower forty-eight contiguous United States was implemented because grizzly bears were listed in 1975 under the Endangered Species Act (USFWS 1982). The plan was developed to provide direction for the conservation of grizzly bears and their habitat to federal agencies responsible for managing land within the recovery zone. That same year, YNP completed an Environmental Impact Statement (EIS) for a grizzly bear management program specifically designed to recover the subpopulation of grizzly bears inhabiting the park (NPS 1982). Management of grizzly bears in YNP has been successful in enabling grizzly bear recovery and reducing bear-human conflicts (e.g., property damage, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the park (Gunther 1994, Gunther and Hoekstra 1998, Gunther et al. 2000, Gunther et al. in press). The USFWS removed grizzly bears in the Greater Yellowstone Ecosystem from the Federal List of Threatened and Endangered Wildlife on April 30, 2007. In 2009, a U.S. District Court returned the grizzly to the federal threatened species list, stating the Conservation Strategy was not enforceable and insufficiently considered the impact of climate change on grizzly food sources. The USFWS and the Department of Justice have appealed and a ruling is expected in 2012.

The range of the grizzly bears in GYA has increased dramatically, as evidenced by the 48% increase in occupied habitat since the 1970s (Pyare et al. 2004, Schwartz et al. 2002, USFWS 2005). The most recent estimate of the known area occupied by grizzly bears in the GYA is approximately 37,258 km² (14,385 mi²), an increase of 2,842 km² from 34,416 km² reported in the year 2000. The increase in distribution likely reflects bears continuing to expand into suitable but unoccupied habitats on the edge of their current distribution and increased sampling. Because of the methods used to determine known area occupied however, occupancy beyond this perimeter cannot be ruled out.

As an alternative monitoring index to population abundance, other population parameters have been used to estimate population size (Knight and Eberhardt 1987). In 1996, Eberhardt and Knight used several different estimates of population parameters to determine a minimum total population size in the GYA of 245 grizzly bears, an estimated population size of 390 grizzly bears using marked females, and an estimated population size of 344 grizzly bears using distinct family groups. In 2003, the Interagency Conservation Strategy team identified the minimum population estimate for the GYA grizzly bear population in 2001 as 365 grizzly bears. In 2011, the Interagency Grizzly Bear Study Team estimated the total GYA population at 602 bears (Haroldson 2011). Intensive management has resulted in the GYA population increasing at a rate of 4 to 7 percent per year since the early 1990s.

Schwartz *et al.* (2006) suggested that grizzly bears are probably approaching carrying capacity inside Yellowstone National Park. Their conclusion resulted from the analysis of survivorship of cubs and yearlings, and of independent bears, inside Yellowstone National Park, outside the Park but inside the Primary Conservation Area (PCA), and outside the PCA, as well as the analysis of bear distribution in those three zones of residency.

There were 31 known and probable mortalities in the GYA during 2009; 24 were attributable to human causes, including 2 road-kills, and 6 are under investigation. Of these 31 mortalities, only 2 were located with the Park, a known subadult male and a probable cub of the year (COY), and both were apparently from natural causes (Haroldson and Frey 2009). In 2010 there were 48 bear mortalities recorded, 42 were human caused, 4 were natural, and 2 were classified as unknown. In YNP there were 7 bear mortalities recorded in 2010. Three were from natural causes, 3 human

caused and 1 unknown. Of the 3 human caused one was from management removal, one from road kill, and one accidental death during capture (USGS, 2011).

Human-caused grizzly bear mortality in Yellowstone National Park, 1980-2011.

Year	Bridge Bay	Lake Village	Fishing Bridge	All Other Park Developments	Road-kill Park-wide	Backcountry Areas Park-wide	Park Total
2011	0	0	0	0	1	4	5
2010	0	0	0	1	1	0	2
2009	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2007	0	1	0	0	0	0	1
2006	0	0	0	0	1	0	1
2005	0	0	0	0	0	0	0
2004	0	0	0	1	1	0	2
2003	0	0	0	0	1	0	1
2002	0	0	0	0	2	0	2
2001	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
1999	0	0	0	1	0	0	1
1998	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0
1996	0	0	0	0	1	0	1
1995	0	0	0	0	0	3 (power-line)	3
1994	0	0	0	1	0	0	1
1993	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1990	0	1	0	0	1	0	2
1989	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1987	0	0	0	1	0	0	1
1986	0	1	0	1	0	0	2
1985	0	0	0	0	1	0	1
1984	0	1	1	1	0	0	3
1983	0	0	0	1	0	0	1
1982	0	1	0	1	0	1	3
1981	0	0	0	0	0	0	0
1980	0	0	0	1	0	1	2

Yellowstone National Park is committed to keeping human-caused grizzly bear mortality as low as possible. Grizzly bear-human conflicts often lead to human-caused bear mortality. Preventing bears from obtaining anthropogenic foods is the foundation of the National Park Service’s strategy for reducing grizzly bear-human conflicts. This is accomplished through education of Park visitors, use of bear-proof food and garbage storage facilities, and strict enforcement of bear-related food and garbage storage regulations. Current management policies and requirements related to grizzly bears include:

- Educating park visitors about the causes of bear-human conflicts and how park visitors can modify their behavior to prevent conflicts from occurring. Educational efforts are made both before and after park visitors arrive in the park.
- All garbage cans and dumpsters are constructed of a bear-proof design.
- Food storage devices are provided in all designated backcountry campsites. Backcountry users not staying in designated backcountry campsites are required to store their food and garbage in a bear-proof manner.
- Regulations that require all anthropogenic foods, garbage, and other attractants to be stored in a bear-proof manner are strictly enforced.
- Regulations prohibiting park visitors from feeding bears are strictly enforced. Developed areas and roadside auto campgrounds are frequently patrolled to ensure compliance with food and garbage storage regulations. All anthropogenic bear attractants left unattended in auto campgrounds are confiscated.
- Seasonal closures around high-use bear areas (i.e., spawning streams, Pelican Valley, etc.)
- Close areas to public use if impacts to resources are evident.
- Bear awareness training provided to employees and contractors
- Maintain and enforce current 45-mph speed limit.
- Compliance with 36 C.F.R. 2.10 for camping and food storage
- Removal of wildlife carcasses from roads and roadsides to reduce vehicle strike mortality of bears.
- Park staff enforce regulations and implement existing procedures to make anthropogenic foods unavailable to grizzly bears and black bears within developments, along roads, and in the backcountry to reduce the chances of bears becoming conditioned to human foods and garbage.

The grizzly bear management program currently being implemented by Yellowstone National Park has been highly effective at minimizing bear-human conflicts and human-caused bear mortality.

The action area falls under two Bear Management Units (BMU), the Firehole/Hayden and Pelican/Clear units. Grizzly bears are distributed throughout the action area and these two BMUs. Since 1980, six human-caused grizzly bear mortalities have occurred in the action area. However, only one of these mortalities occurred in the last decade and only 2 have occurred since conservation measures were implemented 24 years ago under the 1988 EIS.

Habitat surrounding the action area contains high diet diversity for grizzly bears (Knight et al. 1984). In the action area, grizzly bears consume winter-killed bison carcasses, spawning cutthroat trout, pocket gophers and their food caches, new-born elk calves, clover, thistle, graminoids, and seeds of whitebark pine. Bridge Bay is described as having low-quality spring and summer grizzly bear habitat and moderate-quality fall bear habitat, based on vegetation mapping of the ecosystem relative to other areas. Fishing Bridge and Lake Village are described as having medium-quality spring grizzly bear habitat and high-quality summer and fall bear habitat.

In consultation prior to the 1988 EIS, the USFWS had expressed concerns about “(1) the level of human-caused grizzly bear mortality attributable directly or indirectly to the Fishing Bridge development; and (2) human displacement of grizzlies from prime habitat in the Fishing Bridge/Pelican Valley area due to high levels of human use associated with Fishing Bridge.” The

1988 EIS attempted to address these concerns by removing development in the Fishing Bridge area and adoption of additional visitor use restrictions. Specifically the EIS proposed:

- Removal of the 310-site NPS campground at Fishing Bridge.
- Removal of the auto repair shop, service station, and photo shop.
- Removal of all employee and concessionaire housing (with exception of housing on second floor of general store).
- Removal of the Fishing Bridge contractor's camp, helipad, and ball field and restoration of the site to natural conditions.
- Obliteration of all informal trails radiating from any remaining camping facilities at Fishing Bridge and the placement of signs at campground perimeters advising occupants that the areas beyond the campground are closed.
- Assignment of a special patrol to the perimeters of any remaining camping facilities at Fishing Bridge from 10:00 p.m. to 6:30 a.m. to discourage bears from entering the campground.
- Restriction of the Fishing Bridge sewage treatment plant road to administrative vehicle use only (public foot travel would continue to be permitted to use the Howard Eaton Trail).
- Removal of the Turbid Lake road in Pelican Valley.
- Removal and relocation of all trails and backcountry campsites that are in prime grizzly bear habitat in Pelican Valley (including the Turbid Lake trail and six backcountry campsites Pelican Valley) would continue to be accessible on the Pelican Valley trail and the campsites would be relocated outside prime grizzly bear habitat.
- Restriction of Pelican Valley to day use only for all but horse parties until the above removals and relocations are accomplished.
- Closure of Pelican Valley to off-trail travel.
- Closure to human use during the spawning season of areas surrounding all spawning streams tributary to Yellowstone Lake that are used by grizzly bears.
- Park staff would continue to monitor bear-human conflicts at the remaining Fishing Bridge facilities and, if high levels of conflicts continued, additional measures including removal of other facilities would be considered.

