SECTION 8

NACHES RIVER SUB-BASIN
SHORELINE INVENTORY AND ANALYSIS
DISK #4

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NACHES SUB-BASIN CONTEXT SUMMARY

Portions of the following text have been primarily taken, in whole or in part, from the following reports: (Haring, 2001 and USFS, 1995)

NACHES SUB-BASIN OVERVIEW

The Naches River is a major right-bank tributary to the Yakima River, entering at RM 116.3. The Naches River enters the Yakima River immediately downstream of Yakima Ridge anticline (Selah Gap). The Naches sub-basin covers about 131.5 square miles (84,133 acres) of forested and rangeland, portions of which have been developed for agricultural and urban/suburban uses (Naches Watershed Analysis, 1995).

The Naches River is formed by the confluence of the Little Naches River and the Bumping River (RM 44.5) at an elevation of 2540 feet. The river flows, generally, southeast throughout the majority of its course. The Tieton River joins the Naches River at RM 17.6. The headwaters of Naches River and its tributaries reside within the Mt. Baker-Snoqualmie National Forest on the Cascade Mountains. The Naches Rivers exhibits a fairly uniform overall gradient of 0.6%, with the segment above the Tieton River confluence being slightly less steep (0.57% - 30 ft./mi.) than the lower segment (0.66% - 35 ft./mi.)

The Naches River watershed, upstream of the juncture of the Tieton River, includes federal holdings. Lower reaches of the sub-basin include orchards, irrigated agriculture, and grazing and encroaching residential and urban development, as well as the communities of City of Naches, Gleed, Nile, Peterson, and Cliffdell (unincorporated), in addition to urbanized areas with the City of Yakima.

While the gradient of the Naches River exhibits a, generally, uniform gradient, the degree of floodplain confinement varies greatly. With changes in confinement are the expected changes in channel form.

GEOLOGY

Bedrock geology in the Naches River watershed is predominantly volcanic and/or pyroclastic, with secondary sedimentary formations (Fig. N1). The Fife's Peak formation is comprised of interbedded andesite and basalt breccias, tuffs, and lava flows. Breccias and tuffs were deposited mainly as lahars and debris flows. These deposits can be highly fractured allowing deeper infiltration of ground water, which results in weathering of bedrock to clays. Large-scale landslides in the Milk Creek area may be associated with deep weathering of this formation during a period of moister climatic conditions (United States Forest Service [USFS], 1995).

The Ellensburg formation is a sedimentary formation comprised predominantly of volcaniclastic sediments derived from volcanic activity in the Cascade Mountains 9-4 million years ago. This

formation consists of weakly cemented gravels, silts, sands, and clays deposited by mudflows or streams onto alluvial fans. Grain size decreases toward the east (USFS, 1995).

The Grande Ronde Basalt was deposited as a series of lava flows extruded intermittently from 17.5 to 7 million years ago with the bulk of the volume deposited prior to 10 million years ago. Later basalt flows interfinger with the Ellensburg formation. Differences in material and hydrologic properties along the interface of these rock types create slope-stability hazards. The moist climate of the Pleistocene provided conditions suitable for large-scale landslides found in much of the watershed. The deep-seated failure hazard remains high, especially where a thin layer of Grande Ronde basalt overlies the Ellensburg formation or along plateau margins (USFS, 1995).

The structural geology has influenced landform and geomorphic processes. Major ridges and the Naches River follow general west northwest trending geologic faults and folds. All of the mapped formations are folded and/or faulted to some degree. It is estimated that uplift, folding, and faulting of the region began at least 9 million years ago, with the period of greatest intensity between 7 and 5 million years ago. Tilting of younger gravel deposits indicates that folding has continued at reduced rates up to the present time. Rattlesnake, Bethel, and Manastash ridges and Cleman Mountain are anticlinal folds, and the Naches River follows a synclinal fold (USFS, 1995).

Uplift was accompanied by downcutting of stream channels. Though the mainstem Naches River was not glaciated, a wet climate during the Pleistocene resulted in increased river flows and more rapid downcutting of the main and tributary channels (USFS, 1995).

Structural complexity and strong northwest orientation increases in the western portion of the Naches River watershed. Increased complexity and intensity is reflected in landform shape, topographic relief, and drainage density (USFS, 1995).

Geomorphology

The Naches River basin has been divided into geomorphic terranes based on the dominant expression of the landscape. Bedrock geology is predominantly volcanic and/or pyroclastic, with secondary sedimentary formations. The structural geology has influenced landform and geomorphic processes. Major ridges and the Naches River follow generally west-northwest trending geologic faults and folds. The Naches River follows a synclinal (down-warped) fold (USFS, 1995).

Fourteen different landforms are mapped and distributed throughout the Naches River basin: grouped into seven geomorphic terranes. The two terranes constituting the SMP jurisdiction are the Mainstem Corridor and Structurally Controlled (USFS, 1995).

The Mainstem Corridor terrane threads through and controls some features of the Structurally Controlled landscape. Most characteristically, it is a broad, flat-floored valley with steep side slopes. Locally, it narrows due to bedrock constraints. The broad valley buffers the channel from surface runoff and sediment delivery. A system of side channels is important for buffering the effects of peak flow-events and as a refugia for fisheries (USFS, 1995).

The Structurally Controlled terrane is defined by a system of ridges and V-shaped valleys controlled by folded and faulted bedrock. It is characterized by steep slopes and relatively shallow soils. Surface runoff, erosion, and sediment delivery is high. Subsurface water storage is low. This terrane is prone to soil-moisture stress and flashy floods. Seeps and springs are limited and are bedrock controlled. Ponds are rare or absent (USFS, 1995).

VEGETATION

Within the Naches River watershed, the natural vegetation is generally distributed along a gradient of moisture and temperature. Four major vegetation groups can be described: the dry forest vegetation group, the mesic forest group, the wet forest vegetation group, and the non-forest vegetation group. Of these, the mesic forest group and non-forest group predominate within the SMP jurisdiction. North aspects, riparian areas, and mid-elevations support mesic forest vegetation consisting of wet grand fir and Western hemlock plant series. These communities comprise approximate 34 percent (28,600 acres) of the Naches River watershed. Approximately 17 percent (14,664 acres) of the watershed is comprised of non-forest vegetation types that include the mesic, wet, and wet shrub meadows, and the deciduous and gravel bar riparian communities (USFS, 1995)(Fig. N2).

Riparian

The Naches River watershed supports 2686 acres of riparian community type. Riparian communities occur on the banks and shorelines of rivers, creeks, and ponds. Riparian communities are significantly influenced by perennial or intermittent water, high water-tables, and associated soils. Hydrology, solar exposure, and air temperature and humidity are key factors associated with this ecosystem. Three riparian types have been identified within the Naches River watershed: conifer, deciduous, and gravel bar (USFS, 1995). Of these, the deciduous and gravel bar riparian communities are most likely to occur in the SMP jurisdiction.

The deciduous riparian type (574 acres) is characterized by mountain alder, black cottonwood, red-osier dogwood, prickly currant, blue elderberry, wood's rose, and willow. The gravel-bar riparian type (355 acres) occurs along and within rivers and large streams, and is one of constant change. Willow, black cottonwood, quaking aspen, mountain alder, several species of sedge, and various grasses characterize the natural vegetation of this community. The terrace riparian type is found on alluvial material of large cobble and gravel deposited during glacial retreat (USFS, 1995).

Proposed, Endangered, Threatened, and Sensitive (PETS) Plants

Documented, systematic surveys for PETS plants have been conducted in the Naches River watershed since 1988. However, as of 1996, only an estimated 10 percent or less of the watershed (8696 acres) had been included in these surveys. A significant portion of these surveys were conducted in coniferous forest habitats, but several surveys were conducted in riparian habitat along the Naches River, generally in areas influenced by humans within and adjacent to campgrounds, summer homes, and roadside construction. Those PETS plants most likely to occur within the SMP jurisdiction are *Cypripedium montanum* (mountain lady's-

slipper), which is common along benches above streams, *Luina stricta* (strap-leaf luina) which is commonly found in mesic to wet meadows at higher elevations, and *Spiraea pyrimidata* (pyramid spiraea), which is commonly found in valleys, often adjacent to moist meadows (USFS, 1995).

The diversity of habitat conditions present within the Naches River watershed provides potentially suitable habitat for several sensitive plant species not presently documented to occur within the watershed (USFS, 1995).

Noxious Weeds

The State of Washington describes weeds as "any plant which, when established, is highly destructive, competitive, or difficult to control by cultural or chemical practices." In general, they are either introduced or early seral native species that become established on sites that have experienced ground-disturbing activities. Noxious weed surveys in the Tieton River basin are extremely limited. Reconnaissance has been, for the most part, incidental along roadway from vehicles. Noxious weed species of primary concern within, on the approach to, or threatening the Bumping River watershed that are most likely to occur within the SMP jurisdiction include: *Centaurea diffusa* (diffuse knapweed), *Chrysanthumum leucanthumum* (oxeye daisy), *Cirsium vulgare* (bullthistle) and *C. arvense* (Canada thistle), *Hypericum perforatum* (St. Johnswort), and *Verbascum thapsus* (common mullein) (USFS, 1995).

WILDLIFE

Regarding solely the SMP jurisdiction, riparian areas constitute the predominance of wildlife habitat types. Riparian areas are the most critical wildlife habitats, as seen by the disproportionate use of them as compared to other habitat types by wildlife. There is also greater wildlife species diversity in riparian habitat as compared to other habitat types (USFS, 1995).

Some of the characteristics that make riparian areas important to wildlife are: 1) access to food, cover, water, and space (riparian areas always afford water, and often all four components), 2) increased diversity of plant species and structural diversity within the community, 3) linear shape (maximizes the development of edge, which is quite productive in terms of wildlife use), 4) micro-climates that differ from surrounding areas (wildlife are attracted to these areas and some are dependent on it), and 5) provide migration routes, travel corridors, and connectivity between habitat types (USFS, 1995).

The acres of historic habitat availability was most likely similar to existing conditions. Construction of roads, past harvest activities, livestock and big game grazing, and noxious weed invasion has reduced the effectiveness of this habitat (USFS, 1995).

Proposed, Endangered, Threatened, and Sensitive (PETS) Wildlife Species

Five wildlife species, either currently inhabitating or with the potential to inhabit the Naches River watershed, are federally-listed as either threatened or endangered (American peregrine falcon, gray wolf, Northern spotted owl, Northern bald eagle, and American grizzly bear). Of

the five species, three (American peregrine falcon, gray wolf, Northern spotted owl, and Northern bald eagle) are known to occur within the Naches River watershed. Habitat is present for all five species.

The Northern bald eagle was federally listed as threatened in Washington, Oregon, Minnesota, Wisconsin, and Michigan in 1978. At the same time, bald eagles were listed as endangered in the remaining coterminous 48 states, due to population declines resulting from DDT use, shooting, poisoning, habitat alteration, changes/declines in prey base, and human disturbance. In 1995, the status of the bald eagle was re-classified to threatened throughout the lower 48 states. In 1999, the U.S. Fish and Wildlife Service proposed removing the bald eagle from the Endangered Species Act list. A decision is pending.

Nesting habitat for this species consists of mature to old-growth stand conditions, usually within 0.5 miles of large bodies of water that are ice-free in the spring (breeding season) and support and abundant fishery. Nests are built in large, open trees with heavy lateral limbs, and are used year after year. Snags are also needed to provide perch and roost sites. Bald eagle feed primarily on fish during the summer months. There are approximately 1800 acres of suitable nesting habitat within 0.5 miles of the Naches River, however, human development, potential human disturbance, lack of large pools , and lack of adequate prey base limits the nesting opporunities. There are no known nesting pairs of bald eagles within the Naches mainstem. One pair of nesting bald eagles utilizes the Rimrock Lake area.

In addition to nesting habitat, wintering bald eagle habitat, both roosting and foraging, must also be present to suupport existing populations and allow for increases in the populations and recovery of the species. Winter habitat consists of ice-free bodies of water with an abundant fishery and/or large winter waterfowl populations. Winter habitat also includes big game winter ranges where winter-kill carrion provides a food source. Snags are needed for perch and day-time roost sites, and contiguous mature to old-growth stands are needed for nocturnal roosts. Wintering bald eagles have been documented within the Naches mainstem, primarily along the Naches River and low-elevation big game winter ranges from October through the end of March. It is thought that the nesting pair of bald eagles at Rimrock Lake are among the population of wintering bald eagles.

The gray wolf was federally listed in 1978. As the pre-eminent predator of large ungulates, the gray wolf is more dependant on availability of its prey species than on any specific habitat type. The level of human access is an important consideration in the assessment of wolf habitat. Roads alone do not impede wolf activity; rather, it is the deliberate, accidental, and incidental human-caused mortality associated with road access that impacts wolf survival. U.S. Forest Service personnel have conducted informal wolf surveys in the Naches River watershed in 1992. As of 1996, there were no known Class 1 (confirmed) gray wolf observations within the watershed, however, there were several confirmed sightings on adjacent lands (Packwood and Cle Elum Ranger Districts). There had been several Class 2 (highly reliable) gray wolf observations within the Naches River watershed (USFS, 1995).

The grizzly bear was federally listed as threatened in 1975 due to declining populations as the result of habitat loss and overhunting. Grizzly bears require large, wild, mountainous areas rich in food (high elevation meadows, shrubfields, avalanche chutes, lowland meadows, and marshes). Denning habitat, used from late fall through March, is often located in high elevations

on steep slopes with deep snow accumulations. Spring emergence habitat is lower elevations containing drainages with avalanche chutes and ungulate winter ranges. In late spring to early summer, grizzly bears follow plant phenology to higher elevations. Pre-denning habitat, used in late summer and fall, finds grizzlies transitioning to fruits and nuts as well as other herbaceous material. Essential grizzly bear habitat includes all the components of denning, spring emergence, summer and pre-denning habitat, along with isolation from human disturbance. The Naches River watershed contains habitat suitable for grizzly bears, however, it is ineffective due to human disturbance caused from extensive road development and numerous residences, and human activity. While there are no known confirmed sightings within the Naches River watershed, grizzly bears have been confirmed as occurring within the Wenatchee National Forest to the north (USFS, 1995).

Numerous other threatened or sensitive wildlife species that are either known to occur within the Tieton River watershed, or for which the watershed provides suitable habitat, are of concern to a variety of state and federal management agencies (USFS, 1995).

FLOW

Naches River flow comes from snowmelt and rainfall on the eastern slopes of the Cascade Mountains. Precipitation ranges from 20 inches near the eastern National Forest boundary to over 70 inches at the higher elevations of Milk Creek. The majority of annual precipitation falls as snow in the November to March period. Most of the Naches River mainstem is within the snow-dominated zone (43,394 acres – 52.7%). In addition, 23,778 acres (27.6%) lies within the rain-on-snow zone, 14,752 acres (17.1%) are classified as highland, and 2209 acres (2.6%) are rain dominated (USFS, 1995).

The average annual water yield for the Naches River above the confluence of the regulated Tieton River (and the Wapatox Canal diversion) is approximately 850,000 acre feet, or 1174 cubic feet per second (cfs), for the period of record (USFS, 1995).

Major tributaries to the Naches River above the Tieton River (and Wapatox Canal diversion) include the Bumping River (RM 44.6), which contributes 60% of the total flow (the American River at RM 3.5 on the Bumping River contributes 20% of the total flow of the Naches). The Little Naches River (RM 44.6), which contributes 21%, Rattlesnake Creek (RM 27.8) contributes 12%, and other minor tributaries (such as Cowiche Creek at RM 2.7) contribute approximately 7%. The Bumping Reservoir is the only controlled storage in the watershed and accounts for only four percent of the total average annual water yield from the basin. The Little Naches, American, Rattlesnake, and Cowiche rivers are all unregulated and add significant flows, particularly during spring runoff (Haring, 2001, USFS, 1995).

Historically, average flows in the Naches River are highest during April, May, and June as a result of spring snowmelt runoff. However, peak flood flows typically occur during the winter and are associated with warm temperatures and rain-on-snow events, particularly if soils are saturated or frozen (USFS, 1995).

Flow data has been collected by the Bureau of Reclamation (USBR) and the U.S. Geological Survey (USGS) for a number of years at several stream gages located in the Naches River. Average monthly flows for the Naches River above the Tieton River confluence vary from a low of 340 cfs in October to a high of 3025 cfs during normal peak snowmelt in May (USFS, 1995).

Historically, peak flood events have occurred in the December through February period during rain-on-snow events. An analysis was made of the streamflow records for the Naches River near Naches which has 71 years of data. This gage site has had ten years when the maximum yearly flow was in the December through February period and is assumed to be the result of a rain-on-snow event. This is a return period of approximately once every seven years. The 100-year flood has been estimated to have a peak discharge of 15,500 cfs, however, this estimate has a high standard of error due to limited gage information. Flood velocities above the City of Naches can reach 12 to 15 feet per second. In the lower reaches, flood-flow velocities can reach 9 to 13 feet per second (USFS, 1995).

Two gaging stations were used to characterize flows in the lower Naches River: one at RM 0.6, and the other at RM 16.6, below the confluence of the Tieton River. Flows immediately below the Tieton River range from approximately 350 cfs to 2300 cfs. At the mouth of the Naches River, flows range from approximately 530 cfs to 3025 .

Approximately one-fourth of the Yakima Project water-storage capacity is situated in the Naches River watershed; Rimrock Lake (198,000 acre-feet) on the Tieton River and Bumping Lake (33,000 acre-feet) on the Bumping River (Haring, 2001). The flow regime of the Naches River downstream from the Tieton River confluence (RM 17.5) and, to a lesser degree, from the confluence of the Bumping and Little Naches Rivers, is highly choreographed in a management scenario known as "flip-flop" (Yakima Subbasin Plan, 2004). The retention of waters in Rimrock Lake and (to a much lesser degree Bumping Lake) through the irrigation season until early September is followed by the release of waters from these lakes to provide all the water needed to support the Wapato and Sunnyside diversions for the remainder of the irrigation season. However, the hydrograph in the upper Naches remains virtually indistinguishable from the mean historical hydrograph due to the limited regulatory capacity of the 33,000 acre-feet Bumping reservoir (Yakima Subbasin Plan, 2004).

The "typical" hydrograph also exhibits an alteration to this pattern in late Spring as a result of irrigation diversions.

Hyporheic

It is probable that water from the Naches basin plays an important role in recharge of groundwater aquifers utilized for domestic and irrigation water in the Yakima Valley. The Naches watershed is included in the Naches-Cowiche groundwater subbasin of the upper Yakima Basin. Some of the groundwater sourced from the Naches basin likely re-enters and augments surface waters in the lower Naches River (Tieton Watershed Analysis, 1996).

Irrigation

Within the Naches River watershed above the Tieton River confluence, there are 18 points of surface-water diversion for irrigation of approximately 1040 acres. There are 13 diversions for

domestic use and 11 diversions for stockwater or fish propagation. The majority of domestic use in the upper watershed comes from wells, but the actual number has not been inventoried (USFS, 1995).

Water diversion from lower Naches River are mainly associated with power-production and irrigation uses. Within the lower Naches River, up to 500 cfs is diverted at Wapatox Dam (RM 17.1) year round. Most of this water is used for hydroelectric generation and all but 50 cfs (which is used for irrigation April 1 – October 14) is returned to the river at the powerplant outfall (RM 9.7). In addition to the major Wapatox diversion, four smaller diversions downstream take an additional 100 cfs. The portion of the lower Naches River most severely impacted by all of these diversions is the so-called "bypass reach," which extends 7.4 miles from the Wapatox diversion to the powerplant outfall. From mid-July through mid-September, these diversions leave about 150 cfs in the reach from the mouth to Wapatox, which historically had a mean unregulated discharge of 1,800 cfs. Within the bypass reach, the Naches River must supply the needs of the South Naches Channel and the Kelly-Lowerey Ditch before being recharged with approximately 400 cfs of water from the Wapatox powerplant outfall. During drought years, flows can become exceedingly low in the bypass reach, and stranding in the many side channels and braids becomes a distinct hazard for juvenile salmonids (Haring, 2001).

A large number of unscreened/poorly screened Phase II diversions were located on the middle and lower Naches, resulting in a disproportionate impact on American River Spring chinook smolt survival rates. These were replaced with louvered screens in the early 1990s, which should improve survival. One of the larger unscreened diversions from the Naches River is the City of Yakima Water Treatment Plant (WTP), just downstream of the outlet of the Wapatox powerplant. The water right for this diversion is approximately 39 cfs (Haring, 2001).

Low flows during the winter and early spring (particulary between the Wapatox diversion and outfall), and prolonged high and fluctuating flows in the summer are the major factors affecting anadromous salmonid production in the mainstem Naches River. Poor instream flows in winter in the lower Naches River significantly impact natural reproducton of Spring chinook, Steelhead, and Coho (Haring, 2001).

SALMON

Fish Distribution

Salmonids are present in the Naches River and its tributaries. The Naches River supports spring chinook, fall chinook (presumed presence), coho, and summer steelhead, as well as a number of resident salmonid species and non-salmonids. Historically, substantial numbers of salmon (most likely spring chinook, returned to upper Naches River (upstream of Reach 1) to spawn. steelhead, coho, and probably chinook salmon also used the upper Naches watershed (Haring, 2001, USFS, 1995).

Currently, a genetically distinct stock of spring chinook has been identified in the Naches and American rivers. The Naches stock of spring chinook spawns in the Bumping River, the Little

Naches River, Rattlesnake Creek and in the mainstem Naches above the Tieton River confluence (Haring, 2001).

