

1 **1.9 EASTERN BROADLEAF FOREST (CONTINENTAL) ECOREGION**
2 **(222)**

3 The Eastern Broadleaf Forest (Continental) Ecoregion is a deciduous forest with rolling hills and
4 nearly flat areas (Figure 1.1-3). Savanna-like in the northwesternmost region of Minnesota, it is
5 dominated by drought-resistant oak-hickory forest. To the south, increasingly large areas of
6 beech-maple forests inhabit formerly glaciated areas, such as Ohio. Glaciers once covered most
7 of this area. Elevations range from 80 to 1,650 feet (24 to 502 meters) above sea level.

8 States in this ecoregion include New York, Pennsylvania, Ohio, Michigan, and Minnesota.

9 The Eastern Broadleaf Forest (Continental) Province is dominated by deciduous forest, favoring
10 a drought-resistant oak-hickory association due to lower amounts of precipitation. Some
11 formerly glaciated areas throughout the region have beech-maple forests where greater rainfall
12 occurs. In these areas, oak and hickory grow on poorer sites with low fertility levels.

13 Silviculture is one of the dominant economic activities in the midwestern states of this province,
14 especially in Minnesota and Michigan. These forests range from the cool, nearly boreal forests
15 of northern Minnesota to the warm, oak-hickory forests of southern Michigan, and span both the
16 Laurentian Mixed Forest and the Eastern Broadleaf Forest (Continental) ecoregions.

17 This ecoregion shares many characteristics with the oceanic broadleaf forest to the east;
18 however, precipitation decreases in quantity and effectiveness inland. The average annual
19 temperature in the northern portions is 40 degrees Fahrenheit (4 degrees Celsius) with 65 degrees
20 Fahrenheit (18 degrees Celsius) as an average in the south. Summers are typically very warm,
21 and this region experiences frequent tornadoes. Precipitation ranges from about 20 inches (51
22 centimeters) in northwestern Minnesota to approximately 40 inches (102 centimeters) annually
23 in Ohio (Bailey, 1995).

24 **1.9.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT**

25 The blocks of regionally significant habitat below are relatively undeveloped and intact habitat
26 protected as wilderness, state parks, and state and national forests. Regionally significant or
27 intact habitat refers to areas of largely unfragmented habitat with few alterations or
28 disturbances, such as roads or other development. Most areas listed are protected by law
29 (wilderness areas, national parks) and often cross state and country boundaries, while others may
30 occupy large expanses of private lands.

31 Selected regionally significant blocks that represent this region include:

- 32 • Hayes Lake State Park–Northern Minnesota;
- 33 • Zippel Bay State Park–Northern Minnesota;
- 34 • Garden Island State Recreation Area–Northern Minnesota;
- 35 • Seven Lakes State Park–Southeastern Michigan;
- 36 • Maybury State Park–Southeastern Michigan;
- 37 • Van Buren Lake State Park–Northern Ohio; and

- Lake Erie Islands State Park –Northern Ohio.

1.9.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities representing sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and are home to many of the threatened and endangered species in the next section. For example, hardwood swamps exist in many forested areas in this broad geographic region where species such as green ash (*Fraxinus pennsylvanica*) and cattail sedge (*Carex typhina*), as well as a wide variety of other common plant species, such as sphagnum mosses (*Sphagnum* spp.), live. Some habitat names, such as hardwood swamp, describe habitats found across several regional boundaries and are more general in meaning. Others, such as Great Lakes shorelines (a type of wetland plant community), define much more specific ecological associations.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the World Wildlife Fund (2001), ecological system descriptions within the NatureServe.org database, and each state’s respective natural resources agency.

- Inland lake shorelines–Inland lakes with fluctuating water levels and specialized biota adapted to sandy or gravelly habitats;
- Great Lakes shorelines–Adjacent to margins of lakes Huron, Erie, and Ontario;
- Hardwood swamps–Dominated by trees with deciduous leaves;
- Wetlands–Marshes, swamps, or bogs characterized by wetness, soils, and specific vegetation;
- Prairies–Predominately treeless grasslands;
- Natural arches and bridges–Naturally formed bridges, such as Rockbridge in Ohio; and
- Freshwater estuaries–Especially along the Great Lakes where lake waters meet river mouths.

Hardwood swamp



(Michigan State University)

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1 **1.9.3 THREATENED AND ENDANGERED SPECIES**

2 Appendix F3 lists the threatened and endangered species in this ecoregion. An example of a state
3 threatened or endangered species within this province that may be disturbed by human activity is
4 the peregrine falcon (*Falco peregrinus*), which is listed as state endangered in Minnesota and
5 Ohio and threatened in Michigan and New York. These falcons prefer open habitats around
6 water, with tall cliffs where they nest on ledges jutting from bare, steep rock walls. Since the
7 young are completely dependent on their parents, any disturbance during the breeding season
8 may decrease nesting sites and local populations.

9 The piping plover (*Charadrius melodus*), a federally listed species, also occurs in this region.
10 The piping plover offers a primary example of the interaction between threatened and
11 endangered species and human activities. Since the piping plover is federally listed, wildlife
12 refuges already have plans in place for monitoring or recovery of the piping plover’s
13 populations.

14 Other federally listed species in this province live in forested areas near lakeshores and marshes,
15 including other bird species, such as the merlin (*Falco columbarius*), osprey (*Pandion*
16 *haliaetus*), and whooping crane (*Grus americanus*). Other mammals, reptiles, and insects also
17 occur in these habitats, such as the Indiana bat (*Myotis sodalists*), bog turtle (*Glyptemys*
18 *muhlenbergii*), and Karner blue butterfly (*Lycaeides melissa samuelis*) along with many species
19 of mussels.

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Whooping crane



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(USFWS)

23 Although some species are listed as endangered or threatened at either the Federal or state level,
24 others are categorized differently as species of “conservation concern” or “special concern.”

25 **1.9.4 WILDLIFE**

26 Both game (legally hunted) and non-game (legally protected, but not threatened or endangered)
27 animals make their homes in the primary forests and wetlands of this ecoregion. Insectivorous
28 species, among other birds, migrate into or out of this province twice each year. This province
29 also contains a wide variety of year-round wildlife residents. Over 350 species of birds breed in,
30 migrate through, or winter in this ecoregion (NYSOS, 2010).

1 The coniferous forests house numerous species. Some of the mammals include white-tailed deer
2 (*Odocoileus virginianus*), coyote (*Canis latrans*), fox, shrews and squirrel. Common amphibians
3 include the spotted salamander (*Ambystoma maculatum*) and the American toad (*Bufo*
4 *americanus*).

5 Broadleaf forests are rich in wildlife diversity. Red (*Tamiasciurus hudsonicus*), gray (*Sciurus*
6 *carolinensis*), and fox squirrels (*S. niger*) as well as eastern chipmunk (*Tamias striatus*) are
7 locally abundant. Various songbirds, woodpeckers, and owls also live in these forests, which
8 provide good shelter, nesting, and foraging habitat.

9 1.9.5 VEGETATIVE HABITAT

10 Vegetative cover within the Eastern Broadleaf Forest Province is dominated by forested habitats,
11 but also includes grasslands and wetlands. Typical cover consists mainly of oak-hickory forests
12 with increasing numbers of maple-beech forests. Wetter sites can include elm (*Ulmus* spp.) and
13 tulip tree (*Liriodendron tulipifera*). This province typically has a well-developed understory of
14 flowering dogwood (*Cornus florida*), sassafras (*Sassafras albidum*), and hop hornbeam (*Ostrya*
15 *virginiana*), along with other shrubs, evergreens, and wildflowers. Existing wetland types
16 include cattail marshes, wooded wetlands and swamps, and wet meadows (EOE, 2009).

17

Tulip tree flowers



18

19

(University of British Columbia Botanical Garden)

20 Land alterations have greatly affected oak trees (*Quercus* spp.) in this province. Changes due to
21 climate, land use, and natural area disturbance have all contributed to the decline of white oak
22 (*Q. alba*) trees (Abrams, 2003). Red (*Q. rubra*) and chestnut oaks (*Q. prinus*) have replaced
23 white oaks in these areas; however, red oaks are more susceptible to a pathogen known as
24 sudden oak death (*Phytophthora ramorum*) (McShea et al., 2007).

25 Common invasive species of concern include garlic mustard (*Alliaria petiolata*), honeysuckle
26 (*Lonicera* spp.), common (*Rhamnus cathartica*) and glossy buckthorn (*R. frangula*), orange
27 hawkweed (*Hieracium lachenalii*), common reed (*Phragmites australis*), purple loosestrife
28 (*Lythrum salicaria*), and Canada thistle (*Cirsium arvense*) among others.

