5.2 Vegetation Resources

5.2.1 Study Area

The study area is defined as vegetation cover within 5 miles of the centerline (a 10-mile-wide corridor) along the proposed rail line segments. This study area provides context for the evaluation of potential impacts to vegetation resources from the proposed Port MacKenzie Rail Extension. Within the study area is the footprint of the rail line segments, which includes the rail bed, terminal reserve area, access road, and associated facilities. The Surface Transportation Board's (STB or the Board) Office of Environmental Analysis (OEA) focused the analysis of potential impacts to vegetation cover within the rail line footprint.

5.2.2 Analysis Methodology

OEA used Geographic Information System (GIS) analysis to identify, classify, and quantitatively assess potential impacts to vegetation within the footprint for each of the rail line segments. Descriptions of existing conditions for vegetation are based on data in Nowacki *et al.* (2001), Gallant *et al.* (1995), Viereck *et al.* (1992), and ANHP *et al.* (2008). OEA identified and quantified vegetation types within the rail line footprint using the U.S. Geological Survey National Land Cover Database (Homer *et al.*, 2004). OEA also used this database to estimate the prevalence of vegetation types beyond the rail line footprint to assess potential impacts to vegetation. OEA further incorporated data on invasive plant populations (ANHP *et al.*, 2008) and fire management (BLM AFS, 2008a, 2008b) to inform this analysis. Vegetation types are characterized in Appendix D of this Final EIS.

5.2.3 Affected Environment

The study area is in the Cook Inlet Basin Ecoregion, a gently sloping lowland basin characterized by a variety of woodland and wetland habitats (Nowacki *et al.*, 2001). Both mature forests and wetland areas serve important ecological functions and provide key wildlife habitat. Forests provide valuable ecosystem services such as photosynthesis and nutrient cycling, and help to prevent erosion and provide riparian buffers. In addition, forests help maintain clean air and water through respiration and their role in the water cycle. When disturbed, mature forests could take approximately 100 years to recover (Viereck *et al.*, 1992), and, depending on the nature of the disturbance, could be permanently altered.

Wetland plant communities provide habitat and forage for terrestrial and aquatic life, filter surface water flows, and buffer storm and flood waters. In addition, wetland plant communities are remarkably diverse – wetlands are home to 31 percent of all plant species in the United States (USEPA, 2001).

In addition to wetland habits, evergreen, deciduous, and mixed forest stands are the predominant vegetation classes in the study area (Homer *et al.*, 2004; Gallant *et al.*, 1995). Stands of white spruce, black spruce, or a mixture of the 2 species are common in evergreen forests. Closed stands of white spruce occupy young river terraces where soil drainage is good; closed stands of black spruce occupy poorly-drained floodplain soils. Mixed closed stands with both white spruce and black spruce often have tall shrub understories of alder and willow. Colder and

wetter soils support black spruce woodlands, where the tall shrub understory is a much more important component of the ecosystem than in closed forest stands. Mixed forests generally consist of paper birch or quaking aspen with black and/or white spruce, or, in some places, are dominated by white spruce and balsam poplar.

Shrub/scrub communities can be found in floodplains and drainageways and are typically dominated by willow or alder. In wet areas, these shrub/scrub communities can include sedges, marsh fivefinger, or other wetland plants. Woody wetlands consist of low-shrub/scrub plant communities in saturated areas with thick organic mats, and can include resin birch, willows, and typical bog plants like Labrador tea, bog blueberry, leatherleaf, sedges, and sphagnum moss. Some woody wetland communities form tussock bogs dominated by cottongrasses. Emergent herbaceous wetlands occupy lake and pond margins, sloughs, oxbows, fens, and poorly-drained areas of silty or organic soils. Plants characteristic of emergent herbaceous wetlands include sedges, marsh fivefinger, horsetail, cinquefoil, and aquatic plants like pond lily and water milfoil.

Riparian areas scoured by flood water in the study area generally follow a successional sequence from bare alluvium through alluvium with scattered willows and herbs, open willow shrub, closed alder and willow shrub, open balsam poplar forest with a dense alder understory, closed balsam poplar forest with alder understory, and mixed balsam poplar-white spruce forest to closed white spruce forest (Viereck *et al.*, 1992). Development from the closed alder willow shrub to mature balsam poplar forest occurs over a period of 75 to 90 years, and the transition from mixed balsam poplar-white spruce forest to white spruce-dominant forests usually occurs gradually over the span of almost 100 years.

Vegetation cover characteristics in the study area are primarily the result of generally level topography, mild weather, proximity to the coast, soils created by intense historic glaciations of the region, and lack of permafrost. Development of vegetation communities is also influenced by slope, aspect, elevation, parent material (the primary material from which soil is formed), and the succession of vegetation communities subsequent to flooding and fire. Forestry, military activity, agriculture, urban and recreational development, transportation development, gravel mining, insect infestations, moose browsing, and the spread of invasive and noxious plants have also affected vegetation in the study area.

Figure 5.2-1 depicts the distribution of vegetation classes around the proposed rail line segments. Table 5.2-1 shows the relative abundance of the different vegetation cover classes present in the study area. Appendix D describes the relevant vegetation classes.

5.2.3.1 Fire Ecology

In the study area, evergreen forests, and in particular black spruce forests, are the most susceptible to fire. As a result, stands of black spruce older than 100 years are rare (Viereck *et al.*, 1992). Recently burned areas typically revegetate with herbaceous communities, which are often dominated by fireweed, and followed by plant communities dominated with bluejoint reedgrass and willow scrub. Broadleaf forests follow willow communities in uplands on south-facing slopes or on well-drained river terraces, while paper birch forests develop on east-, west-, and some north-facing slopes and in flat areas. Mixed forests develop as spruce becomes established within the broadleaf forests, followed by spruce forests in some locations.