The lower extent of spring chinook spawning in the Naches River is generally considered to be Horseshoe Bend, located about 2 miles upstream from the Tieton confluence. Spring chinook fry emerging from the American River move into the middle Naches by late summer while, at the same time, fry from the upper Naches River move into the lower Naches or Yakima rivers (Haring, 2001).

Historically, the tributary streams of the Naches River were major producers of anadromous salmonids. The Naches River and its tributaries have been thought to produce a significant percentage of the overall spring chinook and steelhead production in the Yakima watershed. Expanded fish counts have indicated that the estimated steelhead production from the Naches watershed may not be as large as previously thought (Haring, 2001, USFS, 1995).

The Naches River makes up a significant amount (26-43% in 1981-1994) of the spawning habitat within the Naches River basin (includes the Little Naches River, Bumping River, American River, Rattlesnake Creek, and mainstem Naches River) (USFS, 1995).

Steelhead spawn and rear in the Naches River throughout the mainstem, but are not known to spawn in the tributaries. The likely reason is habitat availability. Stream flows in the tributaries during the September spawning period are also limiting (USFS, 1995).

Historically, coho salmon most likely occurred throughout the length of the Naches River. Native coho were last seen in the Yakima River basin in 1979. Juvenile coho were reintroduced (planted) in Nile Creek, Rock Creek, Lost Creek, and in high-quality rearing habitat throughout the mainstem Naches River in 1995 (USFS, 1995).

The Naches River also support seven types of resident fish: westslope cutthroat, rainbow (possibly redband), brook, and bull trout, sculpin, speckled dace, and suckers. Bull trout, westslope cutthroat trout, brook trout, rainbow trout, and sculpin are known to occur throughout the Naches River (USFS, 1995).

The USFS identified two reaches of the Naches River mainstem as critical aquatic habitat areas. These include the segment from Lost Creek to just downstream from Cliffdell, which has good adult chinook holding habitat with deep pools and large substrate; and from Boulder Cave Road bridge to Boulder Cave Campground, where approximately 23% of the reach is off-channel habitat. Identified habitat problem areas include the reach from Boulder Cave Campground to the Bumping River confluence, where recreational use was identified as a source of surface erosion, bank erosion, and loss of overhead vegetative fish cover (USFS, 1995).

The segment from Pinecliff to Boulder Cave Road bridge exhibits 26-50% ground cover. The segment from Boulder Cave Road bridge to the confluence of the Little Naches River and Bumping River exhibits 0-25% ground cover. These ratings indicate that bank and surface erosion is a problem in these areas, and that overhead vegetative fish cover is likely lacking (USFS, 1995).

Passage

The Naches-Cowiche Diversion Dam (RM 3.6) is a low-head structure of approximately 6 feet (BOR 2000). Adult salmonids can effectively swim over the structure at median to high flows. A fish ladder was constructed in 1987, and is being further modified to enhance the exit of the ladder and supply additional auxiliary water at the entrance to the ladder (Haring, 2001).

Impeded upstream passage of adult salmonids by low flows downstream of Wapatox Diversion Dam (the largest diversion on the Naches River) was identified as a concern. Impaired passage may not be directly lethal, but it may delay and exhaust adult salmonids to such a degree that they are subject to increased pre-spawning mortality. The dam was rebuilt in 1978 with a new fishway (a modified pool and step-type passage facility). Possible spring chinook passage delays have been observed at the dam, particularly during low stream flows, however, a Steelhead radio-telemetry study conducted did not indicate any passage problems at this site (Haring, 2001).

A large number of unscreened/poorly screened Phase II diversions were located on the middle and lower Naches, resulting in a disproportionate impact on American River spring chinook smolt survival rates. These were replaced with louvered screens in the early 1990s, which should improve survival. One of the larger diversions that remains unscreened is the City of Yakima Water Treatment Plant (WTP), just downstream of the outlet of the Wapatox powerplant. The water right for this diversion is approximately 39 cfs (Haring, 2001).

The City of Yakima Municipal Water intake is located in the tailrace of the Wapatox powerplant, when it is operating. However, the powerplant has not been operating for about 60 days/year in recent years; during these shutdowns, water is diverted through an unscreened auxiliary water intake from the Naches River. The USBR is negotiating with involved parties to buy out the Wapatox Powerplant to benefit salmon and steelhead by increasing instream flows in the Naches River. Retirement of the Wapatox powerplant would result in unscreened water intake to the WTP year round. In addition, the WTP diversion is separated from the main flow of the Naches River only by a low concrete wall running down the left bank of the river. During spring runoff, flows may top this wall, entraining downstream migrants into the WTP. Returning adult spring chinook or summer steelhead may also access the WTP canal during high water, where they are blocked from returning to the Naches River (two adult summer steelhead were observed in the upper end of the water intake canal on May 14, 2000). Juvenile and adult salmonids, including ESA-listed species that enter the WTP canal, are likely entrained and lost to production (Haring, 2001).

Most of the springbrooks and side channels that funneled into Buckskin Slough (upper and lower Naches Valley), have been filled, but a number still emerge from the ground for short distances and the lower 2-mile portion of Buckskin Slough still exists and is heavily used for spawning by coho and occasionally steelhead (Yakima Subbasin Plan, 2004).

Changes in streamflow quantities and timing may be related to forest management activities, but in a watershed as big as the Naches River, it is unlikely that a significant change can be detected from the gage records (USFS, 1995).

Low flows during the winter and early spring, and prolonged high and fluctuating flows in the summer are the major factors affecting anadromous salmonid production in the mainstem Naches River. Poor instream flows in the winter in the lower Naches River significantly impact natural reproduction of spring chinook, steelhead, and coho. Of particular note is the rapid and significant increase in flow that occurs in September as a result of flip-flop water releases from Rimrock Lake. The existing hydrograph of the Naches River, downstream of the mouth of the Tieton River, is without corollary in the natural riverine processes of western North America, unless it would be the sudden draining of a glacial or landslide-formed lake in late fall. Sudden increases in flow cause fish to vacate feeding territories and migrate to new areas, increasing competition and stress, reducing growth, and increasing the likelihood of mortality, either through predation or being displaced to unsuitable downriver habitat. Sudden decreases in flow result in the stranding or death of salmonids that are unable to relocate to nearby pools or runs. Irrigation diversions dry up side-channel habitat prior to mid-July, which is critical for rearing spring chinook. During the 1970-1980s, juvenile salmonids which managed to survive by rearing in the main channel were abruptly flushed out of the reach by the high flows during flip-flop, with flows in and downstream of the Tieton going from 40 cfs to 2,500 cfs in a 24-hour period. Water release operations have changed significantly since the 1970s-1980s and current ramping rates no longer allow a flow change of that magnitude in such a short timeframe. The period of low flow preceding flip-flop coincides with much of the Spring chinook spawning period, but precedes most fall chinook spawning and would follow all Steelhead spawning (Haring, 2001).

Instream flows between the Wapatox diversion and outfall frequently are too low for optimal rearing and adult passage from mid-July to mid-September. Wapatox canal diverts 300-500 cfs from the Naches River, while four smaller diversions downstream take an additional 100 cfs. From mid-July through mid-September, these diversions leave about 150 cfs in the reach from the mouth to Wapatox, which had a mean unregulated discharge of 1,800 cfs. During drought years, flows can become exceedingly low in the bypass reach. During low-flow periods, stranding in the many side channels and braids becomes a distinct hazard for juvenile salmonids (Haring, 2001).

Flows upstream of Wapatox Diversion Dam are seldom too low to cause problems (Haring, 2001).

SALMON HABITAT

Channel Condition

A major issue in the Naches River watershed is aquatic habitat and water quality. Increased fine-sediment is a concern related to this issue. Sediment routing through a system consists of a variety of interactions. These interactions occur naturally, but the results of these actions can be altered through human activities. Increased soil compaction from harvest activities, road building, and recreation results in higher rates of surface runoff and inputs of fine sediments to stream channels (USFS, 1995).

Lack of riparian vegetation contributes to sedimentation by increasing bank erosion and decreasing sediment filtering capabilities of the riparian zone. In the Naches watershed, a lack of riparian vegetation is the result of at least eight causes: roading, recreation, human settlement, timber harvest, fire, grazing, mass wasting, and mining (USFS, 1995).

Reduced channel complexity is a second concern to aquatic habitat and water quality. Habitat quality and diversity is largely determined by physical features within stream channels (channel roughness elements), which create stream complexity. Physical features primarily include riparian vegetation, large woody debris, and substrate. If any of these features are removed, habitat diversity is reduced (USFS, 1995).

The condition of stream channels is influenced by upstream channels, because inputs (runoff, large woody debris, fine sediment, and coarse sediment) from upstream channels help shape channels downstream. The condition of stream channels is also influenced by upslope condition and processes. Channel segments respond to inputs based on confinement and gradient. Based on confinement and gradient combinations and the resulting characteristics, stream segments can be divided into four channel-response types. The response type implies the role each segment plays in the channel network. The categories of response types include: source, transport, response/transport, and response (USFS, 1995).

Most of the roads in the Naches River watershed were constructed for the purpose of harvesting timber. Approximately 60-70% of the road use within the watershed occurs in September to the end of December. The primary activities include hunting, wood gathering, and pleasure driving. Past road-use counts showed a dramatic increase in public use in mid-October and a sharp decline by mid-November. Changes in hunting seasons, however, have produced more gradual increases and decreased in use pattern, while the extending the length of time the public is using the roads (USFS, 1995).

Nearly 50% of roads within the Naches River watershed have native surfaces, with the remainder having aggregate or gravel surface. Only a few miles of road are paved. The combination of road location, road-surface type, and high public use patterns during a normally wet time of the year produces a higher potential for increased road-surface damage and sediment production. At the same time, reductions in harvest levels have reduced the forest road maintenance budgets, which in turn has resulted in reduced maintenance, no maintenance, or closures for many roads (USFS, 1995).

The Naches River consists solely of response channels, exhibiting a well-developed floodplain, channel slopes of less than two percent, a riffle/pool bedform morphology, and are responsive to upstream changes to input of coarse or fine sediment and large woody debris, or changes in flow. Response-type channels provide important spawning and rearing habitat for trout and salmon. These segments are dominated by the riparian vegetation group (riparian gravel bar, riparian deciduous, and riparian conifer vegetation types). The gradient of response-type channels (<2%) and are more sensitive to increases in coarse and fine sediment than source and transport channels. Fine and coarse sediments are deposited in these segments (USFS, 1995).

Based on a comparison of aerial photos from 1962 to 1992 from the Pinecliff bridge to the confluence of the Bumping and Little Naches rivers, indicate the river was wider and exhibited a greater number and size of gravel bars in 1962. This would indicate a greater load of sediment in the river than in 1992. It is likely that much of the sediment came from the Little Naches River. Stream survey data gathered in 1992, and limited field work, indicated that the response segments of the Naches River are not saturated with fine sediment to the point that the stream can no longer carry it through the system. This was indicated by sediment deposits found only behind large rocks with in riffles and in pools. Furthermore, riffles were not covered with sediment (USFS, 1995).

Downstream to the "twin bridges" the channel is constricted at several locations by SR 12, irrigation diversions, and bank armor. At each constriction, large amounts of bedload have accumulated upstream; the channel is actively downcutting through and downstream of the constrictions, which in some cases has resulted in active bank cutting and channel widening. These areas can be expected to regrade completely during flood events (Haring, 2001).

Comparison of aerial photos taken in 1927 with current channel location indicates a loss of channel sinuosity in the reach between the Tieton River confluence and the South Naches bridge. This reach has lost three large meanders, and now flows in a straight channel for a distance of almost five miles. This channel condition allows for very high flow velocities to develop in this reach, resulting in high levels of bedload transport through this reach (Haring, 2001).

The proportion of fine sediments in the lower Naches River appears to be quite high. The dominant substrate particles are from one-half to three-quarters embedded. The narrower, faster flows for the Naches transport smaller particles into the Yakima River. The substrate of the lower Naches River is now an unusual mix of large (5-7 inches) cobble and sand, except in some floodways and side channels where smaller gravels heavily embedded in sand are found (Yakima Subbasin Plan, 2004).

The reach from Wapatox upstream to Bumping River is one of the best spawning reaches in the Naches watershed, with abundant spawning beds interspaced with deep, clear resting pools. Riparian conditions in this reach were "near pristine", but there is significant riparian disturbance throughout, including SR 410 running the full length, numerous residences immediately adjacent to the stream, some agriculture, and several campgrounds, which adversely affect channel conditions (Haring, 2001).

The South Naches channel, as well as a number of smaller springbrooks and side channels on the left bank, has been channelized and converted into irrigation canals. Most of the springbrooks and side channels that funneled into Buckskin Slough (upper and lower Naches Valley), have been filled, but a number still emerge from the ground for short distances and the lower 2-mile portion of Buckskin Slough still exists and is heavily used for spawning by Coho and occasionally steelhead (Yakima Subbasin Plan, 2004).

Riparian

The Naches River and its floodplain have been affected by the location of the White Pass Highway (US 12), State Route 410, and other development within the riparian zone. Riparian

condition is impacted by dike encroachment and roads throughout the lower Naches River from the mouth to the confluence of the Tieton River. There is a lack of instream cover (particularly large woody debris) downstream of Cowiche dam. Riparian conditions in the reach from Wapatox upstream to Bumping River were "near pristine", but there is significant riparian disturbance throughout, including SR 410 running the full length, numerous residences immediately adjacent to the stream, some agriculture, and several campgrounds, which adversely affect channel conditions (Haring, 2001).

Highway 410 has contributed significantly to the lack of riparian vegetation by replacing segments of vegetated streambank with road fill and rip-rap. The filtering of sediment and slowing of water velocity by vegetation is eliminated when rip-rap replaces vegetation. As a result, the river has greater energy to release due to a velocity increase. The river will cut a deeper channel and erode banks downstream. Channel downcutting and bank erosion are also exacerbated by the increased confinement due to the Highway 410 road prism. The increased confinement decreases channel meandering, which leads to a decrease in channel length, and an increase in velocity. Downcutting can result in decreased bank stability, due to lowering the channel bottom to a point where rooting depth no longer functions to hold the bank together (Rosgen in USFS, 1995).

Roading has a significant impact on the presences and recruitment of in-channel large woody debris. A significant portion of the streambanks of the Naches River consists of rip-rap instead of riparian vegetation. The road has eliminated 2.2 miles of bank from large woody debris production. There are no large trees associated with the rip-rap available for recruitment and it is unlikely trees will grow here in the future. There are a total of 20.6 miles of roads within 300 feet of the 15.8 total miles of the Naches River (USFS, 1995).

Riparian vegetation provides edge-of-channel roughness, which functions in filtering out debris during flows greater than bankfull. Roughness is lessened with the replacement of riparian vegetation with rip-rap, so vegetation is no longer functioning to hold wood in place, allowing it to be swept downstream and possibly out of the system. In addition, rip-rap in place of vegetation can increase water velocity, increasing the river's ability to move larger pieces of wood. Consequently, more large woody debris will be swept downstream or out of the Naches River system (USFS, 1995).

From the Tieton River to Rattlesnake Creek, the valley form narrows; the channel is entrenched as a result of a combination of natural confinement exacerbated by development encroaching on the channel. Approximately 10-20% of riparian corridor function is impaired by development. From Rattlesnake Creek to the Bumping River, the riparian corridor is heavily developed, with <50% of the riparian corridor having any functional riparian vegetation (Haring, 2001).

Dispersed camping is scattered throughout the upper Naches River watershed. Combined, in the Naches and Wenas basins, over 600 dispersed sites have been mapped. Eight percent of these sites are either near or in open meadows and four percent are adjacent to water (USFS, 1995). Riparian habitat can be affected by some recreational activities such as camping and fishing. Potentially adverse effects include trampling of riparian vegetation and stream banks, removal of downed woody material for firewood, reduction of snag availability due to hazard-tree removal,

compaction of soils, reconfiguration of pools and riffles, and reduced availability for riparian-dependant species (USFS, 1995).

The primary land use in the lower Naches River (downstream of the Tieton River confluence) is agriculture. As a result of artificial confinement of the Naches River and the introduction of irrigation waters, much of the former floodplain has been converted into agricultural or grazing uses. In the process of conversion, large tracts of the former riparian gallery were harvested. About half of the original cottonwood gallery remains, the rest having been cleared for various kinds of development (Yakima Subbasin Plan, 2004).

Large Woody Debris

Large woody debris is woody material derived from tree limbs, boles, and roots, in various stages of decay. The production and accumulation of large woody debris is dependent on several factors, including: plant association, successional stage, insect and disease activity, weather events (e.g., relative to blowdown), fire return intervals, decay rates, and vegetative management activities (Graham et al. 1994 in Tieton Watershed Analysis, 1996).

Several segments of the Naches River from Pinecliff to the confluence of the Bumping and Little Naches rivers were surveyed for large woody debris (LWD) by the U.S. Forest Service. The inventory protocol identified LWD/mile, streambank armoring, and substrate as evaluation parameters. Large woody debris/mile is a good indicator of habitat quality. (Peterson et al. 1992, Wash. Forest Practices Board, 1993 in USFS, 1995)

The Wenatchee National Forest Plan calls for at least 100 pieces (80% > 12” diameter, 20% > 20” diameter and 50 feet long) of LWD per mile. Most of the Bumping River below Bumping Dam met, or was very close to meeting the Forest Plan standard (USFS, 1995).

Large woody debris is an important input factor for stream channels within forested vegetative types. Large woody debris for streams in the Bumping River watershed is primarily contributed from debris flows. Once LWD is in the channel, it slows water velocities, resulting in fine and coarse sediment sorting and deposition. Therefore, the presence or absence of LWD determines how a channel will respond to inputs of fine and coarse sediment and runoff (Tieton Watershed Analysis, 1996).

The Naches River receives the majority of large woody debris (LWD) from upstream tributary reaches, as well as surrounding riparian conifer stands (Haring, 2001). The riparian deciduous type will provide an occasional piece of large woody debris (LWD), but the majority of LWD in the Naches River is transported to the mainstem from the major tributaries (Little Naches River, Bumping River, and smaller tributaries), and falls into the riparian conifer type (USFS, 1995). There is a lack of instream cover (particularly LWD) downstream of Cowiche dam. A 1992 survey of LWD from Pinecliff Bridge to the Bumping River confluence found all reaches to be well below the Wenatchee National Forest and USFS Region 6 LWD standards. Limited presence of LWD is associated with active removal of LWD from the Naches River from Cottonwood Campground to the Bumping River confluence following a flood in 1976/1977. Channel cleaning efforts were part of flood rehabilitation efforts, with use of heavy equipment in the channel and salvage or burning of the removed debris on gravel bars (Haring, 2001). LWD

was also removed from approximately 10.3 miles of the lower Little Naches River, reducing input to the Naches River. A total of 147 acres of stream channel was cleared of LWD in the Naches River and Little Naches River (USFS, 1995).

Concentrated recreation use, especially in riparian areas, has led to soil compaction and reduced vigor or riparian vegetation. Compaction reduces the water-storage capability of soils, which further reduces a plant's ability to recover from trampling or other physical disturbance. The vegetation in many of the high-use riparian areas is in a downward trend due to the loss of water storage capacity (USFS, 1995).

Riparian-area dispersed recreation affects long-term large woody debris recruitment. Large trees occurring in dispersed campsites are available for large woody debris recruitment, however, compaction from foot or vehicular traffic in these areas decreases opportunities for young tree establishment and growth; decreasing future LWD recruitment potential. LWD is also removed from riparian areas for firewood use (USFS, 1995).

Water Quality

The Naches River is considered a Class AA "Extraordinary" water body. Based on these standards, the highest designated beneficial use for the basin's water is "salmonid spawning and rearing habitat." Although none of the waters in the upper Naches River are designated "water quality impaired," this statement must be considered in light of the very limited amount of water quality data that have been collected in the watershed. The state water-quality standards that are most applicable to the Naches River include fecal coliform, dissolved oxygen, temperature, and turbidity (USFS, 1995). The lower Naches River is listed as water-quality impaired under Section 303(d) for temperature, pH, and silver (Yakima Subbasin Plan 2004).

A considerable amount of data has been collected on stream-water temperature in the Naches watershed. Exceedences from State water-quality standards for water temperature have been documented on the Naches River. While upper-basin tributaries are, generally, meeting the 61°F standard, temperatures in the lower Naches River have consistently averaged in the 65-70°F range. The single-day maximum for the lower Naches River at the Chinook Pass Work Center (1994) was 72.5°F (lethal temperatures for juvenile salmonids are in the 75-77°F range). The Wenatchee Forest Plan standard for average seven-day maximum temperatures (providing an indicator of sustained stream temperatures) at the Chinook Pass Work Center in 1994 was 71.1°F (USFS, 1995).

Stream temperature is a concern. Water temperature plays an important role in regulating aquatic life and productivity by controlling rates of metabolic development and activity. Forest stream temperatures are not normally high enough to cause direct fish mortality, but temperature changes can influence rate of egg development, rearing success, species competition, and other factors. Dissolved oxygen levels decrease as water temperature increases. Other chemical constituents increase their solubility as temperatures increase, and the incidence of pathogens also increases as temperatures increase (USFS, 1995).

Increased stream temperatures in the Naches River are primarily related to lack of riparian vegetation and changes in channel complexity. River temperatures are currently hotter in

summer and colder in winter than those experienced prior to the substantial loss of riparian cover (USFS, 1995).