29 New invasive species to watch for include autumn olive (*Elaeagnus umbellata*), leafy spurge
30 (*Euphorbia esula*), giant hogweed (*Heracleum mantegazzianum*), Japanese knotweed
31 (*Polygonum cuspidatum*), giant knotweed (*P. sachalinense*), and garden valerian (*Valeriana*

1 *officinalis*) (Center for Invasive Plant Management, 2010; MNDNR, 2009; USDA, 2003a). For
2 example, Minnesota has a list of prohibited invasive species, which includes the European wild
3 boar and a list of regulated invasive species, including the koi (*Cyprinus carpio*), goldfish
4 (*Carassius auratus*), rusty crayfish (*Orconectes rusticus*), and mute swan (*Cygnus olor*).

5 1.9.6 WETLANDS AND WATERWAYS

6 Wetlands within the Eastern Broadleaf Forest (Continental) Province portion of the project area
7 include approximately: 2,316,695 acres of forested and scrub-shrub wetlands; 946,175 acres of
8 emergent wetlands; 4,280,190 acres of lakes; 205,830 acres of ponds; and 174,395 acres of
9 riverine habitats (USDOI, 2010b). All types of wetlands are prevalent, but lake habitat is
10 especially abundant because this ecoregion encompasses shoreline along four of the five Great
11 Lakes.

12 Major rivers include the Grand, Cuyahoga, Sandusky, and Maumee in Ohio, the Shiawassee in
13 Michigan, and the Upper Mississippi, Crow Wing, and Rum in Minnesota. Numerous smaller
14 rivers, streams, and tributaries flow through the area. In addition to the Great Lakes, numerous
15 smaller lakes and ponds also dot the region.

16 1.9.7 AQUATIC RESOURCES

17 Aquatic resources are of high quality in the Eastern Broadleaf Province. Abundant lakes, rivers,
18 ponds, and wetlands constitute dominant features of the landscape. Four of the Great Lakes
19 border this province: Michigan, Huron, Erie, and Ontario. These resources attract many outdoor
20 enthusiasts for hunting, fishing, and camping.

21 Many wetland habitats in this region have been disturbed, largely due to agricultural land use
22 practices and urbanization. Wetlands are especially sensitive to disturbances, such as
23 channelization and ditching.

24 The aquatic resources of this region support a diverse fishery. Notable fish species include
25 walleye (*Sander vitreus*), northern pike (*Esox lucius*), muskellunge (*E. masquinongy*) the non-
26 native coho (*Oncorhynchus kisutch*) and chinook salmon (*O. tshawytscha*), smallmouth
27 (*Micropterus dolomieu*) and largemouth bass (*M. salmoides*), brook trout (*Salvelinus fontinalis*),
28 brown trout (*Salmo trutta*), yellow perch (*Perca flavescens*), and emerald shiner (*Notropis*
29 *atherinoides*). Habitat for sunfish (*Lepomis* spp.), and mudminnows (*Umbra* spp.) also exists. A
30 variety of native reptiles, amphibians, waterbirds, aquatic insects, mussels, and crustaceans thrive
31 in these waters and wetlands.

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Zebra mussels



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(University of Michigan)

4 Accidental introductions of invasive species have serious impacts on aquatic resources,
5 damaging fisheries and native habitats. These species pose a great threat to both aquatic and
6 terrestrial resources (USDA, 2010). Common invasive plants of concern include marsh thistle
7 (*Cirsium palustre*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris*
8 *arundinacea*), common reed (*Phragmites australis*), curly pondweed (*Potamogeton crispus*), and
9 flowering rush (*Butomus umbellatus*). Invasive aquatic animal species of concern include the
10 rusty crayfish (*Orconectes rusticus*), sea lamprey (*Petromyzon marinus*), round goby (*Neogobius*
11 *melanostomus*), zebra mussel (*Dreissena polymorpha*), and quagga mussel (*Dreissena*
12 *rostriformis bugensis*) among others.

13 1.10 LAURENTIAN MIXED FOREST ECOREGION (212)

14 The Laurentian Mixed Forest Ecoregion forms a “transition zone” between true boreal forest to
15 the north (predominately coniferous northern forest type) and broad-leaved deciduous forest
16 ecoregions to the south (Figure 1.1-3, Figure 1.1-4, and Figure 1.1-5). It incorporates some
17 characteristics of each.

18 States in this ecoregion include Maine, Vermont, New York, Pennsylvania, Michigan,
19 Wisconsin, and Minnesota.

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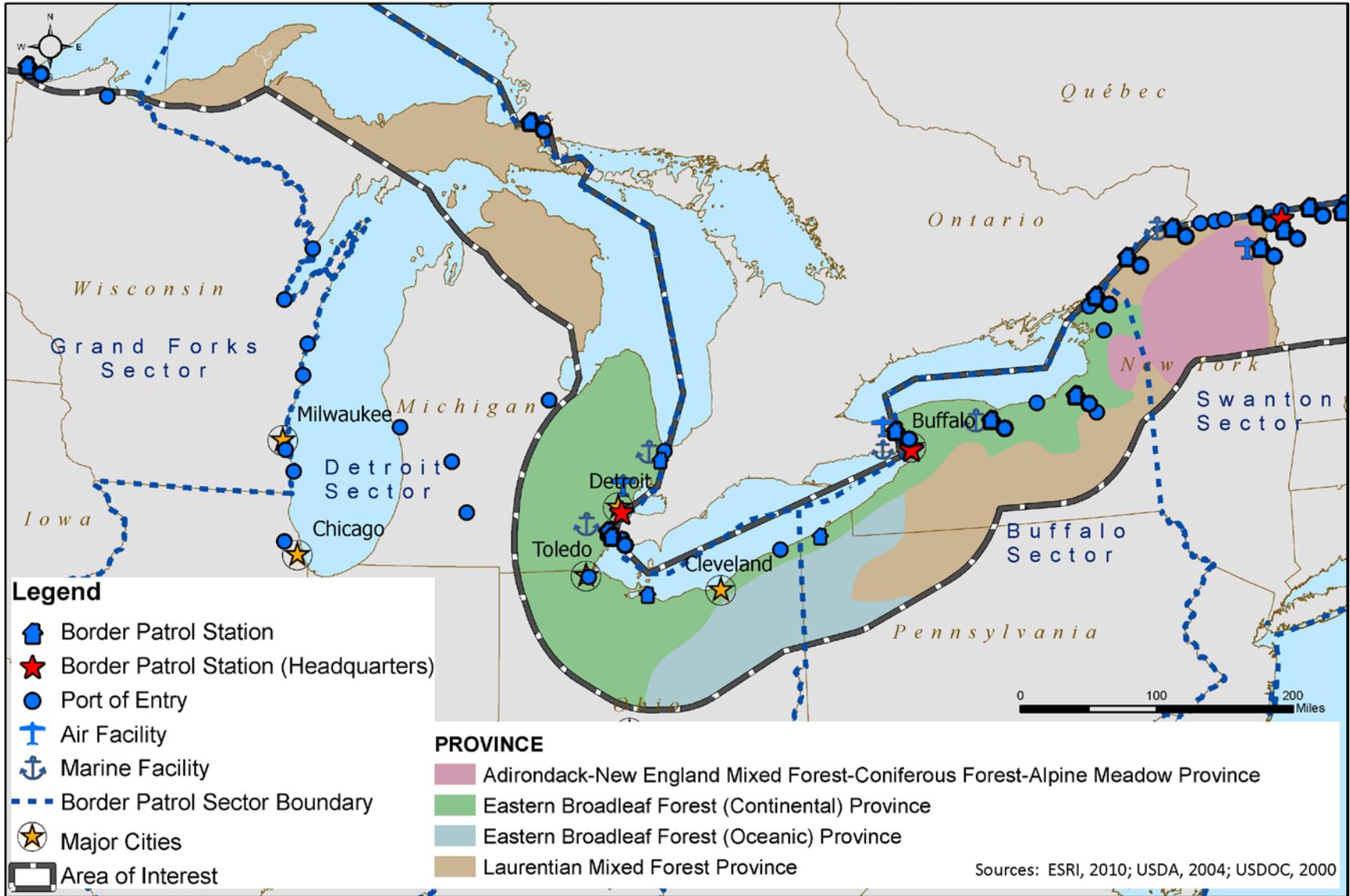
Laurentian Mixed Forest



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(University of Minnesota)

Figure L-4. Ecoregions in the Great Lakes Region



1 Most of this ecoregion is characterized by low relief, with rolling hills in many areas. Many
2 large and small lakes, wetland depressions, moraines, eskers, kames, outwash plains, drumlins,
3 and other glacial features make up the landscape. Glaciers covered this area during parts of the
4 Pleistocene (Bailey, 1995).

5 The climate of the Laurentian Mixed Forest Ecoregion is moderated by proximity to the Great
6 Lakes to the west and the Atlantic Ocean to the east. Winters in this ecoregion are moderately
7 long and fairly severe, but more than one-third of the year has temperatures above 50 degrees
8 Fahrenheit (10 degrees Celsius). Mean temperatures range from 35 to 50 degrees Fahrenheit (2
9 to 10 degrees Celsius). A brief growing season restricts agriculture; the frost-free season only
10 lasts from 100 to 140 days. Snow generally persists all winter. Average annual precipitation is
11 moderate, ranging from 24 to 45 inches (61 to 115 centimeters), with most precipitation falling
12 in summer (Bailey, 1995).