Since 1988, a majority of the actions were completed. The only items not completed were the removal of the auto repair shop, service station, Fishing Bridge housing, and the helipad. With the grizzly bear population increase and the low human caused mortality rate in the park, and specifically the Fishing Bridge location, it was determined that removal of the housing at Fishing Bridge was no longer a priority.

Human developed sites can impact bears through temporary or permanent habitat loss and displacement, unsecured bear attractants, increased length of time of human presence, and increased human disturbance to surrounding areas. Developed sites refer to sites developed or improved for human use or resource development. Examples include campgrounds, trailheads, lodges, restaurants, visitor centers, and work camps. The primary concerns for grizzly bears related to developed sites are direct mortality from bear/human encounters, food conditioning, and habituation of bears to humans (Mattson et al. 1987). Habituation occurs when grizzly bears encounter humans or developed sites frequently, and without negative consequences, so that the bears no longer avoid humans and areas of human activity (FWS 1993). Habituation does not necessarily involve human-related food sources. Food conditioning occurs when grizzly bears receive human-related sources of food and thereafter seek out humans and human use areas as

feeding sites (FWS 1993). Gunther (1994) noted that grizzly bear management in Yellowstone National Park has shifted from problems involving food-conditioned bears to problems involving habituated (but not food-conditioned) bears seeking natural foods near developed sites or along roadsides.

Based on current recreation and human population growth trends, the number of people recreating in grizzly bear habitat is expected to increase (USFS 2006a; Cordell et al. 2008; NPA Data Services 2008, 2009; USFS 2009). The primary concerns associated with recreational activities are the same as those with developed sites: displacement, direct mortality from bear/human encounters and habituation of bears to humans (Joslin and Youmans 1999; White et al. 1999; USFWS 2002). Snowmobiling is restricted to existing roads used by cars in summer and Off Road Vehicle (ORV) use is not allowed in the action area and therefore has very little potential to negatively impact grizzly bears at the individual or population level.

3.1.7 Climate Change

Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality, storm frequency, etc.) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change provide clear evidence that climate change is occurring and will accelerate in the coming decades.

Changes in the western United States have been particularly noticeable in the last century, with increases averaging 0.9-3.6 degrees Fahrenheit (° F) in mean annual temperatures, depending on elevation (Diaz and Eischeid 2007, Pederson et al. 2010). Warmer winters and springs have resulted in more precipitation falling as rain instead of snow, reduced snowpack, earlier snowmelt, earlier streamflow from snowmelt, an 8 to 10 day advance in the onset of spring on average across the West, more frequent large fires, and possibly an increase in insect outbreaks and plant mortality (Breshears et al. 2005, Cayan et al. 2001, Knowles et al. 2006, Mote et al. 2005, Pederson et al. 2010, Raffa et al. 2008, Stewart et al. 2005, Westerling et al. 2006). The northern Rocky Mountain region is expected to see an increase in temperature of approximately 2-4° F during the next 50 years with natural variation over years to decades. Precipitation change is less clear, but a wetter climate is expected (Ashton, 2010).

Yellowstone is actively involved in environmental stewardship, particularly in the last decade with implementation of initiatives such as the Greening of Yellowstone. The greening initiative includes recycling, waste reduction, energy reduction, building a compost facility for park wastes, Leadership in Energy and Environmental Design (LEED) building certification, and the use of hybrid vehicles and bio-fuels in summer and winter. The park continues its advances in environmental education and action, including steps to reduce activities that contribute to climate change.

The NPS, USFS, and USFWS have inventoried the amount of Green House Gas (GHG) emissions they produce in the GYA ecosystem. The inventory at the park revealed the following:

- Electricity use is responsible for more than 60 percent of the GHG emissions because of the emissions created in producing the electricity (coal mines, power plants, etc.).
- Heating and cooling park buildings contributes 27 percent to GHG emissions.

- Cars, trucks, heavy equipment, and other vehicles directly emit almost 13 percent of the GHGs at Yellowstone.

As a result of completing the comprehensive GHG emissions inventory, the agencies have developed an action plan to reduce GHG emissions in all their operations across the entire ecosystem (GYCC 2011). Yellowstone National Park, as well as all other federal facility managers involved, has pledged to reduce GHG emissions by at least 20% by 2020. Below is a list of the status of current GHG reduction initiatives.

- Use of bio-diesel in all diesel vehicles has reduced GHGs by 201 tons annually
- Use of low resistance tires has reduced GHGs by 48.7 tons annually
- Park concessioner’s (Xanterra) re-use of 10,000 gallons of cooking oil into heating fuel has reduced GHGs by 100 tons annually
- The ride share program reduces GHGs by 346 tons annually
- Photovoltaic system at Lamar Buffalo Ranch reduces GHGs by 21 tons annually
- The switch to 17 hybrid vehicles from conventional vehicles in the park’s fleet resulted in a GHG reduction of 68 tons annually
- Operating all unleaded vehicles on a 10% ethanol blend reduces GHGs by 39 tons annually
- Opening of a compost facility has reduced trips to landfill and reduced GHGs by 99 tons annually

3.2 CULTURAL RESOURCES

The Lake Village/Fishing Bridge/Bridge Bay area has been a focus of human activity for thousands of years. Natural resources such as forests, meadows, streams, the lake, and abundant fish and wildlife offered desirable conditions for human use and, later, tourism. As a result, this area is rich in cultural resources including archeology, historic districts (HD), and two National Historic Landmarks (one existing and one proposed.)

The area of potential effect (APE) is within the entire planning boundary (Figure 1-1) which stretches along the lakeshore from Bridge Bay Marina to the Fishing Bridge location. A report of all cultural resources found within the APE was completed November, 30, 2011 (*2011 Lake Developed Area Cultural Resources Planning Document*). Three cultural landscape inventories are also underway to document potentially eligible landscape features and patterns. Cultural resources found within the planning boundary that have been evaluated and documented (or are in the process) have been done so in consultation with the Wyoming State Historic Preservation Office (WYSHPO) and the Keeper of the National Register of Historic Places (NRHP).

Site Number	Title/Name	Status/Comments
48YE0510	Lake Fish Hatchery HD**	Listed 6/25/85 *CLI underway
48YE0852	Lake HD**	Eligible 8/4/1994 ; CLI underway
48YE0829	East Entrance Road HD	Listed; 5/18/95
48YE0520	Grand Loop Road HD	Listed. Abandoned segments Not Contributing.
48YE0675	Fishing Bridge HD**	Eligible; CLI underway
48YE0686	Fishing Bridge Museum NHL	Listed, 5/28/1987
56 sites with 31 listed or eligible	Archeological sites	Report completed 11/30/1; <i>2011 Lake Developed Area Cultural Resources Planning Document</i>

48YE0676	Lake Hotel	Listed in 1991; potentially eligible as NHL (evaluation underway)
	Bridge Bay Marina	Potentially Eligible (Evaluation underway; pending current Mission 66 evaluation)

*CLI, or Cultural Landscape Inventory

**A list of contributing structures within the district can be found in Appendix D.

3.2.1 Archeological Resources

The park's archeological sites provide evidence of human occupation for approximately 11,000 years. These tangible remains are vital to understanding past cultures without written records and provide the basis for continued scientific research. Approximately 1,600 archeological sites have been documented in Yellowstone National Park. The Fishing Bridge peninsula, Lake Area, and Bridge Bay Area have been used by various groups of indigenous peoples prior to establishment of the park. A variety of sites have been found in the Lake Area.

Portions of the comprehensive planning boundary have been surveyed over the years with 3% of the park surveyed for archeology. There are 45 identified archeological sites within the project survey area. Of those, 16 have been determined eligible for listing on the National Register, four are undetermined, two are non-contributing, and 23 have been determined non-eligible.