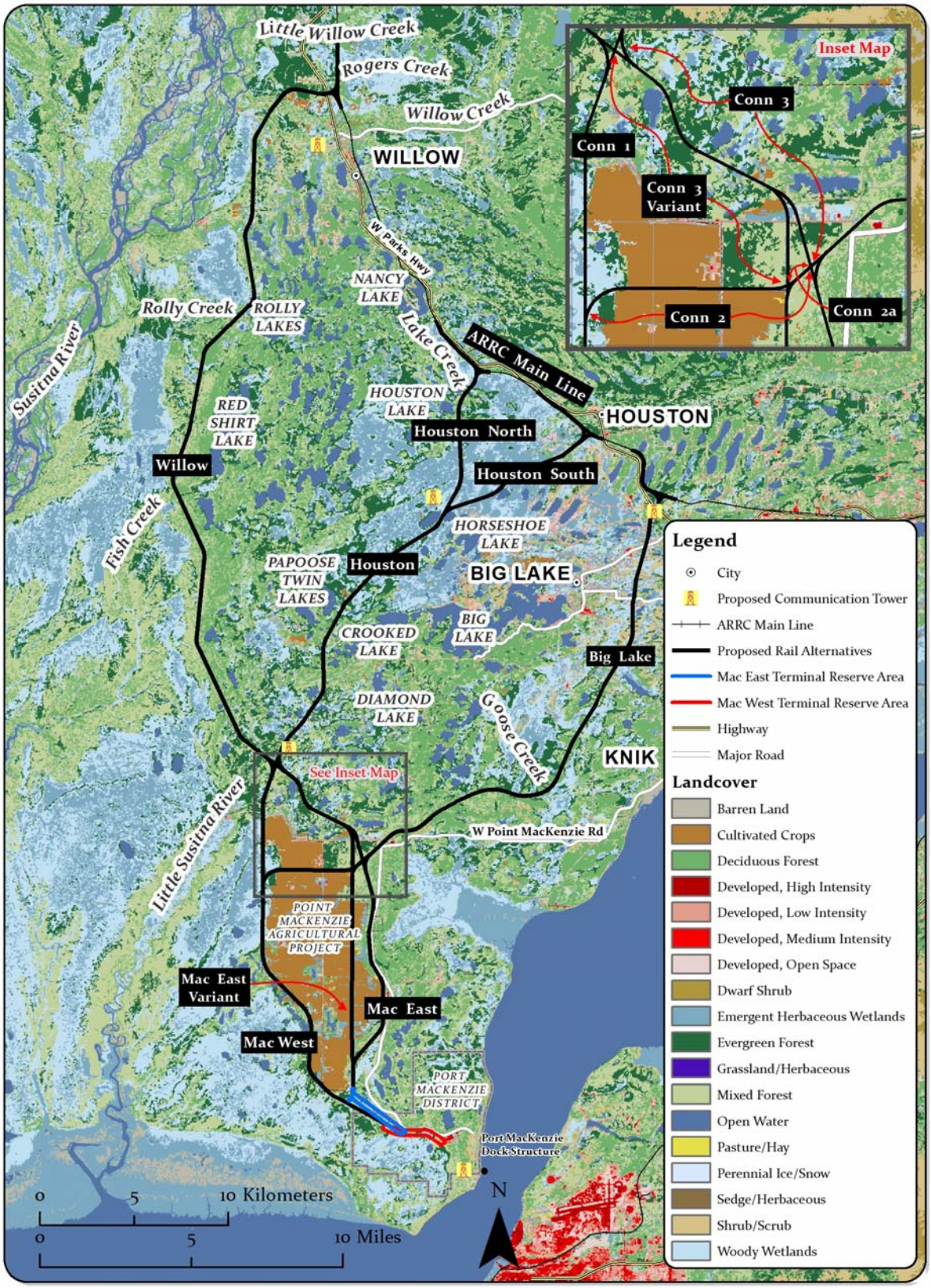

Figure 5.2-1 Overview of Vegetation Classes Around the Rail Line Segments

Table 5.2-1
Vegetation Cover Classes in the Proposed Port MacKenzie Rail Extension Study Area[a]

Study Area Cover (percent)[b]	Class Name	Study Area Cover (percent)	Class Name
<1	Barren Land	13	Evergreen Forest Closed
2	Cultivated Crops	<1	Evergreen Forest Open
16	Deciduous Forest Closed	<1	Evergreen Forest Woodland
2	Deciduous Forest Open	18	Mixed Forest Closed
<1	Deciduous Forest Woodland	<1	Mixed Forest Open
<1	Developed, High Intensity	<1	Mixed Forest Woodland
1	Developed, Low Intensity	11	Open Water
<1	Developed, Medium Intensity	<1	Pasture/Hay
1	Developed, Open Space	3	Shrub/Scrub
14	Emergent Herbaceous Wetlands	16	Woody Wetlands

[a] Source: Homer e*t al.*, 2004; the study area is defined as vegetation cover within 5 miles of the centerline (10 mile total width) of the proposed rail line segments.
[b] < = less than.

5.2.3.2 Invasive and Noxious Plants

Most of Alaska has remained relatively free from large-scale habitat changes resulting from nonnative plant species, primarily because the state has a small human population and relatively few areas of man-made disturbance. However, the Matanuska-Susitna Valley in the study area is one of the most developed regions of the state. As a consequence, 54 species of nonnative plants have been identified in the study area at 179 different sites (ANHP *et al.*, 2008). The most common nonnative plants in the study area are common dandelion, annual bluegrass, and white sweet clover. These plants and some other nonnative plant species common to the area are considered to be highly invasive weed species. Higher concentrations of invasive weed species are found in developed areas, especially along Parks Highway, which passes through the study area between Wasilla and Willow, on Knik-Goose Bay Road between Big Lake and Knik, and in the Point MacKenzie Agricultural Project. However, surveys for invasive weed species generally are concentrated within developed areas; therefore, the extent of invasion away from road systems is likely underreported.

The state regulates the spread of invasive weed species and has listed 14 species as prohibited noxious weeds and 9 species as restricted noxious weeds under Title 11 of Alaska state statutes (Alaska Admin. Code 11 § 34.020). Prohibited noxious weeds are any species of plants, which, when established, are or may become destructive and difficult to control by ordinary means of cultivation or other farm practices. Restricted noxious weeds are species of plants which are very objectionable in fields, lawns, and gardens, but which can be controlled by good cultural practices. Four prohibited noxious weeds and 5 restricted noxious weeds were identified in the study area (Table 5.2-2). Appendix D provides a complete list of regulated and nonregulated invasive plants in the study area based on field surveys performed between 2002 and 2007 (ANHP *et al.*, 2008).

Table 5.2-2
Prohibited and Restricted Noxious Weeds in the Proposed Port MacKenzie Rail Extension Study Area[a]

Common Name	Species	Occurrence (sites)	Status[b]
Canada Thistle	*Cirsium arvense*	1	P
Quackgrass	*Elymus repens*	51	P
Brittlestem Hempnettle	*Galeopsis tetrahit*	7	P
Butter and Eggs	*Linaria vulgaris*	14	R
Plantain	*Plantago major*	85	R
Annual Bluegrass	*Poa annua*	96	R
Black Bindweed	*Polygonum convolvulus*	45	R
Perennial Sowthistle	*Sonchus arvensis*	2	P
Tufted Vetch	*Vicia cracca*	44	R

[a] Source: ANHP *et al.*, 2008; the study area is defined as vegetation cover within 5 miles of the centerline (10 mile total width) of the proposed rail line segments.
[b] R = restricted; P = prohibited.

5.2.3.3 Rare Plants

Extensive surveys for rare plant species have not been completed for the entire study area, but available data do not indicate the presence of any known rare plant species – such as Federal- or state-protected threatened, endangered, or candidate species – within the study area (Lipkin, 2008; HDR, 2008; USFWS, 2009).

5.2.4 Environmental Consequences

5.2.4.1 Proposed Action

The primary impacts to vegetation from proposed rail line construction and operation would be the destruction of vegetation cover and the replacement of some cover with gravel fill. The extent of such impacts would vary based on the affected vegetation types, their relative abundance, soil conditions, hydrology, topography, and the extent of topographic modification required for construction. Permanent impacts would include vegetation loss due to placement of gravel fill for the rail bed and access road, excavation of gravel, and construction of rail line associated facilities. Other long-term impacts would include the loss or alteration of forested habitat due to the removal of vegetation at temporary workplaces that would be restored after project construction. Operation impacts would include ongoing vegetation removal and control from the track ballast and adjacent areas, where necessary, for safe operation. In addition, impacts to vegetation resources could include altered vegetation communities due to soil compaction and the spread of invasive plant species, and altered vegetation succession caused by changes in fire cycles.

The primary construction and operation impacts would be similar across all vegetation types; that is, vegetation would be removed and soil structures could be altered.

Common Impacts

Construction Impacts

There would be impacts to vegetation through clearing for construction within the footprint of the proposed rail line, which includes the rail bed, access road, and other associated facilities. There could also be impacts to vegetation near the rail line footprint as a result of dust deposition, changes in soil and moisture conditions, fragmentation of vegetation communities, invasion by nonnative plants, and the alteration of fire regimes. The extent of these potential impacts to vegetation communities would depend on several factors, including vegetation type, topography, hydrology, proximity to invasive plant populations, and other disturbance patterns. The following paragraphs describe potential construction-related impacts common to all the rail line segments.

Vegetation Clearing and Fill Placement

Clearing of vegetation within the 200-foot right-of-way (ROW) would occur principally within the rail line footprint, so the footprint area is used as the basis for evaluation and comparison of the potential impacts to vegetation from the alternatives. Clearing would alter plant community composition and structure in areas dominated by forest and shrub cover types. Some vegetation re-growth would be expected, although plant communities would be temporarily or permanently altered. Placement of fill to support the rail bed and access road would result in the permanent loss of some vegetation. Vegetation loss would be short term in the areas that could be restored or allowed to revegetate by natural succession. However, the natural-succession process would be hindered by mechanical vegetation management in some areas, as described under Operation Impacts.