13 Agriculture and forestry comprise two of the dominant economic activities in the Laurentian
14 region. Common agricultural practices include row crop, dairy, grazing, orchard, and vegetable
15 crop production. Silviculture and forestry practices are common on publically and federally
16 owned hardwood and coniferous forests in the Great Lakes area as well as the northeastern
17 states.

18 Approximately 20 percent of the Western Great Lakes Laurentian forests remain as intact
19 habitat. Minnesota, for example, has 2630 square kilometers (650,000 acres) of extant old-
20 growth forest, more than any other state in the eastern third of the nation (Davis, 1996). A large
21 portion of this habitat is concentrated in the Boundary Waters/Quetico Provincial area, which is
22 legally protected on both sides of the Minnesota-Ontario boundary. Similarly, with 17.7 million
23 acres of forest, Maine is the most heavily forested state in the Nation with 90 percent still
24 forested. The state's forest has remained essentially stable over recent decades (USDA, 2003c).

25

Boundary Waters Canoe Area Wilderness



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(Jim Brandenburg)

1 The historical forests of the Laurentian Mixed Forest Ecoregion were diverse due to the variety
2 of landforms, soils, disturbance regimes, and reproductive strategies of the tree species in this
3 area. Fires are part of an important disturbance regime in the region, particularly within
4 coniferous stands. Fire suppression and human-induced changes in the composition and
5 structure of the landscape have made modern fire rotations many times longer than those of the
6 historical record for ecosystems in the Laurentian Ecoregion. In a Michigan study—
7 representative of the ecoregion as a whole—natural fire rotations have increased from
8 approximately 250 years in the postglacial past to approximately 3,000 years currently (Cleland
9 et al., 2004).

10 Pines, especially jack pine, are often the pioneer species that revegetate burned areas or
11 abandoned farmland. Fires from lightning storms are common in this ecoregion, particularly
12 where sandy soils dominate.

13 A significant aspect of forest conversion in this ecoregion is the change from mature pine to
14 aspen forest. Logging is the dominant cause of this conversion. Many thousands of hectares of
15 the forest, outside of core, protected areas, have been converted to young successional stands.

16 In some areas, particularly in the northern reaches of the ecoregion, extensive areas of coniferous
17 forest still exists, but much of the landscape has transitioned from its pre-European settlement
18 status to that of an actively managed forest. The majority of the original white and red pine
19 forest was logged in the last two decades of the 19th century and has been replaced by a mixed
20 forest, with remnants of scattered pine species. This conversion has taken place across much of
21 the region and caused extensive ecological change, with pre-settlement (“original”) plant
22 communities replaced or extensively altered.

23 **1920s–1930s logging crew in Minnesota**



(Corbis Images)

24
25
26 Mixed stands, by their nature, include additional coniferous and deciduous species, especially in
27 the southern portions of the region. Some of these coniferous species are eastern red cedar
28 (*Juniperus virginiana*) in New York, northern white cedar (*Thuja occidentalis*) in Vermont, and
29 eastern hemlock (*Tsuga canadensis*) in Maine and New York.

1 **1.10.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT**

2 The blocks of regionally significant habitat below are relatively undeveloped and intact habitat
3 protected as wilderness, state parks, and state and national forests. Intact habitat or regionally
4 significant habitat refers to areas of largely unfragmented habitat with few alterations or
5 disturbances, such as roads or other development. Most areas listed are protected by law
6 (wilderness areas, national parks) and often cross state and country boundaries, while others may
7 occupy large expanses of private lands.

8 Selected regionally significant blocks that represent this region include:

- 9 • Boundary Waters Canoe Area Wilderness–Northeastern Minnesota - (U.S. area is
10 contiguous to Ontario’s Quetico Provincial Park);
- 11 • Quetico Provincial Park–Southeastern Ontario (on the U.S.-Canada border);
- 12 • Chequamegon/Nicolet National Forest–Northern Wisconsin;
- 13 • Superior National Forest–Northeastern Minnesota;
- 14 • Chippewa National Forest–Northern Minnesota;
- 15 • Ottawa National Forest–Northwestern Michigan;
- 16 • Hiawatha National Forest–Northwestern Michigan;
- 17 • Great Lakes: Lake Superior, Lake Michigan, and Lake Huron;
- 18 • Voyageurs National Park–Northern Minnesota;
- 19 • Isle Royale National Park–Northern Michigan;
- 20 • Apostle Islands National Park–Northern Wisconsin;
- 21 • Porcupine Mountains State Park–Northern Michigan;
- 22 • Baxter State Park–Maine;
- 23 • Finger Lakes –New York; and
- 24 • Acadia National Park–Maine.

1

Acadia National Park



(NPS)

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4 1.10.2 SENSITIVE HABITATS

5 Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities
 6 that represent sensitive habitats. The sensitive habitats described here occur in many of the
 7 larger intact habitat areas in the prior section and are home to many of the threatened and
 8 endangered species in the next section. For example, cedar/tamarack swamps exist in many
 9 forested areas in this broad geographic region and house protected species, such as the ram's-
 10 head lady's slipper (*Cypripedium arietinum*), as well as various common plant species. such as
 11 sphagnum mosses (*Sphagnum* spp.). Some habitat names used below, such as the
 12 cedar/tamarack swamp, describe habitats found across several regional boundaries, and are more
 13 general in meaning. Others, such as calcareous fens (a rare type of wetland plant community),
 14 define much more specific ecological associations.

15 Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and
 16 diverse areas. The list of sensitive habitats is based on those enumerated and described by the
 17 World Wildlife Fund (2001), ecological system descriptions within the NatureServe.org
 18 database, and each state's respective natural resources agency.

- 19 • Bogs–Wetland that accumulates acidic peat with deposits built of dead plant material;
- 20 • Calcareous fens–Rarest wetland community in Minnesota and Wisconsin, with input of
 21 alkaline mineral-rich groundwater;
- 22 • Cedar/tamarack swamps–Forested wetland characterized by one or both of these tree
 23 species;
- 24 • Sedge meadow–Wetland dominated by sedges growing on saturated soils typically
 25 composed of peat or muck;
- 26 • Hardwood swamps–Deciduous forested wetland;
- 27 • Flowages–Series of connected lakes;
- 28 • Freshwater estuaries–Ecological community where lake and river waters mix;

- 1 • Boreal forests–Predominately coniferous forest of the Northern Hemisphere;
- 2 • Great Lakes beaches and shorelines–Great Lakes beach natural community at the
- 3 interface of land and water and found at margins of lakes Michigan, Huron, and Superior
- 4 and often associated with sparsely vegetated dune systems; and
- 5 • Inland lake shorelines–Beaches of inland lakes characterized by water-level fluctuations
- 6 preventing development of stable shoreline plant communities, and instead supporting a
- 7 more-specialized biota adapted to sandy or gravelly shorelines.

8 These sensitive ecological communities are less likely to withstand the effects of mechanized
 9 human activities and disturbance at a water-soil interface without sustaining damage than are
 10 broad agricultural zones, deciduous forests, grasslands, or other more generalized areas of
 11 vegetation or land use.

12 Wetlands can prove very sensitive to disturbance with a greater likelihood of slow repair
 13 (Maryland Dept. of Environment, 2010; Sheldon et al., 2005). Half of the nation’s original 221
 14 million acres of wetlands are estimated to have been lost (Feierabend, 1992).

15 **1.10.3 THREATENED AND ENDANGERED SPECIES**

16 Appendix F3 lists the threatened and endangered species in this ecoregion. The piping plover
 17 (*Charadrius melodus*), a federally listed species, is also found in this region, especially along the
 18 shores of the Great Lakes. Since this species nests on wide, flat, open sandy beaches, human
 19 activities that alter or disturb their habitat may affect populations nesting in or migrating through
 20 the area. Landscape alterations may also increase mortality of their young. The piping plover
 21 offers a primary example of the interaction between threatened and endangered species and
 22 human activities. Since this bird is a federally listed species, wildlife refuges have plans in place
 23 for monitoring or recovery of piping plover populations.

24

Young piping plover



25
 26

(USFWS)

27 Federally listed endangered species in Wisconsin, Michigan, Pennsylvania, Ohio, and New York
 28 include the piping plover. Examples of state-listed endangered species in Wisconsin include the
 29 peregrine falcon, Caspian tern (*Sterna caspia*), and Forster’s tern (*S. forsteri*). Michigan, Ohio,
 30 Pennsylvania, New York, and Wisconsin all list the loggerhead shrike (*Lanius ludovicianus*) in

1 the state endangered category. Development and other human activities may affect endangered
2 or threatened species if impacts occur within the habitats used by these species. Also vulnerable
3 are breeding colonies of common terns (*S. hirundo*), which breed and nest on sand beaches
4 similar to those of the piping plover.