The mainstem Naches River has less than ten percent of its length with canopy coverage greater than seventy percent. Summer maximum temperatures reach to 70-72°F (75-78°F are lethal to salmonid juveniles) (USFS, 1995).

Monitoring for turbidity, or suspended sediments, is very limited (USFS, 1995). The lower Naches River is listed as water-quality impaired under Section 303(d) for pH and silver (Yakima Subbasin Plan, 2004).

DISTURBANCE

The river is usually confined on both sides either by abrupt canyon walls or by rip-rapped dikes or road embankments. Highway 12 bisects the floodplain and restricts the river to half or less of its historical width. About half of the original cottonwood stands remain, the rest having been cleared for various kinds of development (Fig. N3). State Route 410 bisects the floodplain and restricts the river to varying degrees (two-thirds to one-half). The Highway 12 twin bridges, Powerhouse Road bridge, South Naches Road, Wapatox diversion dam, and the City of Yakima water filtration plant and associated intake structures also impede channel migration (Haring, 2001).

Flood velocities above the City of Naches can reach 12 to 15 feet per second. Deep water flowing at this rate can cause severe erosion and transport large objects and debris. In the lower reaches, flood-flow velocities can reach 9 to 13 feet per second. Overbank flood-flows near the City of Naches can reach average velocities of 3 to 5 feet per second. Two locations that experience recurring and severe flood damage are the Ramblers Park (approximately RM 4.0) and Lewis Road (south of river adjacent to the City of Naches) areas. Although dikes provide protection for critical facilities and vulnerable developed areas, they can also deflect the bank erosion problem to another location in the river system. In those areas that experience high rates of channel movement, channel migration presents a hazard that can be much more severe than from inundation alone. Sudden channel shift may sweep hundreds of feet of riverbank away in one event.

Development has radically changed the structure and hydrograph of the lower Naches River (Yakima Subbasin Plan, 2004).

NACHES RIVER SUB-BASIN REACH DESCRIPTIONS

The Naches River SMP is divided in to eight distinct reaches (Fig. N5; Table N1). The divisions of the reaches were made based on gradient, landforms, and land use. **Reach 1** represents the lower (6.9 mi.) portion of the stream from its connection to the larger Yakima River to the lower end of the Lower Naches Valley. Through the lower 3 miles of this reach, the Naches River is confined by the Naches Highway (SR 410). That area of its former floodplain that is no longer available to the river is now highly urbanized, occupied by transportation infrastructure, and/or agriculture. Although the channel is actively migrating within this segment, due to confinement, the stream channel exhibits only a slight degree of meandering. The upper 3-mile segment of this reach is largely unconfined. This reach exhibits very little residential, agricultural, or transportation development. The channel is very braided and somewhat meandering. **Reach 2** commences at a point south of Gleed and flows for 2.5 miles to the upper end of Lower Naches Valley. This reach is largely unconfined and exhibits very little agriculture and only a small amount of residential development. The channel is very braided and somewhat meandering. **Reach 3** is a 1.4 mile segment of the Naches River that extends from the upper end of the Lower Naches Valley to the eastern end of the City of Naches. The river becomes somewhat confined by the Naches Highway (SR 410) to the north. This reach is encroached upon by agricultural activities. The channel is very braided and somewhat meandering. **Reach 4** is a 0.5 mile segment of the Naches River that extends from the eastern end of the City of Naches to the western end of the City of Naches. This reach is confined by the bluffs of Naches Heights to the south and the Naches Highway (SR 410) to the north. There is an increasing amount of residential development through this reach. The channel is very braided and somewhat meandering. **Reach 5** is a 3.5 mile segment of the Naches River that extends from the western end of the City of Naches to the junction of the Tieton and Naches rivers. This reach is confined by the bluffs of Naches Heights to the south and the Naches Highway (SR 410) to the north. A residential cluster is found along the south bank. The channel is quite linear, exhibiting only one area of braiding. **Reach 6** is a 12.9 mile segment of the Naches River that extends from the junction of the Tieton and Naches rivers to the upper end of the Nile Valley. This reach is confined by steep canyon walls. Only a small amount of residential development has occurred in this reach. The channel exhibits some sinuosity, but has limited opportunity due to the narrowness of the canyon. Mass-wasting events from the predominately shrub-steppe covered slopes has resulted in some of the sinuosity. **Reach 7** is an 8.6 mile segment of the Naches River that extends from the upper end of the Nile Valley. This reach is confined by steep canyon walls, but with segments of broader floodplain development. The channel exhibits some sinuosity, although within the broader floodplain areas, it exhibits a high degree of channel movement and the opportunity for meandering. In the upper part of the reach, the degree of agricultural and residential development markedly increases, including a retreat camp. In this upper segment, sinuosity increases, at times approaching meandering. **Reach 8** is a 5.7 mile segment of the Naches River that extends to the confluence of the Little Naches and Bumping rivers. This reach is confined by steep canyon walls and is further confined by the Naches Highway (SR 410) on the northeast and Nile Road to the southwest. Much of this area is under residential development and includes the communities of Pinecliff and Cliffdell. There are

several developed recreation sites, as well as a retreat camp. The channel exhibits a high degree of sinuosity.

REACH 1

General Description

Reach 1 comprises the lower 6.9 miles of the Naches River, from its confluence with the Yakima River (at RM 116) to the western end of Maple Way (south of Gleed). The average gradient of this reach is 0.5% (28 ft./mi.). Reach 1 is dominated by Selah Heights to the north and Naches Heights to the south. The upper 3 miles of this reach flows through the Lower Naches Valley and the lower 3 miles through the upper Yakima Valley and Yakima River floodplain.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map
(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)
The floodplain along Reach 1 gradually constricts from its mouth, upstream to a point where it is pinched between Selah Heights to the north and Naches Heights to the South. From this point, the floodplain broadens to encompass the width of the Lower Naches Valley. The lower, westward-trending 3-mile segment of this reach is located against the flanks of Selah Heights to the north. This loess-covered ridge composed of basalt flows rises abruptly from the valley floor to elevations over 1700 feet. To the south, this segment is bounded by low-lying, terraced Holocene sedimentary deposits. Along the upper, northwest-to-southeast trending 3 miles of this reach, the stream is, generally, located against the flanks of Naches Heights, which is composed of younger andesite flows with some exposures of the underlying basalt flows. Selah Heights bounds the floodplain to the north. Throughout this SMP jurisdiction of this reach, the surficial geology is predominately one of alluvium (95.7%) (Washington State Department of Natural Resources [WDNR], 2000). Approximately 76.6% of the reach is within the 100 year floodplain.

There are extensive areas of geologic hazards noted in Reach 1 (Yakima County, 2003c). Throughout the lower 3 mile segment, the majority of SMP jurisdiction includes, or is abutted by, areas rated High Risk due to the potential for rock fall or creep from over-steepened slopes. Throughout the upper 3-mile segment, the majority of SMP jurisdiction includes, or is abutted by, areas rated High Risk due to the potential for rock fall or creep from over-steepened slopes. Approximately 1.0% of this area is also rated as Intermediate Risk where stream erosion has the potential to undercut bank material along the edge of the floodplain.

Soils/Soil Properties (Table N3)
Reach 1 is dominated by (95.7%) by alluvial deposits (WDNR, 2000). The soils within the SMP jurisdiction are predominately silt loams, with much rock outcrop. Within this reach, 64.7% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid (65.2%), runoff is generally classed as slow (69.5%), and the hazard of erosion is rated as slight (69.5%) (USDA Natural Resources Conservation Service [NRCS], 2003).

Stream Type/Channel Form (Table N4)
Channel form throughout Reach 1 is currently classified as pool-riffle. Within this reach, the Naches River flows through the lower end of the Lower Naches Valley before becoming

constricted between Naches Heights and Selah Heights after which it opens up onto its alluvial fan before draining into the Yakima River. Within the lower segment of this reach, the Naches River has been confined tightly to the base of Selah Heights by a four-lane highway. Near the mouth of this river, its course has been further constricted by the bed of the Yakima Valley Transportation Company railroad and the multiple lanes of Interstate 82 and levees. This segment of the river is quite straight, although it does exhibit some channel movement within its confined floodplain. The river, here, exhibits channel braiding with active point bar and side-channel bar deposition. This segment of Reach 1 is currently a transport reach. Within the upper segment of this reach, the Naches River flows through a broad and relatively unrestricted floodplain. The channel exhibits a highly braided form, but remains only moderately sinuous. The river, here, exhibits active point bar and side-channel bar deposition. This segment is a deposition/transport reach.

It is highly likely that the channel form of the lower segment of this reach was once much more complex. Though now largely confined to a single channel, it was once clearly more migratory. This, formerly, was a dispersal reach in which energy was dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Over 90% of the SMP jurisdiction of Reach 1 is underlain by likely deep deposits of alluvium. There existed the opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials. Due to the placement of the Naches Highway (SR 410) and urban development to the south of this highway, there exists little potential for increased channel complexity beyond that which is already exhibited. The upper segment is likely as complex as it was in the past. Although confined to the southern half of its former floodplain, the channel is free to migrate, and clearly has, throughout most of this reach. It is unlikely that the complexity of this segment of the reach would be more complex even if the main channel were to be able to occupy the remaining portion of its former floodplain. Approximately 51.2% of the reach has been identified as having a high potential for being in the channel migration zone, with another 14.3% having a moderate potential (Yakima County, n.d.b).

Stream Flow

The flow regime of the Naches River downstream from the Tieton River confluence (RM 17.5) and, to a lesser degree, from the confluence of the Bumping and Little Naches Rivers, is highly choreographed in a management scenario known as "flip-flop." The retention of waters in Rimrock Lake and (to a much lesser degree Bumping Lake) through the irrigation season until early September is followed by the release of waters from these lakes to provide all the water needed to support the Wapato and Sunnyside diversions for the remainder of the irrigation season. However, the hydrograph in the upper Naches remains virtually indistinguishable from the mean historical hydrograph due to the limited regulatory capacity of the 33,000 acre-feet Bumping Reservoir.

Within the lower Naches, up to 450 cfs is diverted at Wapatox Dam (RM 17.1) year round. Most of this water is used for hydroelectric generation and all but 50 cfs (which is used for irrigation April 1 – October 14) is returned to the river at the powerplant outfall (RM 9.7).

The "typical" hydrograph also exhibits an alteration to this pattern in late spring as a result of irrigation diversions. There are, in addition to the major Wapatox diversion, several clusters of smaller diversions on the lower Naches below Wapatox. The portion of the lower Naches most severely impacted by all of these diversions is the so-called "bypass reach," which extends 7.4 miles from the Wapatox diversion to the powerplant outfall. Within the bypass reach, the Naches River must supply the needs of the South Naches Channel and the Kelly-Lowerey Ditch before being recharged with ±400 cfs of water from the Wapatox powerplant outfall. During drought years, flows can become exceedingly low in the bypass reach, and stranding in the many side channels and braids becomes a distinct hazard for juvenile salmonids.

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely make hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 1 as evidenced by the water-filled gravel pits lying in the former floodplain to the south of the Naches Highway (SR 410) in the lower segment of this reach and by the appearance of springs and streams throughout the upper segment. Examination of aerial photographs and topographic maps reveal numerous springs or seeps in the surrounding lands.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)

Upland

GAP analysis data estimates that the vegetation community in Reach 1 is dominated by shrub-steppe vegetation (Washington Department of Fish and Wildlife [WDFW], 2004a).

Riparian

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 33.4% to 66.7% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is found throughout the breadth of the available floodplain (recognizing that this zone is confined through the lower segment of the reach). Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. There has been some loss of riparian cover due to agricultural development within the upper segment of this reach.

Wetlands

Wetlands occupy 51.5% of the SMP jurisdiction today (United States Fish and Wildlife Service [USFWS], 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential/urban, and infrastructure development, particularly within the lower segment of this reach. An additional 34.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Tables N6 and N7)

Reach 1 has been identified as spawning habitat for summer steelhead, while spring chinook and bull trout may also be present (WDFW, 2004c). A small portion (0.2 miles) of the reach has been identified as spawning and rearing habitat for coho salmon. Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)

GAP analysis data indicates that portions of Reach 1 may provide habitat for two species of current concern, including principally the burrowing owl (68.3.3%), as well as smaller portions for the sage sparrow and sage thrasher (3% each) (WDFW, 2004a). This reach also provides bald eagle wintering habitat. The entire reach provides habitat for bald eagle and all except the lower 3-mile segment provides habitat for golden eagle, as well as for wood duck. Bald eagle habitat constitutes 66.4% and wood duck habitat 59.4% of the SMP jurisdiction.

Terrestrial (Tables N5 and N8)

GAP analysis data indicates that portions of Reach 1 may provide habitat for three species of current concern, including principally the Townsend's big-eared bat (100%), as well as smaller portions for the black-tailed jack rabbit and Townsend's ground squirrel (3% each) (Washington Department of Fish and Wildlife, 1997). The entire riparian zone is listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)

Of the SMP jurisdiction lands along Reach 1, 71.2% remain vacant (Yakima County, 2004a). Of the remaining 28.8% of SMP jurisdiction lands, 7.3% is in agricultural production, 10.0% is under residential development, 8.8% is occupied by transportation development, 2.3% is commercial, and 0.5% is gravel pit. Approximately 12.1% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Transportation, Washington State Department of Fish and Wildlife, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 4.7%, 3.9%, and 0.7%, respectively. Approximately 3.4% of the SMP jurisdiction of this reach is under Urban Natural Open Space designation.

Transportation (Table N11)

Roadways occupy 7.1 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a), along with 0.5 mile of active railroad (Washington State Department of Transportation [WDOT], 1997) and 2 bridge crossings (WDOT, 2004).

Revetments (Table N11)

Reach 1 has 3.6 miles of dikes, 0.5 mile of roadway, and 0.6 mile of bridging impinging upon and confining the river (Central Washington University [CWU], 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 1 is predominantly Remote/Extremely Limited (47.7%) and Light Industrial (37.3%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Suburban Residential (5.9%), Valley Rural (5.7%), Rural Transitional (2.1%), and Agriculture (1.2%). Approximately 77.9% of the reach is designated as Conservancy by the current SMP, with the other 8.3 and13.7% designated as Rural and Urban, respectively.

Cultural Resources (Table N12)
There is one known cultural site noted in the SMP jurisdiction of Reach 1: a site with cremation burial pits (Washington State Historic Preservation Office [WSHPO], 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
Four DOE sites/facilities are found in the SMP jurisdiction of Reach 1: three are involved in crop-preparation service (one also includes refrigerated storage); and the other is a diversion dam (dam site). Within this reach, 0.9 miles of the stream is 303(d)-listed (Washington Department of Ecology [WDOE], 1998). This segment was listed (1998) for lead, copper, chromium, silver, temperature, pH, and dissolved oxygen. Cowiche Creek, at its confluence with the Naches River is 303(d)-listed for temperature and fecal coliform.

ECOLOGICAL FUNCTION SUMMARY

Reach 1 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 6.8% High Runoff soils: 4.4% High erosion soils: 4.4% High soil permeability: 65.2% Channel migration: 51.2% 100-Year Floodplain: 76.6%	Wetlands: 51.5% Vacant/natural: 71.2% Riparian cover: 33.4% Priority habitats: 4 Species of concern: 6 Anadromous habitat: 6.9 mi Total fish species: 18	Public land: 9.3%	Principal land use: Vacant/natural >10% Imperviousness: 13.5% Roads: 7.1 mi Revetments: 4.7 mi Barriers: Passable dam and diversion dam Bridge crossings: 2 DOE sites/facilities: 4

Ecological functions along Reach 1 are principally impaired by agricultural, transportation, and residential development, which covers 26.1% of the jurisdiction. These land uses, in addition to the 7.1 miles of roads and 0.5 miles of active railroad, account for the majority of the estimated 13.5% of the reach that is greater than 10% impervious. In addition, 2 bridge crossings and 2 barriers occur along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 4.7 miles of revetments within the jurisdiction. Four DOE

sites/facilities are also found in the SMP jurisdiction, and there is 0.9 miles of 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 33.4% of the reach, found throughout the breadth of the available floodplain. Much of the reach is presently undeveloped (71.2%), while 51.5% is covered by wetlands. The reach provides habitat for six species of concern, as well as four priority habitats and aquatic habitat for eighteen fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
2) Rationale: Existing riparian buffer on privately owned land. Suggested Action: Work with private landowner to protect riparian buffer.
3) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
4) Rationale: Wood duck priority habitat designation in riparian zone. Suggested Action: Protect habitat from encroachment.
5) Rationale: Bald eagle habitat in riparian zone. Suggested Action: Protect habitat from encroachment.
6) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Marginal riparian buffer on public land. Suggested Action: Establish a larger riparian buffer.
2) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
3) Rationale: Marginal riparian buffer on public land. Suggested Action: Establish a larger riparian buffer.
4) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
5) Rationale: Marginal riparian buffer on public land protecting a recognized anadromous spawning habitat adjacent to an agricultural area. Suggested Action: Establish a larger riparian buffer.
6) Rationale: Marginal riparian buffer on privately-owned agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private

landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.

7) Rationale: Marginal riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
8) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
9) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
10) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
11) Rationale: 303(d) listed facility. Suggested Action: Mitigate 303 (d) facility.
12) Rationale: Marginal riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
13) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
14) Rationale: Marginal riparian buffer on privately-owned agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
15) Rationale: Marginal riparian buffer on privately-owned agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
16) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain..
17) Rationale: Marginal riparian buffer on privately-owned agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
18) Rationale: Marginal riparian buffer on privately-owned agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
19) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.

REACH 2

General Description

Reach 2 is a 2.5 mile segment of the Naches River that extends from the western end of Maple Way (south of Gleed) to the upper end of the Lower Naches Valley. The average gradient of this reach is 0.5% (27 ft/mi.). Reach 2 is dominated by Selah Heights to the north and Naches Heights to the south.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map
(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)
Reach 2 occupies the upper 2.5 miles of the Lower Naches Valley, a northwest to southeast trending valley that gradually constricts from approximately 1.9 miles at the lower end to approximately 0.6 miles at the upper end of the reach. The floodplain of this reach is confined by the flanks of Selah Heights to the north and Naches Heights to the south. Selah Heights is a loess-covered ridge composed of basalt flows rises steeply from the valley floor to elevations of about 1500 feet. Naches Heights is composed of younger andesite flows; some slope failure has occurred. Throughout this SMP jurisdiction of this reach, the surficial geology is one of alluvium.

There are extensive areas of geologic hazards noted along the southern side of Reach 2 (Yakima County, 2003c). Throughout the middle 1.2 miles of the reach where the stream directly abuts the flanks of Naches Heights, the majority of SMP jurisdiction includes, or is abutted by, areas rated High Risk due to the potential for rock fall or creep from over-steepened slopes. Approximately 0.8 mile and 0.3 miles of this same area is also rated as High Risk and Intermediate Risk, respectively, where stream erosion has the potential to undercut bank material along the edge of the floodplain. There is a high risk of landslides along 0.2% of the reach. Approximately 84.5% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)
Reach 2 is dominated by alluvial deposits (98.1%)(WDNR, 2000). The soils within the SMP jurisdiction are predominately silt loams. Within this reach, 78.1% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid (78.5%), runoff is generally classed as slow (82.5%), and the hazard of erosion is rated as slight (82.5%) (NRCS, 2003).

Stream Type/Channel Form (Table N4)
Channel form throughout Reach 2 is currently classified as pool-riffle. Within this reach, the Naches River flows through the Lower Naches Valley. The floodplain of this reach has been confined by the roadbed of the Naches Highway (SR 410) to the north, and for about 0.75 mile on the south by the South Naches Road. The river, within this reach, is still actively altering its channel location and form and exhibits a sinuous course (Yakima County, n.d.b).

It is unlikely that the channel throughout this reach was ever much more complex than it is currently. This is a depositional/transport reach in which energy is dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Over 90% of the SMP jurisdiction of Reach 2 is likely underlain by deep deposits of alluvium. Although confined to only a portion of its former floodplain, the channel is free to migrate, and clearly has, throughout most of this reach. It is unlikely that the complexity of this segment of the reach would be more complex even if the main channel were to be able to occupy the remaining portion of its former floodplain. Approximately 51.7% of the reach has been identified as having a high potential for being in the channel migration zone, with another 33.3% having a moderate potential (Yakima County, n.d.b).

Stream Flow

The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 2 as evidenced by sinking streams with subsequent down-gradient reappearance of springs and streams throughout the floodplain of this reach. Examination of aerial photographs and topographic maps reveal numerous springs or seeps in the surrounding lands.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)

Upland

GAP analysis data estimates that the vegetation community in Reach 2 is dominated by shrub-steppe vegetation (WDFW, 2004a).

Riparian

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 43.4% to 68.2% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is found throughout the breadth of the available floodplain. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. There has been some loss of riparian cover due to agricultural development.

Wetlands
Wetlands occupy 42.1% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development. An additional 0.6 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife
Aquatic (Tables N6 and N7)
Reach 2 has been identified as spawning habitat for summer steelhead, while spring chinook and bull trout may also be present (WDFW, 2004c). Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)
GAP analysis data indicates that all of Reach 2 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). This reach also provides bald eagle wintering habitat (WDFW, 2004b). The entire reach provides habitat for the bald eagle and golden eagle, as well as for the wood duck. Bald eagle habitat constitutes 68.2% and wood duck habitat 68.2% of the SMP jurisdiction.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 2 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 1997). The entire riparian zone is also listed as priority habitat (WDFW, 2003.).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 2, 73.4% remain vacant (Yakima County, 2004a). Of the remaining 26.6% of SMP jurisdiction lands, 2.8% is in agricultural production, 7.8% is under residential development, 0.6% is industrial, 3.9% is occupied by transportation development, and 11.6% is occupied by parks. Approximately 4.2% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 28.5% and 23.2%, respectively. Approximately 1.0% of the SMP jurisdiction of this reach is under Urban Natural Open Space designation.