Erosion along the lakeshore is a continuous concern and requires monitoring to ensure artifacts are not lost. In 2000 and 2002 excavation and collection at various sites were completed in response to site erosion concerns. Surveys are conducted to identify sites eroding along the shoreline of the lake.

Fishing Bridge Area

There are 19 prehistoric sites at Fishing Bridge, one of which is the largest known in the park. Eligibility determinations include 11 National Register eligible sites, four unknown or unevaluated sites, three non-eligible sites, and one non-contributing site. The sites represent multiple periods of occupation on the Fishing Bridge peninsula ranging from the Late Paleoindian Period circa 8800 B.C.E. to the Late Prehistoric Period at 150 B.C.E.

Lake Village

Archeological sites present in the Lake Area (includes Fish Hatchery, hotel, lodge, and maintenance areas) represent multiple periods of occupation including Late Paleoindian Period through Late Prehistoric.

Bridge Bay Area

The 12 archeological sites in the Bridge Bay area are composed of 10 prehistoric, one historic, and one multicomponent site.

3.2.2 Ethnographic Resources

The NPS defines ethnographic resources as “the cultural and natural features of a park that are of traditional significance to traditionally associated peoples” (NPS, 2001).

For at least the last 10,000 years Native Americans occupied the Greater Yellowstone Area. A number of tribes were historically present in the area on at least a seasonal basis. These tribes may

have included the Bannock, Blackfeet, Crow, Kiowa, Nez Perce, Salish, and Shoshone. During the early and middle 19th century, Euro- American explorers documented year- round occupation of areas within the park by a band of Shoshone Indians known as the Sheepeaters. Native Americans often passed through the park for hunting and foraging, migration, or for religious or other cultural endeavors.

Today, the tribes that are associated with Yellowstone National Park and with whom consultation occurs are (in addition to the tribes listed above): Assiniboine and Sioux Tribes, Cheyenne River Sioux Tribe, Cour d’Alene Tribe, Crow Creek Sioux Tribe, Flandreau Santee Sioux Tribe, Gros Ventre & Assiniboine Tribes, Lower Brule Sioux Tribe, Northern Arapaho Tribe, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Sisseton- Wahpeton Sioux Tribe, Spirit Lake Sioux Tribe, Standing Rock Sioux Tribe, and Yankton Sioux Tribe.

An ethnographic overview of Yellowstone National Park was completed in September 2000 and was published in 2002. Yellowstone Lake has been documented as important in oral histories from Native Americans. Many native plants and animals were also used for food, medicinal or ceremonial purposes (Nabokov and Loendorf, 2002). Ethnographic resource information is often sensitive in nature. Requests for this information can be made through the Yellowstone Branch of Cultural Resources.

To date, tribes have not identified any specific ethnographic resources within the planning boundary although they have indicated that many of the ethnographic resources important to them occur throughout the park. Should ethnographic resources be identified, consultation with appropriate tribes will occur to determine the intensity of any impacts and possible mitigations.

3.2.3 Historic Structures

The area within the planning boundary contains six historic districts (three listed, two eligible, and one potentially eligible) and two National Historic Landmarks (one listed and one potentially eligible). The following sections describe the significance of each of the districts.

Fishing Bridge Historic District

The Fishing Bridge Historic District was determined eligible in 1981 and is significant at the state level under National Register Criteria A and C. The period of significance is 1924–1942. The district in part derives its significance from a linear concentration of commercial buildings designed in the rustic style and located east of the rustic Fishing Bridge. This streetscape constitutes one of the earliest commercial strips developed within a national park and the state of Wyoming to accommodate the needs of visitors arriving in automobiles during the 1920s through the 1940s. The district also derives significance from the Fishing Bridge Museum, a National Historic Landmark (see below). Finally, the district is also significant for a long heritage of offering recreational opportunities for visitors that ranged from fishing, boating, and camping to picnicking and hiking.

The principles of the **rustic style** of architecture emphasizes the subordination of built features to the natural environment through use of native materials, irregular massing and line, earth tones, and careful workmanship with prominent handcrafted details. Buildings and structures feature horizontal lines, low silhouettes, and small-scale and simple designs that are practical and efficient. This was the signature style utilized in the National Park Service between 1916 and 1942.

This tradition began in the late nineteenth century, when the site became a popular destination for anglers. The district boundary is shown in Figure 3-2a. A list of contributing structures within the district can be found in Appendix D.

During the 1980s, the importance of this area as grizzly bear habitat led to the removal of the Fishing Bridge campground and nearly all of the tourist cabins that had been constructed in the 1930s. Although structures continued to be shown for removal to support grizzly bear habitat restoration goals, several buildings were ultimately retained, and continue to support visitor activities within the park.

Numerous historic resources survive within the Fishing Bridge district to convey historic associations, including several features located along the commercial strip (the General Store, Service Station, Repair Station and Boy's Dormitory), the Fishing Bridge Museum NHL and amphitheater, the Fishing Bridge, several historic cabins, a ranger station/warming hut, and the site of the former campground. Many of the surviving buildings were designed in the rustic style, and the district conveys a cohesiveness of architectural character that is rooted in the significant pre-World War II period of National Park development.

Fishing Bridge Museum NHL

The Fishing Bridge Museum was listed as a National Historic Landmark in 1987 along with two other surviving museums designed by architect Herbert Maier for the park as part of a “trail-side museum” program developed throughout the park. The Fishing Bridge, Norris, and Madison museums were considered significant for their rustic architecture and as the work of a master. The Fishing Bridge Museum has been noted as one of the most important architectural expression of rustic style architecture developed during the period, and is known to have inspired national and state park architecture. Maier worked to integrate his buildings with their setting, specifically designing structures that appeared to have grown up naturally out of the terrain. In conjunction with the Fishing Bridge Museum, Maier also designed the Naturalist's Residence and an amphitheater in the rustic style. The NHL boundary is shown in Figure 3-2a.

Grand Loop Road and East Entrance Road Historic Districts

The park's Grand Loop Road, which extends through the Lake Historic District and the East Entrance Road, which extends through the Fishing Bridge Historic District, are included in a Multiple Property Documentation of Yellowstone National Park's historic resources. The Grand Loop Road system was a 150-mile circuit system designed to connect the park's most popular attractions in a manner that would lie lightly on the land and respect the natural environment. This road was developed between 1891 and 1906, but built upon earlier efforts to provide access to the remote wilderness. The road was connected to five designated park entrances and two additional access points within Wyoming, Montana, and Idaho, that influenced regional transportation and travel. The nomination includes the Grand Loop Road and the five Entrance Roads; the park's secondary roads are also considered significant.

The Grand Loop Road historic district was listed on the National Register of Historic Places as nationally significant under Criterion A as one of the first, large-scale designed road systems planned by the federal government, and Criterion B, for U.S. Army Corps of Engineering Officer Hiram Martin Chittenden for his vital and innovative role in the development of Yellowstone's road system, for his role in the very early recognition of Yellowstone's place in history in the United

States, for his important historical contributions to the literature of the American West, and for his role toward the development of the design philosophy which the NPS later adopted for its roads and building programs. The Grand Loop Road is also significant at the state level under Criterion C representing the continuing design philosophy of blending with nature.

In 1903, the Grand Loop Road was linked to the newly-constructed East Entrance Road via the park's first bridge crossing of the Yellowstone River northeast of the Lake Hotel. The intersection of these two roads formed an important nexus between these key transportation routes as well as with the scenic attractions of the lake and river, and contributed greatly to development of the Lake Village. During the first half of the twentieth century, the developed area grew to include several lodging and recreation features, park administration, and support elements that arose in response to the interests of visitors in experiencing the natural wonders of the region, particularly boating on the lake and fishing at the Yellowstone Lake outlet.

The Lake Historic District follows the historic alignment of the Grand Loop Road. The Lake Hotel was accessed via the early alignment of the Grand Loop Road. Development of the hotel occurred adjacent to the road, which followed the lakeshore. In 1971, the Grand Loop Road alignment was changed to bypass the hotel and lodge. A paved segment of the original road between the Fish Hatchery and the Ranger Station survives within the district to convey its historic associations. Unpaved traces exist along the lakeshore; however, these are non-contributing.

The East Entrance Road extends through the Fishing Bridge Historic District. It is nationally significant under Criteria A and C. Construction of the East Entrance Road from Cody, Wyoming to Yellowstone Lake was completed in 1903, with the associated river crossing built in 1902. The road contributed greatly to the development of the area. Completion of the bridge connected the east side of Yellowstone to the Grand Loop Road, while the East Entrance Road provided a new route for visitors to access the park from Wyoming. Thus the East Entrance Road, which passes through the Fishing Bridge Historic District, served an important transportation function that increased visitor access to important locations throughout the park.