Some areas, such as temporary staging areas that could be needed outside the 200-foot ROW, would be restored after construction. The type of vegetation that would develop as a result of restoration would depend on the type of vegetation cleared, the soil conditions present, and the surrounding vegetation. Most restoration efforts would be initiated with establishment of an initial grassy and herbaceous ground cover to prevent excess erosion and the spread of invasive weeds. Restoration of grass-like plants such as sedges, rushes, and grasses and shrub/scrub habitats could occur within 5 to 20 years and would be considered a short-term habitat loss. Shrubs would also require approximately 3 to 25 years to return to their original community composition and height (ADF&G, 2001). Forested areas stripped of vegetation during construction would require approximately 25 to 150 years for regeneration and would be considered a long-term loss of habitat, even with restoration (ADF&G, 2001). Forest communities would likely be replaced, in part, by either native early successional-stage vegetation or invasive plants.

Soil Compaction and Erosion

Soil compaction would result from heavy equipment transiting areas associated with construction of the rail bed, access road, and associated facilities and would occur primarily within the 200-foot ROW. Compaction of soils would inhibit germination of some seeds in the upper soil surface, inhibit infiltration of precipitation, inhibit root penetration, and could cause development

of bare soil areas or establishment of invasive plants. In addition, removal of vegetation cover would exacerbate erosion; therefore, rail line construction would increase erosion rates. Erosion and sedimentation effects could extend beyond the 200-foot ROW, especially in areas with steep terrain.

Spread of Invasive Plants

Construction of the rail bed, access road, and associated facilities could increase the spread of invasive plants by the following pathways:

- Construction equipment used on the site could carry seeds or propagative plant parts from other construction projects or infested areas.
- Removal of overburden and cut materials to offsite locations could spread invasive species, and placement of fill from borrow sites could introduce invasive plants.
- Seed mixtures used to revegetate slopes and exposed soils could contain invasive plant seeds.

Thus, native vegetation next to the rail bed, access road, and other areas cleared for the project could experience competition from invasive plants. Changes in local soil conditions and exposed mineral soils also allow invasive plants to spread, which could contribute to encroachment of invasive plants on vegetation communities adjacent to the rail line footprint. This could contribute to larger-scale vegetation changes that could result in altered vegetation communities and impacts to ecological integrity.

Although comprehensive data for invasive plant infestations is not available for all areas, there are higher concentrations of invasive plant species in developed areas, especially along Parks Highway, which passes through the study area between Wasilla and Willow, on Knik-Goose Bay Road between Big Lake and Knik, and the Point MacKenzie Agricultural Project. Construction of segments near developed areas with existing infestations of noxious and invasive weeds would increase the potential to spread invasive plants. Invasive plants pose risks to wildlife habitat and could be of particular concern in areas adjacent to the Susitna Flats State Game Refuge and other wildlife management areas. Table 5.2-3 lists the number of known weed sites near each proposed rail line segment and Parks Highway.

Rare Plants

There are no known threatened or endangered plant species in the study area (Lipkin, 2008; HDR, 2008; USFWS, 2009).

Dust Deposition

Wind-blown dust from the access road and rail bed could damage or eliminate plants by direct cover with mineral fines, which inhibit photosynthesis and respiration. More tolerant native and nonnative invasive plants could replace existing vegetation communities in areas exposed to dust. The magnitude and duration of dust exposure would determine vegetation response and the intensity of potential impacts (Auerbach, 1997).

Table 5.2-3
Weed Sites Near Proposed Port MacKenzie Rail Extension Segments and Parks Highway

	Number of Weed Sites within 0.5 Mile of Segment Centerlines
Segment	
Connector 1	0
Connector 2	2
Connector 3	0
Connector 2a	0
Connector 3 Variant	0
Houston	0
Houston North	4
Houston South	7
Mac East	3
Mac West	1
Mac East Variant	1
Willow	2
Big Lake	10
Parks Highway	41

Fragmentation

Fragmentation of vegetation communities from rail line construction would alter plant communities along the alternatives edges and could facilitate the spread and establishment of invasive nonnative plants (Hansen and Clevenger, 2005). Permanent rail facilities would replace vegetation cover, which would result in linear separation of the landscape (Meffe *et al.*, 1997). Linear construction projects, such as roads and rail lines, divide vegetation communities, converting interior communities into edge communities (Watson, 2005).

Wildland Fires

Clearing of vegetation could affect the fire cycle. Rail line construction would lead to fragmentation of fuel material for wildland fires. This could result in the creation of fire breaks such that a fire starting on one side of the rail line might not cross the cleared rail line footprint to the opposite side of the rail line. This could lead to an increase in fuel accumulation along either side of the rail line footprint and an increased risk of more intense wildland fires, resulting in more damage to vegetation and prolonged vegetation recovery periods. This could change the cycle of fires and lead to decreased biodiversity from ecological succession, because the separated vegetation communities might experience different rates of ecological succession. This potential change in fire cycles and succession patterns would be of special concern in areas where proposed rail line alternatives would cross through black spruce forests, which are especially vulnerable to fire (Viereck, 1992). For example, in 1996, the Millers Reach 2 fire burned 37,348 forested acres in the Big Lake area between Knik and Houston, including 77 acres in the rail line footprint of the Big Lake Segment (BLM AFS, 2008a).

Much of the study area can be considered "wildland-urban interface," where structures and human development intermingle with natural vegetation, increasing the risk for destructive wildland fires. Fires in the wildland-urban interface can pose significant threats to homes, other structures, and forested habitat. Fire management strategies are described in the Bureau of Land Management (BLM) Alaska Wildland Fire Management Plan (BLM, 2005). Under the current fire management scenario, the proposed rail line alternatives would cross 3 levels of fire protection – modified, full, and critical (BLM, AFS 2008b). Areas covered by critical and full protection designations are the highest priorities for fire suppression because these designations indicate risk to human life, property, developed areas, and high-value natural resources. While changes in fire management strategies in the study area are not anticipated, the BLM Alaska Fire Service periodically reviews management strategies as ecological conditions change. Appendix D provides a more detailed description of fire management and fire history in the study area.

Floodplains

Construction of the proposed rail line in floodplain areas could impact vegetation communities through the alteration of natural drainage patterns and floodplain storage capacity. These changes could affect vegetation outside the rail line footprint. For example, alteration of natural drainage patterns could change the location of the mean high water line and cause riparian vegetation to become submerged. In some cases, this would cause a loss of vegetation or alter plant community composition. Floodplains throughout the study area are home to late-successional mixed and evergreen forest communities, which would be vulnerable to construction impacts because of the long time required for recovery.

Operation Impacts

The following paragraphs describe potential operation-related impacts common to all rail line segments.

Maintenance Clearing

Continued disturbance of vegetation would result from ongoing mechanical clearing and trimming of vegetation from the track ballast and adjacent areas where necessary to ensure safe operation of the rail line (see Appendix D). Other methods of vegetation maintenance might include thermal removal, steam or hot water removal, fire removal, smothering vegetation with impenetrable plastic layers, or manual removal (Torstensson, 2001). These activities would disturb successional vegetation cover, providing an opportunity for growth of invasive species. Any vegetation removed by burning could increase the risk of fire spreading beyond the vegetation management target area and could result in the unintentional destruction of vegetation resources (ARRC, 1984). The alteration of vegetation cover from rail bed and access road maintenance would be considered a permanent impact.

Chemical Spills

Vegetation could be affected in the unlikely event of a release of hazardous materials from a train derailment or collision. The level of impact would depend on the type and quantity of material spilled. However, as noted in Section 11.4.1.3, Rail Safety, the Alaska Railroad Corporation (ARRC or the Applicant) has not indicated any plans to carry hazardous materials

along the proposed rail line. In the unlikely event of a spill of hazardous materials, degradation of vegetation would depend on factors such as the specific material spilled, runoff type, and vegetation community affected.