Transportation (Table N11)
Roadways occupy 2.4 mile of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table N11)
Reach 2 has 0.6 mile of dikes and 0.9 mile of roadway impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 2 is predominantly Remote/Extremely Limited (93.0%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Agriculture (2.9%), Valley Rural (2.7%), and Rural Settlement (1.4%). Approximately 92.7% of the reach is designated as Conservancy by the current SMP, with the other 7.3% designated as Rural.

Cultural Resources (Table N12)
There are no known cultural sites noted in the SMP jurisdiction of Reach 2 (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
No DOE sites/facilities are found in the SMP jurisdiction of Reach 2, nor is any segment of the Naches River listed in this reach (WDOE, 1998).

ECOLOGICAL FUNCTION SUMMARY

Reach 2 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 4.8% High soil permeability: 78.5% Channel migration: 51.7% 100-Year Floodplain: 84.5%	Wetlands: 42.1% Vacant/natural: 73.4% Riparian cover: 43.4% Priority habitats: 4 Species of concern: 2 Anadromous habitat: 2.5 mi Total fish species: 17	Public land: 51.7%	Principal land use: Vacant/natural >10% Imperviousness: 4.9% Roads: 2.4 mi Revetments: 1.5 mi Barriers: Diversion dam

Ecological functions along Reach 2 are principally impaired by agricultural, transportation, and residential development, which covers 14.5% of the jurisdiction. These land uses, in addition to the 2.4 miles of roads, account for the majority of the estimated 4.9% of the reach that is greater than 10% impervious. In addition, there is one diversion dam occurring along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 1.5 miles of revetments within the jurisdiction. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 43.4% of the reach, found throughout the breadth of the available floodplain. Much of the reach is presently undeveloped (73.4%), while 42.1% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as four priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
2) Rationale: Bald eagle habitat in riparian zone. Suggested Action: Protect habitat from encroachment.
3) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
4) Rationale: Wood duck priority habitat designation in riparian zone. Suggested Action: Protect habitat from encroachment

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Marginal riparian buffer protecting an anadromous spawning area in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
2) Rationale: Marginal riparian buffer protecting an anadromous spawning area in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
3) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.

REACH 3

General Description

Reach 3 is a 1.4 mile segment of the Naches River that extends from the upper end of the Lower Naches Valley (approximately 0.8 mi. south of the Wapatox Canal powerhouse outfall) to the eastern end of the City of Naches (near the sewage treatment plant). The average gradient of this reach is 0.5% (25 ft./mi.) Reach 3 is dominated by Cleman Mountain/Selah Heights to the north and Naches Heights to the south.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map

(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)

Reach 3 occupies the lower 1.4-mile end of the Upper Naches Valley, a northwest-to-southeast trending valley that broadens from 0.7 miles in width at the lower end to 1.8 miles at the upper end. The valley is confined by continental sediments of the Ellensburg Formation (with some exposures of underlying basalts) to the north and terraced Holocene sedimentary deposits to the south. Only for a short (0.5 mile) distance does the stream abut the confining walls of the valley. Throughout this SMP jurisdiction of this reach, the surficial geology is predominately one of alluvium.

There are no geologic hazards noted for Reach 3 (Yakima County, 2003c). Approximately 85.4% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)

Reach 3 is dominated by (99.8%) by alluvial deposits (WDNR, 2000). The soils within the SMP jurisdiction are predominately stony loams and silt loams. Within this reach, 80.4% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is rapid (80.6%), runoff is classed as slow (82.6%), and the hazard of erosion is rated as slight (83.3%) (NRCS, 2003).

Stream Type/Channel Form (Table N4)

Channel form throughout Reach 3 is currently classified as pool-riffle. Within this reach, the Naches River flows through the Upper Naches Valley. The floodplain of this reach has been confined by the roadbed of the Naches Highway (SR 410) to the north and by agricultural development (orchards) to the south. Currently, the floodplain available to the river is approximately one-third of its former area. The river, within this reach, is still actively altering its channel location and form, eroding and depositing sediments, and exhibits a sinuous course.

It is likely that the channel through this reach was once somewhat more complex. This is a depositional/transport reach in which energy is dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Approximately 99% of the SMP jurisdiction of Reach 3 is likely underlain by deep deposits of alluvium. Although confined to only a portion of its former floodplain, the channel is free to migrate, and clearly has, throughout most of this reach. It is unlikely that the complexity of this segment of

the reach would be more complex even if the main channel were to be able to occupy the remaining portion of its former floodplain

Stream Flow
The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow
Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 3 as evidenced by water-filled ponds and disconnected channels, as well as by disappearing and reappearing stream channels. Examination of aerial photographs and topographic maps reveal numerous springs or seeps in the surrounding lands.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)
Upland
GAP analysis data estimates that the vegetation community in Reach 3 is dominated by shrub-steppe vegetation (WDFW, 2004a).

Riparian
Estimates of the SMP jurisdiction area covered by riparian vegetation range from 40.1% to 72.1% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is found throughout the breadth of the available floodplain. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. Riparian cover is restricted to a narrow strip where the Naches Highway (SR 410) abuts the river. There has been some loss of riparian cover due to agricultural development.

Wetlands
Wetlands occupy 53.5% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development. An additional 2.7 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife
Aquatic (Tables N6 and N7)
Reach 3 has been identified as spawning habitat for summer steelhead (WDFW, 2004c.). Spring chinook and bull trout may also be present. Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)
GAP analysis data indicates that all of Reach 3 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). The reach also provides habitat for the bald eagle and golden eagle, as well as for the wood duck (WDFW, 2004b). Bald eagle habitat constitutes 72.1% and wood duck habitat 72.1% of the SMP jurisdiction.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 3 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 3, 75.0% remain vacant (Yakima County, 2004a). Of the remaining 25.0% of SMP jurisdiction lands, 5.7% is in agricultural production, 4.2% is under residential development, 1.6% is industrial, 10.6% is occupied by transportation development, and 2.9% is gravel pit. Approximately 10.1% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 8.7% and 2.9%, respectively.

Transportation (Table N11)
Roadways occupy 4.3 miles of SMP jurisdiction land in this reach, along with 0.9 mile of active railroad (Yakima County, n.d.a).

Revetments (Table N11)
Reach 3 has a number of revetments, with 2.2 miles of dike and 1.7 miles of roadway impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 3 is predominantly Remote/Extremely Limited (66.2%) and Agriculture (28.7%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Valley Rural (4.8%) and Light Industrial (0.3%). Approximately 55.9% of the reach is designated as Conservancy by the current SMP, with the other 44.1% designated as Rural.

Cultural Resources (Table N12)
There is one known cultural site noted in the SMP jurisdiction of Reach 3: a historic tailrace ditch (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
One DOE site/facility is found in the SMP jurisdiction of Reach 3 (WDOE, 1998). Information regarding the nature of this facility was unavailable. There are no listings for any segment of the Naches River in this reach.

ECOLOGICAL FUNCTION SUMMARY

Reach 3 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
High erosion soils: 0.2% High soil runoff: 0.2% High soil permeability: 80.6% 100-Year Floodplain: 85.4%	Wetlands: 53.5% Vacant/natural: 73.4% Riparian cover: 40.1% Priority habitats: 3 Species of concern: 2 Anadromous habitat: 3.9 mi. Total fish species: 17	Public land: 11.6%	Principal land use: Vacant/natural >10% Imperviousness: 11.3% Roads: 4.3 mi Revetments: 3.9 mi DOE sites/facilities: 1

Ecological functions along Reach 3 are principally impaired by agricultural and residential development, which covers 9.9% of the jurisdiction. These land uses, in addition to the 4.3 miles of roads and 0.9 miles of active railroad, account for the majority of the estimated 11.3% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 3.9 miles of revetments within the jurisdiction One DOE site/facility is also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 40.1% of the reach, found throughout the breadth of the available floodplain. Much of the reach is presently undeveloped (73.4%), while 53.5% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as three priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES -See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Bald eagle habitat in riparian zone. Suggested Action: Protect habitat from encroachment.
2) Rationale: Marginal riparian buffer on private land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect

riparian buffer and provide education regarding erosion control and reduction of chemical applications.

3) Rationale: Marginal riparian buffer on private land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
2) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
3) Rationale: Marginal riparian buffer on agricultural land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
4) Rationale: Marginal riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical.
5) Rationale: Road is acting as a revetment, restricting floodplain processes. Suggested Action: Remove revetment.
6) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.

REACH 4

General Description

Reach 4 is a 0.5 mile segment of the Naches River that extends from the eastern end of the City of Naches (near the sewage treatment plant) to the western end of the City of Naches (approximately 0.2 mi. west of the incinerator). The average gradient of this reach is 0.8% (44 ft./mi.). Reach 4 is dominated by Cleman Mountain to the north and Naches Heights to the south.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map

(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)

Reach 4 occupies a 0.5-mile portion of the mid-Upper Naches Valley, adjacent to the City of Naches. The valley, here, is approximately 1.25 miles in width and is confined by talus deposits (from Cleman Mountain) to the north, and the andesite flows composing the abrupt flanks of Naches Heights to the south; some slope failure has occurred. Throughout this SMP jurisdiction of this reach, the surficial geology is one of alluvium.

There are extensive areas of geologic hazards noted along the southern side of Reach 4 (Yakima County, 2003c). Throughout the upper portion of the reach where the stream directly abuts the flanks of Naches Heights, the SMP jurisdiction is rated High Risk due to the potential for landslides or slumps. Importantly, this same area is also rated as Intermediate Risk due to the potential for the stream to undercut bank material along the edge of the floodplain. Reach 4 also contains the high risk of oversteepened slopes and stream undercutting. Approximately 90.8% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)

Reach 4 is dominated by (96.3%) by alluvial deposits (WDNR, 2000). The soils within the SMP jurisdiction are predominately silt loam/stony loam complexes and clay loams. Within this reach, 83% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is rapid (83.2%), runoff is classed as slow (73.4%), and the hazard of erosion is rated as slight (84.9%) (NRCS, 2003).

Stream Type/Channel Form (Table N4)

Channel form throughout Reach 4 is currently classified as pool-riffle. Within this reach, the Naches River flows through the Upper Naches Valley. The floodplain of this reach has been confined by the roadbed of the Naches Highway (SR 410) to the north and by agricultural development (orchards) to the south. The river, within this reach, is only somewhat sinuous, actively eroding and depositing sediments, but is largely confined to its current location. Comparison of aerial photos taken in 1927 with current channel location indicates a loss of channel sinuosity in the reach between the Tieton River confluence and the South Naches Bridge. This reach has lost three large meanders, and now flows in a straight channel for a distance of almost five miles. This channel condition allows for very high flow velocities to develop in this reach, resulting in high levels of bedload transport through this reach.

It is quite likely that the channel through this reach was once more complex. Though now largely confined to a single channel, it was once clearly more migratory. This, formerly, was a transport/dispersal reach in which energy was dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Over 96% of the SMP jurisdiction of Reach 4 is underlain by, likely deep, deposits of alluvium. There existed the opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials. Due to the placement of the Naches Highway (SR 410) and agricultural development to the south of the river, there exists only a moderate potential for increased channel complexity beyond that which is already exhibited. Approximately 38.6% of the reach has been identified as having a high potential for being in the channel migration zone, with another 6.9% having a moderate potential (Yakima County, n.d.b).

Stream Flow

The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 4 as evidenced by a water-filled pond in the floodplain lying to the south of the river, as well as by disappearing and reappearing stream channels. Examination of aerial photographs and topographic maps reveal numerous springs or seeps in the surrounding lands.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)

<u>Upland</u>

GAP analysis data estimates that the vegetation community in Reach 4 is dominated by shrub-steppe vegetation (WDFW, 2004a).

<u>Riparian</u>

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 29.9% to 47.0% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is present, but found in disjunct locations. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. There has been some loss of riparian cover due to agricultural and residential development.

Wetlands
Wetlands occupy 30.4% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development. An additional 2.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife
Aquatic (Tables N6 and N7)
Reach 4 has been identified as spawning habitat for summer steelhead (WDFW, 2004c.). Spring chinook and bull trout may also be present. Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)
GAP analysis data indicates that most of Reach 4 (95.8%) may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). This reach also provides habitat for the bald eagle and golden eagle, as well as for wood duck (WDFW, 2004b). Bald eagle habitat constitutes 47% and wood duck habitat 47% of the SMP jurisdiction.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 4 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b.).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 4, 65.1% remain vacant (Yakima County, 2004a). Of the remaining 34.9% of SMP jurisdiction lands, 2.0% is in agricultural production, 17.4% is under residential development, 11.3% is industrial, 2.3% is occupied by transportation development, and 1.4% is commercial. Approximately 14.1% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife, Washington State Department of Transportation, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 0.3%, 4.5% and 0.3%, respectively. In addition, 4.8% of the SMP jurisdiction of this reach is under Urban Natural Open Space designation.

Transportation (Table N11)
Roadways occupy 1.2 miles of SMP jurisdiction land in this reach and there are no active railroads (Yakima County, n.d.a).

Revetments (Table N11)
Reach 4 has some revetments, with 2.0 miles of dike and 0.1 mile of roadway impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdictional map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 4 is predominantly Remote/Extremely Limited (65.6%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Valley Rural (14.6%), Light Industrial (11.4%), Single-Family Residential (4.9%), and Industrial (3.6%). Approximately 98% of the reach is designated as Rural by the current SMP, with the other 2% designated as Conservancy.

Cultural Resources (Table N12)
There are no known cultural sites noted in the SMP jurisdiction of Reach 4 (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
One DOE site/facility is found in the SMP jurisdiction of Reach 4: a forest product/services operation (leaking underground storage tank) (WDOE, 1998). There are no listings for any segment of the Naches River in this reach.

ECOLOGICAL FUNCTION SUMMARY

Reach 4 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 1.8% High soil permeability: 83.2% High channel migration: 38.6% 100-Year Floodplain: 90.8%	Wetlands: 30.4% Vacant/natural: 65.1% Riparian cover: 29.9% Priority habitats: 4 Species of concern: 2 Anadromous habitat: 1.8 mi Total fish species: 17	Public land: 5.1%	Principal land use: Vacant/natural >10% Imperviousness: 23.2% Roads: 1.2 mi Revetments: 2.1 mi DOE sites/facilities: 1

Ecological functions along Reach 1 are principally impaired by residential and industrial development, which covers 28.7% of the jurisdiction. These land uses, in addition to the 1.2 miles of roads, account for the majority of the estimated 23.2% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 2.1 miles of revetments within the jurisdiction. One DOE site/facility is also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 29.9% of the reach, though tends to be fragmented. Much of the reach is presently undeveloped (65.1%), while 30.4% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as four priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
2) Rationale: Levee, not protecting any visible infrastructure, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.

REACH 5

General Description

Reach 5 is a 3.5 mile segment of the Naches River that extends from the western end of the City of Naches (approximately 0.2 mi. west of the incinerator) to the junction of the Tieton and Naches rivers. The average gradient of this reach is 0.6% (33 ft/mi.). Reach 5 is dominated by Cleman Mountain to the north and Cleman Mountain to the north and Naches Heights to the south.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map

(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)

Reach 5 occupies the upper 3.5-mile portion of the Upper Naches Valley. The valley is confined by alluvial-fan deposits to the north, and the andesite flows composing the abrupt flanks of Naches Heights combined with terraced Holocene sedimentary and mass-wasting deposits to the south. Throughout this SMP jurisdiction of this reach, the surficial geology is predominately one of alluvium (80.9%).

There are extensive areas of geologic hazards noted along the southern side of Reach 5 (Yakima County, 2003c). Throughout the reach approximately 1.1 mile of the SMP jurisdiction is rated High Risk due to the potential for landslides or slumps. Importantly, 0.9 mile of the SMP jurisdiction is rated as High Risk and another 0.7 mile as Intermediate Risk (which, combined, include all of the landslide hazard zone) due to the potential for the stream to undercut bank material along the edge of the floodplain. Approximately 86.4% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)

Reach 5 is dominated by alluvial deposits (80.9%)(WDNR, 2000). The soils within the SMP jurisdiction are predominately stony loams and silt loams. Within this reach, 69.1% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is rapid (68.4%), runoff is classed as slow (68.9%), and the hazard of erosion is rated as slight (75.9%) (NRCS, 2003).

Stream Type/Channel Form (Table N4)

Channel form throughout Reach 5 is currently classified as pool-riffle. Within this reach, the Naches River flows through the Upper Naches Valley. The floodplain of this reach has been confined by the roadbed of the Naches Highway (SR 410). Currently, the floodplain available to the river is approximately one-half of its former area. The river, within this reach, is only somewhat sinuous, actively eroding and depositing sediments, but is largely confined to its current location. Comparison of aerial photos taken in 1927 with current channel location indicates a loss of channel sinuosity in the reach between the Tieton River confluence and the South Naches Bridge. This reach has lost three large meanders, and now flows in a straight channel for a distance of almost five miles. This channel condition allows for very high flow velocities to develop in this reach, resulting in high levels of bedload transport through this reach.

It is quite likely that the channel form through this reach was once more complex. Though now largely confined to a single channel, it was clearly once more migratory. This, formerly, was a transport, deposition reach in which energy was dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Approximately 81% of the SMP jurisdiction of Reach 5 is underlain by likely relatively deep deposits of alluvium. There existed the opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials. Due to the placement of the Naches Highway (SR 410) and proximity of the bluffs of Naches Heights the south of the river, there exists only a moderate potential for increased channel complexity beyond that which is already exhibited. Approximately 22.5% of the reach has been identified as having a high potential for being in the channel migration zone, with another 22.9% having a moderate potential (Yakima County, n.d.b).

Stream Flow
The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow
Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread throughout Reach 5. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 4 as evidenced by a water-filled pond in the floodplain lying to the south of the river, as well as by disappearing and reappearing stream channels.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)
Upland
GAP analysis data estimates that the vegetation community in Reach 5 is dominated by shrub-steppe vegetation (WDFW, 2004a).

Riparian
Estimates of the SMP jurisdiction area covered by riparian vegetation range from 30.1% to 67.5% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is quite restricted; due to the abrupt bluffs of Naches Heights to the south and to agricultural development to the north. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. In general, riparian cover is limited to a narrow strip, however, there are areas that exhibit broader expanses of cover.

Wetlands
Wetlands occupy 27.0% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development. An additional 7.8 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife
Aquatic (Tables N6 and N7)
Reach 5 has been identified as spawning habitat for summer steelhead, while spring chinook and bull trout may also be present (WDFW, 2004c.). Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)
GAP analysis data indicates that 13.7% of Reach 5 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). The reach also provides habitat for the bald eagle and golden eagle, as well as for the wood duck (WDFW, 2004b). Bald eagle habitat constitutes 67.5% and wood duck habitat 67.5% of the SMP jurisdiction.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 5 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b.).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 5, 64.6% remain vacant (Yakima County, 2004a). Of the remaining 35.4% of SMP jurisdiction lands, 1.1% is in agricultural production, 26.6% is under residential development, 0.1% is industrial, 4.2% is occupied by transportation development, 0.2% is commercial, and 3.2% is occupied by a RV parks. Approximately 9.9% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife is the only public owner of land within the SMP jurisdiction, holding title to 2.5%. In addition, 7.2% of the SMP jurisdiction of this reach is under Urban Natural Open Space designation.

Transportation (Table N11)
Roadways occupy 3.6 miles of SMP jurisdiction land in this reach, including one bridge crossing (Yakima County, n.d.a).

Revetments (Table N11)
Reach 5 has revetments through portions, with 0.1 mile of dike, 1.1 miles of roadway, and 0.3 mile of bridge impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 5 is predominantly Remote/Extremely Limited (92.4%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Valley Rural (6.8%), Forested Watershed (0.6%), and Agriculture (0.2%). Approximately 80.4% of the reach is designated as Rural by the current SMP, with the other 19.6% designated as Conservancy.

Cultural Resources (Table N12)
There are two known cultural sites noted in the SMP jurisdiction of Reach 5: both are campsites (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
One DOE site/facility is found in the SMP jurisdiction of Reach 5: a forest product/services operation (hazardous waste generator) (WDOE, 1998). There are no listings for any segment of the Naches River in this reach.

ECOLOGICAL FUNCTION SUMMARY

Reach 5 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 6.1% High soil permeability: 68.4% High channel migration: 22.5% 100-Year Floodplain: 86.4%	Wetlands: 27% Vacant/natural: 64.6% Riparian cover: 30.1% Priority habitats: 4 Species of concern: 2 Anadromous habitat: 3.5 mi Total fish species: 17	Public land: 2.5%	Principal land use: Vacant/natural >10% Imperviousness: 12.9% Roads: 3.6 mi Revetments: 1.5 mi Barriers: Passable, insufficient flow, dam Bridge crossings: 1 DOE sites/facilities: 1

Ecological functions along Reach 5 are principally impaired by transportation and residential development, which covers 30.8% of the jurisdiction. These land uses, in addition to the 3.6 miles of roads, account for the majority of the estimated 12.9% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing and one passable insufficient flow dam occur along the reach. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 1.5 miles of revetments within the jurisdiction. One DOE site/facility is also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 30.1% of the reach, though tends to be quite restricted due to the abrupt bluffs of Naches Heights to the south and to agricultural development to the north. Much of the reach is

presently undeveloped (64.6%), while 27% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as four priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Bald eagle habitat in riparian zone. Suggested Action: Protect habitat from encroachment.
2) Rationale: Wood duck priority habitat designation in riparian zone. Suggested Action: Protect habitat from encroachment
3) Rationale: Existing riparian buffer on privately owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.
4) Rationale: Existing riparian buffer on privately owned land protecting a recognized anadromous spawning habitat in an area with high soil erosion potential. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control and reduction of chemical applications.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Marginal riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
2) Rationale: Marginal riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.

