3.20 Wetlands and Vegetation

3.20.1 Affected Environment

This section includes a description of the existing environment as it relates to wetlands and vegetation in the project area, including discussion of threatened and endangered plant species, sensitive plant species, and invasive plant species.

3.20.1.1 Wetlands

Section 404 of the Clean Water Act and Executive Order 11990, *Protection of Wetlands*, require avoiding and minimizing wetland impacts. The project must avoid wetlands unless there is "no practicable alternative," and if an alternative uses wetlands, it must undergo "all possible planning to minimize harm." Additional information is included in the wetlands mapping found in the *Preliminary Jurisdictional Determination* (HDR 2010b) and the corresponding *Wetland Functional Assessment* (HDR 2010c).

An office-based geographic information system (GIS) evaluation was conducted to identify possible hydrologic connections between wetlands and other regulated waters mapped in the project area. The Kenai River and Kenai Lake are Federally listed traditional navigable waters, and all major streams in the project are tributaries to these waters, suggesting that wetlands identified in the project area are under the jurisdiction of the U.S. Army Corps of Engineers (USACE). The USACE asserts jurisdiction over all traditional navigable waters, wetlands adjacent to traditional navigable waters, non-navigable tributaries to traditional navigable waters that are relatively permanent and wetlands that directly abut such tributaries. As such, potential impacts to jurisdictional wetlands and water bodies in the project area are subject to permit approval by the USACE. Understanding the wetland value and function loss from a proposed project is an element of the USACE permitting process.

Approximately 90 percent of the project area is uplands. The remaining 10 percent is composed of wetlands and water bodies. Wetlands in the project area that could be affected by project alternatives were mapped and field verified in a one-quarter-mile corridor along the proposed alternative alignments and including an area adjacent to the existing Quartz Creek material site (HDR 2010c). The mapping limits comprise 4,414.4 acres within the project area (the mapped area). In addition to wetlands, many water bodies, typically ponds are found in the project area. These ponds are generally small and are located near the Kenai River. Map 3.20-1 shows the locations and types of wetlands in the project area (more detailed depictions can be found in the documents mentioned above). Table 3.20-1 shows acreage and percentages of areas mapped by wetland type.

Wetlands identified within the project area are palustrine. Palustrine wetlands are shallow and nontidal. They are adjacent to rivers and lakes, on floodplains, or self-contained in isolated basins on uplands and slopes. Typical vegetation in the project area includes spruce, shrubs, emergent plants, mosses, and lichens. Water regimes vary between saturated and semi-permanently flooded. The palustrine wetlands in the project area are categorized into five broad types based on dominant vegetation type: forested wetland, deciduous shrub thicket wetland, shrub-dominated bog wetland, emergent wetland, and pond wetland. The majority of wetlands in the project area are connected to the Kenai River system and likely perform important

hydrological, ecological, and water quality functions. In addition, the majority of the project area wetlands are relatively undisturbed. Most wetlands adjacent to the existing Sterling Highway, however, have been affected by development, which has lowered the quality of these wetlands. Wetlands adjacent to the existing highway likely retain sediment and pollution from highway runoff and improve the water quality in downstream water bodies, including the Kenai River.

Table 3.20-1. Mapped wetland types

Type	Mapped Acres	Percent (%) of Mapped Area
Forested Wetland	223.5	5.1
Deciduous Shrub Thicket Wetland	63.0	1.4
Shrub-Dominated Bog Wetland	64.0	1.5
Emergent Wetland	78.5	1.8
Pond Wetland	10.5	0.2
Upland (non-wetland)	3,974.8	90.0
Total	**4,414.4**	**100**

Note: Acreage differs slightly from those reported in HDR (2010c) due to minor updates of project area wetlands mapping conducted since 2010.

Wetland functions are the chemical, physical, and biological processes or attributes that contribute to the self-maintenance of a wetland and relate to the ecological significance of wetland properties without regard to subjective human values (ASTM 1999). Individual wetlands vary with respect to the type and degree of functional performance. The location and size of a wetland may determine what functions it will perform (Novitzki et al. 1997). Scientists used a combination of wetlands field data and best professional judgment to assign wetland functions in the project area (HDR 2010c).

Wetland types connected to the Kenai River or its tributaries provide valuable aquatic habitat for rearing anadromous fish species and provide nutrients for the aquatic ecosystem. The palustrine wetlands near the Kenai River and its tributaries provide enriched organic material, which serves as a primary food for aquatic invertebrates and habitat for terrestrial insects and other invertebrates, in turn providing important food sources for juvenile salmon and resident fish. Riparian wetland vegetation provides a number of additional functions, including providing protective cover for fish and providing feeding areas and travel corridors for wildlife such as moose and brown bear (DNR, ADF&G, KPB 1997). Wetlands that are contiguous to the Kenai River and its tributaries also regulate water flow by acting as areas for groundwater recharge/discharge and as a natural retention area for storm and floodwater events. These wetlands also provide runoff water filtration by accumulating sediments, reducing nutrient loads, and increasing the oxygen content of the waters that pass through them. Drainage characteristics, sedimentation, and flushing characteristics of upland and lowland water flows are also influenced by these wetlands.

General descriptions and functions these wetland types are likely to perform are provided below. Additional information regarding project area wetland functions is included in the *Wetland Functional Assessment* (HDR 2010c).

Forested Wetlands. Forested wetlands are the most abundant wetland type mapped in the project area, covering approximately 223.5 acres (5.1 percent) of the mapped area. This wetland type is dominated by an overstory of black spruce (more than 20 feet tall) with an understory comprised of a mix of low-bush cranberry, crowberry, cloudberry, Barclay's willow, bog blueberry, Sitka alder, northern Labrador tea, meadow horsetail, field horsetail, and bluejoint reedgrass. All forested wetlands sampled in the field had saturated soils and evidence of drainage features (i.e., low-lying depressions, swales, rivulets, etc.). Identified functions of these forested wetlands are:

- Groundwater recharge
- Groundwater discharge
- Sediment retention and pollution removal
- Food chain support
- Wildlife habitat
- Human non-consumptive values and uses

Deciduous Shrub Thicket Wetlands. Approximately 63.0 acres of deciduous shrub thicket wetlands were identified (1.4 percent of the mapped area). Most of these are adjacent to streams or ponds. Characteristics typical of this wetland type include a dense overstory dominated by Sitka alder and Barclay's willow. Traces of black spruce, Lutz spruce, or paper birch were found at some sites. Dominant herbaceous species included meadow horsetail, dwarf dogwood, and bluejoint reedgrass. Identified functions of these deciduous shrub thicket wetlands are:

- Groundwater recharge
- Groundwater discharge
- Streamflow moderation
- Shoreline, stream bank, and soil stabilization
- Sediment retention and pollution removal
- Food chain support
- Wildlife habitat
- Fish habitat

Shrub Bog Wetlands. Shrub bogs cover approximately 64.0 acres (1.5 percent of the mapped area). Dominant shrubs in this wetland type include stunted black spruce (less than 20 feet tall), bog blueberry, dwarf birch, crowberry, northern Labrador tea, shrubby cinquefoil, sweet gale, Sitka alder, and Barclay's willow. Common herbs include bluejoint reedgrass, field horsetail, northern scouring rush, and water sedge. Identified functions of these shrub bog wetlands are:

- Groundwater recharge
- Groundwater discharge

- Streamflow moderation
- Shoreline, stream bank, and soil stabilization
- Sediment retention and pollution removal
- Food chain support
- Wildlife habitat
- Human non-consumptive values and uses

Emergent Wetlands. In the project area, emergent wetlands are located in old sloughs or channels of the Kenai River or on benches on the mountain slopes north of the river. Approximately 78.5 acres of emergent wetlands were identified (1.8 percent of the mapped area). General characteristics include a dense mat comprised of a mix of beaked sedge, water sedge, narrow-leaved cotton grass, Chamisso's cotton grass, northern scouring-rush, and few-flowered sedge. Higher areas within emergent wetlands support stunted black spruce, shrubby cinquefoil, dwarf birch, Sitka alder, and northern Labrador tea. Emergent wetlands are the wettest of the project area wetlands; all of the sites visited in the field were saturated at the ground surface or appeared to experience periodic inundation. Identified functions of these emergent wetlands are:

- Groundwater recharge
- Groundwater discharge
- Streamflow moderation
- Shoreline, stream bank, and soil stabilization
- Sediment retention and pollution removal
- Food chain support
- Wildlife habitat
- Fish habitat, where wetlands are connected to fish bearing waters

Pond Wetlands. Most ponds within the project area are located near or directly adjacent to the Kenai River. These ponds are generally small and shallow, and some support aquatic vegetation. Approximately 10.5 acres of ponds were identified (0.2 percent of the mapped area). Identified functions of pond wetlands are:

- Groundwater recharge
- Groundwater discharge
- Streamflow moderation
- Shoreline, stream bank, and soil stabilization
- Sediment retention and pollution removal
- Food chain support
- Wildlife habitat
- Fish habitat

- Human non-consumptive values and uses
- Uniqueness and heritage

3.20.1.2 Vegetation

Vegetation in the project area that could be affected by alternatives was delineated in a one-quarter-mile corridor around project alternatives, and extended beyond the one-quarter-mile corridor in areas where alternatives would require major creek/river crossings. Six main vegetation types dominate the project area: needle-leaved forests, broad-leaved forests, mixed needle-leaved and broad-leaved forests, shrub thickets, dry meadows, and wet meadows. Map 3.20-2 shows the locations and types of vegetation in the project area. Table 3.20-2 provides acreages and percentages of the mapped vegetation.

Table 3.20-2. Mapped vegetation types

Type	Mapped Acres	Percent (%) of Mapped Area
Needle-Leaved Forests	1,803	36
Broad-Leaved Forests	383	8
Mixed Needle-Leaved and Broad-Leaved Forests	2,049	41
Shrub Thickets	98	2
Dry Meadows	40	1
Wet Meadows	76	2
Non-vegetated[a]	523	10
Total	**4,972**	**100**

[a] Non-vegetated cover type includes unvegetated mudflats, gravel bars, water, roads, buildings, disturbed fill embankments, and all other cleared or developed areas within the mapped area.

Additional information regarding vegetation is available in the *Preliminary Jurisdictional Determination* (HDR 2010b) and the *Biological Evaluation for Plants* (HDR 2006c). General descriptions of these vegetation types are provided below.

Needle-Leaved Forests. Needle-leaved forests are found throughout the project area and are dominated by evergreen species such as Lutz spruce, black spruce, or mountain hemlock. More than one evergreen tree species can be present in these forests and the density of the canopy ranges from 10 to 60 percent. Needle-leaved forests comprise approximately 36 percent of the mapped project area. Understory species in these forests are variable depending upon a variety of factors including overstory species, slope, aspect, soil conditions, and hydrology.

Spruce bark beetle infestation has impacted the upland needle-leaved forest on the Kenai Peninsula in the project area. In infested areas, spruce mortality is high, creating a dramatically increased potential for large, intense wildfires. Additional areas of the Chugach National Forest (CNF) in the project area have recently been manually or mechanically cleared to reduce fire fuels accumulation. To enhance moose habitat in these stands, some areas have been burned and

seeded to promote hardwood sapling growth. Forest stands that have been cleared have substantially reduced canopy densities, typically ranging from 10 to 25 percent.

Broad-Leaved Forests. Broad-leaved forests are scattered throughout the project area and are dominated by paper birch, quaking aspen, or black cottonwood. More than one species of tree can be present and understory species are variable. Canopy closure in these forests ranges from 10 to 100 percent. Broad-leaved forests comprise approximately 8 percent of the mapped project area.

Mixed Needle-Leaved and Broad-Leaved Forests. Mixed needle-leaved and broad-leaved forests are the most common vegetative type in the project area, comprising approximately 41 percent of the mapped project area. These areas are dominated by a mix of needle-leaved and broad-leaved trees, including Lutz spruce, black spruce, mountain hemlock, paper birch, quaking aspen, and black cottonwood. Canopy closure ranges from 10 to 100 percent and understory species are variable.

Shrub Thickets. Shrub thickets are dominated by broad-leaved shrubs such as Sitka alder and various willow species. Shrub thickets usually have dense canopies and are typically located adjacent to streams. This cover type comprises 2 percent of the mapped project area.

Dry Meadows. Dry meadows are dominated by bluejoint reedgrass or fireweed with lesser amounts of other plants, including Sitka alder and oak fern. Dry meadows comprise approximately 1 percent of the mapped project area and are primarily found in disturbed areas (such as adjacent to the existing highway and in avalanche chutes).

Wet Meadows. Wet meadows are wetlands that are dominated by a variety of herbaceous plants including beaked sedge, water sedge, and Chamisso's cotton grass. This vegetation type comprises 2 percent of the mapped project area and is found either in close proximity to the Kenai River or in the Juneau Creek Valley.

3.20.1.3 Threatened and Endangered Plant Species

There are no plants listed as endangered and threatened under the Endangered Species Act of 1973, as amended, in the project area; therefore, impacts to endangered and threatened species are not discussed in this Supplemental Environmental Impact Statement (SEIS).

3.20.1.4 Sensitive Plant Species

The 2009 U.S. Forest Service (USFS) Alaska Region Sensitive Species[1] List identified plant species for which population viability is a concern. The list, updated from 2002 to add seven new species, designated 18 plants found in Alaska as sensitive species. Thirteen of these species were known or suspected to occur within the CNF and nine species were known or suspected to occur specifically in the Seward Ranger District (Table 3.20-3).

In 2003 and 2006, sensitive plant field surveys (based on the 2002 Sensitive Species List) were conducted to identify any rare plants within a 200-foot corridor of the build alternatives (HDR 2006c). No sensitive plant species, as designated from the 2002 List, were discovered on potentially affected CNF lands within the project area during the survey (HDR 2006c).

[1] Sensitive Species: "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a. significant current or predicted downward trends in population numbers or density, or b. significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (USFS 1997)

The 2009 revision to the 2002 Alaska Region Sensitive Species List states that current or planned USFS actions that are underway at the time the updated sensitive species list goes into effect are exempt from the requirement to conduct a biological evaluation for the newly added species (Goldstein, Martin and Stensvold 2009). This allows actions, such as the road construction proposals evaluated in this SEIS, which have been planned using the 2002 list of sensitive species, to progress using that list. Regardless, a GIS analysis was conducted to evaluate the likelihood of the occurrence of the seven newly added species. The likelihood of occurrence was evaluated based on the availability of appropriate habitat within the project area, review of all plants observed in all habitat types in the project area during the 2003 and 2006 sensitive plant surveys, and discussion with USFS scientists with knowledge of the occurrence of sensitive plants in the CNF and throughout Alaska.

Table 3.20-3. USFS sensitive plant species in Chugach National Forest

Known	Suspected
Eschscholtz's little nightmare (*Aphragmus eschscholtzianus)* [a]	Moosewort fern (*Botrychium tunux*) [a]
Pale poppy (*Papaver alboroseum)* [a]	Moonwort fern, no common name (*Botrychium yaaxudakeit*) [a]
Unalaska mist-maid (*Romanzoffia unalaschcensis)* [a]	Spatulate moonwort (*Botrychium spathulatum*)
	Sessileleaf scurvygrass (*Cochlearia sessifolia*) [a]
	Mountain lady's slipper (*Cypripedium montanum)*
	Large yellow lady's slipper (*Cypripedium parviflorum* var. *pubescens)*
	Alaska rein orchid *(Piperia unalascensis)* [a]
	Dune tansy (*Tanacetum binnatum* ssp. *huronense*) [a]
	Calder's lovage (*Ligusticum calderi)*
	Spotted lady's slipper *(Cypripedium guttatum)* [a]

Source: Goldstein, Martin, and Stensvold (2009) and Erickson, personal communication (2013).
[a] Species that are known or suspected to occur in the Seward Ranger District.
Note: USFS = U.S. Forest Service

Two of the added species (sessileleaf scurvygrass and dune tansy) were excluded from evaluation due to their association with habitats not identified within the project area (marine estuaries and sand dunes, respectively). Based on the associated habitat types, the remaining five species (spatulate moonwort, spotted lady's slipper, mountain lady's slipper, large yellow lady's slipper, and Alaska rein orchid) may potentially occur in the project area since the area contains appropriate habitat and is within the known or suspected range of the plants. Of these species, the two most likely to occur in the project area are the spotted lady's slipper and the Alaska rein orchid, as they are the only two of the five that are suspected to occur in the Seward Ranger District. The remaining three are not suspected to occur in the Seward Ranger District, but are suspected to occur within the larger CNF.

