USDA Natural Resources Conservation Service

Ecological site F144BY002ME
Marine Terrace Depression

Last updated: 9/27/2024
Accessed: 09/27/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

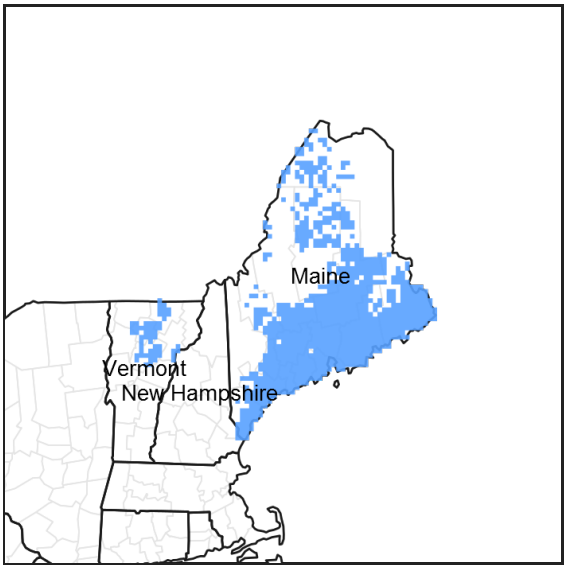

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 144B–New England and Eastern New York Upland, Northern Part

This major land resource area (MLRA) is in Maine (56 percent), New Hampshire (22 percent), Vermont (14 percent), Massachusetts (6 percent), Connecticut (1 percent), and New York (1 percent). It makes up about 22,728 square miles (58,864 square kilometers). The MLRA consists of a relatively young landscape shaped by the Laurentide Ice Sheet, which covered the region from 35,000 to 10,000 years ago. Rolling hills of dense basal till converge on ridges of shallow bedrock that were scoured by glacial ice. River valleys that were flooded by melting glacial water or seawater house large expanses of glacial outwash and stratified drift in inland areas and, to a lesser extent, glaciomarine and glaciolacustrine sediment deposits in coastal areas. Organic bogs, ablation till, and alluvial flood plains make up the remaining portions of the MLRA.

The soils in this region are dominantly Entisols, Spodosols, and Inceptisols. They commonly have a fragipan. The dominant suborders are Ochrepts, Orthods, Aquepts, Fluvents, and Saprists. The soils in the region dominantly have a frigid soil temperature regime with some cryic areas at higher elevation, a udic soil moisture regime, and mixed mineralogy. Most of the land is forested, and 98 percent is privately owned. Significant amounts of forest products are produced including lumber, pulpwood, Christmas trees, and maple syrup. Principal agricultural crops include forage and grains for dairy cattle, potatoes, apples, and blueberries. Wildlife habitat and recreation are important land uses. Stoniness, steep slopes, and poor drainage limit the use of many of the soils.

Classification relationships

This Ecological Site occurs in the Maine portion of the New England and Eastern New York Upland, Northern Part Major Land Resource Area (MLRA 144B). This site is a more general classification than the Maine Natural Areas Program (MNAP) natural communities and ecosystems, which was developed to provide general information on specific rare & exemplary natural communities. This site appears to be a combination of “common” types of MNAP communities that are not correlated directly one-for-one to this particular soil type. The MNAP communities that most closely resemble the reference site in vegetation are: Cedar-Spruce Seepage Forest and Northern White Cedar Swamp. The ponded state most closely resembles the Mixed Graminoid-Shrub Marsh plant community. It appears to be correlated with Laurentian-Acadian Alkaline Conifer-Hardwood Swamp Association in the reference state or Laurentian-Acadian Wet Meadow-Shrub-Swamp Association in the ponded state as described by NatureServe’s Terrestrial Ecological System Classification. This site correlates with a Palustrine Forested Wetland in the Cowardin Wetland Classification System (Cowardin et al. 1979) and may correlate to several Hydrogeomorphic (HGM) Wetland Classification System (Brinson, M.M. 1993) types including semi-closed depression, riverine-tidal, and mineral soil flat wetlands depending on the landscape location.