REACH 6

General Description

Reach 6 is a 12.9 mile segment of the Naches River that extends from the junction of the Tieton and Naches rivers to the upper end of the Nile Valley (at the Nile Road Bridge – RM 31). The average gradient of this reach is 0.6% (34 ft./mi.). Reach 6 is dominated by Cleman Mountain to the northeast and Bethel Ridge/Devil Table to the southwest.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map *(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)*

Geology/Landform (Table N2)

Reach 6 occupies the lower, 12.9 mile portion of Naches Canyon. The abrupt canyon walls are comprised of basalt flows, in places overlain by mass-wasting deposits and in others by continental sediments. The southern sides of the upper 2.5 miles of this reach are composed of continental sediments of the Ellensburg Formation.

There are extensive areas of geologic hazards noted along both sides of Reach 6 (Yakima County, 2003c). Generally, this reach is more-or-less continuously rated for geologic hazards. A total of 5.2 miles is rated High Risk due to the potential for rock fall or creep from oversteepened slopes and 3.2 miles is rated High Risk and 0.25 mile rated as Intermediate Risk due to the potential for landslides or slumps. An additional 1.1 mile of High Risk due to landslide potential directly abuts the SMP jurisdiction. Approximately 78.9% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)

Reach 6 is dominated by alluvial deposits (85.9%) (WDNR, 2000). The soils within the SMP jurisdiction are predominately shallow silt loams and cobbly silt loams. Within this reach, 59.3% of the soils are Aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is rapid (58.2%), runoff is classed as slow (69.8%), and the hazard of erosion is rated as slight (71.2%) (NRCS, 2003).

Stream Type/Channel Form (Table N4)

Channel form throughout Reach 6 is currently classified as plane-bed. Within this reach, the Naches River flows through the confines of Naches Canyon with alternately constricted and broadened floodplain. Some area of floodplain has been occupied by the roadbed of the Naches Highway (SR 410). The river, within the lower 8-mile segment of this reach, is only slightly sinuous, with the majority of sinuosity being dictated by geologic structures, although it does exhibit some channel movement within its confined floodplain. The river, here, exhibits active point bar and side-channel bar deposition. Throughout the upper, 5-mile segment, sinuosity increases as the floodplain widens, and meandering occurs in some places. The river, within this reach, is still actively altering its channel location and form and eroding and depositing sediments.

It is unlikely that the channel form of the lower segment of this reach was ever much more complex. This lower, 8-mile segment of Reach 6 is a transport reach that is geologically

confined; functioning to maintain the concentration of flows. The inability of the stream to reduce velocity through lateral movement (channel migration) or braiding/distributaries (multiple channels) has resulted in an erosional environment. Throughout this reach, there exists little opportunity for flood waters to spread and thus, for shifting channel locations. As a result, this reach has only a slight potential for increased channel complexity. Under extreme thunderstorm events or rain-on-snow events in the upper basin, the chance for flood flows exhibiting high velocities and turbulent flow is highly probable. During these episodes, the movement of large substrate materials is likely.

It is likely that the channel form of the upper 5-mile segment of this reach, was once somewhat more complex. This reach is a transport/deposition reach, sourcing a variety of sediment classes to lower reaches. Within this reach, the Naches River is adjusting to the addition of both water and sediment flows from Rattlesnake and Nile creeks. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate, in addition to sediment-sourcing from tributaries, resulted in a depositional environment. There exists the opportunity for flood waters to spread, and the channel is free to migrate, and clearly has, throughout most of this reach, albeit at the peril of residential development. Under extreme thunderstorm events or rain-on-snow events in the upper basin and tributary basins, the chance for flood flows exhibiting high velocities and turbulent flow is highly probable. During these episodes, the movement of large substrate materials is likely.

Approximately 28.5% of the reach has been identified as having a high potential for being in the channel migration zone, with another 8.0% having a moderate potential (Yakima County, n.d.b).

Stream Flow
The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow
Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 6 as evidenced by water-filled ponds as well as sinking streams with subsequent down-gradient reappearance of springs and streams throughout the floodplain of this reach.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)
Upland
GAP analysis data estimates that the natural vegetation communities in Reach 6 are a combination of oak (77.7%) and shrub-steppe vegetation (22.3%) (WDFW, 2004a).

Riparian
Estimates of the SMP jurisdiction area covered by riparian vegetation range from 31.6% to 61.2% (WDFW, 2004b and Yakima County, 2003b). Within the lower, confined, segment of this reach, riparian vegetation is generally quite restricted (usually to a very narrow band along the banks of the river), very patchy, and small in stature. There has been much loss of riparian cover due to agricultural development. Throughout the upper, broader-floodplain, segment of this reach, riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. Riparian cover is restricted to a narrow strip, or entirely absent, where the Naches Highway (SR 410) abuts the river. There has been substantial loss of riparian cover due to agricultural and residential development.

Wetlands
Wetlands occupy 28.0% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development.

Wildlife
Aquatic (Tables N6 and N7)
Reach 6 has been identified as spawning habitat for summer steelhead, while spring chinook and bull Trout may also be present (WDFW, 2004c.). A smaller portion of the reach (3.3 miles) also provides spawning habitat for spring chinook. Adequate habitat is expected for 13 species of resident fish species in the majority of the reach, including Eastern brook trout and mountain whitefish. A smaller portion (5.7 miles) of the reach also provides habitat for rainbow trout.

Avian (Tables N5 and N8)
GAP analysis data indicates that portions of Reach 6 may provide habitat for three species of current concern, including principally the sage sparrow and sage thrasher (8.2%), as well as smaller portions for the burrowing owl (WDFW, 2004a). The reach also provides priority habitat for bald eagle and golden eagle, as well as for wood duck (WDFW, 2004b). Bald eagle habitat constitutes 8.1% and wood duck habitat 8.1% of the SMP jurisdiction. The dramatic reduction in eagle and duck habitat compared to lower river reaches is likely reflective of the degree of floodplain confinement, reduction and fragmentation of riparian habitat, and level of human activities.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that portions of Reach 6 may provide habitat for four species of current concern, including principally the Townsend's big-eared bat (100%), as well as smaller portions for the Western gray squirrel (13.2%) as well as the black-tailed jack rabbit and Townsend's ground squirrel (8.2% each) (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b.). The riparian area provides habitat for fur-bearers. This reach represents Bighorn sheep habitat and moderate-to-excellent winter range habitat for resident elk, and mule deer and black-tailed deer. Bighorn sheep habitat constitutes 31.3%, elk habitat 28.6%, and mule deer and black-tailed deer habitat 54.6% of the SMP jurisdiction.

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 6, 61.0% remain vacant (Yakima County, 2004a). Of the remaining 39.0% of SMP jurisdiction lands, 5.3% is in agricultural production, 16.0% is under residential development, 4.6% is industrial, 8.5% is occupied by transportation development, 0.3% is commercial, 2.6% is gravel pit, and 1.0% is occupied by parks. Approximately 10.2% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife, Washington State Department of Natural Resources, Washington State Department of Transportation, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 9.2%, 6.2%, 0.1%, and 0.1%, respectively.

Transportation (Table N11)
Roadways occupy 11.3 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table N11)
Reach 6 has revetments through small portions, with 0.2 mile of dike impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 6 is predominantly Remote/Extremely Limited (84.0%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Mountain Rural (7.6%), Planned Development (6.8%), and Forested Watershed (1.6%). Approximately 68.8% of the reach is designated as Conservancy by the current SMP, with the other 31.2% designated as Rural.

Cultural Resources (Table N12)
There are no known cultural sites noted in the SMP jurisdiction of Reach 6 (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
Three DOE sites/facilities are found in the SMP jurisdiction of Reach 6: a non-classifiable operation (hazardous waste generator); a sand/gravel crushing operation (general permit industrial); and a construction operation (type unknown) (underground storage tank) (WDOE, 1998).

ECOLOGICAL FUNCTION SUMMARY

Reach 6 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 18.8% High erosion soils: 11.9% High soil runoff: 11.9% High soil permeability: 58.2% High channel migration: 28.5% 100-Year Floodplain: 78.9%	Wetlands: 28% Vacant/natural: 61% Riparian cover: 31.6% Priority habitats: 6 Species of concern: 7 Anadromous habitat: 13.6 mi Total fish species: 17	Public land: 87.6%	Principal land use: Vacant/natural >10% Imperviousness: 16.5% Roads: 11.3 mi Revetments: 0.2 mi Barriers: Passable, insufficient flow, dam DOE sites/facilities: 3

Ecological functions along Reach 6 are principally impaired by agricultural and residential development, which covers 21.3% of the jurisdiction. These land uses, in addition to the 11.3 miles of roads, account for the majority of the estimated 16.5% of the reach that is greater than 10% impervious. In addition, one passable insufficient flow dam occurs along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 0.2 miles of revetments within the jurisdiction. Three DOE sites/facilities are also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 31.6% of the reach. This vegetation tends to be restricted to a very narrow band along the banks of the river, very patchy, and small in stature, with much loss of riparian cover due to agricultural development. Much of the reach is presently undeveloped (61%), while 28% is covered by wetlands. The reach provides habitat for seven species of concern, as well as six priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control.
2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat adjacent to an area with high soil erosion potential. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control.
3) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

4) Rationale: Existing riparian buffer and wetlands on privately-owned land protecting a recognized anadromous spawning habitat in an area with high soil erosion potential. Suggested Action: Work with private landowners to protect riparian buffer and wetlands, and provide education regarding erosion control.
5) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control.
6) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control.
7) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion control.
8) Rationale: Rocky Mountain Elk Priority Species habitat in riparian zone. Suggested Action: Protect Rocky Mountain Elk habitat.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
2) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
3) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
4) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
5) Rationale: Marginal riparian buffer protecting an anadromous spawning. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control.
6) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
7) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.

8) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
9) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
10) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
11) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
12) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.

REACH 7

General Description

Reach 7 is an 8.6 mile segment of the Naches River that extends from the upper end of the Nile Valley (at the Nile Road Bridge) to approximately 1 mile south of Cliffdell. The average gradient of this reach is 0.6% (33 ft./mi.). Reach 7 is dominated by abrupt ridges to both the northeast and southwest.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map *(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)*

Geology/Landform (Table N2)

Reach 7 occupies the middle, 8.6 mile portion of Naches Canyon. The abrupt canyon walls of the lower, 2.2-mile segment are composed of basalt flows; often overlain by mass-wasting deposits on the northern side and by continental sediments of the Ellensburg Formation on the south. The geology of the upper 6.4 miles of this reach is dominated by andesite flows, with some overlying mass-wasting deposits.

There are extensive areas of geologic hazards noted along both sides of Reach 7 (Yakima County, 2003c). On the north side of the river, a total of 2.1 miles is rated High Risk due to the potential for rock fall or creep from over-steepened slopes and 0.4 mile is rated as Intermediate Risk due to the potential for flash-flooding (emanating from side canyons). On the south side of the river, a total of 1.8 miles is rated High Risk and 0.2 mile as Intermediate Risk due to the potential for rock fall or creep from over-steepened slopes. An additional 0.1 mile of High Risk and 0.2 mile of Intermediate Risk due to rock fall or creep directly abuts the SMP jurisdiction. Approximately 0.7 mile is rated Intermediate Risk due to the potential for landslides or slumps, with another 0.4 mile of High Risk area directly abutting the SMP jurisdiction. A small area is rated Intermediate Risk due to the potential for flash-flooding (emanating from side canyons). Approximately 73% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)

Reach 7 is dominated by alluvial deposits (83.9%) (WDNR, 2000). The soils within the SMP jurisdiction are predominately silt loams and loams. Within this reach, 24.6% of the soils are Aquic, a direct reflection of limited stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is rapid (56.7%), and the hazard of erosion is rated as slight (66.7%). Information on soil runoff is not available due to data gaps (NRCS, 2003).

Stream Type/Channel Form (Table N4)

Channel form throughout Reach 7 is currently classified as plane-bed. Within this reach, the Naches River flows through the confines of Naches Canyon with alternately constricted and broadened floodplain. Some area of floodplain has been occupied by the roadbed of the Naches Highway (SR 410). The river throughout the lower 6-miles of this reach is sinuous, with the majority of sinuosity being dictated by geologic structures, although it does exhibit some channel movement within its confined floodplain. The river, here, exhibits active point bar and side-channel bar deposition. Throughout the upper 2-mile segment, sinuosity increases as the

floodplain widens. The river, within this segment of the reach, is still actively altering its channel location and form and eroding and depositing sediments.

It is unlikely that the channel form of the lower segment of this reach was ever much more complex. This lower, 6-mile segment of Reach 7 is a transport reach that is geologically confined; functioning to maintain the concentration of flows. The inability of the stream to reduce velocity through lateral movement (channel migration) or braiding/distributaries (multiple channels) has resulted in an erosional environment. Throughout this reach, there exists little, opportunity for flood waters to spread and, thus, for shifting channel locations. As a result, this reach has only a slight potential for increased channel complexity. Under extreme thunderstorm events or rain-on-snow events in the upper basin, the chance for flood flows exhibiting high velocities and turbulent flow is highly probable. During these episodes, the movement of large substrate materials is likely.

It is likely that the channel form of the upper, 2-mile segment of this reach was once somewhat more complex. This reach is a transport/deposition reach, sourcing a variety of sediment classes to lower reaches. Within this reach, the Naches River is adjusting to the addition of both water and sediment flows from the confluence of the Bumping and Little Naches rivers. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate, in addition to sediment-sourcing from tributaries, resulted in a depositional environment. There exists the opportunity for flood waters to spread, and the channel is free to migrate, and clearly has, throughout most of this reach, albeit at the peril of residential development. Under extreme thunderstorm events or rain-on-snow events in the upper basin and tributary basins, the chance for flood flows exhibiting high velocities and turbulent flow is highly probable. During these episodes, the movement of large substrate materials is likely.

Approximately 21.8% of the reach has been identified as having a high potential for being in the channel migration zone, with another 5.9% having a moderate potential (Yakima County, n.d.b).

Stream Flow

The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 7 as evidenced by water-filled ponds as well as sinking streams with subsequent down-gradient reappearance of springs and streams throughout the floodplain of this reach.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)

Upland

GAP analysis data estimates that the vegetation communities in Reach 7 are a combination of Douglas fir (77.7%), oak (30.9%), and ponderosa pine vegetation (18.1%) (WDFW, 2004a). USFS data indicates that vegetation types within Reach 7 are dominated by Douglas fir communities primarily in mid-successional stages, which comprise 34% of the SMP jurisdiction. Other vegetation types include rural agriculture (19.7), shrubland (12.7%) and riparian communities (29.9%).

Riparian

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 20.7% to 36% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is found throughout the breadth of the available floodplain. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits. Riparian cover is restricted to a narrow strip, or entirely absent, where the Naches Highway (SR 410) abuts the river. There has been substantial loss of riparian cover due to agricultural and residential development, in places involving the denuding of the river bank.

Wetlands

Wetlands occupy 26.2% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural, residential, and infrastructure development. An additional 15.6 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Tables N6 and N7)

Reach 7 has been identified as spawning habitat for summer steelhead and spring chinook (WDFW, 2004c). Bulltrout may also be present. The majority of the reach (7.6-8.6 miles) provides adequate habitat for two resident species, including the Northern pike minnow and bridgelip sucker, while much smaller portions of the reach (0.5-1.4 miles) provide habitat for another 12 species of resident fish species, including the rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)

GAP analysis data indicates that 51.1% of Reach 7 may provide habitat for one species of current concern, namely the spotted owl (WDFW, 2004a). The USFS has classified 2.4% of the jurisdiction as suitable habitat for the spotted owl. This reach also provides bald eagle wintering habitat.

Terrestrial (Tables N5 and N8)

GAP analysis data indicates that all of Reach 7 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b). This reach represents bighorn sheep habitat and

moderate quality winter range habitat for resident elk, and mule deer and black-tailed deer. Bighorn sheep habitat constitutes 18.9%, elk habitat 14%, and mule deer and black-tailed deer habitat 64.9% of the SMP jurisdiction.

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 7, 72.7% remain vacant (Yakima County, 2004a). Of the remaining 27.3% of SMP jurisdiction lands, 1.1% is in agricultural production, 18.6% is under residential development, 0.1% is industrial, 5.9% is occupied by transportation development, 1.0% is occupied by RV parks, and 0.5% is occupied by parks. Approximately 9.1% of the SMP jurisdiction is greater than 25% impervious. The U.S. Forest Service and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 29.3% and 0.2%, respectively.

Transportation (Table N11)
Roadways occupy 6.7 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table N11)
Reach 7 has revetments through small portions, with 0.5 mile of dike impinging upon and confining the river (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 7 is predominantly Remote/Extremely Limited (56.8%) and Forested Watershed (33.7%)(Yakima County, 2004b). Minor portions of the jurisdiction are zoned Mountain Rural (9.0%) and Planned Development (0.5%). Approximately 98% of the reach is designated as Conservancy by the current SMP, with the other 2% designated as Rural.

Cultural Resources (Table N12)
There are four known cultural sites noted in the SMP jurisdiction of Reach 7: a lithic scatter; a pit site that was possibly used for a helicopter landing; a historic irrigation ditch; and a possible grave site (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
Two DOE sites/facilities are found in the SMP jurisdiction of Reach 7: a forest products/services operation (hazardous waste generator); and a non-classifiable operation (hazardous waste generator) (WDOE, 1998).

ECOLOGICAL FUNCTION SUMMARY

Reach 7 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 0.9% High erosion soils: 5.5% High soil permeability: 62.9% High channel migration: 21.8% 100-Year Floodplain: 73%	Wetlands: 26.2% Vacant/natural: 72.7% Riparian cover: 36% Priority habitats: 4 Species of concern: 2 Anadromous habitat: 9.1 mi Total fish species: 17	Public land: 100%	Principal land use: Vacant/natural >10% Imperviousness: 12.3% Roads: 6.7 mi Revetments: 0.5 mi Barriers: Diversion dam DOE sites/facilities: 2

Ecological functions along Reach 7 are principally impaired by transportation and residential development, which covers 24.5% of the jurisdiction. These land uses, in addition to the 6.7 miles of roads, account for the majority of the estimated 12.3% of the reach that is greater than 10% impervious. In addition, one diversion dam occurs along the reach. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Naches River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 0.5 miles of revetments within the jurisdiction. Two DOE sites/facilities are also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 36% of the reach, found throughout the breadth of the available floodplain. However, riparian cover is restricted to a narrow strip, or entirely absent, where the Naches Highway (SR 410) abuts the river, and there has been substantial loss of riparian cover due to agricultural and residential development. Much of the reach is presently undeveloped (72.7%), while 26.2% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the spotted owl, as well as four priority habitats, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
2) Rationale: Existing riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.
3) Rationale: Existing riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.

4) Rationale: Existing riparian buffer on residential land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
3) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
4) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
5) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.
6) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion control and reduction of chemical applications.

REACH 8

General Description
Reach 8 is a 5.7 mile segment of the Naches River that extends from approximately 1 mile south of Cliffdell to the confluence of the Little Naches and Bumping Rivers. The average gradient of this reach is 0.75% (40 ft/mi.). Reach 8 is dominated by abrupt ridges to both the northeast and southwest.

ABIOTIC - See Naches Physical map and Naches Physical (soil characteristics) map
(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)

Geology/Landform (Table N2)
Reach 8 occupies the upper 5.7mile portion of Naches Canyon. The abrupt canyon walls of the lower, 1.6-mile segment are composed of andesite flows with the surface geology of the remainder being basalt flows, with some overlying mass-wasting deposits.

There are extensive areas of geologic hazards noted along both sides of Reach 8 (Yakima County, 2003c). On the north side of the river, a total of 2.3 miles is rated High Risk due to the potential for rock fall or creep from over-steepened slopes and 0.08 mile is rated as Intermediate Risk due to the potential for landslides or slumps. On the south side of the river, a total of 1.2 miles is rated High Risk and 0.3 mile as Intermediate Risk due to the potential for rock fall or creep from over-steepened slopes.

Approximately 0.05 miles are rated High Risk due to the potential for landslides or slumps, and 0.1 miles are rated Intermediate Risk due to the potential for flash-flooding (emanating from side canyons). Approximately 15% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)
Reach 8 is dominated by (87.2%) by alluvial deposits (WDNR, 2000). The soils within the SMP jurisdiction are predominately silt loams. No information is available regarding the percentage of soils that are Aquic within this reach (Yakima County, n.d.c). Soil permeability is rapid (72.9%), and the hazard of erosion is rated as slight (74.8%). Information on soil runoff is not available due to data gaps (NRCS, 2003).