Both the Grand Loop Road and East Entrance Road historic districts retain evidence of the design philosophy harmonizing with the environment as expressed and executed during the historic period, including:

- the introduction of certain elements of grace in alignment--the road lies gently on the landscape;
- the use of architecturally pleasing structures--manmade features such as culverts, walls, curbing, etc., constructed of natural materials and their scale compatible with the natural environment;
- the protection of trees, shrubs, and other natural growths from destruction and damage-- this provided undisturbed vegetation along the road, which offered a feeling of a natural setting; and
- diminution of scars--large cuts and fills were avoided.

Lake Historic District

The Lake Historic District was determined eligible for listing in the National Register of Historic Places in 1994. It is significant at the state level under Criteria A and C. The period of significance is shown as 1889-1940s. The Lake Hotel was individually listed in the National Register for its architecture in 1991. The period of significance begins with 1889 as the date of construction for the original Lake Hotel, which became the focus of all development within the district.

However, it is the 1903 remodeling of the hotel based on designs prepared by architect Robert Reamer that conveys significance under Criterion C. The hotel is also considered significant under Criterion A for its association with tourism and commerce in national park history. The end date of 1941 coincides with completion of a plan that directed work at the site for the next eleven years.

Colonial Revival style: When completed, the Lake Hotel architecture included monumental “temple front” porticoes with Ionic columns, architrave window trim, small balcony projections, and balustrades steeped in classical architecture traditions. Regularity, symmetry, and emphasis on straight lines were key elements of the building’s expression.

The district in part derives its significance from the Lake Hotel, a notable work of architecture initially completed in 1891 and remodeled by recognized architect Robert Reamer in 1903 in the Colonial Revival style, popular during the late nineteenth and early twentieth centuries for the traditional American values it represented. It is the oldest surviving hotel from Yellowstone’s early history, as well as in any U.S. National Park.

The district also derives its significance from several exceptional examples of rustic style architecture that became the signature style of the National Park Service beginning in the 1920s. Numerous historic resources survive within the Lake historic district to convey its historic associations, including the Lake Hotel, Lake Lodge, General Store, service station, ranger station, boathouse, a collection of cottages associated with the Lake Hotel, and several utility and support buildings. Many of the surviving buildings, including the Lake Lodge, General Store, Lake service station, and ranger station, were designed in the rustic style and exhibit architectural character rooted in the significant pre-World War II period of national park development. A list of contributing structures within the district can be found in Appendix D.

Lake Fish Hatchery Historic District

The Lake Fish Hatchery Historic District is listed on the National Register as significant under Criteria A and C. It was originally listed in 1985 for significance under Criteria A and C. Under Criterion A, it is significant for the role it played in the administration and development of fisheries-related conservation policy and practices in Yellowstone National Park and throughout the western United States including its role as the primary source for wild cutthroat trout eggs. The district is also listed under Criterion C for rustic style architecture. In 2005, a determination of eligibility elevated its significance from local/state to the national level for its role in the development of national policies regarding parks and conservation and as the primary source for wild cutthroat trout propagation for over 50 years. The operation was heavily visited by the public. It featured aquaria and other exhibits where visitors could learn about the operation. During the period 1930–1957, the National Park Service gradually changed its earlier policies that manipulated natural conditions in the park, thus making substantial strides in fishery science and ecosystem

management and the evolving natural ecosystem management currently in place today. The hatchery operation was halted in 1957, although fisheries management continues.

The complex, built between 1930 and 1932, consists of ten buildings and was constructed by the Bureau of Fisheries in the rustic style of architecture, which was the signature style of the National Park Service that flourished during the 1920s, 1930s, and early 1940s. The buildings are of wood with log framing and cedar shingle roofs. A list of contributing structures within the district can be found in Appendix D.

Bridge Bay Marina Historic District (potentially eligible)

The Bridge Bay Marina and campground were built at the end of the Mission 66 era. While there are many examples of campgrounds built during this era, there are only a few examples of marinas. The Bridge Bay Marina is currently being evaluated for eligibility into the National Register of Historic Places. The marina will likely be determined eligible as it represents a unique architectural example of east coast marina village architecture in a western park. For purposes of this analysis the NPS assumes eligibility for the Bridge Bay Marina.

3.2.4 Cultural Landscapes

Cultural landscapes consist of “a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.” They provide a living record of an area’s past, and a visual chronicle of its history. The character-defining features and patterns of a cultural landscape may include, as appropriate: natural systems and features, spatial organization, topography and landforms, vegetation, circulation systems and features, land use, buildings and structures, building cluster arrangement, water features, small scale features, archeological sites, and views and vistas.

Three separate cultural landscape inventories (CLIs) are being completed to document significant landscape features and patterns in the Lake Area, including the Fish Hatchery, Lake, and Fishing Bridge historic districts. These landscapes are being documented using the National Park Service Cultural Landscape Inventory format. It is anticipated that Section 110 consultations with the Wyoming State Historic Preservation Office (SHPO) for these landscapes within the Area of Potential Effect (APE) will continue to occur within the first quarter of the 2012 calendar year. Initial consultation began in the fall of 2011. Section 110 consultations would occur through consensus determination of eligibility, using the findings of the CLI. The CLI is an evaluated inventory of landscapes having historical significance that are listed on or eligible for listing in the National Register of Historic Places. Like the List of Classified Structures, the CLI assists the NPS in its efforts to fulfill the identification and management requirements associated with Section 110(a) of the National Historic Preservation Act, National Park Service Management Policies (2006), and Director’s Order #28: Cultural Resource Management. Section 106 consultation and compliance will be completed for individual actions proposed as they are designed and finalized.

Fishing Bridge Historic District Cultural Landscape

The Fishing Bridge Historic District cultural landscape is composed of a variety of features and patterns that together with historic structures present a cohesive appearance and continue to convey historic associations with early twentieth century development of the site and the rustic design style employed by the National Park Service to connect visitors with the natural environment. Buildings and structures as well as roads, paths, and trails were designed to afford

views and vistas of the lake. The developments themselves were carved from the native lodgepole and subalpine forest, which continue to form the setting. The Fishing Bridge Museum was integrated into the changes in topography using terraces and stone walls that help connect visitors to the views and shore of the lake, while the Fishing Bridge offered the advantage of a prime location for fishing and was designed with pedestrian walks to either side to accommodate anglers. This path system linked the bridge to the commercial strip. The commercial strip and its parking were both connected to and separated from the East Entrance road through a system of planted medians. Trees and shrubs were planted specifically to vegetate the roadway medians, which diminished the visual impact of buildings on the East Entrance Road. Plantings were also used to complement the development at the Fishing Bridge Museum. Here, Maier provided tree wells in the terraces to accommodate the larger specimens that existed on the sites prior to construction. Crenelated stone curbing, rock/boulder edging, and log and stone fencing were employed along trails, parking areas, and medians, and roads throughout the Fishing Bridge Historic District. Despite the removal of the campgrounds and tourist cabin areas, these sites are generally screened from view along principal corridors due to the existing vegetation and do not substantially affect the feeling of the commercial strip, the museum, and the road corridor and bridge. The Fishing Bridge Museum NHL complex retains a high degree of integrity of design, including the buildings, associated walks and paths, terraces, planting beds, and retaining walls.

Lake Historic District Cultural Landscape

The landscape associated with the Lake Historic District is composed of several landscape characteristics that together with historic structures create a cohesive appearance that continues to convey its associations with late-nineteenth and early-twentieth century development of the site, and the associated design style that reflects a particular ethic regarding the park experience for visitors. The existing historic district landscape reflects cultural responses to natural features such as the forest, mountains, and scenic Yellowstone Lake. The Lake Hotel was sited to access a prominent view across the lake. Buildings and structures as well as roads, paths, and trails were designed to afford views and vistas of the lake. The developments themselves were integrated into the native lodgepole and subalpine forest, which continue to form the setting. District development also follows the Grand Loop Road, designed in the nineteenth century to connect the natural wonders and attractions of the park for visitors. Forests and meadows separate distinct land use areas and also screen views of incompatible development from visitor use areas to create an overall natural effect. A large meadow in front of the Lake Lodge has served as an open foreground for views of the lake through a thin screen of trees since its construction in 1921. These approaches to vegetation management and design using existing native vegetation were developed during the period of significance.

As noted previously, the Grand Loop Road provided the initial structure for the historic district. A bypass established in 1971 altered the intended relationship between the Lake Hotel and the road corridor, although a portion of the paved road and trace of its original alignment along the lakeshore survives. Cluster arrangements, such as the historic patterns of spatial organization that characterized the Eastern Cottage cluster also added structure to the landscape.