Dust Deposition and Runoff

Soil disturbance due to rail line operation would produce fugitive dust, which could result in the deposition of dust along the rail line. High quantities of dust deposited on plants such as mosses and lichens can lead to a greater chance of mortality due to a reduction in the plant's ability to photosynthesize. Increased soil erosion can lead to an overall decrease in the number of plant species found in a plant community (Klinger *et al.*, 1983; Walker *et al.*, 1987a, 1987b). Runoff from road and rail embankments and associated facilities and across dust deposits during rail line operation could result in changes in soil chemistry. The extent of such impacts would depend on the site-specific pH (measure of acidity or alkalinity) of the soil, which would result in reduced nutrient levels, altered organic horizon depth, higher soil bulk density, and lower soil moisture. These changes could cause reduced vegetation biomass and diversity, especially in areas with acidic soils, such as evergreen forest habitats (Auerbach *et al.*, 1997). Potential effects on plant communities from dust deposition and runoff would occur primarily within and adjacent to the rail line footprint.

Wildland Fire and Fire Management

While railroads in Alaska are not known to have been a common cause of wildland fires in the past, sparks from rail line operation and maintenance could increase the potential for fires (DeWilde and Chapin, 2006). OEA anticipates that the increased risk of fire from operation of the proposed rail line would be low and does not anticipate changes in fire management practices as a result of the proposed rail line. Appendix D provides a more detailed description of fire management and fire history in the study area.

Impacts by Segment and Segment Combination

Vegetation would be permanently removed during clearing for construction of the rail bed, access road, and associated facilities. The level of potential impact would depend on the size and type of vegetation in the area to be cleared during rail line construction and operation. The following paragraphs describe the vegetation types and areas of vegetation that would be removed within the rail line footprint by segment and segment combination. The descriptions include identification and discussion of construction and operation impacts when there would be differences between segments and segment combinations, or when impacts would be notable.

Southern Segments and Segment Combinations

Construction of any of the southern segments and segment combinations (Mac West-Connector 1, Mac West-Connector 2, Mac East-Connector 3, Mac East, Mac East Variant-Connector 2a, and Mac East Variant-Connector 3 Variant) would impact a variety of vegetation. Each of these segments and segment combinations would pass through a combination of undisturbed forest and woodlands, wetlands, and agricultural areas, as shown in Figure 5.2-2. Table 5.2-4 lists vegetation cover within the rail line footprint of the southern segments and segment combinations. Construction of southern segments and segment combinations would fragment

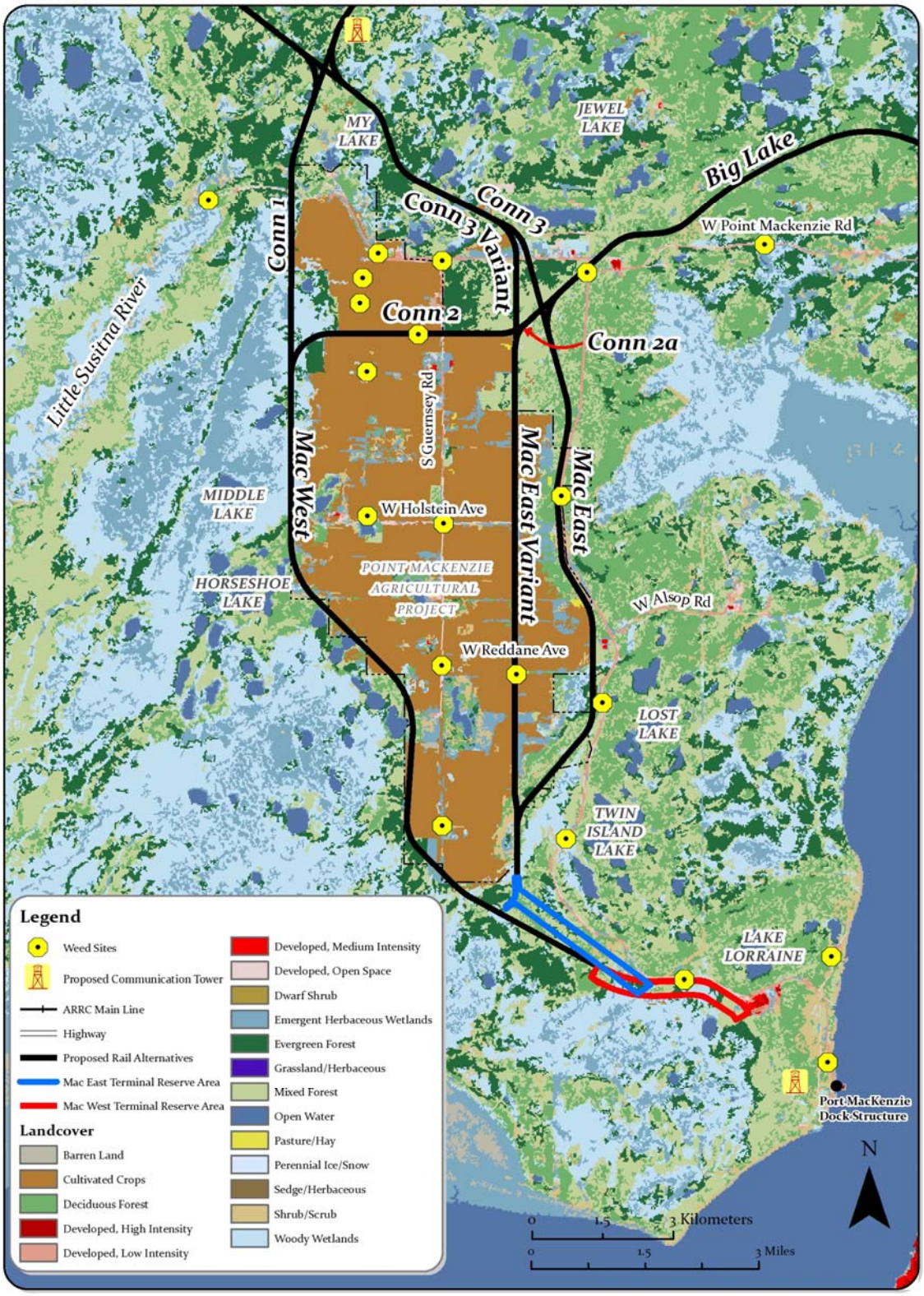

Figure 5.2-2. Vegetation Classes along the Mac West, Mac East, Mac East Variant, and Connector Segments

Table 5.2-4
Vegetation (acres) Within the Rail Line Footprint of the Southern Segments and Segment Combinations[a]

Segment/ Segment Combination	Cultivated Crops/ Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	*Total Area*[b]
Mac West-Connector 1	26	32	85	128	**245**	6	104	26	***407***
Mac West-Connector 2	36	31	72	124	**227**	6	95	23	***387***
Mac East-Connector 3	4	128	64	196	**387**	24	36	15	***467***
Mac East	3	121	44	170	**336**	23	33	12	***407***
Mac East Variant-Connector 2a	50	78	40	138	**257**	25	30	24	***386***
Mac East Variant-Connector 3 Variant	52	87	59	167	**313**	27	32	29	***453***

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding.

vegetation communities already affected by existing development. This would reduce the capacity of remaining forests and other plant communities to provide ecological functions like wildlife habitat and nutrient cycling.

Clearing and cultivation associated with agricultural activities within the Point MacKenzie Agricultural Project area have been the most significant sources of disturbance in the area of the southern segments and segment combinations. Higher concentrations of invasive plant species are found in developed agricultural areas near Port MacKenzie. The potential for the spread of invasive plant species in this area is much lower than for the northern segments and segment combinations, as fewer weed sites have been identified in the southern portion of the study area (see Table 5.2-3). The fire protection level in this area is primarily "full," indicating that human life, property, developed areas, or high-value natural resources could be at risk, with small areas designated as "modified" (see Appendix D). Fire activity in this area has been historically low (see Appendix D).

Mac West-Connector 1 Segment Combination

Construction of this segment combination would result in the clearing of approximately 407 acres of vegetation within the rail line footprint – 26 acres of cultivated crops/pasture/hay, 32 acres of deciduous forest, 85 acres of evergreen forest, 128 acres of mixed forest, 6 acres of shrub/scrub, 104 acres of woody wetlands, and 26 acres of emergent herbaceous wetlands (Table 5.2-4). There are 2 known weed sites within 0.5 miles of the rail line centerline for this segment combination (Table 5.2-3).