5 In forested habitats within the Laurentian Ecoregion, the merlin (*Falco columbarius*), Kirtland's
6 warbler (*Dendroica kirtlandii* (found only locally in Michigan and Wisconsin), spruce grouse
7 (*Falcipennis canadensis*), northern goshawk (*Accipiter gentilis*), and black-backed woodpecker
8 (*Picoides arctus*) are some of the sensitive species that could be affected by construction or
9 other human disturbances, especially during the breeding season (generally from March through
10 July).

11 Although some species are listed as endangered or threatened at either the Federal or state level,
12 other species are categorized differently as of "conservation concern" or "special concern."

13 1.10.4 WILDLIFE

14 The primary forests and wetlands in this ecoregion are home to various wildlife species,
15 including both game (legally hunted) species and non-game (legally protected but not
16 endangered or threatened) species. Many birds, especially insectivorous species, migrate into or
17 out of this ecoregion twice each year, with over 300 avian species throughout the year, either
18 during breeding season, spring or fall migration, or winter (NYSOS, 2010). A wide variety of
19 wildlife species remain in the ecoregion throughout the year.

20 The coniferous woodlands of the ecoregion are characterized by long winters and a short
21 growing season. The forest stands provide good shelter, nesting, and foraging habitat. Common
22 mammals include black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*),
23 fisher (*Martes pennanti*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), foxes, shrews, and
24 squirrels. Amphibians include red-backed salamander (*Plethodon cinereus*), spotted salamander
25 (*Ambystoma maculatum*), red-spotted newt (*Notophthalmus viridescens*), and American toad
26 (*Bufo americanus*). Common garter snakes (*Thamnophis* spp.) and wood turtles (*Glyptemis*
27 *insculpta*) are adapted to this northern climate.

28 1.10.5 VEGETATIVE HABITAT

29 Forests dominate the vegetative cover in the Laurentian Ecoregion. Mixed forest stands are
30 comprised of several species of conifers, particularly white pine (*Pinus strobus*) in the Great
31 Lakes region, along with a mix of deciduous species. Typical vegetative cover consists of mixed
32 pine with aspen-birch (*Populus* spp. and *Betula* spp.), white pine, red pine (*P. resinosa*), jack
33 pine (*P. banksiana*), black spruce (*Picea mariana*), eastern hemlock (*Tsuga canadensis*), balsam
34 fir (*Abies balsamea*), and white cedar (*Thuja occidentalis*), sugar maple-beech-birch (*Acer*
35 *saccharum*, *Fagus* spp., *Betula* spp.), white-red-jack pine, and oak-hickory (*Quercus* spp. and
36 *Carya* spp.) cover types among others.

1

Ram's-head lady slipper, a state endangered plant in Maine



(Maine Natural Areas Program)

2
3

4 Mixed forest stands are common with species assemblages highly dependent on the soil.
 5 Deciduous species typically favor nutrient-rich soils, while conifers thrive in poor soils. Pine
 6 trees are common in areas frequented by fire. Shrub and herbaceous layers add to the vegetative
 7 diversity in each of these forests (Bailey, 1995; EOE, 2009). Mixed stands, by their nature,
 8 include additional coniferous and deciduous species, especially in the southern portions of the
 9 region. Such coniferous species include eastern red cedar (*Juniperus virginiana*) in the New
 10 York regions, northern white cedar in Vermont, and eastern hemlock in Maine and New York.

11 Land use changes in the region have led to broad-scale changes in forest patch or block sizes
 12 (Mladenoff et al., 1993), diminished plant and ecological community diversity (White and
 13 Mladenoff, 1994), and a general simplification of ecological communities, including the loss of
 14 some native species (Schultz et al. 2001, Anderson and Loucks, 1979). The landscape-wide,
 15 mixed coniferous-deciduous forest has, with a few exceptions, lost extensive areas of its conifers
 16 due to these changes.

17 Common invasive species of concern include garlic mustard (*Alliaria petiolata*), Japanese
 18 barberry (*Berberis thunbergii*), honeysuckle (*Lonicera* spp.), common buckthorn (*Rhamnus*
 19 *cathartica*), and glossy buckthorn (*Frangula alnus*), spotted knapweed (*Centaurea maculosa*),
 20 orange hawkweed (*Pilosella aurantiaca*), Canada thistle (*Cirsium arvense*), and sweet clovers
 21 (*Melilotus* spp.). New invasive species of increasing concern include wild chervil (*Anthriscus*
 22 *sylvestris*), purple crown vetch (*Securigera varia*), autumn olive (*Elaeagnus umbellata*), leafy
 23 spurge (*Euphorbia esula*), giant hogweed (*Heracleum mantegazzianum*), Dame's rocket
 24 (*Hesperis matronalis*), Japanese knotweed (*Fallopia japonica*), giant knotweed (*F.*
 25 *sachalinensis*), and garden valerian (*Valeriana officinalis*). These plants are only representatives
 26 of a growing list (USDA, 2003a). For example, Minnesota has a list of prohibited invasive
 27 species that includes the sea lamprey (*Petromyzon marinus*), New Zealand mud snail
 28 (*Potamopyrgus antipodarum*), European wild boar (*Sus scrofa*), and tubenose goby
 29 (*Proterorhinus marmoratus*).

1 **1.10.6 WETLANDS AND WATERWAYS**

2 Wetlands within the project area of the Laurentian Mixed Forest Ecoregion include
3 approximately: 143 acres of marine and estuarine deepwater habitats; 2,433 acres of marine and
4 estuarine marshes, beaches, and intertidal flats; over 7,159,520 acres of palustrine forested/scrub
5 shrub wetlands (swamps and wooded bogs); over 613,540 acres of palustrine emergent wetlands
6 (marshes, fens, wet meadows, sedge meadows, wet prairies); 1,373,290 acres of lacustrine
7 wetlands (lakes); 171,325 acres of palustrine open water (ponds); and 152,625 acres of riverine
8 habitat (rivers and streams) (USDOJ, 2010b). The marine and estuarine systems within the
9 ecoregion occur along the southeast coast of Maine, a portion of which sits within the project
10 area. The other wetland types are distributed widely with Maine, Michigan, and Wisconsin
11 having the greatest share.

12 **Forested wetland**



13
14 (Cedarburg Science/Lesley Brotkowski)

15 Several different types of wetlands in this ecoregion not only contain some rare species, but also
16 function as important aquatic resources. These wetlands include lacustrine shallow and open-
17 water communities, which are especially important for waterfowl production, along with
18 palustrine forested coniferous swamps. Some of the rare plant species in these wetlands are lake
19 cress, autumnal water-starwort, prickly hornwort, ram’s head lady slipper, and the round-leaved
20 orchid. Estuarine wetlands can include algal beds, cordgrass, salt marshes, and rushes.

21 Several major rivers run through the northeast part of this ecoregion, including the Aroostook,
22 Narragaus, St. Croix, and St. John in Maine; the White, Winooski, and Connecticut in
23 Vermont; and the St. Lawrence, Black, and Raquette in New York. The large water bodies
24 classified as lacustrine include the Cranberry, West Grand, and Big lakes in Maine. Wetlands of
25 special significance include maritime slope bogs, coastal plateau bogs, circumneutral fens, peat
26 bogs, and Atlantic white cedar wetlands. Wetlands such as the Appleton Bog in Maine are well
27 known and draw visitors. Maine designates emergent wetlands over 20,000 square feet as
28 wetlands of special significance (Maine Natural Areas Program, 2005).

29 In the Great Lakes part of the ecoregion, major rivers include the Allegheny in New York and
30 Pennsylvania, the Black, Au Sable, and Ontonagon in Michigan, the St. Louis in Wisconsin and

1 Minnesota, and the Big Fork, Little Fork, and Rainy in Minnesota. Several large lakes are within
2 the Minnesota portion of the project area: Mullet, Gogebic, Mud, Kabetogama, Rainy,
3 Vermilion, Red Lakes, and Lake of the Woods.

4 1.10.7 AQUATIC RESOURCES

5 Aquatic resources are highly regarded within the Laurentian Ecoregion, luring outdoor
6 enthusiasts to the region for hunting and fishing. Abundant lakes, rivers, ponds, and wetlands,
7 along with the remnants of glacial recession, are dominant features on the landscape. Three of
8 the Great Lakes (Superior, Michigan, and Huron), the St. Lawrence Seaway, and the Atlantic
9 Ocean border portions of this ecoregion.

10

Forested Stream



11

12

(Cedarburg Science/Lesley Brotkowski)

13 These aquatic resources support a diverse fishery. Notable fish species include the lake sturgeon
14 (*Acipenser fulvescens*), walleye (*Sander vitreus*), northern pike (*Esox lucius*), muskellunge (*Esox*
15 *masquinongy*), salmon (*Salmo salar*), smallmouth bass (*Micropterus dolomieu*), largemouth bass
16 (*M. salmoides*), brook trout (*Salvelinus fontinalis*), lake trout (*S. namaycush*), yellow perch
17 (*Perca flavescens*), white sucker (*Catostomus commersonii*), mottled sculpin (*Cottus bairdii*),
18 common shiner (*Luxilus cornutus*), and creek chub (*Semotilus atromaculatus*). Various native
19 reptiles, amphibians, waterbirds, aquatic insects, mussels, and crustaceans also thrive in these
20 waters (NOAA, 2010).