The hotel forms a linear edge to the lake with views afforded through groves of trees between the lake and the hotel. A circular loop road provides a formal sense of arrival at the hotel and its porte cochere. Service buildings edge the hotel to its rear. These include the powerhouse, root cellar, and girls' dormitory. As noted above, the supporting buildings are set behind and north of the hotel to protect the reciprocal view between the hotel and the lake and Grand Loop Road.

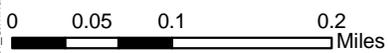
Lake Fish Hatchery Historic District Cultural Landscape

The landscape associated with the Lake Fish Hatchery Historic District is composed of several landscape characteristics that together create a cohesive appearance that continues to convey its associations with the role it played in natural resource conservation policies and practices and the rustic design style employed in Yellowstone National Park during the period of significance.

The siting of the development was in direct response to the convergence of Hatchery Creek, Yellowstone Lake, and the Grand Loop Road, which offered both propagation and transportation advantages. Three rectangular rearing ponds were located along Hatchery Creek, which provided an improvement in fish propagation. East of the new building, workmen built an exhibit pond where mature fish could be kept for exhibition, however this was demolished with the construction of a parking area south of the hospital. Out of view of the lakeshore portion of the district, the administrative buildings, also constructed in the rustic style, are located upslope and are screened from view.

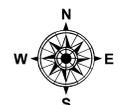


Lake Historic Resources - Fishing Bridge



Legend

- | | | | |
|--------------------------|-------------------|---------------------------|-------------------|
| Planning Boundary | Planning Boundary | Historic Resources | Historic District |
| Trails | Trails | Proposed Historic Distri | Landmark |
| Roads | Roads | Proposed Landmark | |
| Buildings | Buildings | | |



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Figure 3-2a Lake Historic Resources - Fishing Bridge



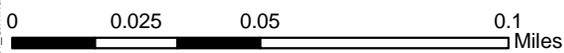
Lake Historic Resources - Lake Village



Figure 3-2b Lake Historic Resources - Lake Village



Lake Historic Resources - Bridge Bay



Legend

- | | |
|--------------------------|---------------------------|
| Planning Boundary | Historic Resources |
| Planning Boundary | Historic District |
| Trails | Proposed Historic Distri |
| Trails | Landmark |
| Roads | Historic Place |
| Roads | |
| Buildings | |
| Buildings | |



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Figure 3-2c Lake Historic Resources - Bridge Bay

3.3 SAFETY, OPERATIONS, AND VISITOR EXPERIENCE

3.3.1 Visitor Use and Experience

People from around the world come to Yellowstone each year to experience its wonders. Visitation is highly seasonal, with June, July, and August being the busiest months. The shoulder-season months of May and September receive less use, but the volume is still substantial. Use in the winter months is relatively low, accounting for about six percent of the overall visitation, totaling between 113,000 and 140,000 in recent years. In 2010, the park received 3.6 million recreational visits.

Yellowstone National Park, in its *Long-Range Interpretive Plan* (NPS 2000), established a number of visitor experience goals that the park would like to be available to visitors. These, in part, include:

- to experience the essence of the park's wild nature;
- to behave in ways that do not hurt themselves or park resources;
- to successfully plan their visits and orient themselves to facilities, attractions, features, and experiences;
- to experience programs, media, and facilities that enhance their educational experiences;
- to understand the park's significance; and,
- to enjoy themselves, have memorable experiences, and go home feeling enriched.

The NPS operates visitor centers in central locations where visitors can obtain general information, orientation, and interpretive and educational information about the park, its resources, and visitor services.

Summer visitor use patterns generally reflect entrance traffic and the tendency of visitors to drive to the major developed areas. Old Faithful is the most popular developed area in the park, with 90% of visitors stopping at this area during 2006; more than 60% of summer visitors reported visiting Mammoth Hot Springs and Canyon Village, (Manni et al. 2007). The most common activities in the park were sightseeing/taking a scenic drive (96%) and viewing wildlife/bird watching (86%). For 59% of park visitors, sightseeing/taking a scenic drive was the primary reason for visiting the park (Manni et al. 2007).

Recreational activities that are most likely to be affected by this Comprehensive Plan are not confined to one subset of user. Impacts to the backcountry and by day use visitors and anglers were analyzed based on the sale of special use permits and other data routinely collected by park staff. In 2009, park staff issued a total of 5,638 backcountry permits, 2,986 boating permits, and 50,113 fishing permits. Anglers typically spend a total of 270,000 days fishing in the park each year.

In 2006, 90% of park visitors were from the United States (California, 12%; Utah, 10%; and 5% each from Idaho, Colorado, Washington, and Texas; and smaller percentages from 43 other states and Washington, D.C. (Manni et al. 2007). International visitors were from Canada (25%), Netherlands (17%), Germany (10%), United Kingdom (9%), Italy (7%), and 17 other countries. Visiting the park was the primary reason that 60% of the visitors came within 150 miles of the park; 53% of visitors were seeing Yellowstone for the first time (Manni et al. 2007).

The Lake Area does not receive the number of visitors that Old Faithful, Canyon, and Mammoth areas receive. The area is known as a quiet place within the park and according to public scoping for this document, visitors would like it to “stay the same.”



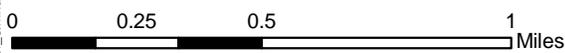
Lake Visitor Use - Fishing Bridge



Figure 3-3a Lake Visitor Use - Fishing Bridge



Lake Visitor Use - Lake Village & Gov't Area



Legend

Planning Boundary



Trails



Roads



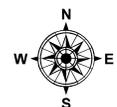
Buildings



Primary User

Yellow square: Administrative

Orange square: Visitor



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Figure 3-3b Lake Visitor Use - Lake Village & Gov't Area



Lake Visitor Use - Bridge Bay



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Figure 3-3c Lake Visitor Use - Bridge Bay

3.3.2 Scenic Resources

Scenery has always been an integral part of the fundamental resources and values of national parks. Yellowstone's enabling legislation from 1872 reserves the park as a "pleasuring-ground for the benefit and enjoyment of the people." Historian Ethan Carr explains that "in the context of the 19th century landscape park, the preservation of unimpaired scenery could be identified with civic virtue." The 1916 Organic Act that created the National Park Service sought to "conserve the scenery...and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Thomas Moran's paintings and William Henry Jackson's photographs of Yellowstone scenery were instrumental in convincing the Congress to set this area aside and "preserve it from injury or spoliation."

Outstanding scenic character has always distinguished national parks from other areas, including national forests. Yellowstone National Park abounds with impressive viewsheds of the highest quality. Despite being one of the oldest units in the park system, the majority of its landscapes appear untouched by humans and retain their primeval characteristics. Less than ten percent of the park is within the "park developed zone" (NPS 1991) and facilities are predominantly grouped along the figure-eight Grand Loop Road system and within a handful of small park communities, leaving substantial acreage in its natural condition. Wide vistas of unique scenery such as Old Faithful geyser with a backdrop of forest and blue sky have attained iconic status representing not only Yellowstone, but the entire National Park Service.

Part of the allure and expectations associated with Yellowstone involve the impression that the park is predominantly in its natural condition. Because the primary viewsheds are natural, built structures often stand out in stark contrast to the scenery and thereby degrade part of the fundamental resource. Important views of the Lake Area include Yellowstone Lake, the Lake Hotel and Lodge, Fishing Bridge, and views from the shoreline.

Yellowstone strives to preserve its naturally dark nighttime skies, a valuable park resource. In developed areas, there is a delicate balance between providing the appropriate amount and level of human-generated light for the safety of visitors and staff and the protection of the dark night skies. Human vision is least effective when extreme lighting contrasts are presented (for example, when very bright areas transition to very dark areas), and these situations are avoided/corrected in developed areas.