Review of daily plant lists from 2003 and 2006 field surveys did not identify presence of the five sensitive species in question. While the field surveys were not specifically designed to search for the five species, both efforts covered all appropriate habitats in which the five species have the potential to occur. Field surveys also documented all plant species found in all habitat types and would have documented the presence of the five species in question if they had been located. Additionally, the four orchid species are visually dramatic, and would be unlikely to be

overlooked by the botanists conducting the surveys. This review suggests that it is unlikely that any of the five sensitive species in question occur in the project area. This conclusion was confirmed by USFS biologists (HDR 2011d).

3.20.1.5 Invasive Plant Species

The term "invasive species" used in this section is defined by the Department of Interior's National Invasive Species Council as "a species that are non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (NISC 2008). Executive Order 13112 (1999) requires all Federal agencies to prevent the introduction of invasive species; provide for their control; and minimize their impact to the local economy, ecology, and human health.

Presence and distribution of non-native plant species in the area that could be affected by project alternatives were identified using records from the Alaska Exotic Plant Information Clearinghouse (AKEPIC). AKEPIC is an internet-based, publicly available database created to track occurrences of non-native plants in Alaska that is administered by the University of Alaska Anchorage. The AKEPIC dataset has more than 19,000 records of 97 non-native plant species on the Kenai Peninsula, with nearly 1,500 records of 46 non-native plant species in the project area.

AKEPIC records and surveys indicate that non-native plants in the project area are concentrated in close proximity to existing right-of-way. Records of invasive plant species have been noted along the Sterling Highway and Skilak Lake Road, along the Kenai River, within the Russian River Campground, along the Russian Lakes trail, and under power lines. At these locations, invasive plant populations occupy roadsides, gravel parking lots, trailheads, trail-sides, and gravel river bars (DeVelice, et al. 1999, Duffy 2003, Chumley and Klausner 2005, Cortes-Burns and Carlson 2006, Barnett and Simonson 2007, AKEPIC 2013).

Not all non-native plants are invasive. Invasiveness is the ability of a plant to establish itself in an undisturbed native community and out-compete native vegetation. The Alaska Natural Heritage Program developed a ranking system to assess the invasiveness of a plant species based on its ecological impacts, biological attributes, distribution, and response to control measures (Carlson, et al. 2008). This ranking system categorizes non-native plants as extremely invasive, highly invasive, moderately invasive, modestly invasive, weakly invasive, and very weakly invasive. Extremely invasive and highly invasive plants are of the greatest concern to land managers. Table 3.20-4 lists invasive plants with highest record of occurrence in the project area and the highest categories of invasiveness ranking. There are approximately 50 records of four extremely invasive or highly invasive plants in the project area.

Invasive species are not regulated by law at the state level; however, the State of Alaska has developed a list of prohibited and restricted noxious weeds to protect agriculture and the public interest (AAC 1987). Three of the 16 Alaska prohibited noxious weeds found in the project area, Canada thistle, hempnettle, and quackgrass, are also listed in Table 3.20-4.

Experts agree that reed canary grass poses one of the greatest concerns in Alaska (AKEPIC 2013). Surveys on the Kenai Peninsula have documented the presence of reed canary grass in and near wetlands and streams that are important for water quality, flooding, and erosion, and that also support a variety of wildlife, including anadromous fish. In the project area, reed canary grass is restricted to areas with disturbed soil and vegetation. None of the records indicate that this plant has been observed affecting a native plant community or reducing open water.

Table 3.20-4. Invasive plant species with highest [a] categories of invasiveness ranking documented in the project area

Scientific Name	Common Name	AKNHP Rank/State Regulation
Phalaris arundinacea	Reed canary grass	Extremely invasive
Melilotus alba	White sweet clover	Extremely invasive
Cirsium arvense	Canada thistle	Highly invasive / prohibited noxious weed
Vicia cracca ssp. cracca	Bird vetch	Highly invasive
Galeopsis tetrahit	Hempnettle	Modestly invasive / prohibited noxious weed
Elymus repens	Quackgrass	Modestly invasive / prohibited noxious weed

[a] Table includes invasive species ranked in the three highest categories of invasiveness ranking as defined by the AKNHP (Carlson, et al. 2008).
Note: AKNHP = Alaska Natural Heritage Program

3.20.2 Environmental Consequences

This section describes the potential impacts of the project on wetlands and vegetation, as well as efforts made to avoid and minimize harm to wetlands. Upland (non-wetland) and wetland vegetation are important to wildlife as food sources and habitat. Impacts to vegetation are most often reflected in wildlife habitat functions. Impacts related to vegetative loss and the consequential effect on wildlife are further discussed in Section 3.22, Wildlife. Vegetation also is important in both capturing and reducing surface runoff from the roadway, a water quality benefit. See Section 3.13, Water Bodies and Water Quality, for a discussion related to water quality impacts. The evaluation of effects of the alternatives on vegetation is described in detail in the *Biological Evaluation for Plants* (HDR 2006c).

3.20.2.1 Wetland and Vegetation Impact Assessment Methods

This assessment of impacts is based on the best design information available at this stage of project development. The *Wetland Preliminary Jurisdictional Determination* and *Wetland Functional Assessment* (HDR 2010b, 2010c) provide details about the impacts on wetlands and vegetation, including wetland functions and values that could be lost as a result of the project alternatives.

For the purpose of direct impact evaluation, the cut and fill limits have been assumed to be the direct impact zone for both wetlands and vegetation. The amount of wetlands and vegetation within this zone was calculated with GIS and reported as acres lost. The functions assigned to each wetland within the cut and fill limits were calculated with GIS and reported as acres of wetland function lost. Direct impacts on sensitive species and invasive species are more appropriately discussed in qualitative terms, so these impacts are not discussed as acres.

For the purpose of an indirect impact evaluation for wetlands, land 300 feet beyond the designed cut and fill limits has been assumed to be within the indirect impact zone. The amount of wetlands within this zone was calculated with GIS and reported in acres. The size of the indirect impact zone was based on the area in which indirect adverse impacts of development and construction activities are most likely to occur, as established in the Anchorage Debit Credit Method that was developed by the USACE Alaska Region, U.S. Environmental Protection Agency Region 10, and the Municipality of Anchorage (USACE 2011). The indirect impact zone extends 300 feet from the edges of developed areas and other proposed construction zones that

may cause indirect impacts to neighboring aquatic areas. Existing undeveloped areas outside these limits are not expected to be indirectly impacted from this project. Indirect impacts to water bodies are discussed in Section 3.13, Water Bodies and Water Quality.

Indirect impacts on vegetation are more appropriately described in qualitative terms. Therefore, the indirect impacts on vegetation types, sensitive species, and invasive species are not discussed in terms of acres.

3.20.2.2 No Build Alternative

Direct and Indirect Impacts

Wetlands. In terms of direct impacts, there would be no fill in or loss of wetlands under the No Build Alternative. Storm water runoff from the existing highway would continue to contribute sediment and pollutants to adjacent wetlands. With continued high use of the existing highway, there remains a higher potential for trucking accidents to spill hazardous materials in vegetated areas adjacent to the Kenai River, some of which are wetlands. See Section 3.17, Hazardous Waste Sites and Spills, for additional discussion of hazardous material spill risk.

Continued long-term indirect impacts on approximately 60 acres of wetlands and ponds located within 300 feet of the existing highway are expected. These impacts include, but are not limited to, ongoing changes to natural wetland hydrology, continued reductions to the hydrological connectivity of wetlands to water bodies, decreased water quality, increases in invasive plant species, reductions in species richness, and continued human use of these wetlands. Potential future hazardous material spills in wetlands and other impacts on wetlands adjacent to the existing highway could result because roadway characteristics (e.g., curve design, sight distance, grades, and lane and shoulder widths) would not be upgraded. As these impacts have already occurred, their effects are addressed in Section 3.27, Cumulative Impacts.