21 While shifting water levels in the Great Lakes have an important ecological role, inlet and outlet
22 controls within the basin have stabilized water levels to some degree, leading to significant
23 changes in lakeshore ecology. These changes include alteration of spawning areas for some fish
24 species. Natural raising and lowering of water levels allow some aquatic species to gain
25 footholds for brief periods. With dropping water level, aquatic vegetation can grow farther from
26 shore, providing new habitat for fish when water levels rise again.

27 Wetlands are also abundant within the Laurentian Ecoregion. Typical wetland habitats include
28 bogs, coniferous swamps, hardwood swamps, and fens. These wetlands are high-quality natural
29 areas that are particularly sensitive to disturbance. Dominant species include white cedar (*Thuja*

1 *occidentalis*), black spruce (*Picea mariana*), and tamarack (*Larix laciniata*), along with various
2 shrubs, sedges, rushes, grasses, mosses, and forbs (WWF and TNC, 2008).

3 Communities, such as dunes, beaches, and upland marshes, characterize the Maine coast and
4 may include American beachgrass (*Ammophila breviligulata*), bayberry (*Myrica pensylvanica*),
5 beach plum (*Prunus maritima*), and marsh elder (*Iva annua* var. *annua*). Ocean tides strongly
6 influence coastal regions in Maine, which is dramatically different from inland areas adjacent to
7 the Great Lakes. For example, tides in the Lubec embayment in Maine reach six meters on full
8 and new moon spring tides — the maximum tidal range on the U.S. East Coast. (Maine
9 Geological Survey, 2005).

10 Accidental introductions of invasive species have negative impacts on aquatic resources,
11 damaging fisheries and native habitats. Common invasive plant species of concern include
12 marsh thistle (*Cirsium palustre*), purple loosestrife (*Lythrum salicaria*), spike water milfoil
13 (*Myriophyllum spicatum*), reed canary grass (*Phalaris arundinacea*), curly pondweed
14 (*Potamogeton crispus*), and flowering rush (*Butomus umbellatus*). Invasive animal species of
15 concern include the rusty crayfish (*Orconectes rusticus*), sea lamprey (*Petromyzon marinus*),
16 round goby (*Neogobius melanostomus*), zebra mussel (*Dreissena polymorpha*), quagga mussel
17 (*Dreissena rostriformis bugensis*), and water flea (*Daphnia pulex*) among others.

18 The Asian carp (*Hypophthalmichthys spp.*) poses a significant and highly visible threat to the
19 aquatic resources of the Great Lakes region. This species has invaded the Illinois River, which
20 lies outside of the Laurentian Ecoregion; however, it is nearing Lake Michigan and is a serious
21 invasive threat. Zebra and quagga mussels have already seriously affected Great Lakes
22 ecosystems, water treatment facilities, and water-based infrastructure and municipal equipment,
23 with the potential for similar damage to inland waterways (Robinson, 2003).

24 **1.11 EASTERN BROADLEAF FOREST (OCEANIC) ECOREGION (221)**

25 The Eastern Broadleaf Forest (Oceanic) Province is a beech-maple forest with rounded hills,
26 ridges, and broad valleys (Figure 1.1-4). Appalachian Oak, oak-hickory, northern hardwood, and
27 mixed-deciduous forest also make up portions of this province. Elevations in this province range
28 from 650 to 1,000 feet (200 to 300 meters) with local relief of 6 to 50 feet (2 to 15 meters).

29 States in this ecoregion include Maine, New Hampshire, New York, Pennsylvania, and Ohio.

1

Eastern broadleaf forest



2

3

(Radford University)

4 The Appalachian Plateau portion (west of the Appalachian Mountains from New York into Ohio
5 within the 100-mile project area) of the Eastern Broadleaf Forest (Oceanic) Province has
6 extensive areas of deciduous forest cover. Aquatic resources range from small natural lakes to
7 wetlands. Numerous steep headwater and low-gradient streams flow into the Ohio River and
8 Lake Erie. Deep course sand and gravel underlie most of these streams. Deciduous trees in this
9 province include beech (*Fagus* spp.), maple (*Acer* spp.), oak (*Quercus* spp.), and hickory (*Carya*
10 spp.). Naturally occurring disturbances include flooding, droughts, and windstorms that may
11 knock down trees.

12 The climate in the Eastern Broadleaf Forest (Oceanic) Province is moderated by the Atlantic
13 Ocean to the east and has cold winters and warm summers. The average annual temperature is
14 around 50 degrees Fahrenheit (10 degrees Celsius). Precipitation of either rain or snow is
15 consistent year round and ranges from 35 to 40 inches (90 to 102 centimeters) per year in the
16 Appalachian Plateau. The growing season runs for approximately 160 days with frost as a
17 determining factor. About 50 percent of this region is used for agriculture and 25 percent is
18 forested. Half of the forested areas are small woodlots.

19 The New England portion of the ecoregion, an area within the 100-mile project area in southern
20 Maine and eastern New Hampshire, is very similar. The average annual temperature is
21 influenced by elevation and proximity to the Atlantic Ocean and ranges from 45 to 50 degrees
22 Fahrenheit (7 to 10 degrees Celsius). Annual precipitation ranges from 35 to 50 inches (82 to
23 127 centimeters) from both rain and snow. The amount of snow rises as elevation increases and
24 varies from 36 to 100 inches (91.5 to 254 centimeters). The growing season usually extends
25 from 120 to 180 days with elevation and frost creating some restrictions. Nearly 75 percent of
26 this area is forested, with about 15 percent used for agriculture and 10 percent urbanized.

27 Rounded hills and valleys characterize most of the Appalachian Plateau. Glaciers covered this
28 area approximately 8,000 to 10,000 years ago. This glaciation created the wide and dendritic
29 drainages on the flat, homogenous, subsurface material. Gentle slopes cover about 50 to 80
30 percent of the area.

1

Appalachian Plateau



2

3

(Emporia State University)

4

1.11.1 REMAINING BLOCKS REGIONALLY SIGNIFICANT HABITAT

5 The blocks of regionally significant habitat below are relatively undeveloped and intact habitat
6 that are protected as wilderness, state parks, and state and national forests. Regionally
7 significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or
8 disturbances, such as roads or other development. Most areas are protected by law (wilderness
9 areas, national parks) and often cross state and country boundaries, while others may occupy
10 large expanses of private lands.

11 Selected regionally significant blocks that represent this region include:

- 12 • Kyle (Arthur) Woods State Nature Preserve–Ohio;
- 13 • Eagle Creek State Nature Preserve–Ohio;
- 14 • Bear Run Nature Reserve–Western Pennsylvania; and
- 15 • Raccoon Creek State Park–Western Pennsylvania.

16

1.11.2 SENSITIVE HABITATS

17 Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities
18 representing sensitive habitats. The sensitive habitats described here occur in many of the larger
19 intact habitat areas in the prior section and are home to many of the threatened and endangered
20 species in the next section. For example, hardwood swamps exist in many forested areas in this
21 geographic region and house many plant species, such as Pennsylvania bitter cress (*Cardamine*
22 *pensylvanica*), jack-in-the-pulpit (*Arisaema triphyllum*), and oak fern (*Gymnocarpium*
23 *dryopteris*). Some habitat names, such as hardwood swamps, describe habitats found across
24 several regional boundaries and are more general in meaning. Others, such as “black swamp”
25 forest (a rare type of forest remnants), define much more specific ecological associations.

1

Jack-in-the-pulpit



(Cedarburg Science, Lesley Brotkowski)

2

3

4 Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and
 5 diverse areas. The list of sensitive habitats is based on those enumerated and described by the
 6 World Wildlife Fund (2001), ecological system descriptions within the NatureServe.org
 7 database, and each state’s respective natural resources agency.

- 8 • Barrier beach and Great Lakes beaches–Great Lakes beach and dune complex
 9 characterized by pioneering beach and dune vegetation adjacent to lakes Michigan,
 10 Ontario, and Erie;
- 11 • Riverine marsh–Riverside deep-marsh wetland;
- 12 • Sedge meadow–Wetland dominated by sedges on saturated soils typically composed of
 13 peat or muck
- 14 • Wet prairie–Wet grassland habitat, dominated by sedges and rushes;
- 15 • “Black Swamp” forest–Forest remnants remaining from extensive post-glacial lake plains
 16 southwest of Lake Erie;
- 17 • Hardwood swamps–Deciduous forested wetland;
- 18 • Bogs–Wetland that accumulates acidic peat with deposits of dead plant material; and
- 19 • Freshwater estuaries–Ecological community where lake and river waters mix

20 1.11.3 THREATENED AND ENDANGERED SPECIES

21 Appendix F3 lists the threatened and endangered species in this ecoregion. The piping plover
 22 (*Charadrius melodus*) is a federally listed species in this region, especially on sandy beaches
 23 along lakes. The federally listed shortnose sturgeon (*Acipenser brevirostrum*) inhabits large
 24 rivers connected to marine estuaries. It is the smallest sturgeon species in eastern North America
 25 at a maximum length of about 4.7 feet, but is often mistaken for the Atlantic sturgeon. As an
 26 anadromous fish spending time in both marine and freshwater environments, human activities,
 27 such as boating and fishing, may disturb this species.