Mac West-Connector 2 Segment Combination

Construction of this segment combination would result in the clearing of about 387 acres of vegetation within the rail line footprint – 36 acres of cultivated crops/pasture/hay, 31 acres of deciduous forest, 72 acres of evergreen forest, 124 acres of mixed forest, 6 acres of shrub/scrub,

95 acres of woody wetlands, and 23 acres of emergent wetlands (Table 5.2-4). There are 4 known weed sites within 0.5 miles of the rail line centerline for this segment combination (Table 5.2-3). In 1991, the Stromberg Fire burned 475 acres of mixed agricultural and forested land near the intersection of the Mac West and Connector 2 segments, outside the proposed 200-foot ROW (BLM AFS, 2008a).

Mac East-Connector 3 Segment Combination

Construction of this segment combination would result in the clearing of about 467 acres of vegetation within rail line footprint – 4 acres of cultivated crops/pasture/hay, 128 acres of deciduous forest, 64 acres of evergreen forest, 196 acres of mixed forest, 24 acres of shrub/scrub, 36 acres of woody wetlands, and 15 acres of emergent wetlands (Table 5.2-4). There are 4 known weed sites within 0.5 miles of rail line centerline for this segment combination (Table 5.2-3).

Mac East Segment

Construction of this segment would involve the clearing of approximately 407 acres of vegetation within the rail line footprint – 3 acres of cultivated crops/pasture/hay, 121 acres of deciduous forest, 44 acres of evergreen forest, 170 acres of mixed forest, 23 acres of shrub/scrub, 33 acres of woody wetlands, and 12 acres of emergent wetlands (Table 5.2-4). There are 4 known weed sites within 0.5 miles of rail line centerline for this segment (Table 5.2-3). The Mac East Segment is very similar to Mac East-Connector 3 Segment Combination, with proportionally the same approximate vegetation distribution within the rail line footprint.

Mac East Variant-Connector 2a Segment Combination

Construction of this segment combination would result in the clearing of approximately 386 acres of vegetation within the rail line footprint – 50 acres of cultivated crops/pasture/hay, 78 acres of deciduous forest, 40 acres of evergreen forest, 138 acres of mixed forest, 25 acres of shrub/scrub, 30 acres of woody wetlands, and 24 acres of emergent wetlands (Table 5.2-4). There are 2 known weed site within 0.5 miles of the proposed rail line centerline for this segment combination (Table 5.2-3).

Mac East Variant-Connector 3 Variant Segment Combination

Construction of this segment combination would result in the clearing of approximately 453 acres of vegetation within the rail line footprint – 52 acres of cultivated crops/pasture/hay, 87 acres of deciduous forest, 59 acres of evergreen forest, 167 acres of mixed forest, 27 acres of shrub/scrub, 32 acres of woody wetlands, and 29 acres of emergent wetlands (Table 5.2-4). There are 2 known weed sites within 0.5 miles of the proposed rail line centerline for this segment combination (Table 5.2-3).

Northern Segments and Segment Combinations

Construction of any of the northern segments and segment combinations (Willow, Big Lake, Houston-Houston North, or Houston-Houston South) would impact a variety of vegetation. These segments and segment combinations would pass through relatively undisturbed forests,

woodlands, and wetlands, and some developed areas, as shown in Figures 5.2-3 and 5.2-4. Table 5.2-5 lists vegetation cover within the rail line footprint of the northern segments and segment combinations.

Residential and commercial development and associated roads and infrastructure have been the most significant sources of disturbance in the area of the northern segments and segment combinations. Higher concentrations of invasive plant species are found in developed areas near Big Lake and along Parks Highway. The potential for the spread of invasive plants in this area is moderate to high. Rail line construction and operation would increase the likelihood that weeds would spread to more remote areas. The fire protection level in this area is primarily "critical", especially in developed areas near Parks Highway; more remote areas along the Willow Segment are designated as "full". These designations indicate that human life, property, developed areas and/or high-value natural resources are at risk (refer to figures and tables in Appendix D for more detail on fire protection designations). Fire activity in this area has been moderate (see Appendix D). In 1996, the Millers Reach 2 fire burned 37,348 acres in the Big Lake area between Knik and Houston.

Willow Segment

This segment would pass through areas that are primarily undeveloped; vegetation cover is mostly mixed and deciduous forest. Construction of the Willow Segment could alter fire cycles and provide a vector for the introduction and spread of nonnative plants. Construction of this segment would result in the clearing of about 380 acres of vegetation within the rail line footprint – 1 acre of cultivated crops/pasture/hay, 152 acres of deciduous forest, 46 acres of evergreen forest, 154 acres of mixed forest, 3 acres of shrub/scrub, 11 acres of woody wetlands, and 13 acres of emergent wetlands (Table 5.2-5). There are 2 known weed sites within 0.5 miles of the proposed rail line centerline of this segment (Table 5.2-3). Much of this segment would pass through remote areas, and, in contrast to the other northern segments, the fire protection level here is mostly "full" (see Appendix D).

Big Lake Segment

This segment would pass through deciduous and mixed forests and wetlands that have been fragmented by human development. Impacts to vegetation remaining in these areas could contribute to additional fragmentation of forested and wetland habitats. Construction of this segment would result in the clearing of about 329 acres of vegetation within the rail line footprint – less than 1 acre of cultivated crops/pasture/hay, 96 acres of deciduous forest, 34 acres of evergreen forest, 84 acres of mixed forest, 25 acres of shrub/scrub, 50 acres of woody wetlands, and 40 acres of emergent wetlands (Table 5.2-5). There are 10 known weed sites within 0.5 miles of the proposed rail line centerline of this segment (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 77 acres within the proposed rail line footprint along 21 miles of the Big Lake Segment (see Appendix D, Table D-7).

Houston-Houston North Segment Combination

There are many lakes and associated wetlands along the Houston-Houston North Segment Combination. In some locations, construction of the Houston-Houston North Segment