Lake Scenic Resources - Fishing Bridge



Fishing Bridge



Figure 3-4a Lake Scenic Resources - Fishing Bridge



Lake Scenic Resources - Lake Village

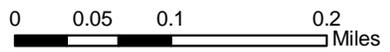
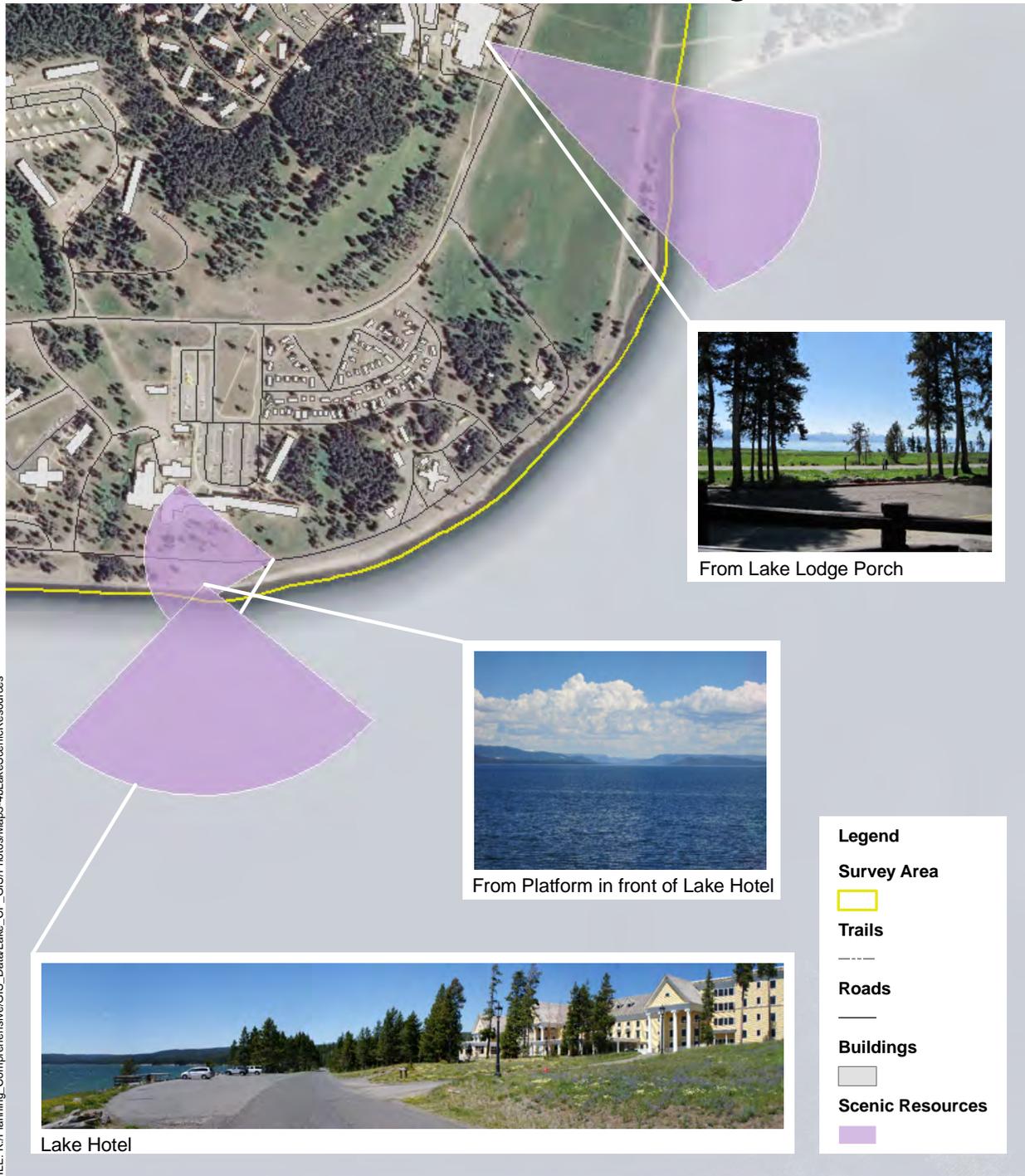


Figure 3-4b Lake Scenic Resources - Lake Village



Lake Scenic Resources - Bridge Bay

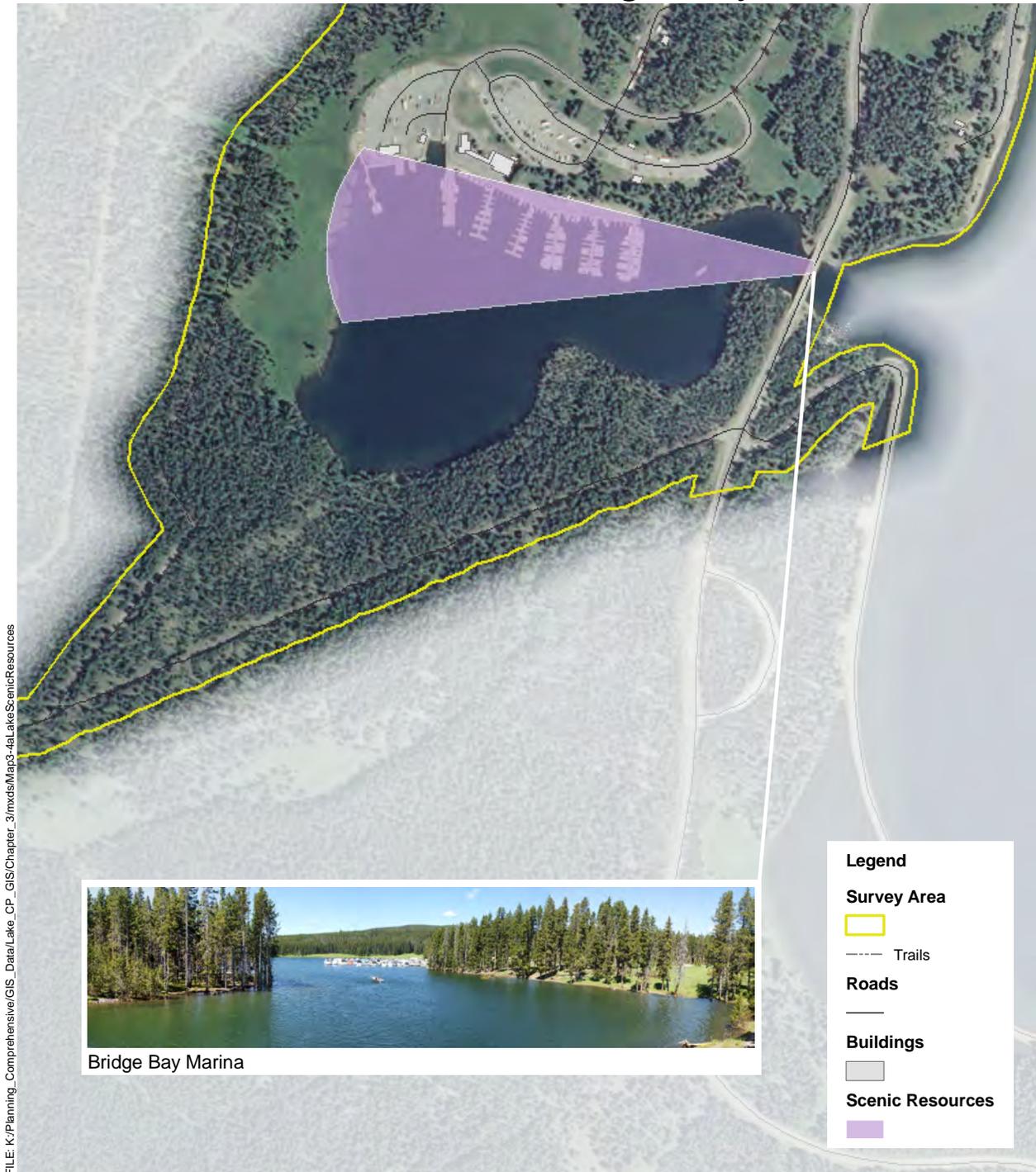


Figure 3-4c Lake Scenic Resources - Bridge Bay

3.3.3 Natural Soundscapes

Certain types of land uses are considered to be more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure time and intensity) and the types of activities typically involved with these land uses. Schools, libraries, churches, hospitals, convalescent and nursing homes, auditoriums, parks, and outdoor recreation areas are generally more sensitive to noise than are commercial and industrial land uses. Residences may also be considered noise-sensitive uses because residents may be disturbed by noise. Land uses within the project area are a combination of recreational and open space. There is also some road traffic in and out of the project area.

In a park setting, a natural soundscape is an area characterized by certain ambient acoustical and sound level qualities, absent the intrusion of sounds caused by humans or human technology. Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and they can be transmitted through air, water, or solid materials (NPS, 2006).

The natural soundscape is a component of any park setting that is intended to be managed or appreciated as natural, such as wilderness areas. The natural soundscape is viewed as a resource, as having value for its presence, and as a value to be appreciated by visitors. Many park visitors have an expectation of seeing, hearing, and experiencing phenomena associated with a specific natural environment. The sounds made by wind, birds, waves, elk, wolves, waterfalls, and many other natural phenomena are associated by visitors with unique features and resources of parks.