Vegetation. In terms of direct impacts, there would be no fill in, or loss of, vegetation under the No Build Alternative. There would be continued long-term indirect impacts on vegetated areas adjacent to the existing highway as a result of the No Build Alternative, including alterations to native plant communities. Native plant communities would be altered by the continued presence of invasive and exotic plant species and disturbance from road maintenance activities, including the introduction of sand and gravel (for traction) and the effects of pollutants from runoff and roadway trash and debris.

3.20.2.3 Issues Applicable to the Build Alternatives

Direct and Indirect Impacts

Wetlands. All build alternatives would cross wetlands and would result in the filling of wetlands for construction of the new road, resulting in permanent loss of wetlands. In developing the alignments for each of the alternatives, the Alaska Department of Transportation & Public Facilities (DOT&PF) attempted to avoid and minimize the extent to which aquatic ecosystems (e.g., wetlands) would be excavated or filled as much as practicable. Map 3.20-3 shows the locations of alternatives relative to wetlands in the project corridor. Direct impacts to wetlands and ponds are shown in Table 3.20-5. The following sections present more detail on direct impacts by wetland type and function. Impacts to water bodies, such as the Kenai River, are discussed in Section 3.13, Water Bodies and Water Quality. Fish-related impacts associated with the fill of wetlands are discussed in Section 3.21, Fish and Essential Fish Habitat.

Table 3.20-5. Direct impacts on wetlands

Wetland Type	Approximate Area of Fill (acres)			
	Cooper Creek	G South	Juneau Creek	Juneau Creek Variant
Forested	2.3	17.6	24.2	24.2
Deciduous Shrub	1.7	3.1	4.7	3.0
Shrub bogs/fens	3.7	2.6	2.2	1.5
Emergent	1.1	1.1	6.3	6.7
Ponds	2.2	2.2	1.1	2.1
Total wetlands and ponds filled	11.0	26.6	38.5	37.5

Wetland degradation occurring outside of but adjacent to the footprint of transportation projects can result in changes to water quality, quantity, and flow rates; increases in pollutant inputs; and changes in species composition as a result of disturbance and introduction of non-native species. With all the build alternatives, permanent impacts to wetlands functions in the indirect impact zone, adjacent to segments built on new alignment, would be expected. The amount of wetlands affected by these indirect impacts is shown in Table 3.20-6. Impacts to water bodies, including acreage of the Kenai River that is within the 300-foot indirect impact zone, are not included in this table.

Table 3.20-6. Indirect impacts on wetlands, acreage of wetlands adjacent to alternatives

Amount of wetlands within indirect impact zone[a]	Wetland Area by alternative (acres)				
	No Build	Cooper Creek	G South	Juneau Creek	Juneau Creek Variant
New alignment	—	14	67	130	119

[a] The indirect impact zone is defined as 300 feet beyond each side of the cut and fill limits of each build alternative. For the No Build Alternative, the indirect impact zone is 300 feet from the edge of pavement of the existing highway. The amount of wetlands contained within the indirect impact zone includes wetlands affected by construction activities.

Changes to hydrological, water quality, ecological, and socioeconomic functions performed by wetlands in the indirect impact zone would be likely. As is the case with the existing Sterling Highway along its alignment through the KNWR, roads can impound a wetland, even if culverts are used. Such inadvertent impoundment and hydrologic alteration can change the functions of the wetland. The placement of a new road prism in wetlands can slow the movement of water through the entire wetland complex, altering the existing hydrology of adjacent wetlands. In addition, a reduction in the overall hydrological connectivity of the wetland complex to water bodies could result. With an increase in the amount of impervious surface, a decrease in groundwater recharge within the watershed is likely, which reduces water flow into wetlands. Contaminants contained in runoff from the new alignments could be introduced to adjacent wetlands, reducing water quality. Wildlife use of wetlands adjacent to new alignments could also be affected by the physical fragmentation of habitat as well as increased noise levels from operation. Fish that use stream and pond habitat in wetlands near the new alignments could be affected by reduced water quality.

Wetlands closer to the build alternative alignments would likely experience more indirect effects and at a larger magnitude than those wetlands located farther from these alignments. The wetlands located within the indirect impact zone of the alternatives may also be indirectly affected by other developments, including local roads, driveways, homes, and businesses.

Vegetation. All build alternatives would require permanent removal of vegetation. Table 3.20-7 presents the approximate acreage of each vegetation type that would be removed by project alternatives. Acreages were calculated by comparing the construction footprint areas with the mapped vegetation in the project area.

Table 3.20-7. Areas of vegetation, by type removed under build alternatives (acres)

Vegetation Type	Cooper Creek	G South	Juneau Creek	Juneau Creek Variant
Needle-leaved forest	88	64	127	122
Broad-leaved forest	11	26	25	17
Mixed needle- and broad-leaved forest	79	104	102	105
Shrub thicket	4	3	4	1
Dry meadow	5	4	4	4
Wet meadow	1	1	7	7
Total	**188**	**202**	**269**	**256**
Non-vegetated areas[a] *(not included in totals)*	57	50	31	36

[a] Non-vegetated cover type primarily includes existing road surfaces and disturbed fill embankments associated with the existing highway and located within the proposed cut/fill construction limits of the build alternatives.

Under the Juneau Creek and Juneau Creek Variant alternatives, a new trailhead would be constructed for the Resurrection Pass Trail near where the alignment would cross the existing trail. The new trailhead would result in additional impact to vegetation beyond those acreages noted in Table 3.20-7.

Permanent removal of vegetation will result in a net loss of that vegetation type. While removal of vegetated cover is not subject to permitting authority, vegetation is a factor of consideration for additional area resources, including water quality, wildlife, wetlands, hydrology, recreational use, and visual impacts. Permanent vegetation loss affects the ability of these resources to function as effectively as they would in an undisturbed condition.

Long-term impacts on vegetation adjacent to new alignments of the build alternatives would be expected. Road maintenance activities, such as the introduction of sand and gravel (for traction) and the effects of pollutants from runoff and roadway trash and debris, could also affect vegetation in areas adjacent to new alignments.

Impacts on vegetation from build alternatives would result in the loss of wildlife habitat (see Section 3.22 for effects on wildlife species) and an increase in surface runoff volume (see Section 3.13 for effects on water bodies).

Sensitive Species. Based on the review of published data, field survey data, and consultation with USFS biologists, there is a low likelihood of USFS recognized sensitive plant species occurring within the project area; therefore, the project build alternatives are not expected to adversely impact USFS sensitive plant species.

Invasive Species. Continued long-term impacts on vegetated areas adjacent to the existing highway include alterations to native plant communities. Changes to native plant communities would be primarily from the presence of invasive and exotic plant species and from disturbance resulting from road maintenance activities. For example, the introduction of sand and gravel (for traction) and the effects of pollutants from runoff and roadway trash and debris would disturb native plants. Improved access to trails could increase the number of trail users, which may lead to an increased of spread of invasive plant species along the trails in the project area.

Construction Impacts

Wetlands. Construction of the build alternatives would result in temporary impacts on wetlands and associated wetland functions and values. Road and bridge construction activities can increase sediment loading to wetlands and can also disrupt habitat continuity, driving out more sensitive, interior plant species, and providing habitat for hardier opportunistic edge and non-native species. Further, borrow pits (used to provide fill for road construction) that are adjacent to wetlands can degrade water quality through increased turbidity of runoff water leading to sediment deposition in adjacent wetlands.

Permit stipulations and recommendations will be developed that would include specification of techniques and timing of activities that will further minimize impacts during construction. Additionally, best management practices (BMPs) would be used during construction of all build alternatives to minimize wetland impacts (see mitigation detail below). No cleared vegetation and excess soil disposal sites or access roads would be located in wetlands to the extent practicable. Temporary fill in wetlands for staging areas adjacent to proposed bridge locations would be required for material stockpiling and equipment operation. Only the necessary area required for construction activities would be impacted during the construction process. At the conclusion of construction, the fill will be removed, disposed of in an approved disposal area, and the wetlands reestablished. Wetland areas within 10 feet of the cut and fill limits are likely to be disturbed by equipment operation. Table 3.20-8 lists the total acreage of wetlands (by type), including ponds, affected by construction activities for each build alternative. Approximate temporary fill totals for wetlands also are presented.