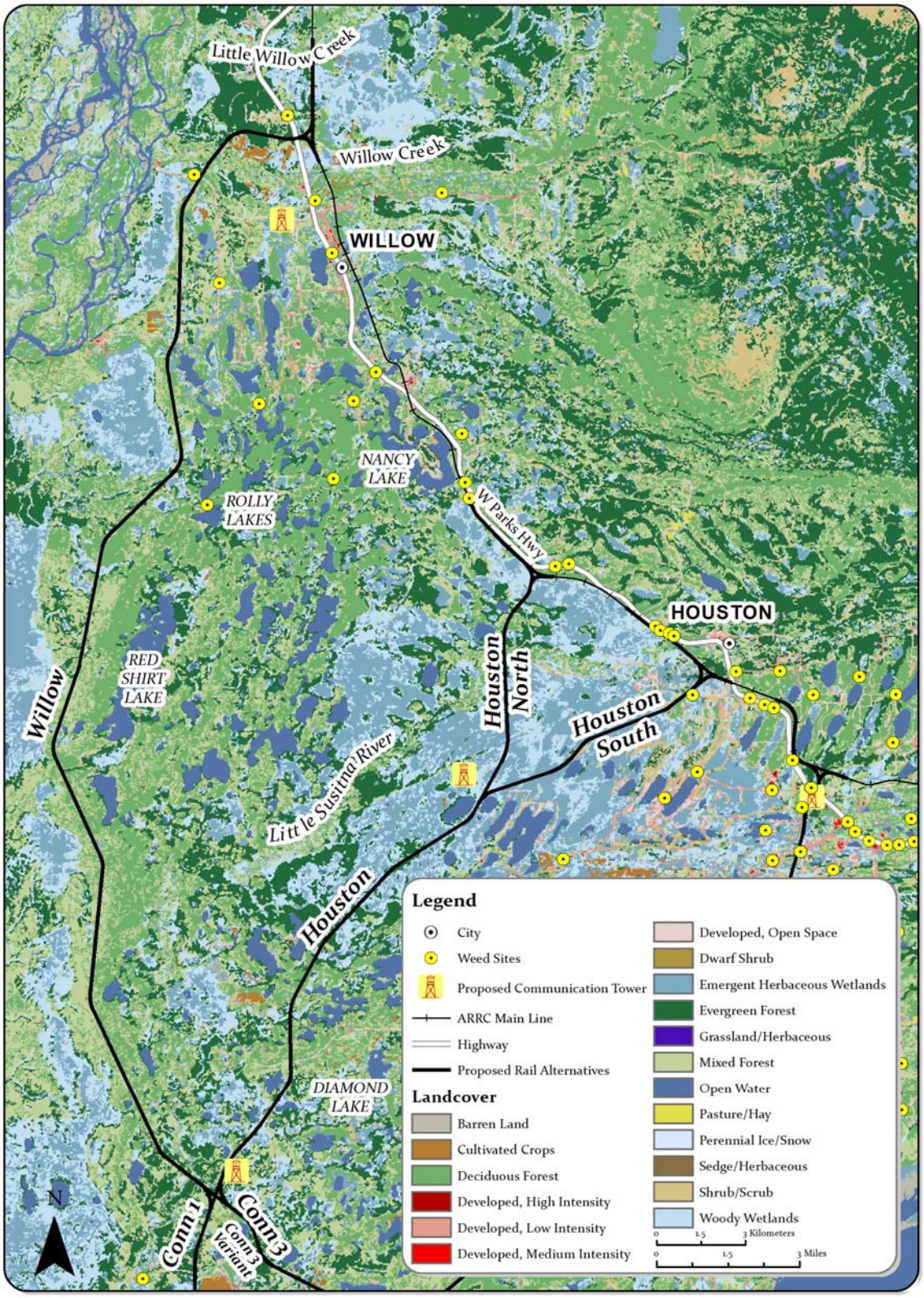

Figure 5.2-3. Vegetation Classes along the Willow, Houston, Houston North, and Houston South Segments

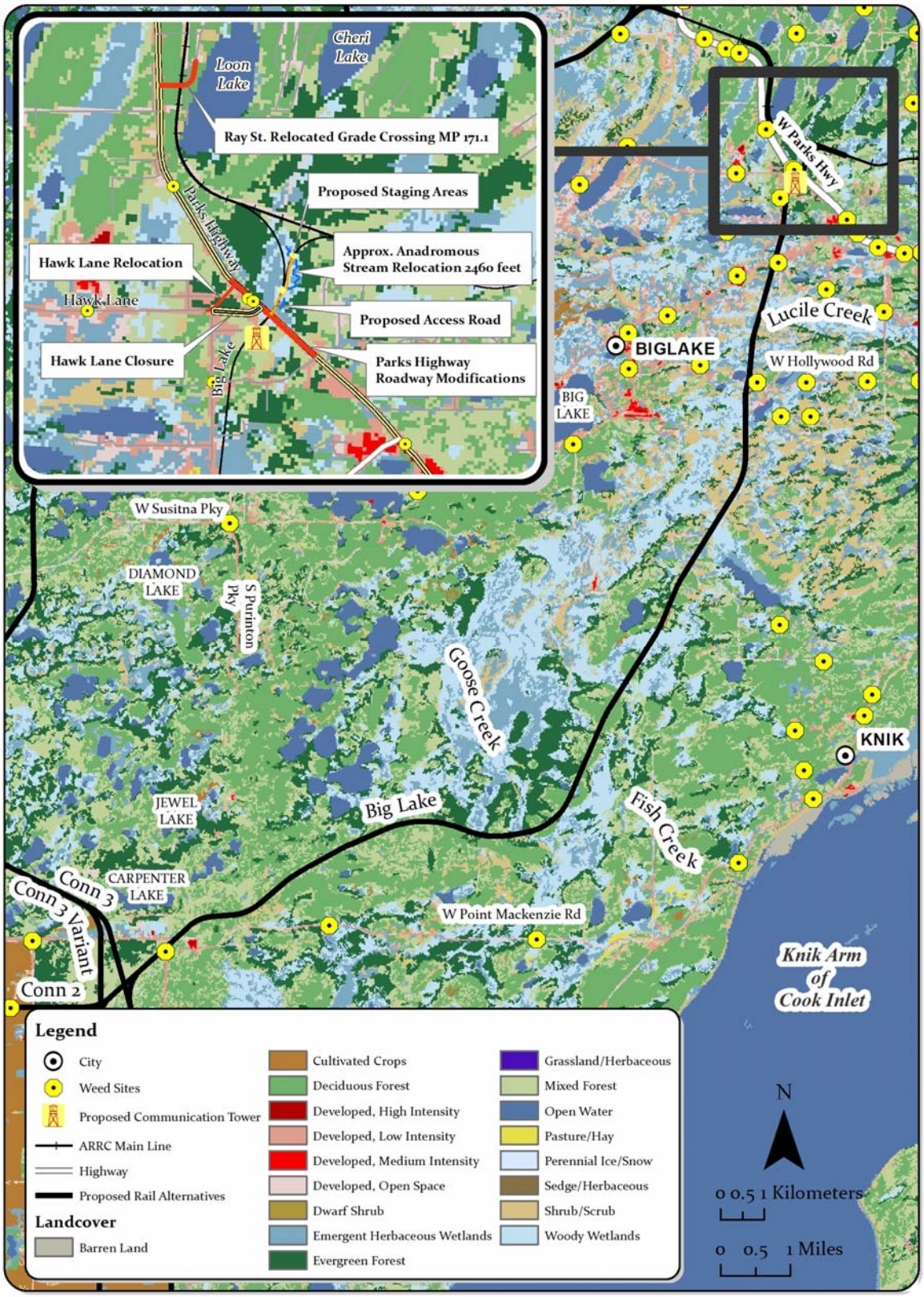

Figure 5.2-4. Vegetation Classes along the Big Lake Segment

Table 5.2-5
Vegetation (acres) Within the Rail Line Footprint of the Northern Segments and Segment Combinations[a]

Segment/ Segment Combination	Cultivated Crops/ Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	*Total Area[b]*
Willow	1	152	46	154	**352**	3	11	13	***380***
Big Lake[c]	<1	96	34	84	**214**	25	50	40	***329***
Houston-Houston North	0	72	48	47	**167**	<1	57	41	***265***
Houston-Houston South	0	37	33	26	**96**	14	36	63	***210***

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding. Values less than one were rounded to one acre.
[c] < = less than.

Combination would separate forested areas from adjacent wetland plant communities, which could disrupt water flow, nutrient cycling, and wildlife use of lake fringe areas. Construction of this segment combination would result in the clearing of about 265 acres of vegetation within the rail line footprint – 72 acres of deciduous forest, 48 acres of evergreen forest, 47 acres of mixed forest, less than 1 acre of shrub/scrub, 57 acres of woody wetlands, and 41 acres of emergent wetlands (Table 5.2-5). There are 4 known weed sites within 0.5 miles of the proposed rail line centerline for this segment combination (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 52 acres within the proposed rail line footprint along 19 miles of the Houston-Houston North Segment Combination (see Appendix D, Table D-7).

Houston-Houston South Segment Combination

Construction of this segment combination would result in the clearing of about 210 acres of vegetation within the rail line footprint – 37 acres of deciduous forest, 33 acres of evergreen forest, 26 acres of mixed forest, 14 acres of shrub/scrub, 36 acres of woody wetlands, and 63 acres of emergent wetlands (Table 5.2-5). There are 7 known weed sites within 0.5 miles of the proposed rail line centerline of this segment combination (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 89 acres within the proposed rail line footprint along 20 miles of this segment combination (see Appendix D, Table D-7).

Summary of Potential Impacts by Rail Line Alternative

The primary impact to vegetation from the proposed rail line would be the loss of existing vegetation cover. Other impacts could include an increase in the spread of invasive plant species and changes in fire cycle as the rail line could restrict the natural pathway of wildland fires. Potential impacts were quantitatively assessed for the areas within the proposed rail line footprint. Table 5.2-6 summarizes the estimated cleared vegetation along the rail line alternatives.