Intrusive sounds are also a matter of concern to park visitors. As was reported to the U.S. Congress in the “Report on the Effects of Aircraft Overflights on the National Park System,” a system-wide survey of park visitors revealed that nearly as many visitors come to national parks to enjoy the natural soundscape (91 percent) as come to view the scenery (93 percent). Noise can also distract visitors from the resources and purposes of cultural areas--the tranquility of historic settings and the solemnity of memorials, battlefields, prehistoric ruins, and sacred sites (NPS, 2000).

Existing Noise Sources

Background noise in the park is generally much lower than that expected or tolerated in developed areas in which federal noise guidelines are generally applied. In the times that the Lake Area is closed to wheeled vehicles, the ambient noise in the environment is primarily influenced by oversnow vehicles and natural soundscapes. Park operations generate noise intermittently from personnel, vehicles, generators, hand tools such as hammers and power saws, heavy equipment such as backhoes and tractors, and smaller power equipment such as chain saws and weed eaters. The majority of noise from park operations is confined to daylight hours. During the peak tourist season, noise can be attributed to motor vehicles travelling along the parks access roads and to human use of recreational facilities. These include the Fishing Bridge RV site, Bridge Bay Campground, the Lake Hotel, Lake Lodge, multiple picnic sites, and various restroom facilities. Noise associated with park maintenance also increases during peak season as a result of increased use. Additionally, occasional aircraft overflights also contribute to the ambient noise environment.

3.3.4 Human Health and Safety

The NPS is committed to providing appropriate, high-quality opportunities for visitors and employees to enjoy the parks in a safe and healthful environment. Further, the NPS strives to protect human life and provide for injury-free visits. Employee and volunteer safety within the workplace for the park and concessioners is a high priority. Visitation to Yellowstone has increased steadily over the decades with a high of 3.6 million visitors reached in 2010. Due to the closure of facilities in the winter, most visitations occur during the summer months. Human health and safety concerns associated with activities and services in the Lake Area include:

- Wildlife-human conflicts, particularly with bears and bison
- Cold, deep, and sometimes violent lake water can be a safety issue for inexperienced boaters
- Thermal areas along the lake are fragile and hazardous
- Vehicle/pedestrian conflicts along the lakeshore between the Lake Hotel and the Lake General Store

3.3.5 Park Operations

Park operations consist of NPS, concessioner, and contractor operations which encompass protection of natural resources; maintaining all roads, trails, buildings and other structures in a safe and aesthetically pleasing condition; preventing deterioration that would render them unsightly, unsafe, or beyond repair and providing dining, shopping, and lodging opportunities to park visitors.

National Park Service Operations

The NPS provides operations and support for administrative services, resource management, cultural and natural resources, visitor facilities, visitor protection, and emergency services throughout the park. NPS employee housing and administrative offices are located at developed areas including Mammoth Hot Springs, Norris, Canyon, Tower, Northeast Entrance, Lake, Grant, Madison, South, Old Faithful, and West Yellowstone. Parkwide operations include maintenance of museums, ranger stations, housing, campgrounds, warming huts, vault toilets, water and sewage systems, housing and other buildings, road maintenance, garbage collection, and maintaining the NPS vehicle fleet (snowmachines, snowcoaches, boats, cars, trucks, and heavy equipment). In addition, NPS personnel maintain hundreds of miles of trails throughout the park.

Resource and visitor protection operations in YNP include the backcountry office, communication center, corral operations, and law enforcement rangers. The backcountry office provides technical support for backcountry activities undertaken by both park visitors and park employees. During 2009, Yellowstone had 39,736 overnight stays at backcountry campsites. The communication center is the central dispatch for all park communications. Corral operations provide practical support for livestock use and backcountry trips. Law enforcement rangers regularly patrol front-country and backcountry areas and are responsible for visitor and resource protection, emergency services, and structural fire response to the park's developed areas

The water distribution system in the Lake Area has been replaced and repaired in various places over the years, but a large portion of the system is 70 to 80 years old. The water lines at Fishing Bridge and the Lake Village have degraded and no longer operate efficiently, leading to a 20-35% water loss. In addition to leakage, the current system is too shallow to allow operation during the winter. Because of this, historic structures do not have fire protection in the winter. Currently, the water main is attached under the Fishing Bridge as it crosses the Yellowstone River. The water main

is exposed and contributes to the requirement for draining prior to winter. The Fishing Bridge Water Tank is a partially buried 250,000 gallon concrete tank that was built in the 1930s. The outside of the tank is covered by layers of calcium deposit and is likely the result of leakage out of the tank. Leakage from the tank is calculated at 12,000 gallons per day. Currently on high summer use days the tank is drained so the amount of water loss is decreased and demands can be met. This results in limited fire supply storage to the entire Fishing Bridge, Lake and Bridge Bay areas.

Concession Operations

Xanterra Parks and Resorts operates lodging, gift shops, and dining and camping facilities in the park's developed areas. They also operate bus tours during summer months and offer oversnow vehicle use in the winter. In 2009, park concessioners provided 1,074,288 overnight stays for park visitors.

Delaware North operates stores that sell gifts and souvenirs, groceries camping supplies, Yellowstone fishing licenses, and fishing tackle and equipment, and offer limited food and beverage service.

Yellowstone Park Service Station operates service stations in Mammoth Hot Springs, Canyon, Fishing Bridge, Grant Village, Old Faithful, and Tower that sell fuel, snacks, and refreshments. Most of the stations also offer vehicle towing and maintenance service for park visitors.

Medcor, Inc. operates medical clinics at Old Faithful, Mammoth, and Lake that provide care for NPS and concessions employees as well as park visitors.