Stream Type/Channel Form (Table N4)
Channel form throughout Reach 8 is currently classified as plane-bed. Within this reach, the Naches River flows through the confines of Naches Canyon with a, generally, constricted floodplain. Some area of floodplain has been occupied by the roadbed of the Naches Highway (SR 410). The river throughout this reach is sinuous, with sinuosity being dictated alternately by sediment deposition and geologic structures. The river does exhibit some channel movement within its confined floodplain and active point bar and side-channel bar deposition.

It is unlikely that the channel form of the lower segment of this reach was ever much more complex. This lower, 6-mile segment of Reach 8 is a transport reach that is geologically confined; functioning to maintain the concentration of flows. The inability of the stream to reduce velocity through lateral movement (channel migration), braiding/distributaries (multiple

channels), or percolation into alluvium has resulted in an erosional environment. Throughout this reach, there exists little opportunity for flood waters to spread and, thus, for great shifting of channel location. As a result, this reach has only a slight potential for increased channel complexity beyond that which is currently expressed. Under extreme thunderstorm events or rain-on-snow events in the upper basin, the chance for flood flows exhibiting high velocities and turbulent flow is highly probable. During these episodes, the movement of large substrate materials is likely.

Approximately 39.1% of the reach has been identified as having a high potential for being in the channel migration zone (Yakima County, n.d.b).

Stream Flow
The flow regime is atypical of that of streams throughout the region, which generally exhibit lowest flows in late fall and early winter, rapidly ascending flows commencing in early spring, and gradually declining flows throughout late spring and summer. Due to "flip-flop," the lower Naches witnesses rapidly increased flows during late fall.

Hyporheic Flow
Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Ground water/surface water interactions occur throughout Reach 8 as evidenced by sinking streams with subsequent down-gradient reappearance of springs and streams throughout the floodplain of this reach.

BIOTIC - See Naches Biological map *(Naches_Biological.pmf)*

Natural Vegetation (Table N5)

Upland
GAP analysis data estimates that the vegetation communities in Reach 8 are a combination of Douglas fir (82.5%) and grand fir (17.5%) (WDFW, 2004a). USFS data indicates that vegetation types within Reach 7 are dominated by grand fir communities primarily in mid-successional stages, which comprise 37% of the SMP jurisdiction. Other vegetation types include Douglas fir (2.4%) and riparian communities (45.9%).

Riparian
Estimates of the SMP jurisdiction area covered by riparian vegetation range between 42.4 to 62.16% (WDFW, 2004b and Yakima County, 2003b). Within this reach, riparian vegetation is found throughout the breadth of the available floodplain. Riparian vegetation is absent from recent alluvial deposits, but exhibits varying age classes and structure on older, stabilized deposits, with approximately half in a mid-successional stage. Riparian cover is restricted to a narrow strip, or entirely absent, where the Naches Highway (SR 410) abuts the river. There has been some loss of riparian cover due to residential development.

Wetlands
Wetlands occupy 37.3% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic residential and infrastructure development. An additional 25.1 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife
Aquatic (Tables N6 and N7)
Reach 8 has been identified as spawning habitat for summer steelhead and spring chinook (WDFW, 2004c). Bull Trout may also be present. Adequate habitat is expected for 14 species of resident fish species in this reach, including rainbow trout, Eastern brook trout and mountain whitefish.

Avian (Tables N5 and N8)
GAP analysis data indicates that all of Reach 8 may provide habitat for one species of current concern, namely the spotted owl (WDFW, 2004a). The USFS has classified 13.2% of the jurisdiction as suitable habitat for the spotted owl.

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 8 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). There is one Wildlife Heritage Location noted within the SMP jurisdiction of this reach (WDFW, 2003). Several portions of the reach are listed as priority habitat, including meadows (9.9%), cliffs/bluffs (1.6%) and talus slopes (0.1%) (WDFW, 2004b).

CULTURAL MODIFICATIONS – See Naches Cultural Modifications map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 8, 82.4% remain vacant (Yakima County, 2004a). Of the remaining 17.6% of SMP jurisdiction lands, 3.9% is under residential development, 12.6% is occupied by transportation development, and 1.0% is commercial. Approximately 7.1% of the SMP jurisdiction is greater than 25% impervious. The U.S. Forest Service is the only public owner of land within the SMP jurisdiction, holding title to 98.6%.

Transportation (Table N11)
Roadways occupy 6.8 miles of SMP jurisdiction land in this reach, including 2 bridge crossings (Yakima County, n.d.a).

Revetments (Table N11)
No information was available regarding the amount of revetments along this reach (CWU, 2002).

CULTURAL JURISDICTION – See Naches Cultural Jurisdicitonal map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 8 is predominantly Forested Watershed (90.2%) (Yakima County, 2004b). Minor portions of the jurisdiction are zoned Rural Settlement (9.3%), Remote/Extremely Limited (0.3%), and Mountain Rural (0.2%). The entire reach is designated as Conservancy by the current SMP.

Cultural Resources (Table N12)
There are six known cultural sites noted in the SMP jurisdiction of Reach 8: two are lithic scatter sites, and four are historic summer homes (WSHPO, 2004)

DOE Sites/facilities and 303(d) Listings (Table N12)
No DOE sites/facilities are found in the SMP jurisdiction of Reach 8 (WDOE, 1998). The Little Naches River, at its confluence with the Naches River is 303(d)-listed for temperature.

ECOLOGICAL FUNCTION SUMMARY

Reach 8 Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
Steep slopes: 20.5% High erosion soils:13% High soil permeability: 72.9% High channel migration: 39.1% 100-Year Floodplain: 15%	Wetlands: 37.3% Vacant/natural: 82.4% Riparian cover: 42.4% Priority habitats: 3 Species of concern: 2 Wildlife Heritage location: 1 Anadromous habitat: 5.7 mi Total fish species: 17	Public land: 100% Boat launches: 1	Principal land use: Vacant/natural >10% Imperviousness: 14.5% Roads: 6.8 mi Bridge crossings: 2

Ecological functions along Reach 8 are principally impaired by transportation and residential development, which covers 16.5% of the jurisdiction. These land uses, in addition to the 6.8 miles of roads, account for the majority of the estimated 14.5% of the reach that is greater than 10% impervious. In addition, 2 bridge crossings occur along the reach. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. There is one 303(d)-listed stream segment found in the SMP jurisdiction but no DOE sites/facilities. Riparian vegetation, which is a buffer for nonpoint pollution, covers approximately 42.4% of the reach, Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 36% of the reach, found throughout the breadth of the available floodplain. However, riparian cover is restricted to a narrow strip, or entirely absent, where the Naches Highway (SR 410) abuts the river, and there has been substantial loss of riparian cover due to agricultural and residential development. Much of the reach is presently undeveloped (82.4%), while 37.3% is covered by wetlands. The reach

provides habitat for two species of concern, the Townsend's big-eared bat and the spotted owl, as well as three priority habitats, one wildlife heritage location for harlequin ducks, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES - See Naches Opportunity for Protection map *(Naches_Opp_Protection.pmf)*

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Naches River.

1) Rationale: Existing riparian buffer on privately owned residential land protecting a recognized anadromous spawning area. Suggested Action: Work with private landowners to protect riparian buffer.
2) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES - See Naches Opportunity for Restoration map *(Naches_Opp_Restoration.pmf)*

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Naches River.

1) Rationale: Marginal riparian buffer on forestry land protecting a recognized anadromous spawning habitat. Suggested Action: Work with U.S. Forest Service to establish a larger riparian buffer

REACH 5a- Wenas Lake

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map ***(Naches_Physical.pmf and Naches_Soil_Characteristics.pmf)***

Geology/Landform (Table N2)
The primary geology along this reach is one of alluvium (56.6%). There are extensive areas of geologic hazards noted along both sides of Reach 5a (Yakima County, 2003c). There are areas of intermediate risk due to alluvial fan and flash flooding (6.6%) and high risk of landslides (3.7%). Approximately 17.2% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table N3)
Reach 5a is dominated by alluvial deposits (56.6%). Within this reach, 1.8% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily slow and moderately slow, runoff is classed as rapid and the hazard of erosion is rated as high (NRCS, 2003).

BIOTIC- See Yakima Biological Map ***(Naches_Biological.pmf)***

Natural Vegetation
Upland
Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table N5)
There is an estimated 2.2% of riparian zones along the reach.

Wetlands (Table N5)
Wetlands occupy 1.3% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development.

Wildlife
Aquatic (Table N6)
There is no aquatic fish data available for this lake.

Avian (Table N8)
GAP analysis data indicates that portions of Reach 5a may provide habitat for species of current concern, including the burrowing owl (33.4%) and the sage thrasher (33.4%) (WDFW, 2004a).

Terrestrial (Tables N5 and N8)
GAP analysis data indicates that all of Reach 5a may provide habitat for species of current concern, namely the Townsend's big-eared bat (100%), the Townsend's ground squirrel (33.4%) and the black- tailed jack rabbit (33.4%) (WDFW, 2004a). Wetland and riparian zones, mule and black tailed deer, elk and the bald eagle are listed as priority species and habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(Naches_Cultural_ Modifications.pmf)

Land Use (Table N9)
Of the SMP jurisdiction lands along Reach 5a, 92.6% remain vacant/natural (Yakima County, 2004a). 8.8% of the SMP jurisdiction is greater than 25% impervious (Yakima County, 2004a). The United States Forest Service is the public owner of land within the SMP jurisdiction, holding title to 98.6% of the jurisdiction (WDNR, 2003).

Transportation (Table N11)
Roadways and railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table N11)
There are is no revetment data available for this reach.

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(naches_cultural_jurisdictional.pmf)

Zoning (Table N10)
Current zoning within the SMP jurisdiction of Reach 5a is mountain rural (56.9%) and remote extremely limited (43.1%) (Yakima County Zoning, 2004b). The entire reach is designated as conservancy by the current SMP.

Cultural Resources (Table N12)
There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 5a on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table N12)
There are no DOE sites/facilities or 303(d)-listed stream segments found in the SMP jurisdiction of Reach 5a (WDOE, 1998).

ECOLOGICAL FUNCTION SUMMARY

Reach 5a Characterization Summary

Hazard Potential	Habitat Conditions	Public Access	Key Modifications
High erosion soils: 92.1% High soil runoff: 92.1% 100-Year Floodplain: 17.2%	Wetlands: 1.3% Vacant/natural: 92.6% Priority habitats: 5 Species of concern: 5 Total fish species: 3	Public land: 100% Boatlaunch:1	Principal land use: Vacant/natural >10% Imperviousness: 8.8% Barriers: Dam

Ecological functions along Reach 5a are principally impaired by transportation development and recreation, which covers 7.4% of the jurisdiction. These land uses, account for the majority of the estimated 8.8% of the reach that is greater than 10% impervious. In addition, one dam occurs along the reach. Upland vegetation has been removed and replaced with roads and buildings, which can promote increased runoff and nonpoint source pollution. Much of the reach is presently undeveloped (92.6%), while 1.3% is covered by wetlands. The reach provides habitat for five species of concern, as well as five priority habitats, and aquatic habitat for 3 fish species.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map *(Naches_Opp_Protection.pmf)*

1) Rationale: Wetlands present. Suggested action: Work with property owner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map *(Naches_Opp_Restoration.pmf)*

1) Rationale: Marginal riparian buffer on vacant land. Suggested Action: Establish a larger riparian buffer.

APPENDIX

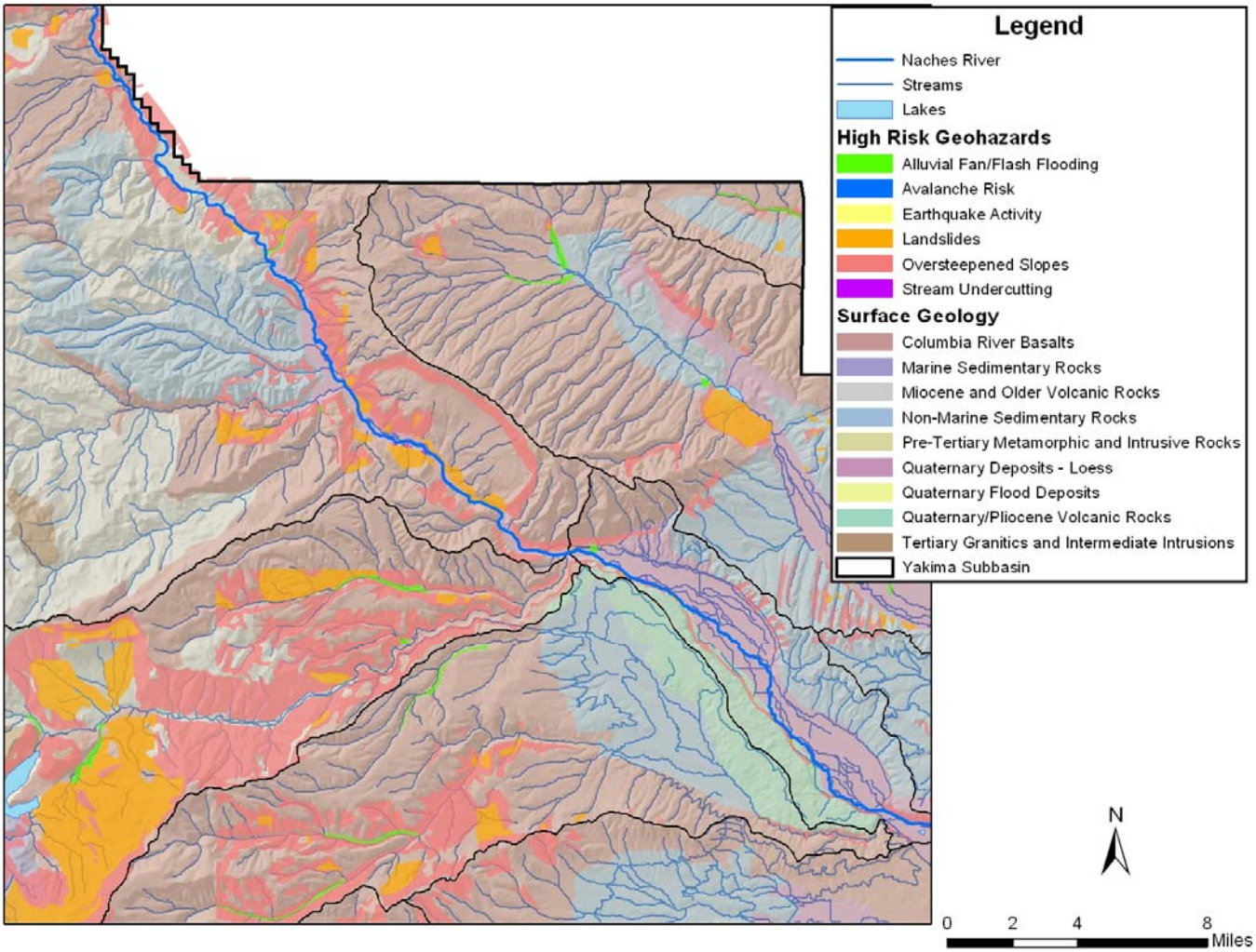

Figure N1. Geology and Geohazards in the Naches River.

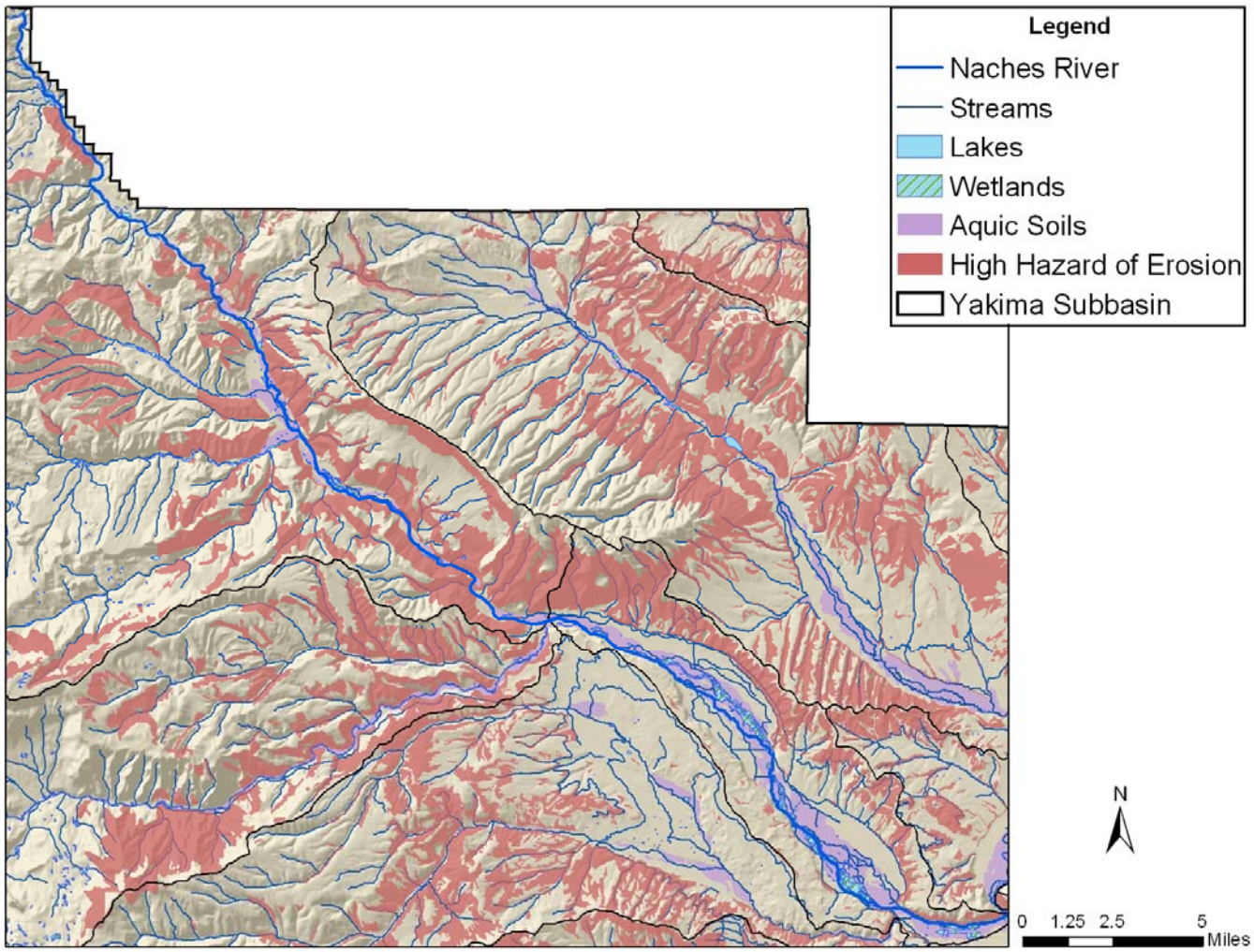

Figure N2. Wetlands and Soil Characteristics in the Naches River.

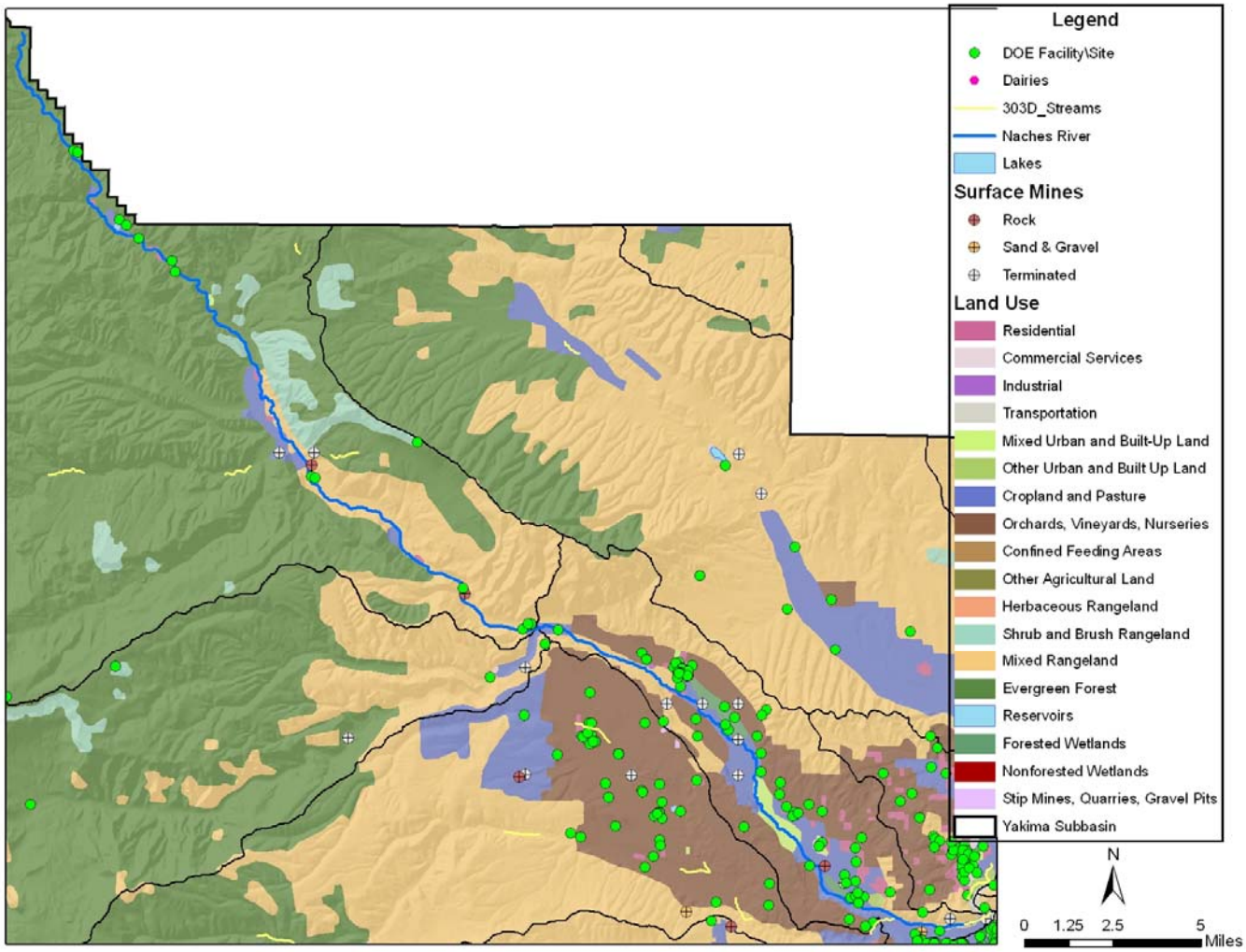

Figure N3. Cultural Modifications in the Naches River.