Vegetation. Construction activities required for any build alternative would temporarily affect vegetation outside the cut and fill prism. Impacts to vegetation from equipment operation and use of staging areas, disposal sites for cleared vegetation and unusable or excess soils, access roads, and ground 10 feet immediately adjacent to the cut and fill limits are unavoidable. These impacts would be temporary and would not permanently remove vegetation; these areas would be restored to near original contours and revegetated with native vegetation if needed following construction. Table 3.20-9 presents the approximate acreage of vegetation (of all types) that would be directly, temporarily affected by each project alternative during construction.

Slash (cut vegetation) generated from clearing for construction will be disposed of in accord with the *Chugach National Forest Revised Land and Resource Management Plan*. As such, sediment, ash, and debris would not enter riparian areas (see Section 3.2.1.2).

Sensitive Species. Based on the review of published data, field survey data, and consultation with USFS biologists, there is a low likelihood of sensitive plant species occurring within the project area; therefore, construction activities are not expected to adversely impact USFS listed sensitive plant species.

Invasive Species. Because invasive plant species commonly thrive in disturbed areas, construction activity can create favorable conditions for invasive plants to spread and become established. Removal of native vegetation and top soil can create perfect conditions for invasive plants to take hold. Construction materials, such as gravel or sand imported from material source sites, may introduce new, or allow the spread of existing, invasive plant species into the area.

Table 3.20-8. Construction impacts to wetlands and ponds by build alternative (acres)

Wetland Type	Edge Disturbance	Temporary fill[a]
Cooper Creek Alternative		
Forested	0.2	0.0
Deciduous shrub thickets	0.3	0.0
Shrub bogs	0.5	0.0
Emergent	0.3	0.0
Ponds	0.6	0.0
Total edge disturbance and temporary fill area	**1.9**	
G South Alternative		
Forested	2.2	0.0
Deciduous shrub thickets	0.5	0.3
Shrub bogs	0.5	0.0
Emergent	0.3	0.0
Ponds	0.6	0.0
Total edge disturbance and temporary fill area	**4.4**	
Juneau Creek Alternative		
Forested	2.9[b]	2.1
Deciduous shrub thickets	0.6[b]	0.0
Shrub bogs	0.3[b]	0.1
Emergent	1.0[b]	4.0
Ponds	0.3[b]	0.0
Total edge disturbance and temporary fill area	**11.3**	
Juneau Creek Variant Alternative		
Forested	2.9[b]	2.1
Deciduous shrub thickets	0.6[b]	0.0
Shrub bogs	0.2[b]	0.1
Emergent	1.1[b]	4.0
Ponds	0.4[b]	0.0
Total edge disturbance and temporary fill area	**11.4**	

[a] Temporary fill for staging area/vegetation/soils disposal areas.
[b] Disturbance of areas within 10 feet of edge of the project's cut/fill prism or footprint.

Table 3.20-9. Areas of construction disturbances to vegetation types under build alternatives (acres)

Disturbance Type	Build Alternative			
	Cooper Creek	G South	Juneau Creek	Juneau Creek Variant
Areas within 10 feet of cut/fill prism	31	32	34	34
Staging areas	5	20	17	17
Access roads	2	3	4	4
Vegetation/soils disposal sites	47	57	46	45
Total	**85**	**112**	**101**	**100**

Practicable Measures to Minimize Harm/Mitigation

The close proximity of the project to Kenai Lake, Kenai River, Cooper Creek, Juneau Creek, and unnamed tributaries and their wetland complexes makes complete avoidance of wetlands impractical; there is no practicable build alternative that would avoid construction in wetlands. Throughout project development, proposed alignments were considered with respect to identified wetlands in order to minimize harm by avoiding and minimizing placement of fill into wetlands. Impacts to wetlands and vegetation are anticipated following the construction of all build alternatives.

Wetlands. Topographical, geotechnical, cost, and other environmental constraints limit the practicality of avoiding all wetland impacts. DOT&PF is committed to minimizing unavoidable impacts to wetlands and waters of the U.S. Where avoidance is not practicable, the following general design commitments are proposed:

- The roadway will be constructed using the minimum-width fill footprint necessary to provide a stable road base
- The roadway will be constructed with a low-profile embankment to limit the fill footprint

If a build alternative is selected as the preferred alternative, a detailed discussion of the unavoidable impacts to waters of the U.S. and a demonstration that the preferred alternative is the least environmentally-damaging practicable alternative in compliance with Section 404(b)(1) guidelines would be included with the Final SEIS.

DOT&PF is committed to paying a fee to a qualified land trust to fund appropriate wetland conservation or enhancement activity in lieu of completing such a project itself. This action would compensate for the unavoidable impacts to wetland and waters of the U.S. to offset wetland loss remaining after all appropriate and practicable steps have been taken. A compensatory mitigation plan with sufficient information about how the proposed compensatory mitigation relates to the individual and cumulative impacts to aquatic resources within the proposed project area, including an assessment to quantify debits and credits for aquatic resource function impacts, will be provided in the Final SEIS.

Should one of the build alternatives be selected, the following BMPs would be used to mitigate construction-related impacts to wetlands:

- Cleared vegetation and unusable soils would not be permanently located in wetlands.
- To the extent practicable, staging areas and temporary construction roads would be located in uplands; however, it may be necessary to locate staging areas required for river or creek crossings in wetlands. Temporary fill may be required at these sites. Where temporary fill would be required, the construction contractor will be required to place temporary fill on geotextile mats or other suitable materials of sufficient thickness to facilitate the removal of the fill when no longer needed for construction. Wetlands would be stabilized against erosion once protective mats were removed. Wetlands that had been temporarily filled would be restored by reseeding and revegetating the disturbed areas as necessary with native plant materials.
- Erosion and sedimentation control measures would be employed prior to ground disturbing activity. Permanent erosion control measures would be employed as early in construction as practical. Only clean fill material would be used for the roadway embankment.
- Construction limits would be clearly staked prior to construction to ensure that ground disturbing impacts are limited.
- Riprap would be used to stabilize toes of slopes at ponds and stream crossings.
- Riprap would incorporate vegetation where practicable.
- Road slopes would be revegetated. Topsoil would be applied to the surface of road slopes to promote revegetation. Native plant species would be used for vegetating road slopes to protect the integrity of the existing plant communities, except non-native annual grasses would be used to provide initial soil stabilization.
- No grubbing would be done outside of the construction footprint.
- Silt fences would be used adjacent to waterways just beyond the estimated toe of fill.
- Ditch check-dams would be used to reduce erosion during construction.
- Sedimentation basins would be used, as necessary, during construction.
- Roadside swales would be designed to keep surface water within the natural drainage basins.
- Culverts would be installed through fill slopes in appropriate locations to maintain existing flow patterns for surface water.
- No vehicles or equipment would be fueled or serviced within 100 feet of wetlands or fish bearing streams, with the exception of "low-mobility" equipment used for pile driving, drilled shaft construction, or other bridge construction. A plan would be provided detailing the process for fueling this equipment within 100 feet of wetlands or fish-bearing streams. Fueling and service vehicles would be equipped with adequate materials (e.g., sorbent pads, booms, etc.) to immediately contain and commence clean-up of spilled fuels and other petroleum products. Fuel would be stored a minimum of 100 feet from any wetland or water body.

- Spill response equipment would be readily available and construction personnel would be trained in spill response to contain accidental leaks of oil or fuel from construction equipment.

Vegetation. Loss of vegetative cover would be mitigated primarily through native plant revegetation, while the composition of vegetation would be maintained through invasive plant prevention measures employed during construction.

Sensitive Species. As previously mentioned, no USFS listed sensitive plant species are expected to be affected under any of the build alternatives. Impacts to vegetation that are most likely to occur are loss of vegetative cover and alteration of the site's vegetation composition.