Table 5.2-6
Impacts to Vegetation (acres) by Alternative[a,c]

Alternative	Cultivated Crops/ Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	*Total Area*[b]
Mac West-Connector 1-Willow	27	184	129	277	**590**	9	116	38	***779***
Mac West-Connector 1-Houston-Houston North	26	103	129	171	**403**	6	161	67	***663***
Mac West-Connector 1-Houston-Houston South	26	69	114	150	**332**	20	140	89	***608***
Mac West-Connector 2-Big Lake	36	128	105	208	**441**	31	145	64	***716***
Mac East-Connector 3-Willow	5	275	107	334	**716**	27	46	28	***822***
Mac East-Connector 3-Houston-Houston North	3	195	110	227	**531**	24	91	57	***708***
Mac East-Connector 3-Houston-Houston South	4	160	94	206	**460**	39	70	78	***652***
Mac East-Big Lake	2	217	78	250	**545**	47	83	52	***731***
Mac East Variant-Connector 2a-Big Lake	50	176	73	221	**470**	50	80	64	***714***
Mac East Variant-Connector 3 Variant-Willow	53	238	102	313	**653**	29	43	42	***821***
Mac East Variant-Connector 3 Variant-Houston-Houston North	52	158	105	205	**468**	27	89	70	***707***
Mac East Variant-Connector 3 Variant-Houston-Houston South	52	123	89	184	**397**	41	68	92	***651***

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding.
[c] Segment-level data does not sum to alternative-level data as a result of the method used to calculate the rail line routes. Connector segment acreages were calculated by summing both possible "arms" of each connector segment (the arms necessary to connect the segment to either the Willow or Houston segments). Alternative acreages were calculated by generating a smooth path from the respective Mac Terminal to either the Willow, Houston, or Big Lake segment, and thus include only the one, necessary connector "arm" (as the extra "arm" connecting to the other segment would not be necessary if that route was built).

OEA also compared the percentage of each vegetation class the alternatives would affect to the relative abundance of each vegetation class. Through this analysis, OEA determined that regardless of alternative, all vegetation classes would experience a vegetation loss of 0.5 percent or less as a result of rail line construction. It should be noted that while such a small reduction in relative abundance may seem negligible in the context of the overall study area, this loss could still represent a meaningful loss of habitat at the local level.

Vegetation clearing would result in a long-term impact for forest communities, even with restoration, especially for late-succession forests and wetlands that would be slow to recover. Some cleared areas would likely be restored after construction; other areas would be covered by fill. Loss of vegetation cover, soil disturbance, and the use of fill materials and seed sources contaminated with invasive plant seeds could contribute to the spread of weed species. With

appropriate restoration efforts, vegetation clearing would result in a short-term impact to grasslands and shrub/scrub communities.

Potential impacts to vegetation from rail line construction and operation vary by alternative. While all rail line alternatives would result in the loss of vegetation across all vegetation classes, the Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives would have the largest numbers of known weed sites within 0.5 mile of the rail line centerline when compared to the other alternatives, and, therefore, would be the alternatives most likely to contribute to the spread of invasive weeds.

Forested areas at greatest risk for fire are those dominated by evergreen trees, and, in particular, black spruce. While all of the alternatives would impact forested areas to some extent, the Mac West-Connector 1-Willow and Mac West-Connector 1-Houston-Houston North alternatives would impact the greatest amount of evergreen forest, and thus would clear vegetation in those areas most at risk for fire. As a result of the more developed nature of these areas, the Mac West-Connector 2-Big Lake, Mac East-Big Lake, and Mac East Variant-Connector 2a-Big Lake Alternatives would impact the greatest amount of land at the highest priority of fire protection (see Appendix D, Tables D-4 and D-6).

All rail line alternatives would cross areas of steeper terrain and highly or potentially highly erodible soils, leading to impacts resulting from erosion and sedimentation along the rail line footprint when vegetation is removed. The Mac East Variant-Connector 2a-Big Lake Alternative would cross the highest percentage of highly or potentially highly erodible soils (43 percent of soils crossed). For all rail line alternatives, 28 percent or more of soils crossed would be highly or potentially highly erodible (see Chapter 3, Table 3-8). Finally, all rail line alternatives would be located partially within a floodplain. Across all the alternatives, those that include the Houston-Houston North Segment Combination and the Willow Segment would impact the greatest amount of floodplains (27 and 26 acres, respectively) within the rail line footprint (see Chapter 4, Table 4.4-4). Construction of the rail line in these floodplain areas could result in alteration of natural drainage patterns and floodplain storage capacity, creating changes that could affect vegetation outside the rail line footprint. The following paragraphs and Table 5.2-6 summarize potential impacts to vegetation by alternative.

Mac West-Connector 1-Willow Alternative

Construction of this alternative would impact 779 acres of vegetation within the rail line footprint (Table 5.2-6). The Mac West-Connector 1-Willow and Mac West-Connector 1-Houston-Houston North alternatives would impact the largest amount of evergreen forests, which are more susceptible to fire than other vegetation types in the area (Table 5.2-6). Because a large amount of the potential impact would be to forested areas, restoration of vegetation along this alternative could take between 25 and 150 years, representing a long-term loss of habitat. In addition, this alternative would impact approximately 26 acres of floodplains within the rail line footprint (see Chapter 4, Table 4.4-4). Construction in floodplain areas could impact vegetation through the alteration of natural drainage patterns and floodplain storage within the rail line footprint, creating changes that could affect vegetation outside the rail line footprint. Because the Mac West-Connector 1-Willow Alternative would traverse the flattest terrain with only 700 linear feet of the rail line with a slope greater than 5 percent (see Chapter 3, Table 3-2), removal

of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the rail line footprint. This alternative only has 33 percent of its soils classified as highly or potentially highly erodible (see Chapter 3, Table 3-8).

Mac West-Connector 1-Houston-Houston North Alternative

Construction of this alternative would impact 663 acres of vegetation within the rail line footprint. Compared to other alternatives, the Mac West-Connector 1-Houston-Houston North Alternative would impact the greatest number of acres of woody wetlands and the least amount of shrub/scrub. The Mac West-Connector 1-Houston-Houston North Alternative and the Mac West Connector 1-Willow Alternative would impact the largest amount of evergreen forests, which are more susceptible to fire than other vegetation types in the area (Table 5.2-6). In addition, this alternative would impact approximately 27 acres of floodplains within the rail line footprint (see Chapter 4, Table 4.4-4), which could lead to impacts to vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage within the rail line footprint. Because the Mac West-Connector 1-Houston-Houston North Alternative would traverse a small portion of highly erodible soils (only 28 percent of soils crossed are highly or potentially highly erodible and only 1,600 linear feet with a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the rail line footprint.

Mac West-Connector 1-Houston-Houston South Alternative

Construction of this alternative would impact 608 acres of vegetation within the rail line footprint. Compared to other alternatives, the Mac West-Connector 1-Houston-Houston South Alternative would impact the least number of acres of deciduous forest and mixed forest. Compared to other alternatives, this alternative would result in the greatest impact to emergent wetlands (Table 5.2-6). The Houston South Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would impact 4 acres of floodplains within the rail line footprint (see Chapter 4, Table 4.4-4). Because the Mac West-Connector 1-Houston-Houston South Alternative would traverse a small portion of highly erodible soils (only 26 percent of the soils crossed are highly or potentially highly erodible and only 1,600 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the rail line footprint.

Mac West-Connector 2-Big Lake Alternative

Construction of this alternative would impact 716 acres of vegetation within the rail line footprint. Compared to the other alternatives, the Mac West-Connector 2-Big Lake Alternative would impact the second greatest number of acres of woody wetlands (Table 5.2-6). The Big Lake Segment of this alternative would travel through some developed areas and would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. The Big Lake Segment would also travel through one of the greatest areas of steep terrain and highly erodible soils (29 percent of the soils crossed by this alternative are highly or potentially highly erodible and 6,000 linear feet of land has a slope

greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along this alternative could contribute to an increase in erosion and sedimentation beyond the rail line footprint. Because this alternative, along with all alternatives including the Big Lake Segment, would have the least impact to floodplains (approximately 1 acre within the rail line footprint, see Chapter 4, Table 4.4-4), it would not be expected to lead to substantial impacts to vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage within the rail line footprint. Because of its proximity to more developed areas, the Mac West-Connector 2-Big Lake Alternative would also have the largest footprint area under a critical fire protection classification.