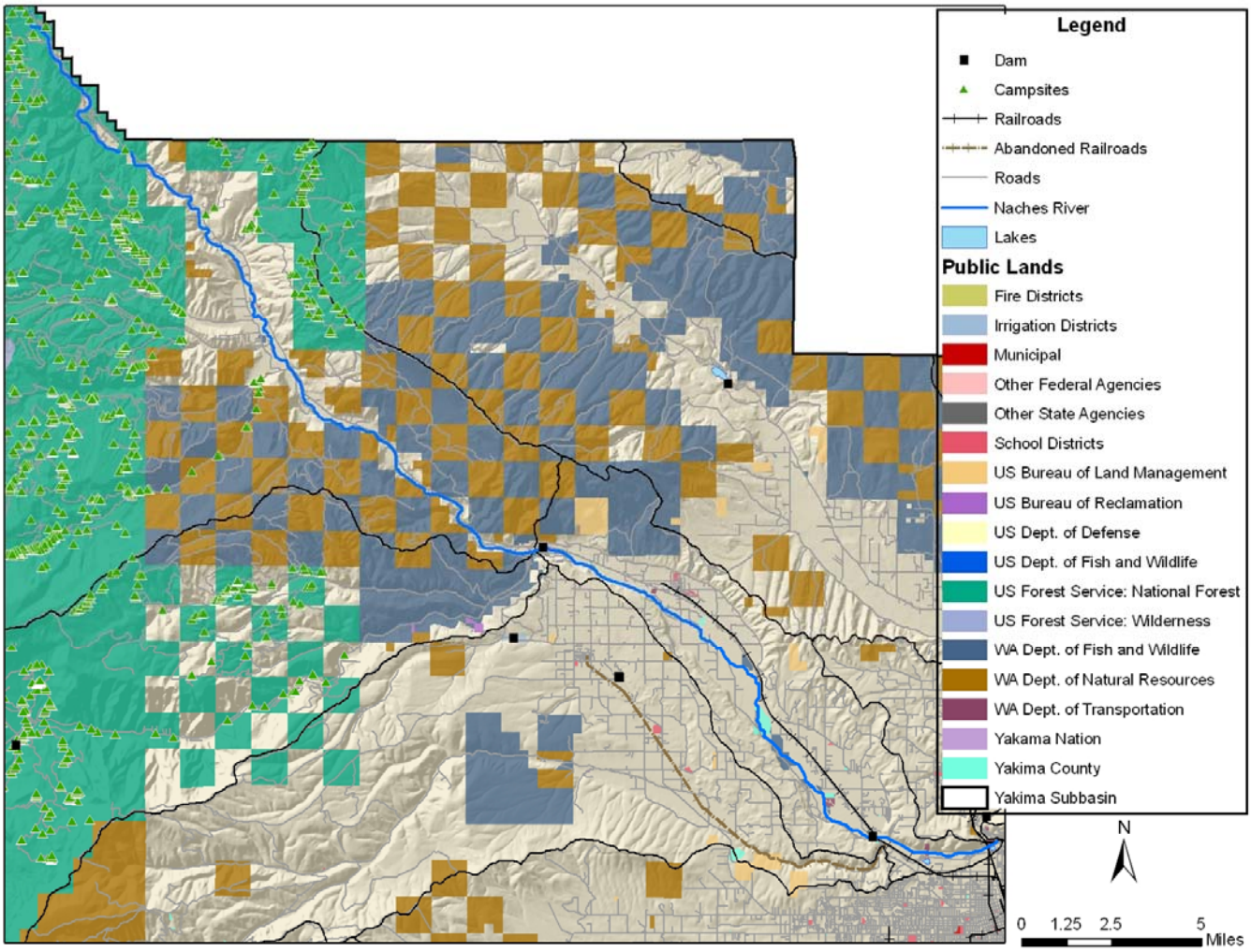

Figure N4. Public Resources and Access in the Naches River.

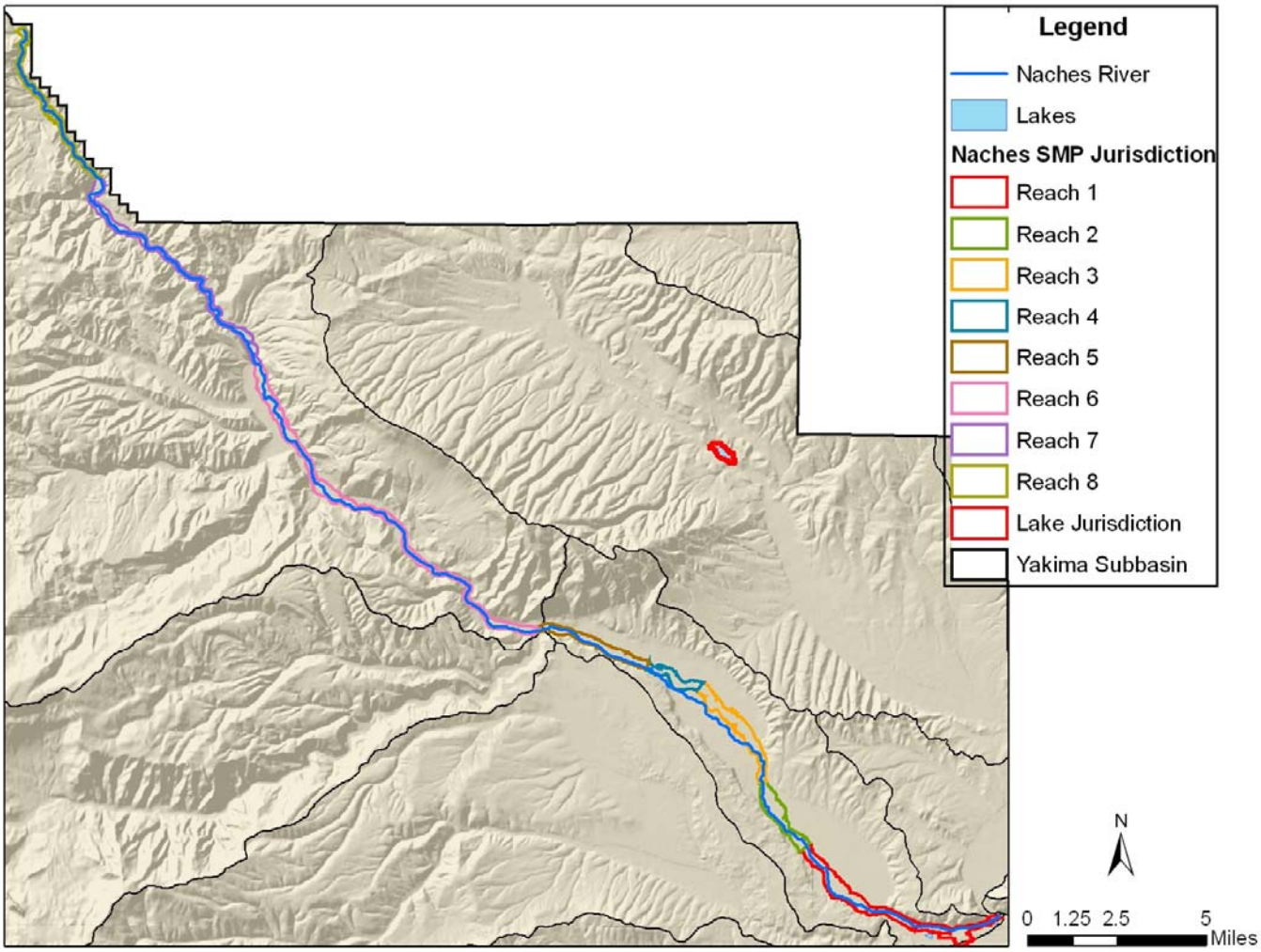

Figure N5. SMP Jurisdiction Breaks for the Naches River.

Table N1. SMP Reach Breaks for Inventory and Analysis, Naches River.

Reach	Length	Start	Reach Break Justification	End
1	6.9 Miles	SW¼, NE¼, S12, T13R, R18E	Geomorphic: Confluence with Yakima River.	South line of SE¼, NW¼, S31, T14N, R18E
2	2.5 Miles	South line of SE¼, NW¼, S31, T14N, R18E	Landuse: Changes from mixed urban to cropland and pasture	NW¼, SW¼, S24, T14N, R17E
3	1.4 Miles	NW¼, SW¼, S24, T14N, R17E	Landuse: Changes from croplands and pasture to urban.	SE¼, SW¼, S3, T14N, R17E
4	0.5 Miles	SE¼, SW¼, S3, T14N, R17E	Landuse: Changes form urban, city of Naches, to forested wetlands.	NE¼, SE¼, S5, T14N, R17E
5	3.5 Miles	NE¼, SE¼, S5, T14N, R17E	Landuse: City of Naches to orchards, groves and cropland pasture.	NW¼, SE¼, S35, T15N, R16E
6	12.9 Miles	NW¼, SE¼, S35, T15N, R16E	Geomorphic: Near confluence of Tieton. Less constricted floodplain. Gradient change from plane-bed to pool-riffle. Landuse: Changes from mixed range to areas of orchards.	NW¼, NE¼, S28, T16N, R15E
7	8.6 Miles	NW¼, NE¼, S28, T16N, R15E	Landuse: Changes from mixed rangeland, cropland and pasture to evergreen forest.	North line of SE¼, SE¼, S26, T17N, R14E
8	5.7 Miles	North line of SE¼, SE¼, S26, T17N, R14E	Geomorphic: Floodplain widens and becomes less confined. Landuse: More small farms and houses on wider floodplain.	NW¼, SE¼, S4, T17N, R14

Table N2. Geology and Geohazards Characteristics for the Naches River.

REACH	Geology		Geohazard	
	Lithology	**Area (%)**	**Geohazard**	**Area (%)**
1 Area: 1101.4 Acres	Alluvium Andesite Flows Basalt Flows Terraced Deposits	95.7 0.2 3.9 0.2	Oversteepened Slopes (High Risk) Stream Undercutting (Intermediate Risk) 100-Year Floodplain	6.8 1.0 76.6
2 Area: 483.1 Acres	Alluvium Andesite Flows Mass-Wasting Deposits, Mostly Landslides	98.1 0.8 1.1	Landslides (High Risk) Oversteepened Slopes (High Risk) Stream Undercutting (Intermediate Risk) Stream Undercutting (High Risk) 100-Year Floodplain	0.2 4.8 3.1 4.6 84.5
3 Area: 625.2 Acres	Alluvium Basalt Flows (Frenchman Springs Member [CRB, WB])	99.8 0.2	100-Year Floodplain	85.4
4 Area: 260.7 Acres	Alluvium Mass-Wasting Deposits, Mostly Landslides	96.3 3.7	Landslides (High Risk) Oversteepened Slopes (High Risk) Stream Undercutting (Intermediate Risk) Stream Undercutting (High Risk) 100-Year Floodplain	5.6 1.8 3.4 0.8 90.9
5 Area: 483.1 Acres	Alluvium Andesite Flows Basalt Flows Continental Sedimentary Deposits or Rocks Mass-Wasting Deposits, Mostly Landslides Terraced Deposits	80.9 1.2 0.3 2.4 6.0 9.2	Alluvial Fan/Flash Flooding (High Risk) Landslides (High Risk) Oversteepened Slopes (High Risk) Stream Undercutting (Intermediate Risk) Stream Undercutting (High Risk) 100-Year Floodplain	0.9 0.7 6.1 2.3 4.0 86.4
6 Area: 1452.5 Acres	Alluvium Basalt Flows Mass-Wasting Deposits, Mostly Landslides	85.9 13.7 0.4	Landslides (Intermediate Risk) Landslides (High Risk) Oversteepened Slopes (High Risk) 100-Year Floodplain	1.5 10.9 18.8 78.9

REACH	Geology		Geohazard	
	Lithology	**Area (%)**	**Geohazard**	**Area (%)**
7 Area: 806.3 Acres	Alluvium Andesite Flows Basalt Flows Mass-Wasting Deposits, Mostly Landslides Terraced Deposits	83.9 7.8 5.2 1.0 2.1	Alluvial Fan/Flash Flooding (Intermediate Risk) Alluvial Fan/Flash Flooding (High Risk) Landslides (Intermediate Risk) Landslides (High Risk) Oversteepened Slopes (Intermediate Risk) 100-Year Floodplain	2.3 1.0 4.6 0.7 0.9 73
8 Area: 435.9 Acres	Alluvium Andesite Flows Basalt Flows Mass-Wasting Deposits, Mostly Landslides Terraced Deposits	87.2 2.2 7.6 2.9 0.2	Oversteepened Slopes (Intermediate Risk) Oversteepened Slopes (High Risk) 100-Year Floodplain	1.3 19.2 15
5a Area: 52.8 Acres	Alluvium Basalt Flows (Frenchman Springs Member [CRB, WB]) Mass-Wasting Deposits, Mostly Landslides Water Basalt Flows (Frenchman Springs Member [CRB, WB]) Continental Sedimentary Deposits or Rocks	56.6 2.1 19.5 17.9 3.7 0.2	Alluvial Fan/Flash Flooding (Intermediate Risk) Landslides (High Risk) 100-Year Floodplain	6.6 3.7 17.2

Table N3. Soil Characteristics for the Naches River.

REACH	Soil Characteristics						Aquic Soils
	Permeability	**Area (%)**	**Runoff**	**Area (%)**	**Hazard of Erosion**	**Area (%)**	**Area (%)**
1	moderate	9.1	medium	4.4	moderate	4.4	
	moderately rapid	4.1	rapid	4.4	high	4.4	
Area: 1101.4 Acres	rapid	65.2	slow	69.5	slight	69.5	64.7
	N/A	21.7	very slow	0.0	N/A	21.7	
			N/A	21.7			
2	moderate	3.1	medium	3.1	moderate	3.1	
	moderately rapid	4.0	slow	82.5	slight	82.5	78.1
Area: 483.1 Acres	rapid	78.5	N/A	14.4	N/A	14.4	
	N/A	14.4					
3	moderate	1.5	medium	0.5	moderate	0.5	
	moderately rapid	1.9	rapid	0.2	slight	83.3	
Area: 625.2 Acres	rapid	80.6	slow	82.6	very high	0.2	80.4
	N/A	15.9	very slow	0.7	N/A	15.9	
			N/A	15.9			
4	moderate	3.7	medium	3.7	moderate	3.7	
	moderately rapid	1.7	slow	73.4	slight	84.9	83.0
Area: 260.7 Acres	rapid	83.2	very slow	11.5	N/A	11.4	
	N/A	11.4	N/A	11.4			

REACH	Soil Characteristics						Aquic Soils
	Permeability	**Area (%)**	**Runoff**	**Area (%)**	**Hazard of Erosion**	**Area (%)**	**Area (%)**
5	moderate	11.6	medium	11.4	moderate	11.4	
	moderately rapid	7.4	slow	68.9	slight	75.9	
Area: 483.1 Acres	moderately slow	0.0	very slow	7.0	N/A	12.7	69.1
	rapid	68.4	N/A	12.7			
	N/A	12.7					
6	moderate	7.2	medium	2.4	high	10.7	
	moderately rapid	11.2	rapid	11.9	moderate	2.5	
Area: 1452.5 Acres	moderately slow	9.0	slow	69.8	slight	71.2	59.3
	rapid	58.2	very slow	1.5	very high	1.2	
	N/A	14.4	N/A	14.4	N/A	14.4	
7	moderate	8.4			high	5.5	
	moderately rapid	10.7			moderate	13.6	
Area: 806.3 Acres	moderately slow	3.7	N/A	N/A	slight	66.7	24.6
	rapid	56.7			N/A	14.2	
	very rapid	6.2					
	N/A	14.2					
8	moderate	16.8			moderate	9.6	
	moderately slow	6.5	N/A	N/A	severe	13.0	NO DATA
Area: 435.9 Acres	rapid	72.9			slight	74.8	
	slow	1.3			N/A	2.5	
	N/A	2.5					

REACH	Soil Characteristics						Aquic Soils
	Permeability	**Area (%)**	**Runoff**	**Area (%)**	**Hazard of Erosion**	**Area (%)**	**Area (%)**
5a	slow	57.9	N/A	1.307388	high	47.88162	
	moderately rapid	4.2	rapid	92.11058	moderate	0.067754	
Area: 52.8 Acres	moderate	0.1	slow	4.308383	N/A	1.307388	1.8
	moderately slow	36.5	very slow	2.273644	slight	6.514273	
					very high	44.22896	

Table N4. Stream Channel Characteristics for the Naches River.

REACH	Stream Lengths		Channel Migration	
	Total Streams (Miles)	**SMP Stream (Miles)**	**Potential**	**Area (%)**
1 Area: 1101.4 Acres Length: 6.9 Miles	13.6	6.9	High Moderate	51.2 14.3
2 Area: 483.1 Acres Length: 2.5 Miles	6.1	2.5	High Moderate	51.7 33.3
3 Area: 625.2 Acres Length: 1.4 Miles	1.4 jurisdiction and buffer lengths combined	1.4	No Data	No Data
4 Area: 260.7 Acres Length: 0.5 Miles	2.7	0.5	High Moderate	38.6 6.9
5 Area: 483.1 Acres Length: 3.5 Miles	6.5	3.5	High Low Moderate	22.5 0.2 22.9
6 Area: 1452.5 Acres Length: 12.9 Miles	16.2	12.9	High Moderate	28.5 8.0

REACH	Stream Lengths		Channel Migration	
	Total Streams (Miles)	**SMP Stream (Miles)**	**Potential**	**Area (%)**
7 Area: 806.3 Acres Length: 8.6 Miles	11.1	8.6	High Moderate	21.8 5.9
8 Area: 435.9 Acres Length: 5.7 Miles	7.3	5.7	High	39.1
5a Area: 52.8 Acres Length: N/A	N/A	N/A	N/A	N/A

Table N5. Habitat Characteristics for the Naches River.

REACH	Wildlife Heritage Locations Common Name	Wildlife Heritage Locations (#)	Wetlands Area (%)	Riparian Areas Area (%)	Priority Species & Habitats		Forest Type/Series		Successional Stage	
					Habitat	Area (%)	Plant Series	Area (%)	Forest Type Stage	Area (%)
1 Area: 1101.4 Acres	0	0	51.5	33.4	Bald Eagle Riparian Zones Urban Natural Open Space Wood Duck	66.4 66.7 3.4 59.4	No Data	No Data	No Data	No Data
2 Area: 483.1 Acres	0	0	42.1	43.4	Bald Eagle Riparian Zones Urban Natural Open Space Wood Duck	68.2 68.2 1.0 68.2	No Data	No Data	No Data	No Data
3 Area: 625.2 Acres	0	0	53.5	40.1	Bald Eagle Riparian Zones Wood Duck	72.1 72.1 72.1	No Data	No Data	No Data	No Data
4 Area: 260.7 Acres	0	0	30.4	29.9	Bald Eagle Riparian Zones Urban Natural Open Space Wood Duck	47.0 47.0 4.8 47.0	No Data	No Data	No Data	No Data

REACH	Wildlife Heritage Locations Common Name	Wildlife Heritage Locations (#)	Wetlands Area (%)	Riparian Areas Area (%)	Priority Species & Habitats		Forest Type/Series		Successional Stage	
					Habitat	Area (%)	Plant Series	Area (%)	Forest Type Stage	Area (%)
5 Area: 483.1 Acres	0	0	27.0	30.1	Bald Eagle Riparian Zones Urban Natural Open Space Wood Duck	67.5 67.5 7.2 67.5	No Data	No Data	No Data	No Data
6 Area: 1452.5 Acres	0	0	28.0	31.6	Bald Eagle Bighorn Sheep Elk Mule and Black-Tailed Deer Riparian Zones Wood Duck	8.1 31.3 28.6 54.6 61.2 8.1	Douglas Fir Riparian Rock Rural AG Shrubland	0.43 24.13 2.25 6.77 0.70	Douglas Fir - Mid Riparian - Mid	0.43 16.45
7 Area: 806.3 Acres	0	0	26.2	36.0	Bighorn Sheep Elk Mule and Black-Tailed Deer Riparian Zones	18.9 14.0 64.9 20.7	Grand Fir Riparian Rock Rural AG Shrubland Douglas fir Water	0.79 42.71 1.78 11.58 8.81 34.30 0.01	Grand Fir - Mid Douglas Fir - Late Douglas Fir - Mid Riparian - Mid	0.79 3.52 30.79 7.05

REACH	Wildlife Heritage Locations Common Name	Wildlife Heritage Locations (#)	Wetlands Area (%)	Riparian Areas Area (%)	Priority Species & Habitats		Forest Type/Series		Successional Stage	
					Habitat	Area (%)	Plant Series	Area (%)	Forest Type Stage	Area (%)
8 Area: 435.9 Acres	Harlequin Duck	1	37.3	42.4	Cliffs/Bluffs Meadows Talus Slopes	1.6 9.9 0.1	Grand Fir Douglas Fir Riparian Rock	28.68 2.47 62.16 6.67	Grand Fir - Mid Grand Fir - Late Douglas Fir - Mid Douglas Fir - Late Riparian - Mid	22.46 6.22 1.94 0.53 35.85
5a Area: 52.8 Acres	0	0	1.3	No Data	Bald eagle Elk Mule and black-tailed deer Riparian zones Wetlands	2.2 25.4 25.4 2.2 0.4	No Data	No Data	No Data	No Data

Table N6. Fish Characteristics for the Naches River.