Invasive Species. To minimize the spread of invasive plant species, weed management best practices should be implemented during construction. Such BMPs might include:

- Eradicate existing infestations prior to construction
- Wash and clean vehicles, equipment, and tools prior to entering/exiting the site or moving to another site
- Minimize clearing and grading
- Clear areas in winter to minimize spreading of invasive weed seeds and vegetative propagules (i.e., a bud or other offshoot that aids in dispersal of the species)
- Clear with a hydroaxe to minimize soil disturbance
- Use fill material only from invasive species-free sites
- Use certified invasive-free mulches, topsoils, or seeds purchased from a local provider
- Use only Alaska native plant species for landscaping, per Alaska Department of Natural Resources' *A Revegetation Manual for Alaska* for reseeding and vegetating of disturbed areas
- Gating all access roads to limit access by others
- Sequencing of reseeding efforts should begin with areas uninfested by invasive plant species and work towards area infested by invasive plant species to minimize spread of invasives
- Educating workers about management practices to reduce spread of weeds

To monitor and manage the spread of invasive plant species along the highway during road maintenance activities such as mowing in the summer and applying sand and gravel in the winter, DOT&PF Maintenance and Operations implements the following BMPs:

- Cleaning vehicles and equipment regularly
- Re-vegetating disturbed areas with native, local, and/or non-invasive plant species
- Avoiding known contaminated areas, if practicable
- Managing uninfested areas before moving toward infested areas
- Coordinating with local groups that are managing invasive species

- Timing mowing to prevent seed production of invasive plants, as practicable
- Using certified weed-free materials whenever possible
- Identifying locations of known invasive plant infestations
- Recording and reporting locations of invasive plants to the University of Alaska Fairbanks (UAF) Cooperative Extension Service

3.20.2.4 Cooper Creek Alternative

Direct and Indirect Impacts

Wetlands. Table 3.20-10 presents the acreage of permanent loss of wetlands, by type and function. Impacts to forested and shrub bog wetlands would occur primarily near the intersection of the existing highway and Snug Harbor Road. Impacts to deciduous shrub thickets would occur primarily at proposed stream crossings. Emergent wetland and pond impacts would occur primarily along the western end of the Cooper Creek Alternative where it maintains the same alignment as the existing highway and where impacts result from the four build alternatives' common alignment. The functions that would be most impacted, based on acreage, would be sediment retention and pollution removal, food chain support, groundwater recharge, and wildlife habitat.

Approximately 14 acres of wetlands are located in the indirect impact zones along the new alignment for the Cooper Creek Alternative and could be indirectly affected under this alternative (Table 3.20-6). Indirect impacts are discussed in Section 3.20.2.2. Additionally, the 60 acres of wetlands currently located in the indirect impact zone of the existing highway would continue to be indirectly affected by the existing highway, as discussed in Section 3.20.2.1.

Table 3.20-10. Approximate area of wetland fill—Cooper Creek Alternative

Acreage filled, by wetland function[a]		Acreage filled, by wetland type[a]	
Groundwater recharge	9.13	Forested	2.3
Groundwater discharge	1.98	Deciduous shrub thicket	1.7
Stream flow moderation	3.68	Shrub bog	3.7
Shoreline, stream bank, and soil stabilization	3.33	Emergent	1.1
Sediment retention and pollution removal	10.84	Ponds	2.2
Food chain support	9.73	***Total wetland loss***	**11.0**
Wildlife habitat	9.02	***Associated fill volume (cy)***	***154,410***
Fish habitat[b]	2.42		
Human non-consumptive values and uses	1.85		
Human consumptive values and uses	0		
Uniqueness and heritage	1.85		

[a] Acres lost by function does not match acres lost by type, because a given wetland type may have multiple functions.

[b] Fish habitat includes (1) wetlands with open water and ponds that are adjacent to mapped fish streams, (2) wetlands with surface water and a defined and consistent inlet and outlet, (3) wetlands bordering streams and ponds that may provide shade over areas of open water, enhancing fish habitat, and (4) wetlands that have plant species that typically produce large quantities of annual biomass (e.g., leaves, stems, and seeds) that fall to the ground, decompose, and are exported to downstream aquatic habitats.

Construction Impacts

Construction impacts applicable to all build alternatives are described above in Section 3.20.2.3. There are no construction impacts unique to the Cooper Creek Alternative.

Practicable Measures to Minimize Harm/Mitigation

Wetland mitigation and commitments common to all alternatives are described above and in Section 3.20.2.3. During preliminary engineering, project engineers evaluated options to reduce impacts to wetlands. While topographical, geotechnical, and other constraints limited the opportunities for design modifications to minimize wetland impacts, riprap was integrated into the design of the Cooper Creek Alternative to allow steeper slopes and minimize total wetlands impacts.

3.20.2.5 G South Alternative

Direct and Indirect Impacts

Wetlands. Table 3.20-11 presents the acreage of permanent loss of wetlands. Forested wetlands would be impacted primarily north of the Kenai River and east of Juneau Creek. Impacts to deciduous shrub thickets would occur primarily at stream crossings. Shrub bogs, emergent wetlands, and ponds would be impacted intermittently along the length of the alignment. The functions expected to incur the greatest impact, based on acreage, are food chain support, wildlife habitat, sediment retention and pollution removal, and groundwater recharge.

Table 3.20-11. Approximate area of wetland fill—G South Alternative

Acreage filled, by wetland function[a]		Acreage filled, by wetland type[a]	
Groundwater recharge	19.78	Forested	17.6
Groundwater discharge	3.32	Deciduous shrub thicket	3.1
Stream flow moderation	3.68	Shrub bog	2.6
Shoreline, stream bank, and soil stabilization	0.34	Emergent	1.1
Sediment retention and pollution removal	21.49	Ponds	2.2
Food chain support	23.01	***Total wetland loss***	26.6
Wildlife habitat	22.46	***Associated fill volume (cy)***	*602,691*
Fish habitat[b]	3.82		
Human non-consumptive values and uses	2.64		
Human consumptive values and uses	0.00		
Uniqueness and heritage	1.85		

[a] Acres lost by function does not match acres lost by type, because a given wetland type may have multiple functions.

[b] Fish habitat includes (1) wetlands with open water and ponds that are adjacent to mapped fish streams, (2) wetlands with surface water and a defined and consistent inlet and outlet, (3) wetlands bordering streams and ponds that may provide shade over areas of open water enhancing fish habitat, and (4) wetlands that have plant species that typically produce large quantities of annual biomass (e.g., leaves, stems, and seeds) that fall to the ground, decompose, and are exported to downstream aquatic habitats.

Approximately 67 acres of wetlands are located in the indirect impact zones along the new alignment for the G South Alternative (Table 3.20-6). These wetlands could be indirectly

affected under this alternative. Indirect impacts are discussed in Section 3.20.2.2. Additionally, the 60 acres of wetlands currently located in the indirect impact zone of the existing highway would continue to be indirectly affected by the existing highway, as discussed in Section 3.20.2.1.

Construction Impacts

Construction impacts applicable to all build alternatives are described above in Section 3.20.2.3. There are no construction impacts unique to the G South Alternative.

Practicable Measures to Minimize Harm/Mitigation

Wetland mitigation and commitments common to all alternatives are described above in Section 3.20.2.3. Specific G South Alternative mitigation is proposed for the vegetation removal anticipated along the Bean Creek Trail. To lessen potential impact, following construction the Bean Creek Trail area would be reseeded wherever construction disturbance occurs or trailside vegetation is disturbed.

3.20.2.6 Juneau Creek and Juneau Creek Variant Alternatives

Direct and Indirect Impacts

Juneau Creek Alternative

Wetlands. Table 3.20-12 presents the acreage of permanent loss of wetlands. Forested wetlands would be impacted primarily north of the Kenai River and east of Juneau Creek. Impacts to deciduous shrub thickets would occur primarily at proposed stream crossings. Shrub bogs would be impacted intermittently along the length of the alignment. Impacts to emergent wetlands would occur primarily west of Juneau Creek. Impacts to ponds would occur primarily where the alternative maintains the same alignment as the existing highway. Sediment retention and pollution removal, wildlife habitat, food chain support, and groundwater recharge functions would be most affected, based on acreage, by the alternative.