1 Other aquatic federally listed species in Maine, New Hampshire, New York, Pennsylvania, and
2 Ohio include the northern riffleshell (*Epioblasma torulosa rangiana*) and clubshell (*Pleurobema*
3 *perovatum*) mollusks. The lake sturgeon (*A. fulvescens*) is a state-listed species in both
4 Pennsylvania and Ohio.

5 **Lake sturgeon**



6
7 (USFWS)

8 In forested and wetland habitats, several other federally listed species exist, including the least
9 bittern (*Ixobrychus exilis*), Canada lynx (*Lynx canadensis*), Karner blue butterfly (*Lycaeides*
10 *melissa samuelis*), and eastern prairie fringed orchid (*Platanthera leucophaea*). Other state-listed
11 species may include the short-eared owl (*Asio flammeus*), Persius duskywing butterfly (*Erynnis*
12 *persius*), and Appalachian shoestring fern (*Vittaria appalachiana*).

13 Although some species are listed as endangered or threatened at either the Federal or state level,
14 other species are categorized differently as of “conservation concern” or “special concern.”

15 **1.11.4 WILDLIFE**

16 Many birds, especially species such as the white-throated sparrow (*Zonotrichia albicollis*),
17 migrate through this province twice each year. Bird populations are diverse and include raptors,
18 game birds, and songbirds. Wild turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa*
19 *umbellus*), woodcock (*Scolopax minor*), bobwhite quail (*Colinus virginianus*), mourning dove
20 (*Zenaida macroura*), and many passerines are common (USEPA, 2010). The Cooper’s hawk
21 (*Accipiter cooperi*), sharp-shinned hawk (*A. striatus*), great horned owl (*Bubo virginianus*),
22 coyote (*Canis latrans*), red fox (*Vulpes vulpes*), American toad (*Bufo americanus*), and painted
23 turtle (*Chrysemys picta*) are other birds, mammals, amphibians, and reptiles that remain in the
24 province year-round.

1

American toad



(New York City Department of Parks & Recreation)

2

3

4 1.11.5 VEGETATIVE HABITAT

5 Temperate deciduous forests dominate the vegetative cover in the Eastern Broadleaf Forest
 6 (Oceanic) Ecoregion. This mixed vegetative cover occupies moist and well-drained sites,
 7 especially in the New England portion. Species in these areas are American beech (*Fagus*
 8 *grandifolia*), sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), white oak (*Q. alba*),
 9 sweet buckeye (*Aesculus flava*), basswood (*Tilia americana*), red cedar (*Juniperus virginiana*),
 10 and northern hardwood-hemlock-(*Tsuga* spp.) white pine (*Pinus strobus*) species. Various oaks
 11 (*Quercus* spp.) are also common in some small oak-hickory (*Carya* spp.) associations in the
 12 Appalachian Plateau. Pine-oak forests grow on the Appalachian Plateau in dry sandy soils with
 13 thick shrubs beneath. Wetlands sit in areas with poorer drainage and generally have a smaller
 14 geographic extent.

15 Land use changes have increased erosion in the Midwest. Ohio’s Hueston Woods State Park at
 16 the base of the Upper Four Mile Creek watershed, for example, is experiencing serious erosion
 17 problems due to row crops (Medley et al., 2003). These land-use alterations have also resulted in
 18 significantly more small, lower-diversity forest patches when compared to intact old-growth
 19 landscapes (White and Mladenoff, 1994).

20 Common invasive species of concern include garlic mustard (*Alliaria petiolata*), Japanese
 21 barberry (*Berberis thunbergii*), honeysuckle (*Lonicera* spp.), knotweed (*Polygonum* spp.),
 22 commonand glossy buckthorn (*Rhamnus cathartica*, *R. frangula*), Eurasian water-milfoil
 23 (*Myriophyllum spicatum*), sweet clovers (*Melilotus* spp.), among others. New invasive species
 24 that require vigilance include spotted knapweed (*Centaurea stoebe*), kudzu (*Pueraria lobata*),
 25 mile-a-minute vine (*Persicaria perfoliata*), and leafy spurge (*Euphorbia esula*).

26 1.11.6 WETLANDS AND WATERWAYS

27 Many of the dominant and important plant species in this province grow in different types of
 28 wetland communities. These wetlands include floodplain forests, shallow, open-water
 29 communities, and hardwood and coniferous swamps that include species such as silver maple
 30 (*Acer saccharinum*), American elm (*Ulmus americana*), yellow birch (*Betula alleghaniensis*),

1 red maple (*A. rubra*), white water-lily (*Nymphaea odorata*), and sedges (*Carex* spp.). These
2 areas are also important to many waterfowl species that may migrate through or nest in the area.

3 Wetlands in the Eastern Broadleaf Forest (Oceanic) Ecoregion portion of the project area include
4 approximately: 365,390 acres of forested and scrub-shrub wetlands; 54,190 acres of emergent
5 wetlands; 239,745 acres of lakes; 53,850 acres of ponds; and 38,355 acres of riverine habitats
6 (USDOI, 2010b). This area sits too far from the coast to have any marine and estuarine systems.

7 **Floodplain forest**



8
9 (NH Dept. of Forests and Lands)

10 The Batten Kill River, the Champlain Canal, and Cossayuna Lake in New York State are within
11 this province and the project area.

12 The Ohio River in Ohio and Pennsylvania sits at the southern extreme of the study area and the
13 upper Cuyahoga also flows through both of these states within the study area. Other rivers in
14 Pennsylvania include the Shenango, Beaver, and Allegheny, and the French and Neshannock
15 creeks. Other rivers in Ohio include Little Beaver and Sandy creeks, the Tuscarawas River, and
16 the Mahoning River.

17 Important lakes in Pennsylvania include: the Shenango River, Mahoning Creek, Crooked Creek,
18 and Woodcock Creek lakes, along with lakes Tionesta, Arthur, and Wilhelm. Important lakes in
19 Ohio include Atwood, Berlin, Salt Fork, Piedmont, Mosquito Creek, Senecaville, Tappan, and
20 Leesville.

21 **1.11.7 AQUATIC RESOURCES**

22 Aquatic resources are highly regarded within the ecoregion due to the area's excellent fish
23 diversity. The abundant rivers and estuaries offer fishing for many freshwater and marine
24 species.

25 Accidental introductions of invasive species have negative impacts on aquatic resources,
26 damaging fisheries and native habitats. Common invasive plant species of concern in this
27 province include purple loosestrife (*Lythrum salicaria*), yellow loosestrife (*Lysimachia vulgaris*),
28 reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), and flowering
29 rush (*Butomus umbellatus*). Invasive animal species of concern include the Asian clam (*Nutallia*

1 *obscurata*), rusty crayfish (*Orconectes rusticus*), northern snakehead (*Channa argus*), zebra
2 mussel (*Dreissena polymorpha*), and quagga mussel (*Dreissena bugensis*) among others.
3 Species such as the rusty crayfish reduce the amount of aquatic vegetation and compete with
4 native crayfish.