Lake Area Operations - Fishing Bridge

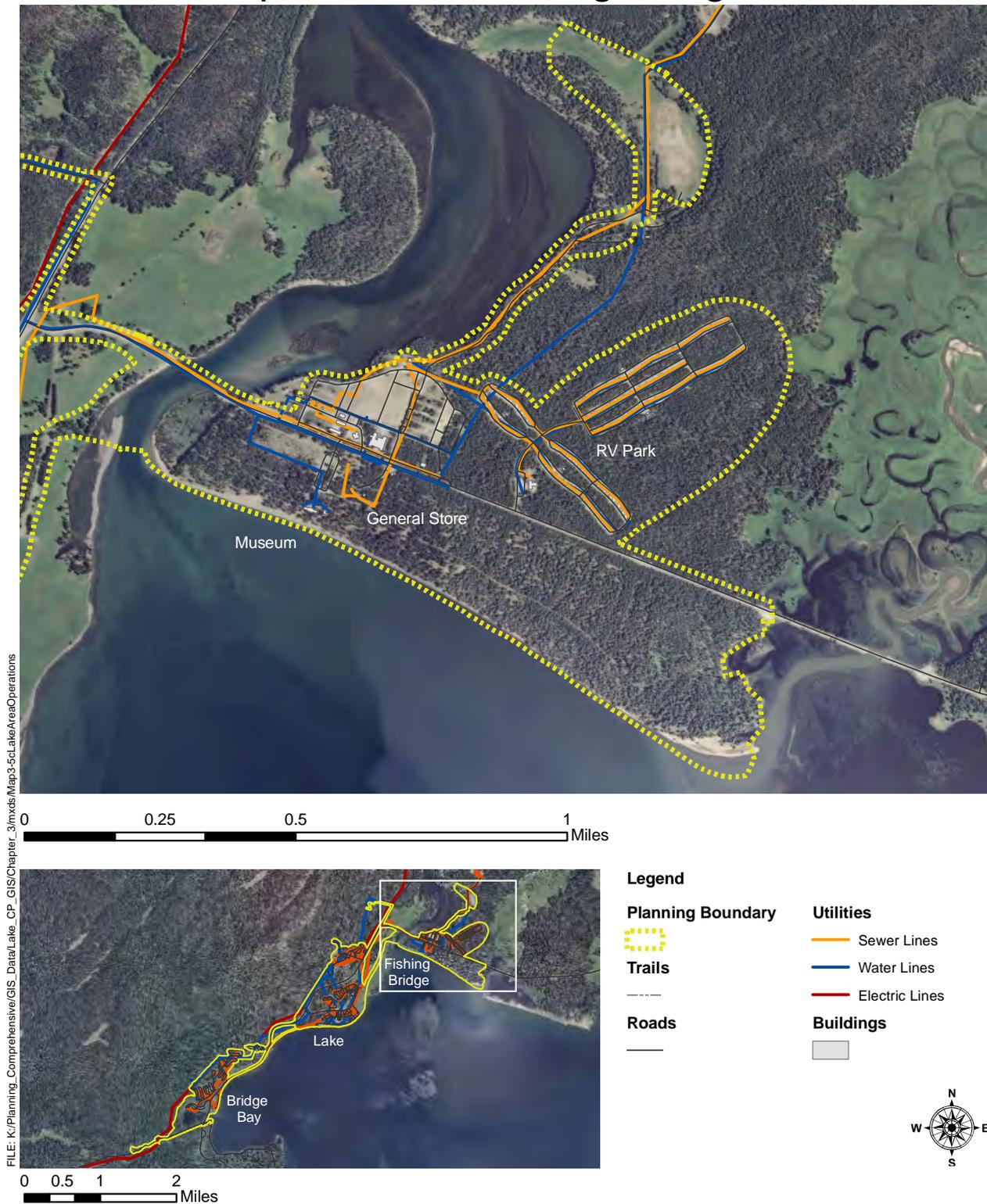


Figure 3-5a Lake Area Operations - Fishing Bridge



Lake Area Operations - Lake Village & Gov't Area

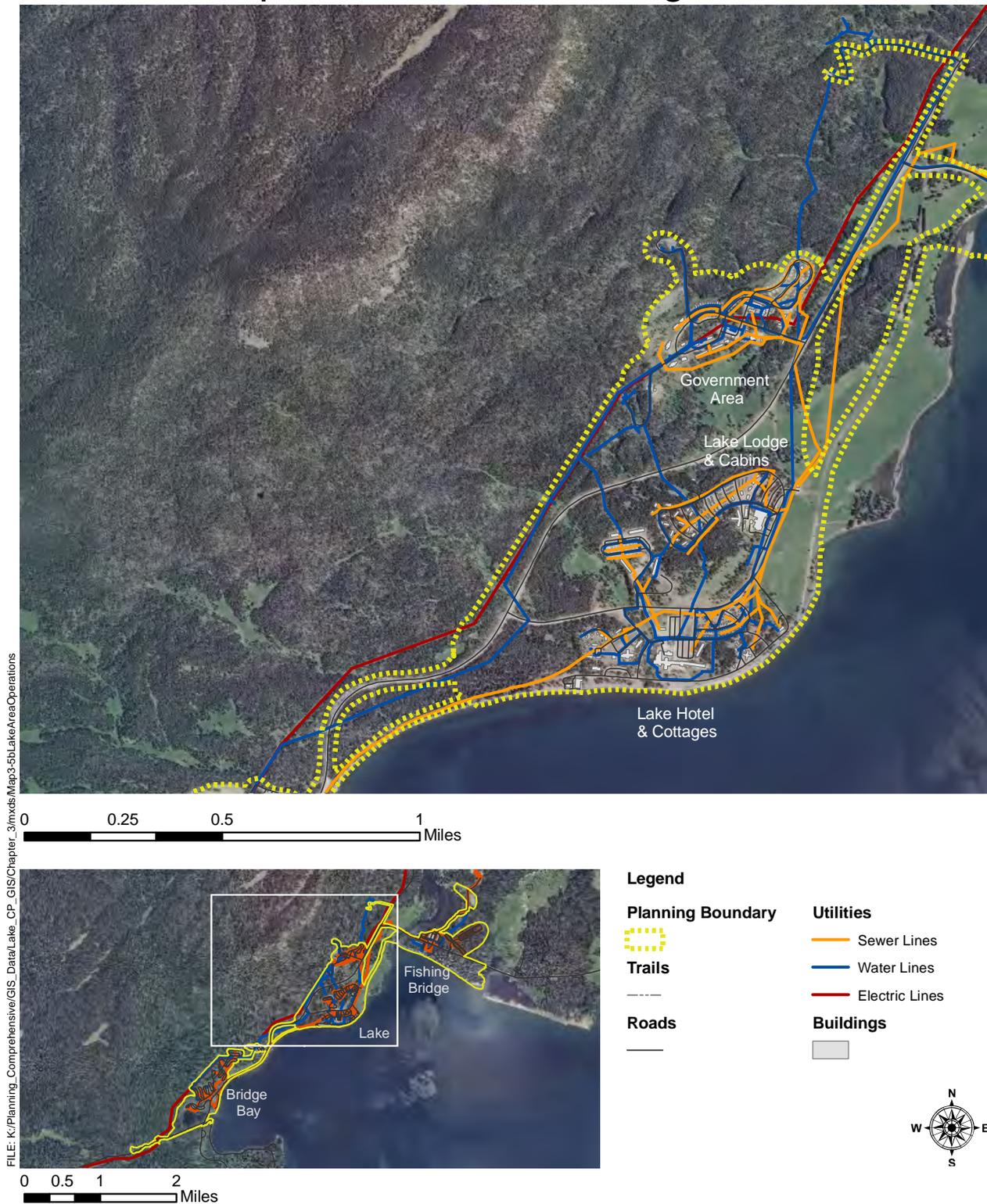


Figure 3-5b Lake Area Operations - Lake Village & Gov't Area



Lake Area Operations - Bridge Bay

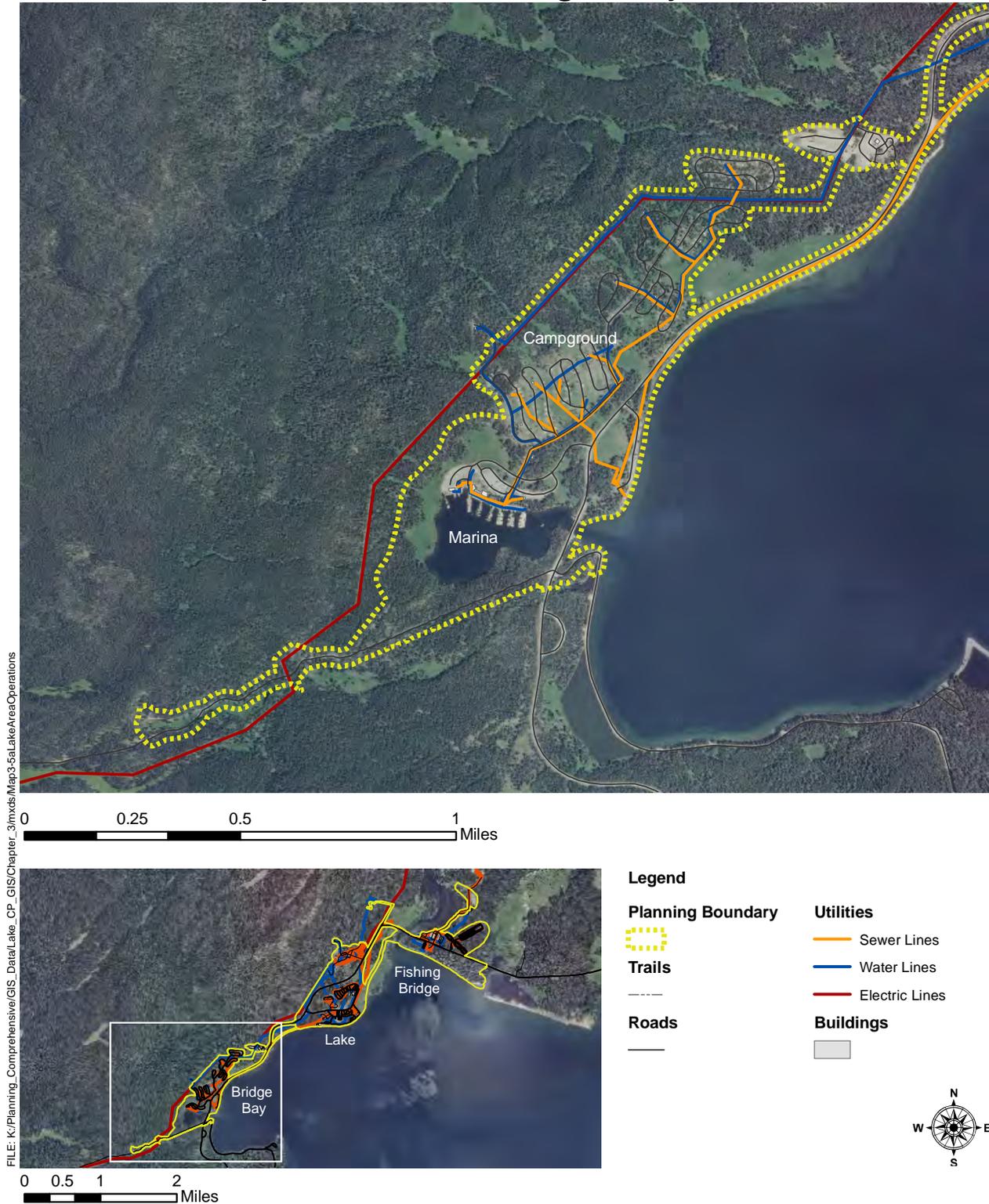


Figure 3-5c Lake Area Operations - Bridge Bay