Under the Juneau Creek Alternative, a new trailhead would be constructed for the Resurrection Pass Trail near where the alignment would cross the existing trail. There are wetlands in this general area, and the location and general layout of the trailhead have been coordinated with the USFS. The proposed location of the trailhead could result in more people entering wetlands in the area. Potential wetland impacts resulting from proposed mitigation have not been quantified and are not included in Table 3.20-12.

Approximately 130 acres of wetlands are located in the indirect impact zone along the new alignment of the Juneau Creek Alternative (Table 3.20-6). These wetlands could be indirectly affected under the Juneau Creek Alternative. Indirect impacts are discussed in Section 3.20.2.2. Additionally, the 60 acres of wetlands currently located in the indirect impact zone of the existing highway would continue to be indirectly affected by the highway, as discussed in Section 3.20.2.1.

Table 3.20-12. Approximate area of wetland fill—Juneau Creek Alternative

Acreage filled, by wetland function[a]		Acreage filled, by wetland type[a]	
Groundwater recharge	29.05	Forested	24.2
Groundwater discharge	11.06	Deciduous shrub thicket	4.7
Stream flow moderation	6.73	Shrub bog	2.2
Shoreline, stream bank, and soil stabilization	3.28	Emergent	6.3
Sediment retention and pollution removal	37.42	Ponds	1.1
Food chain support	35.54	***Total wetland loss***	38.5
Wildlife habitat	36.19	***Associated fill volume (cy)***	*742,460*
Fish habitat[b]	5.07		
Human non-consumptive values and uses	2.63		
Human consumptive values and uses	0.00		
Uniqueness and heritage	8.55		

[a] Acres lost by function does not match acres lost by type, because a given wetland type may have multiple functions.

[b] Fish habitat includes (1) wetlands with open water and ponds that are adjacent to mapped fish streams, (2) wetlands with surface water and a defined and consistent inlet and outlet, (3) wetlands bordering streams and ponds that may provide shade over areas of open water enhancing fish habitat, and (4) wetlands that have plant species that typically produce large quantities of annual biomass (e.g., leaves, stems, and seeds) that fall to the ground, decompose, and are exported to downstream aquatic habitats.

Juneau Creek Variant Alternative

Wetlands. Table 3.20-13 presents the acreage of permanent loss of wetlands. Forested wetlands would be impacted primarily north of the Kenai River and east of Juneau Creek. Impacts to forested wetlands would primarily occur north of the Kenai River and east of Juneau Creek. Impacts to deciduous shrub thickets would occur primarily at proposed stream crossings. Shrub bogs would be impacted intermittently along the length of the alignment. Impacts to emergent wetlands would occur primarily west of Juneau Creek. Impacts to ponds would occur primarily where the alternative maintains the same alignment as the existing highway. Wildlife habitat, food chain support, sediment retention and pollution removal, and groundwater recharge functions would be most affected, based on acreage, by the alternative.

Under the Juneau Creek Variant Alternative, a new trailhead would be constructed for Resurrection Pass Trail near where the alignment would cross the existing trail. There are wetlands in this general area, and the location and general layout of the trailhead have been coordinated with the USFS. The proposed location of the trailhead could result in more people entering wetlands in the area. Potential wetland impacts resulting from proposed mitigation have not been quantified and are not included in Table 3.20-13.

Approximately 119 acres of wetlands are located in the indirect impact zone along the new alignment of the Juneau Creek Variant Alternative (Table 3.20-6). These wetlands could be indirectly affected under the Juneau Creek Variant Alternative. Indirect impacts are discussed in Section 3.20.2.2. Additionally, the 60 acres of wetlands currently located in the indirect impact zone of the existing highway would continue to be indirectly affected by the highway, as discussed in Section 3.20.2.1.

Table 3.20-13. Approximate area of wetland fill—Juneau Creek Variant Alternative

Acreage filled, by wetland function[a]		Acreage filled, by wetland type[a]	
Groundwater recharge	29.96	Forested	24.2
Groundwater discharge	8.26	Deciduous shrub thickets	3.0
Stream flow moderation	7.13	Shrub bogs	1.5
Shoreline, stream bank, and soil stabilization	3.28	Emergent	6.7
Sediment retention and pollution removal	35.28	Ponds	2.1
Food chain support	35.94	***Total wetland loss***	**37.5**
Wildlife habitat	36.59	***Associated fill volume (cy)***	***661,500***
Fish habitat[b]	3.28		
Human non-consumptive values and uses	3.42		
Human consumptive values and uses	0		
Uniqueness and heritage	1.84		

[a] Acres lost by function does not match acres lost by type, because a given wetland type may have multiple functions.

[b] Fish habitat includes (1) wetlands with open water and ponds that are adjacent to mapped fish streams, (2) wetlands with surface water and a defined and consistent inlet and outlet, (3) wetlands bordering streams and ponds that may provide shade over areas of open water enhancing fish habitat, and (4) wetlands that have plant species that typically produce large quantities of annual biomass (e.g., leaves, stems, and seeds) that fall to the ground, decompose, and are exported to downstream aquatic habitats.

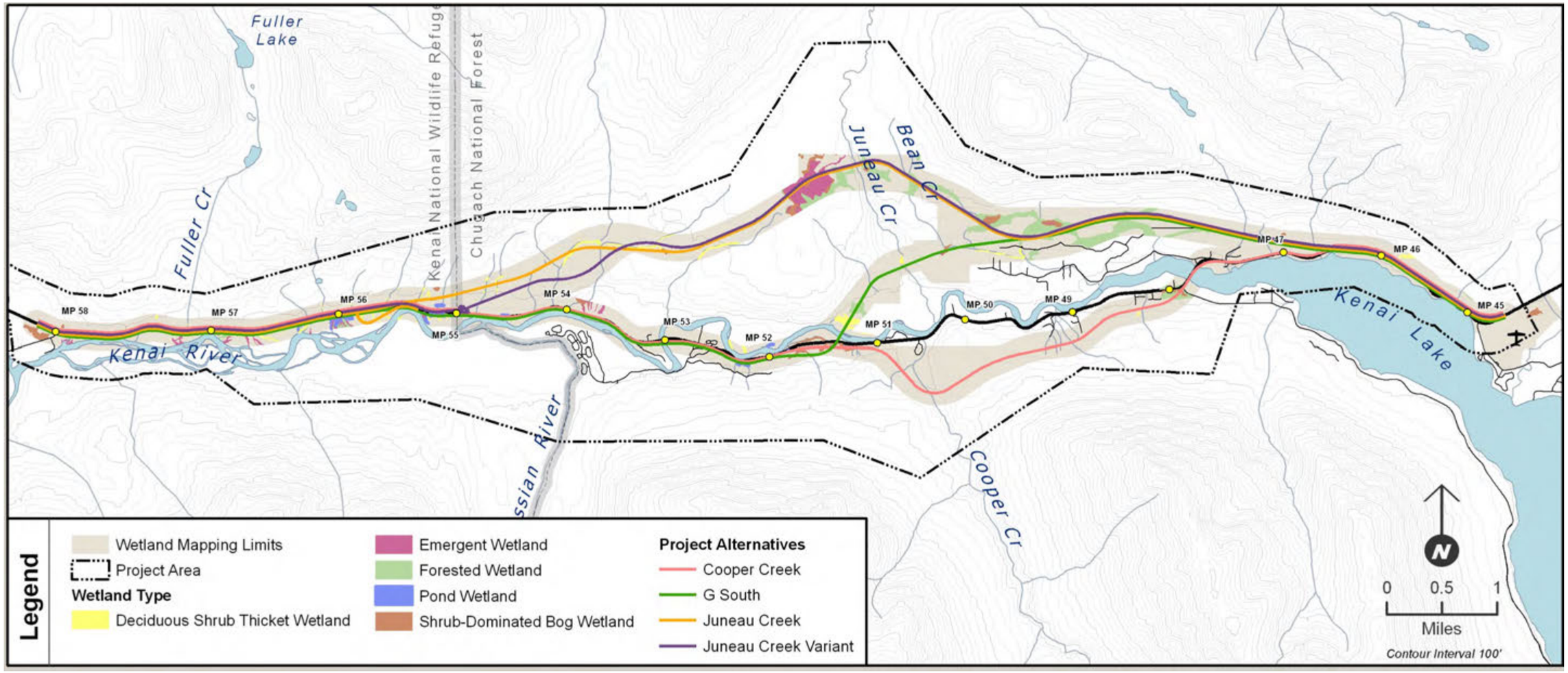
Construction Impacts

Construction impacts applicable to all build alternatives are described above in Section 3.20.2.3. There are no construction impacts unique to the Juneau Creek and Juneau Creek Variant alternatives.