Mac East-Connector 3-Willow Alternative

Construction of this alternative would impact 822 acres of vegetation within the rail line footprint. This alternative would have the greatest impact to vegetation (in terms of acreage) across all the alternatives. Compared to other alternatives, the Mac East-Connector 3-Willow Alternative would impact the greatest number of acres of forested land and the least number of acres of emergent wetlands (Table 5.2-6). Due to the large acreage of forested land this alternative would impact, restoration of vegetation along this alternative could take between 25 and 150 years, representing a long-term habitat loss. In addition, this alternative would impact approximately 26 acres of floodplain in the rail line footprint (see Chapter 4, Table 4.4-4). Construction in floodplain areas could impact vegetation through the alteration of natural drainage patterns and floodplain storage within the rail line footprint, creating changes that could affect vegetation outside the rail line footprint. This alternative would also travel through areas of steep terrain and highly erodible soils (38 percent of the soils crossed are highly or potentially highly erodible and 2,000 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8).

Mac East-Connector 3-Houston-Houston North Alternative

Construction of this alternative would impact 708 acres of vegetation within the rail line footprint (Table 5.2-6). The Houston North Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would also impact approximately 27 acres of floodplains in the rail line footprint (see Chapter 4, Table 4.4-4), which could lead to impacts to vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage within the rail line footprint. This alternative would also travel through areas of steep terrain and highly erodible soils (34 percent of the soils crossed are highly or potentially highly erodible and 2,900 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8).

Mac East-Connector 3-Houston-Houston South Alternative

Construction of this alternative would impact 652 acres of vegetation within the rail line footprint. The Houston South Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would also travel through areas of steep terrain and highly erodible soils (33 percent of the soils crossed are highly or potentially highly erodible and

2,900 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). The Mac East-Connector 3-Houston-Houston South Alternative would also impact 4 acres of floodplains in the rail line footprint (see Chapter 4, Table 4.4-4).

Mac East-Big Lake Alternative

Construction of this alternative would impact 731 acres of vegetation within the rail line footprint (Table 5.2-6). Compared to other alternatives, the Mac East-Big Lake Alternative would impact the fewest number of acres of agricultural land. Along with the other alternatives that include the Big Lake segment, this alternative would result in the least impact to floodplains (approximately 1 acre in the rail line footprint, see Chapter 4, Table 4.4-4). Therefore, the Mac East-Big Lake Alternative would not be expected to lead to substantial impacts to vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage capacity. The Mac East-Big Lake Alternative would travel through the greatest area of steep terrain and cross the second highest percentage of highly erodible soils (40 percent of the soils crossed are highly or potentially highly erodible and 7,300 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along the rail line could contribute to a substantial increase in erosion and sedimentation beyond the rail line footprint. This alternative, along with the Mac West-Connector 2-Big Lake Alternative, would have the largest footprint area under a critical fire protection classification. However, this alternative would impact the second lowest amount of acreage of evergreen forest, which is the most susceptible vegetation in the study area to fire.

Mac East Variant-Connector 2a-Big Lake Alternative

Construction of this alternative would impact 714 acres of vegetation within the rail line footprint. The Big Lake Segment of this alternative would travel through some developed areas and would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would travel through one of the greatest areas of steep terrain and cross the highest amount of highly erodible soils (43 percent of the soils crossed by this alternative are highly or potentially highly erodible and 6,000 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along this alternative could contribute to increased erosion and sedimentation beyond the rail line footprint. Because this alternative, along with the other alternatives including the Big Lake Segment, would have the least impact on floodplains (approximately 1 acre within the rail line footprint, see Chapter 4, Table 4.4-4), it would not be expected to impact vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage within the rail line footprint. This alternative, along with the Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives, would have the largest footprint area under a critical fire protection classification.

Mac East Variant-Connector 3 Variant-Willow Alternative

Construction of this alternative would impact 821 acres of vegetation within the rail line footprint. After the Mac East-Connector 3-Willow Alternative, this alternative would have the greatest impact to vegetation (in terms of acreage) across all the alternatives. Specifically, this alternative has the greatest impact to cultivated crops/pasture/hay and the second greatest

impacts to deciduous and mixed forests. Compared to other alternatives, the Mac East Variant-Connector 3 Variant-Willow Alternative would impact the least number of acres of woody wetlands (Table 5.2-6). Due to the large acreage of forested land this alternative would impact, restoration of vegetation along this alternative could take between 25 and 150 years, representing a long-term habitat loss. In addition, this alternative would impact approximately 26 acres of floodplains in the rail line footprint (see Chapter 4, Table 4.4-4). Construction in floodplain areas could impact vegetation through the alteration of natural drainage patterns and floodplain storage within the rail line footprint, creating changes that could affect vegetation outside the rail line footprint. Because the Mac East Variant-Connector 3 Variant-Willow Alternative would traverse the flattest terrain with only 700 linear feet of the rail line with a slope greater than 5 percent (see Chapter 3, Table 3-2), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the rail line footprint. This alternative has 40 percent of its soils classified as highly or potentially highly erodible, the second highest percentage among all alternatives (see Chapter 3, Table 3-8).

Mac East Variant-Connector 3 Variant-Houston-Houston North Alternative

Construction of this alternative would impact 707 acres of vegetation within the rail line footprint (Table 5.2-6). Compared to other alternatives, the Mac East Variant-Connector 3 Variant-Houston-Houston North Alternative would have the second greatest impact to agricultural land, along with the Mac East Variant-Connector 3 Variant-Houston-Houston South Alternative. The Houston North Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would also impact approximately 27 acres of floodplains in the rail line footprint (see Chapter 4, Table 4.4-4), which could lead to impacts to vegetation outside the rail line footprint due to alteration of natural drainage patterns and floodplain storage within the rail line footprint. This alternative would also travel through a small portion of steep terrain and a significant amount of highly erodible soils (37 percent of the soils crossed are highly or potentially highly erodible and 1,600 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along this alternative could contribute to an increase in erosion and sedimentation beyond the rail line footprint.

Mac East Variant-Connector 3 Variant-Houston-Houston South Alternative

Construction of this alternative would impact 651 acres of vegetation within the rail line footprint. Compared with other alternatives, the Mac East Variant-Connector 3 Variant-Houston-Houston South Alternative would have the second greatest impact to cultivated crops/pasture/hay and emergent wetlands. The Houston South Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would impact 4 acres of floodplains within the rail line footprint (see Chapter 4, Table 4.4-4). The Mac East Variant-Connector 3 Variant-Houston-Houston South Alternative travels through a small portion of steep terrain and a significant amount of highly erodible soils (36 percent of the soils crossed are highly or potentially highly erodible and 1,600 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along this

alternative could contribute to an increase in erosion and sedimentation beyond the rail line footprint.

5.2.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to vegetation.

5.2.5 Unavoidable Environmental Consequences of the Proposed Action

To avoid or minimize the potential environmental impacts to vegetation from the proposed rail line as described above in Section 5.2.4.1, OEA is recommending that the Board impose 4 mitigation measures, including 1 measure volunteered by the Applicant (see Section 19.3). These measures include requiring: acquisition of appropriate state permits and authorizations; minimization of ground disturbance and vegetation clearing; development and implementation of a nonnative invasive species control plan; and development of a restoration and revegetation plan for disturbed areas.

Notwithstanding the recommended mitigation measures, there still would be potential unavoidable impacts to vegetation from the proposed rail line. Potential impacts would include: loss in vegetation; loss or alteration of forested habitat; ongoing vegetation removal and control from the track ballast and adjacent areas, where necessary, for safe operation; altered vegetation communities due to soil compaction; and altered vegetation succession caused by changes in fire cycles.