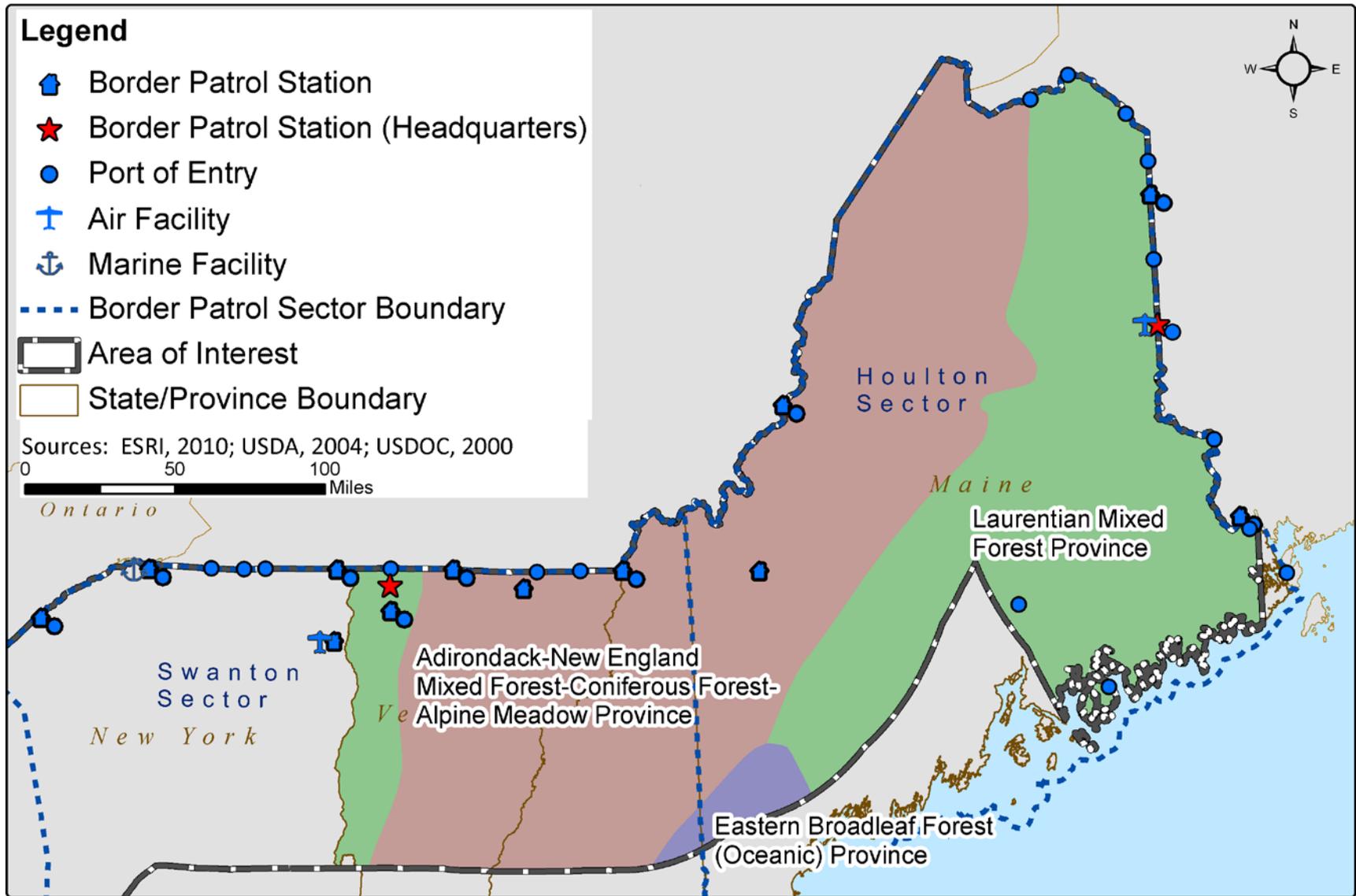
5 **1.12 ADIRONDACK- NEW ENGLAND MIXED FOREST CONIFEROUS**
6 **FOREST–ALPINE MEADOW ECOREGION (M212)**

7 The Adirondack–New England Mixed Forest–Coniferous Forest-Alpine Meadow Ecoregion has
8 areas of both coniferous and deciduous forest cover with some alpine meadows near the
9 timberline (Figure 1.1-4 and Figure 1.1-5). Aquatic resources, similar to those in the Laurentian
10 region, range from lakes to conifer bogs and swamps

11 States in this province include Maine, New Hampshire, Vermont, and New York.

12

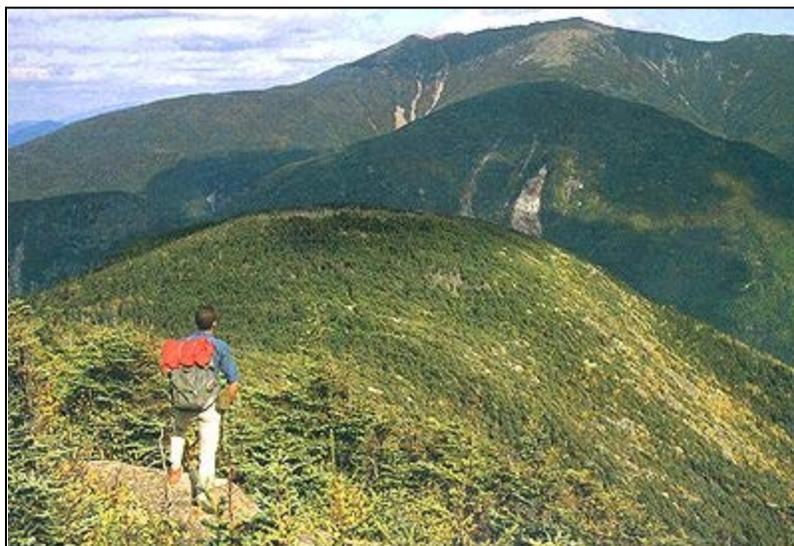
Figure L-5. Ecoregions in the New England Region



1 The Adirondack–New England Mixed Forest Coniferous Forest–Alpine Meadow Ecoregion is a
2 mountainous region that transitions between true spruce–fir forest in the north to deciduous forest
3 in the south. The growth forms and species of this forested province are similar to those further
4 north, but red spruce (*Picea rubens*) grows here instead of white spruce (*P. glauca*). Vegetation
5 zones occur, with both elevation and latitudinal aspects. Mountain slopes at lower elevations are
6 mixed forest, typically composed of spruce, fir, maple (*Acer* spp.), and birch (*Betula* spp.). The
7 effect of latitude is also noticeable; for example, from north to south, the approximate limit of
8 spruce and fir is 500 feet (150 meters) on Mt. Katahdin, 2,500 feet (800 meters) in the White
9 Mountains, 3,000 feet (900 meters) in the Adirondack Mountains, and 3,500 feet (1,100 meters)
10 in the Catskills. A stunted forest zone occurs above the mixed-forest zone, with underdeveloped
11 stands of balsam fir and red spruce at higher elevations.

12

White Mountains in New Hampshire



13
14

(New Hampshire Historical Society)

15 The historic forests of the ecoregion are recovering from an array of previous disturbances,
16 including forest clearing for agriculture, logging, and fires of the 18th and 19th centuries (Niering,
17 1998). Landscapes in this region have shifted from largely forested during pre-colonial times to
18 agricultural in the 19th century; they are currently re-establishing as forest (Latty et al., 1994).

19 The climate of this province is defined by its warm summers and cold winters. Nearby moist air
20 masses above the northwestern Atlantic cause precipitation to be fairly evenly distributed
21 throughout the seasons. This aspect of the climate differs from that of the Laurentian Mixed
22 Forest Province. Winters in this region are often severely cold, but moderate towards the ocean.
23 Average annual temperatures range from 37 to 52 degrees Fahrenheit (3 to 11 degrees Celsius).
24 The frost-free period is about 100 days on average. Precipitation near Albany, New York,
25 averages 35 inches (89 centimeters) per year, while snowfall averages above 100 inches (255
26 centimeters) each year.

27 Agriculture and silviculture comprise two of the dominant economic activities in the Laurentian
28 region. Common agricultural practices include row crop, dairy, grazing, orchard, and vegetable

1 crop production. Silviculture is common on publicly and federally owned lands in hardwood and
2 coniferous forests.

3 Historic fire regimes have been suppressed in forests in this area in recent times. These forests
4 are characterized by large blowdowns from severe wind as well as smaller blowdowns. Higher-
5 elevation forests often exhibit an even-aged windthrow disturbance known as fir waves. Insect
6 and disease damage has resulted from gypsy moth (*Lymantria dispar*), spruce budworm
7 (*Choristoneura fumiferana*), spruce beetle (*Dendroctonus rufipennis*), severe beech bark disease
8 (*Nectria coccinea*), and butternut canker (*Sirococcus clavignenti-juglandacearum*) infestations.
9 Forests at lower elevations have been influenced by agriculture since colonial times and more
10 recently by farm abandonment, as well as by selective logging of certain species (McNab and
11 Avers, 1994).

12 Across this region, the distributions of both modern-day and pre-settlement forest types are
13 similar, but 250 years of land use has affected forest structure and composition. Both selective
14 and intensive logging has taken place for more than 200 years. Forest has been cleared and the
15 land farmed dating to early Euro-American settlement. Since approximately the 1870s, land not
16 suitable for farming has been abandoned and, in many cases, allowed to return to forest.
17 Deciduous forests are more extensive now than in pre-settlement times due to logging of conifers
18 through the start of the 20th century, followed by periods of fire.

19 1.12.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

20 The blocks of regionally significant habitat listed below are relatively undeveloped and intact
21 habitat protected as wilderness, state parks, and state and national forests. “Intact habitat” or
22 regionally significant habitat refers to areas of largely unfragmented habitat with few alterations
23 or disturbances, such as roads or other development. Most areas listed are protected by law
24 (wilderness areas, national parks) and often cross state and country boundaries, while others may
25 occupy large expanses of private lands.

26 Selected regionally significant blocks that represent this region include:

- 27 • Adirondack Park–New York;
- 28 • Baxter State Park–Maine;
- 29 • Big Reed Forest–Maine;
- 30 • Green Mountains–Vermont;
- 31 • Mahoosuc Mountains–Maine;
- 32 • Nash Stream Forest–New Hampshire; and
- 33 • White Mountains–New Hampshire.