Practicable Measures to Minimize Harm/Mitigation

Wetland and vegetation mitigation and commitments common to all alternatives are described above in Section 3.20.2.3. Specific to the Juneau Creek and Juneau Creek Variant Alternatives, the Bean Creek Trail area would be reseeded following construction wherever embankment material is removed or trailside vegetation disturbed.

Under the Juneau Creek and Juneau Creek Variant alternatives, the Juneau Creek Bridge drainage could deflect rainwater away from vegetation. In order to mitigate this potential impact, the bridge drainage would be designed to direct rainwater runoff beneath bridge and promote retention of natural vegetation buffer between the Resurrection Pass National Recreation Trail and the bridge abutment.



Map 3.20-1. Wetlands in the project area

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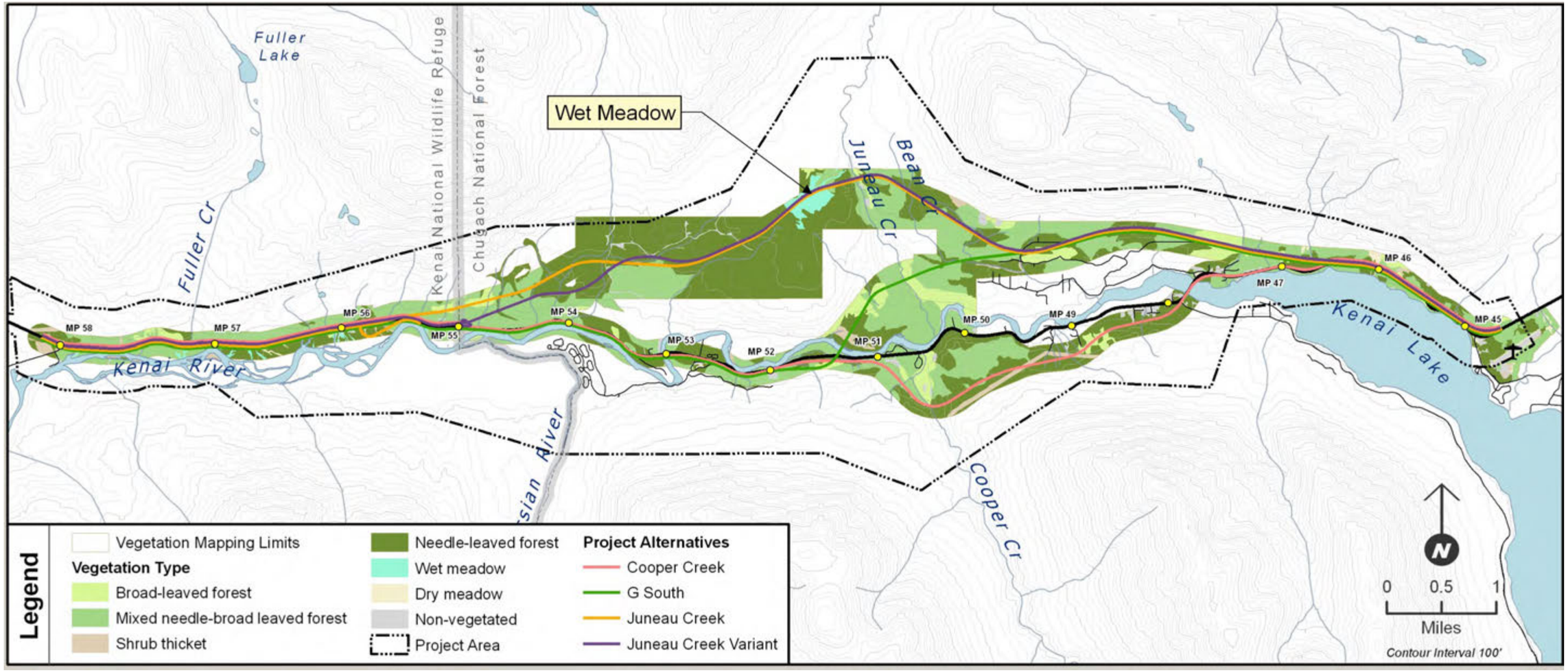

Map 3.20-2. Vegetation types in the project area

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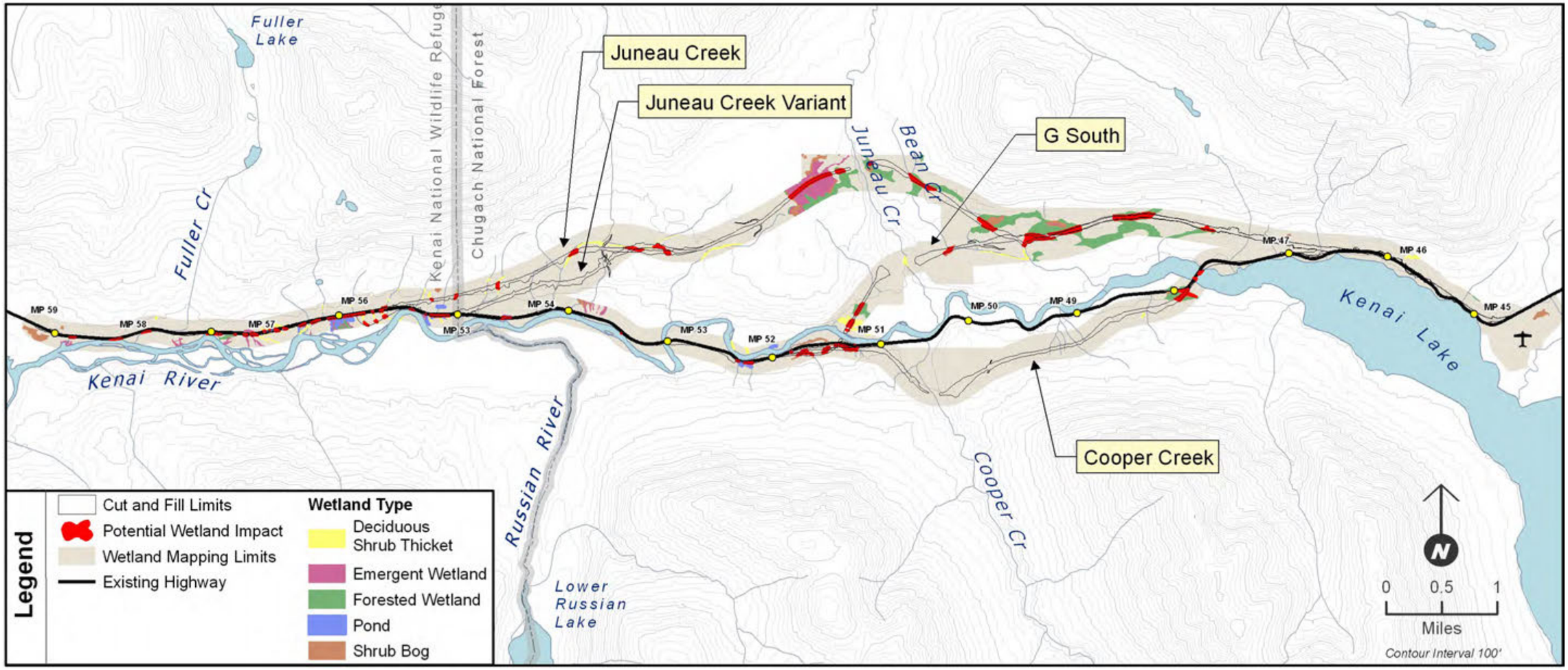

Map 3.20-3. Wetland impacts in the project area

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