REACH	Anadromous Fish						Barriers	
	Presence		Spawning		Rearing			
	Species	Length (Miles)	Species	Length (Miles)	Species	Length (Miles)	Type	Species Blocked
1 Length: 6.9 Miles	Coho Spring Chinook Summer Steelhead	4.1 7.0 7.1	Coho Summer Steelhead	0.2 5.0	Coho	0.2	Dam Passable, Dam Diversion Dam	Coho
2 Length: 2.5 Miles	Spring Chinook Summer Steelhead	2.5 2.5	Summer Steelhead	2.5	N/A	N/A	Diversion Dam	N/A
3 Length: 1.4 Miles	Spring Chinook Summer Steelhead	3.9 3.9	Summer Steelhead	3.9	N/A	N/A	N/A	N/A
4 Length: 0.5 Miles	Spring Chinook Summer Steelhead	1.8 1.8	Summer Steelhead	1.8	N/A	N/A	N/A	N/A
5 Length: 3.5 Miles	Spring Chinook Summer Steelhead	3.5 3.5	Summer Steelhead	3.5	N/A	N/A	Passable, Insufficient Flow	N/A
6 Length: 12.9 Miles	Spring Chinook Summer Steelhead	13.6 13.6	Spring Chinook Summer Steelhead	3.3 13.6	N/A	N/A	Passable, Insufficient Flow	N/A
7 Length: 8.6 Miles	Spring Chinook Summer Steelhead	9.1 9.0	Spring Chinook Summer Steelhead	8.6 8.6	Spring Chinook	0.5	Diversion Dam	N/A
8 Length: 5.7 Miles	Spring Chinook Summer Steelhead	5.7 5.7	Spring Chinook Summer Steelhead	5.7 5.7	N/A	N/A	N/A	N/A
5a Length: N/A	N/A	N/A	N/A	N/A	N/A	N/A	Dam	N/A

Table N7. Fish Characteristics for the Naches River, cont.

REACH	Bulltrout		Resident Fish	
	Presence	**Length (Miles)**	**Species**	**Length (Miles)**
1	Currently Occupied	6.7	Bridgelip Sucker	4.9
	Potentially Occupied	0.3	Chiselmouth	6.6
Length: 6.9 Miles			Eastern Brook Trout	6.1
			Lamprey	6.8
			Largescale Sucker	5.8
			Mountain Whitefish	5.2
			Northern Pike Minnow	6.9
			Peamouth	6.8
			Rainbow Trout	7.1
			Redside Shiner	6.1
			Sculpin	6.8
			Shiner Perch	6.8
			Speckled Dace	7.1
			Starry Flounder	6.7
2	Currently Occupied	2.5	Bridgelip Sucker	2.5
			Chiselmouth	2.5
Length: 2.5 Miles			Eastern Brook Trout	2.5
			Lamprey	2.5
			Largescale Sucker	2.5
			Mountain Whitefish	2.5
			Northern Pike Minnow	2.5
			Peamouth	2.5
			Rainbow Trout	2.5
			Redside Shiner	2.5
			Sculpin	2.5
			Shiner Perch	2.5
			Speckled Dace	2.5
			Starry Flounder	2.5

REACH	Bulltrout		Resident Fish	
	Presence	**Length (Miles)**	**Species**	**Length (Miles)**
3 Length: 1.4 Miles	Currently Occupied	3.9	Bridgelip Sucker	3.9
			Chiselmouth	3.9
			Eastern Brook Trout	3.9
			Lamprey	3.9
			Largescale Sucker	3.9
			Mountain Whitefish	3.9
			Northern Pike Minnow	3.9
			Peamouth	3.9
			Rainbow Trout	3.9
			Redside Shiner	3.9
			Sculpin	3.9
			Shiner Perch	3.9
			Speckled Dace	3.9
			Starry Flounder	3.9
4 Length: 0.5 Miles	Currently Occupied	1.8	Bridgelip Sucker	1.8
			Chiselmouth	1.8
			Eastern Brook Trout	1.8
			Lamprey	1.8
			Largescale Sucker	1.8
			Mountain Whitefish	1.8
			Northern Pike Minnow	1.8
			Peamouth	1.8
			Rainbow Trout	1.8
			Redside Shiner	1.8
			Sculpin	1.8
			Shiner Perch	1.8
			Speckled Dace	1.8
			Starry Flounder	1.8
5	Currently Occupied	3.5	Bridgelip Sucker	3.4
			Chiselmouth	3.4

REACH	Bulltrout		Resident Fish	
	Presence	**Length (Miles)**	**Species**	**Length (Miles)**
Length: 3.5 Miles			Eastern Brook Trout	3.4
			Lamprey	3.4
			Largescale Sucker	3.3
			Mountain Whitefish	3.4
			Northern Pike Minnow	3.5
			Peamouth	3.4
			Rainbow Trout	3.4
			Redside Shiner	3.4
			Sculpin	3.4
			Shiner Perch	3.4
			Speckled Dace	3.4
			Starry Flounder	3.3
6 Length: 12.9 Miles	Currently Occupied	12.9	Bridgelip Sucker	7.6
	Other Undetected	0.7	Chiselmouth	7.6
			Eastern Brook Trout	7.9
			Lamprey	7.6
			Largescale Sucker	7.6
			Mountain Whitefish	7.6
			Northern Pike Minnow	12.8
			Peamouth	7.6
			Rainbow Trout	5.7
			Redside Shiner	7.6
			Sculpin	8.4
			Shiner Perch	7.6
			Speckled Dace	7.6
			Starry Flounder	7.6
7 Length: 8.6 Miles	Currently Occupied	8.6	Bridgelip Sucker	7.6
			Chiselmouth	0.6
			Eastern Brook Trout	0.6

REACH	Bulltrout		Resident Fish	
	Presence	Length (Miles)	Species	Length (Miles)
			Lamprey	0.5
			Largescale Sucker	0.6
			Mountain Whitefish	0.5
			Northern Pike Minnow	8.6
			Peamouth	0.5
			Rainbow Trout	1.4
			Redside Shiner	0.6
			Sculpin	0.9
			Shiner Perch	0.5
			Speckled Dace	0.6
			Starry Flounder	0.6
8 Length: 5.7 Miles	Currently Occupied	5.8	Bridgelip Sucker	5.3
			Chiselmouth	5.3
			Eastern Brook Trout	5.3
			Lamprey	5.3
			Largescale Sucker	5.4
			Mountain Whitefish	5.3
			Northern Pike Minnow	5.4
			Peamouth	5.4
			Rainbow Trout	5.9
			Redside Shiner	5.4
			Sculpin	5.4
			Shiner Perch	5.3
			Speckled Dace	5.4
			Starry Flounder	5.3
5a Length: N/A	N/A	N/A	Redside Shiner	N/A
			Sculpin	N/A
			Speckled Dace	N/A

Table N8. GAP Analysis of SMP Jurisdiction for the Naches River.

REACH	GAP Analysis						Spotted Owl Habitat	
	Mammals		Birds		Vegetation			
	Type	Area (%)	Type	Area (%)	Type	Area (%)	Suitability	Area (%)
1 Area: 1101.4 Acres	Black-Tailed Jack Rabbit Townsend's Big-Eared Bat Townsend's Ground Squirrel	3.0 100.0 3.0	Burrowing Owl Sage Sparrow Sage Thrasher	68.3 3.0 3.0	Central Arid Steppe	100.0	No Data	No Data
2 Area: 483.1 Acres	Townsend's Big-Eared Bat	100.0	Burrowing Owl	100.0	Central Arid Steppe	100.0	No Data	No Data
3 Area: 625.2 Acres	Townsend's Big-Eared Bat	100.0	Burrowing Owl	100.0	Central Arid Steppe	100.0	No Data	No Data
4 Area: 260.7 Acres	Townsend's Big-Eared Bat	100.0	Burrowing Owl	95.8	Central Arid Steppe	100.0	No Data	No Data
5 Area: 483.1 Acres	Townsend's Big-Eared Bat	100.0	Burrowing Owl	13.7	Central Arid Steppe	100.0	No Data	No Data
6 Area: 1452.5 Acres	Black-Tailed Jack Rabbit Townsend's Big-Eared Bat Townsend's Ground Squirrel Western Gray Squirrel	8.2 100.0 8.2 13.2	Burrowing Owl Sage Sparrow Sage Thrasher	5.4 8.2 8.2	Central Arid Steppe Oak	22.3 77.7	No Data	No Data

REACH	GAP Analysis						Spotted Owl Habitat	
	Mammals		Birds		Vegetation			
	Type	Area (%)	Type	Area (%)	Type	Area (%)	Suitability	Area (%)
7 Area: 806.3 Acres	Townsend's Big-Eared Bat	100.0	Spotted Owl	51.1	Oak Ponderosa Pine Interior Douglas Fir	30.9 18.1 51.1	Suitable Non Suitable	0.93 44.65
8 Area: 435.9 Acres	Townsend's Big-Eared Bat	100.0	Spotted Owl	100.0	Interior Douglas Fir Grand Fir	82.5 17.5	Suitable Non Suitable	7.81 92.19
5a Area: 52.8 Acres	Townsend`s Ground Squirrel Townsend`s Big-eared Bat Black-tailed Jack Rabbit	33.4 100.0 33.4	Sage Thrasher Burrowing Owl	33.4 33.4	Central Arid Steppe	100.0	No data No data	No data No data

Table N9. Land-use Characteristics for the Naches River.

REACH	Land Use		Land Use Type on Rapid Runoff Soil		Impervious Surface	
	Type	**Area (%)**	**Type**	**Area (%)**	**Range**	**Area (%)**
1	Agriculture - Hay	0.4	Vacant/Natural	0.7	0	74.0
	Agriculture - Livestock	0.4	Residential - Single Family	0.3	1-10	12.6
Area: 1101.4 Acres	Agriculture - Orchard/Vineyard	4.4			11-25	1.4
	Agriculture - Pasture/Grazing	2.0			26-50	0.7
	Commercial - Office	0.7			51-75	0.7
	Commercial - Retail	1.2			76+	10.7
	Commercial - Wholesale/Warehouse	0.4				
	Industrial - Transportation	8.8				
	Mining (gravel pits)	0.5				
	Residential - Multi-Family	0.7				
	Residential - Other	0.1				
	Residential - Single Family	9.2				
	Vacant/Natural	71.2				
2	Agriculture - Orchard/Vineyard	0.8	Vacant/Natural	23.5	0	69.4
	Agriculture - Pasture/Grazing	2.0	Residential - Single Family	1.0	1-10	25.8
Area: 483.1 Acres	Industrial - Power Generation	0.6	Agriculture - Pasture/Grazing	1.6	11-25	0.7
	Industrial - Transportation	3.9	Industrial - Transportation	0.1	26-50	0.3
	Recreation - Parks	11.6			51-75	0.1
	Residential - Other	0.2			76+	3.8
	Residential - Single Family	7.6				
	Vacant/Natural	73.4				

REACH	Land Use		Land Use Type on Rapid Runoff Soil		Impervious Surface	
	Type	**Area (%)**	**Type**	**Area (%)**	**Range**	**Area (%)**
3	Agriculture - Pasture/Grazing	2.3	Vacant/Natural	1.4	0	75.9
	Industrial - Power Generation	1.3	Agriculture - Orchard/Vineyard	0.1	1-10	12.9
Area: 625.2 Acres	Agriculture - Hay	0.3			11-25	1.1
	Agriculture - Orchard/Vineyard	3.1			26-50	0.5
	Industrial - Light Manufacturing	0.3			51-75	0.6
	Industrial - Transportation	10.6			76+	9.1
	Mining (gravel pits)	2.9				
	Residential - Single Family	4.2				
	Vacant/Natural	75.0				
4	Agriculture - Hay	0.2	Vacant/Natural	1.2	0	50.9
	Agriculture - Orchard/Vineyard	1.8	Industrial - Heavy Manufacturing	1.7	1-10	25.9
Area: 260.7 Acres	Commercial - Retail	1.4			11-25	9.1
	Government (School/Work Camp)	0.9			26-50	2.7
	Industrial - Heavy Manufacturing	7.1			51-75	3.2
	Industrial - Power Generation	4.2			76+	8.2
	Industrial - Transportation	2.3				
	Residential - Single Family	17.4				
	Vacant/Natural	65.1				
5	Agriculture - Orchard/Vineyard	1.1	Vacant/Natural	31.2	0	68.4
	Commercial - Retail	0.2	Residential - Single Family	20.3	1-10	18.6
Area: 483.1 Acres	Industrial - Power Generation	0.1	Agriculture - Orchard/Vineyard	0.9	11-25	3.0
	Industrial - Transportation	4.2	Recreation - RV Parks	3.1	26-50	5.6
	Recreation - RV Parks	3.2	Commercial - Retail	0.1	51-75	4.3
	Residential - Single Family	26.6	Industrial - Power Generation	0.1	76+	0.0
	Vacant/Natural	64.6	Industrial - Transportation	4.1		

REACH	Land Use		Land Use Type on Rapid Runoff Soil		Impervious Surface	
	Type	**Area (%)**	**Type**	**Area (%)**	**Range**	**Area (%)**
6	Agriculture - Hay	3.8	Mining (gravel pits)	0.7	0	59.4
	Agriculture - Pasture/Grazing	1.5	Vacant/Natural	31.1	1-10	24.1
Area: 1452.5 Acres	Commercial - Retail	0.3	Government (School/Work Camp)	0.6	11-25	6.3
	Government (School/Work Camp)	0.6	Residential - Single Family	11.0	26-50	1.4
	Industrial - Power Generation	4.6	Residential - Other	0.9	51-75	2.6
	Industrial - Transportation	8.5	Agriculture - Pasture/Grazing	0.5	76+	6.2
	Mining (gravel pits)	2.6	Agriculture - Hay	3.1		
	Recreation - Parks	1.0	Recreation - Parks	0.6		
	Residential - Other	0.9	Industrial - Power Generation	4.0		
	Residential - Single Family	15.1	Industrial - Transportation	4.5		
	Vacant/Natural	61.0				
7	Agriculture - Hay	0.3	Vacant/Natural	0.7	0	58.3
	Agriculture - Pasture/Grazing	0.8	Residential - Single Family	0.6	1-10	29.4
Area: 806.3 Acres	Industrial - Light Manufacturing	0.1	Agriculture - Pasture/Grazing	0.7	11-25	3.2
	Industrial - Transportation	5.9	Industrial - Transportation	0.1	26-50	2.7
	Recreation - Parks	0.5			51-75	5.1
	Recreation - RV Parks	1.0			76+	1.3
	Residential - Multi-Family	0.1				
	Residential - Single Family	18.5				
	Vacant/Natural	72.7				
8	Agriculture - Pasture/Grazing	0.1	N/A	0.0	0	42.8
	Commercial - Lodging	1.0			1-10	42.7
Area: 435.9 Acres	Industrial - Transportation	12.6			11-25	7.4
	Residential - Single Family	3.9			26-50	0.3
	Vacant/Natural	82.4			51-75	3.9
					76+	2.9

REACH	Land Use		Land Use Type on Rapid Runoff Soil		Impervious Surface	
	Type	**Area (%)**	**Type**	**Area (%)**	**Range**	**Area (%)**
5a Area: 52.8 Acres	Industrial - Transportation Recreation-Boat Launches Vacant/Natural	2.4 5.0 92.6	N/A	0.0	0 1-10 11-25 26-50 51-75 76+	72.6 18.7 0.0 6.4 0.0 2.4

Table N10. Cultural Jurisdiction Characteristics for the Naches River.

REACH	Zoning		Public Land Ownership		Environmental Designation (1981)	
	Type	**Area (%)**	**Owner**	**Area (%)**	**Designation**	**Area (%)**
1	Agriculture	1.2	WA Dept. of Fish and Wildlife	3.9	Conservancy	77.9
	Highway Commercial	0.1	WA Dept. of Transportation	4.7	Rural	13.7
Area: 1101.4 Acres	Industrial	0.1	Yakima County	0.7	Urban	8.3
	Light Industrial	37.3				
	Remote/Extremely Limited	47.7				
	Rural Transitional	2.1				
	Suburban Residential	5.9				
	Valley Rural	5.7				
2	Agriculture	2.9	WA Dept. of Fish and Wildlife	28.5	Conservancy	92.7
	Remote/Extremely Limited	93.0	Yakima County	23.2	Rural	7.3
Area: 483.1 Acres	Rural Settlement	1.4				
	Valley Rural	2.7				
3	Agriculture	28.7	WA Dept. of Fish and Wildlife	8.7	Conservancy	55.9
	Light Industrial	0.3	Yakima County	2.9	Rural	44.1
Area: 625.2 Acres	Remote/Extremely Limited	66.2				
	Valley Rural	4.8				
4	Industrial	3.6	WA Dept. of Fish and Wildlife	0.3	Conservancy	2.0
	Light Industrial	11.4	WA Dept. of Transportation	4.5	Rural	98.0
Area: 260.7 Acres	Single Family Residential	4.9	Yakima County	0.3		
	Remote/Extremely Limited	65.6				
	Valley Rural	14.6				

REACH	Zoning		Public Land Ownership		Environmental Designation (1981)	
	Type	Area (%)	Owner	Area (%)	Designation	Area (%)
5 Area: 483.1 Acres	Agriculture Forested Watershed Remote/Extremely Limited Valley Rural	0.2 0.6 92.4 6.8	WA Dept. of Fish and Wildlife	2.5	Conservancy Rural	19.6 80.4
6 Area: 1452.5 Acres	Forested Watershed Mountain Rural Planned Development Remote/Extremely Limited	1.6 7.6 6.8 84.0	Blank WA Dept. of Fish and Wildlife WA Dept. of Natural Resources WA Dept. of Transportation Yakima County	72.0 9.2 6.2 0.1 0.1	Conservancy Rural	68.8 31.2
7 Area: 806.3 Acres	Forested Watershed Mountain Rural Planned Development Remote/Extremely Limited	33.7 9.0 0.5 56.8	Blank US Forest Service: National Forest Yakima County	70.5 29.3 0.2	Conservancy Rural	98.0 2.0
8 Area: 435.9 Acres	Forested Watershed Mountain Rural Remote/Extremely Limited Rural Settlement	90.2 0.2 0.3 9.3	Blank US Forest Service: National Forest	1.4 98.6	Conservancy	100.0
5a Area: 52.8 Acres	Mountain Rural Remote/Extremely Limited	56.9 43.1	Blank US Forest Service: National Forest	1.4 98.6	Conservancy	100.0

Table N11. Transportation Characteristics of the Naches River.

REACH	Length of Revetments		Total Road Length (Miles)	Length of Railroads		Bridge Crossing (#)
	Type	Length (Miles)		Active (Miles)	Abandoned (Miles)	
1 Length: 6.9 Miles	Bridge Dike Road	0.6 3.6 0.5	7.1	0.5	0.0	2
2 Length: 2.5 Miles	Dike Road	0.6 0.9	2.4	0.0	0.0	0
3 Length: 1.4 Miles	Dike Road	2.2 1.7	4.3	0.9	0.0	0
4 Length: 0.5 Miles	Dike Road	2.0 0.1	1.2	0.0	0.0	0
5 Length: 3.5 Miles	Bridge Dike Road	0.3 0.1 1.1	3.6	0.0	0.0	1
6 Length: 12.9 Miles	Dike Road	0.2 0.0	11.3	0.0	0.0	0
7 Length: 8.6 Miles	Dike	0.5	6.7	0.0	0.0	0
8 Length: 5.7 Miles	N/A	0.0	6.8	0.0	0.0	2
5a Length: N/A	N/A	0.0	0.0	0.0	0.0	0

Table N12. Cultural Modifications for the Naches River.

REACH	Floodgates (#)	Boat Launches (#)	Campsites (#)	Known Cultural Sites (#)	DOE Sites/facilities and 303(d)-Stream Listings	
					Sites/ facilities (#)	Stream (Miles)
1 Length: 6.9 Miles	5	0	NO DATA	1	4	0.9
2 Length: 2.5 Miles	0	0	NO DATA	0	0	0.0
3 Length: 1.4 Miles	0	0	NO DATA	1	1	0.0
4 Length: 0.5 Miles	3	0	NO DATA	0	1	0.0
5 Length: 3.5 Miles	0	0	0	2	1	0.0
6 Length: 12.9 Miles	0	0	0	0	3	0.0
7 Length: 8.6 Miles	0	0	1	4	2	0.0
8 Length: 5.7 Miles	0	0	12	6	0	0.2
5a Length: N/A	0	1	No Data	0	0	0.0