1

Adirondack Park



2

3

(New York Department of Conservation)

4 1.12.2 SENSITIVE HABITATS

5 Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities
 6 that represent sensitive habitats. The sensitive habitats described here occur in many of the
 7 larger intact habitat areas in the prior section and house many of the threatened and endangered
 8 species in the next section. For example, hardwood swamps occupy many forested areas in this
 9 broad geographic region and are home to rare or protected species, such as the sharp manna-
 10 grass (*Glyceria acutiflora*), as well as a wide variety of common plants, such as cinnamon fern
 11 (*Osmunda cinnamomea*). Some habitat names used below, such as hardwood swamp, can
 12 describe habitats across several regional boundaries and are more general in meaning. Others,
 13 such as subalpine krummholz (stunted coniferous trees near the tree line), define much more
 14 specific ecological associations.

15

Cinnamon fern



16

17

(Wisconsin State Herbarium)

18 Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and
 19 diverse areas. The list of sensitive habitats is based on those enumerated and described by the

1 World Wildlife Fund (2001), ecological system descriptions within the NatureServe.org
2 database, and each state’s respective natural resources agency.

- 3 • Hardwood swamps–Deciduous forested wetlands;
- 4 • Limestone bluff cedar-pine forests–Forests of these species on limestone bedrock;
- 5 • Alpine Meadow–Open areas on Adirondack Province mountains, generally above 3,500
6 feet where cold temperatures and high winds favor a community of ground-layer plants
7 that can tolerate such conditions;
- 8 • Subalpine krummholz–Stunted wind-shaped coniferous forest below the timberline;
- 9 • Montane yellow birch-red spruce forest – Birch-fir forests on mountain slopes;
- 10 • Montane spruce-fir forest–Spruce-fir forest on mountain slopes;
- 11 • Cold-air talus woodland–Talus areas with large, ice-cooled boulders where the
12 microclimate supports black and red spruce, heaths, and evergreen shrubs;
- 13 • Pitch pine-oak-heath rocky summit–Lower-elevation transition zone with pitch pine, oak,
14 and an associated shrub zone;
- 15 • Acadian-Appalachian montane spruce-fir forest–Spruce-fir forest on mountain slopes;
- 16 • Acadian-Appalachian alpine tundra–Tundra vegetation above the timberline; and
- 17 • Northeastern interior pine barrens–Dry pine forest on sandy, acidic, nutrient-poor soil

18 **1.12.3 THREATENED AND ENDANGERED SPECIES**

19 Appendix F3 lists the threatened and endangered species in this ecoregional province. Examples
20 of federally listed species in this region include the Karner blue butterfly (*Lycaeides melissa*
21 *samuelis*), Indiana bat (*Myotis sodalis*), and Canada lynx (*Lynx canadensis*). The eastern
22 mountain lion (*Puma concolor cougar*), a federally listed species, also lives in this region.
23 Since the eastern mountain lion is a federally listed species, wildlife refuges already have plans
24 in place for monitoring or recovery of the species’ population.

25 Examples of state-listed endangered species include the peregrine falcon in Maine; the golden
26 eagle (*Aquila chrysaetos*) and common nighthawk (*Chordeiles minor*) in New Hampshire; and
27 the spruce grouse (*Falcapennis canadensis*) in Vermont and New York.

28 **Golden Eagle**



(Kevin Kowalchuk)

29
30

1 Although some species are listed as endangered or threatened at either the Federal or state level,
2 other species are categorized differently as of “conservation concern” or “special concern.”

3 1.12.4 WILDLIFE

4 The spruce-fir forests of this province have a well-developed canopy. Examples of wildlife
5 species using this habitat at higher elevations include grouse and woodpeckers. Black bear
6 (*Ursus americanus*), snowshoe hare (*Lepus americanus*), salamanders, and turtles are just a few
7 of the many species that occupy lower-elevation forests.

8 In forested habitats, the merlin (*Falco columbarius*), the northern goshawk (*Accipiter gentilis*),
9 and black-backed woodpecker (*Picoides arcticus*) represent some of the sensitive species. Many
10 bird species migrate into or out of this province twice each year, including more than 20 species
11 of warblers, the rose-breasted grosbeak (*Pheucticus ludvicianus*), golden-crowned kinglet
12 (*Regulus satrapa*), and hermit thrush (*Catharus guttatus*). More than 300 total bird species breed
13 in, migrate through, or overwinter in this ecoregion (LePage, 2011). Some bird species
14 (“permanent residents”), most mammal species other than migratory bats, reptiles, and
15 amphibians remain in the province year-round.

16 1.12.5 VEGETATIVE HABITAT

17 Northern hardwood-spruce and northeastern spruce-fir forest dominate the vegetative cover
18 within the province. Regionally defined important vegetation communities include highland
19 spruce-fir, lowland spruce-fir, northern hardwood-conifer, alpine krummholz (stunted coniferous
20 trees near the tree line), and alpine meadow habitat. Typically dominant species include sugar
21 maple (*Acer saccharum*) and American beech (*Fagus grandiflora*), with some stands containing
22 hemlock (*Tsuga canadensis*).

23

Sugar maple



24
25

(Cindy Kowalchuk)

1 Common invasive species of concern include purple loosestrife (*Lythrum salicaria*), hydrilla
2 (*Hydrilla verticillata*), flowering rush (*Butomus umbellatus*), goutweed (*Aegopodium*
3 *podagraria*), crofton weed (*Ageratina adenophora*), tree-of-heaven (*Ailanthus altissima*), reed
4 canary grass (*Phalaris arundinacea*), orange hawkweed (*Hieracium aurantiacum*), garlic
5 mustard (*Alliaria petiolata*), Oriental bittersweet (*Celastrus orbiculatus*), dodder (*Cuscuta* spp.),
6 curly pondweed (*Potamogeton crispus*), and Eurasian water-milfoil (*Myriophyllum spicatum*),
7 among others. New invasive species of potentially increasing concern include spotted knotweed
8 (*Persicaria praetermissa*), black swallow-wort (*Cynanchum louiseae*), large-leaved lupine
9 (*Lupinus polyphyllus*), poison hemlock (*Conium maculatum*), rough-stalked meadow grass (*Poa*
10 *trivialis*), spearmint (*Mentha spicata*), and yellow loosestrife (*Lysimachia punctata*) (USDA,
11 2003a).

12 1.12.6 WETLANDS AND WATERWAYS

13 Wetlands in the study area include approximately: 781,790 acres of forested and scrub-shrub
14 wetlands; 123,175 acres of emergent wetlands; 734,400 acres of lakes; 39,380 acres of ponds;
15 and 365,000 acres of riverine habitats (USDOJ, 2010b). This area is too far from the coast for
16 marine and estuarine systems, but lakes and forested wetlands are abundant.

17 Major rivers in this ecoregion include: the Allagash in Maine; the Androscoggin, Pemigewasset,
18 Saco, Merrimack, and Ammonoosuc in New Hampshire; the Connecticut between New
19 Hampshire and Vermont; the Missisquoi and Passumpsic in Vermont, and the Saranac and St.
20 Regis in New York. Important lakes include: Mooselookmeguntic, Flagstaff, Brassua, and
21 Moosehead in Maine; the Connecticut Lakes, Winnepesaukee, Ossipee, Sunapee, Newfound, and
22 Umbagog in New Hampshire; Saranac and Oneida in New York, and Champlain and
23 Memphremagog in Vermont. Notable wetlands include: the large tertiary peat bogs of Maine;
24 the Hurlbert (Atlantic white cedar) Swamp in New Hampshire (The Nature Conservancy,
25 2010b); the LaPlatte River Marsh and Gillette Swamp in Vermont; and the Spring Pond Bog in
26 New York (The Nature Conservancy, 2010c).

27 Spring Pond Bog



28
29 (Edwin Romanowicz)

1 **1.12.7 AQUATIC RESOURCES**

2 The aquatic resources in this province are highly regarded due to the richly diverse fish
3 populations. Large lakes, rivers, and streams constitute important habitat for freshwater fish in
4 this province. Fish species include largemouth bass (*Micropterus salmoides*), smallmouth bass
5 (*M. dolomieu*), walleye (*Sander vitreus*), northern pike (*Esox lucius*), brook trout (*Salvelinus*
6 *fontinalis*), and rainbow trout (*Oncorhynchus mykiss*).

7 Invasive plants and animals alter habitat quality and suitability for a wide variety of native plant
8 and animal species. Some of the invasive aquatic species with the potential for introduction
9 include the zebra mussel (*Dreissena polymorpha*), alewife (*Alosa pseudoharengus*), rusty
10 crayfish (*Orconectes rusticus*), European rudd (*Scardinius erythrophthalmus*), round goby
11 (*Neogobius melanostomus*), and snakehead.

12

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