Ecological site concept

This ecological site is found on the frigid, very poorly drained, non-acidic, glacio-marine deposits in coastal and central interior marine terraces and river valleys. Northern white cedar inland or red and black spruce on the coast, are the dominant trees found on forested states and community phases of the ecological site. Other tree species that may commonly occur include red maple, balsam fir, black ash, and tamarack. On non-forested, permanently ponded, sites, alder, grasses, and sedges are common. This site is intermittently ponded and has a permanent high water table within 6 inches of the surface. The slow to very slow permeability in the sub-soil in relation to the relative linear landscape positions these soils are found on, results in the accumulation of 8 to 16 inches of organic matter at the surface and the high water table.
The reference state is considered a Palustrine forested wetland in the Cowardin Wetland Classification System (Cowardin et al. 1979) and a Mineral Soil Flat in the Hydrogeomorphic (HGM) Wetland Classification System (Brinson, M.M. 1993). Due to some micro-relief, pit and mound mostly, this site sometimes occurs as a major component of associations and complexes with drier mineral soils. A majority of the acreage is mapped as consociations. The reference plant community is dominantly hydrophytic vegetation. It is transitional to the vegetation of the very poorly drained organic soils positioned below it and the poorly drained mineral soils positioned above it.

Associated sites

F144BY001ME	**Marine Terrace Flat** This site occurs adjacent to Marine Terrace Depression on the better drained, but still hydric areas.

Table 1. Dominant plant species

Tree	(1) *Picea mariana* (2) *Abies balsamea*
Shrub	Not specified
Herbaceous	(1) *Carex trisperma*

Physiographic features

The ecological site is generally located in forestland on terrace depressions of coastal lowlands and river valleys in MLRA 144B in Maine. Aspect is not a factor. Slope is generally from 0 to 3 percent and depth to a seasonal high water table is always less than 6 inches. A high water table is likely to occur all year round. These soils are not subject to flooding. Ponding, up to 4 inches, may occur occasionally because surface water is very slow to runoff. Ponding duration may be very brief or very long. These sites are found from 0 to 900 feet in elevation. Hydrologic group is D.

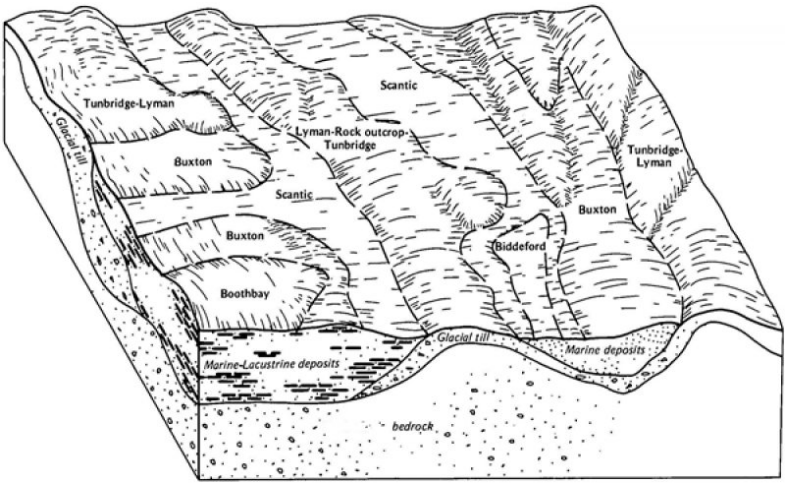

Figure 2. Marine Terrace Depression (Biddeford) Block Diagra

Table 2. Representative physiographic features

Landforms	(1) Plains > Marine terrace (2) Plains > River valley
Flooding frequency	None
Ponding frequency	Frequent
Elevation	2–274 m
Slope	Not specified
Ponding depth	Not specified
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid and temperate. It is characterized by warm summers and cold winters. The average first frost around October 1st and the last freeze of the season occurs around April 23rd. Temperature extremes in the summer can reach as high as 100 degrees F and as low as -33 degrees F in the winter.

The average relative humidity is 71 percent. The sun shines on average 57 percent of the time. The prevailing wind direction is usually from the west, either north or south, but Maine weather is very unpredictable. Bad storm events can come in from the northeast, thus the term “nor’easter”. Winter blizzards can result in several feet of snow, while summer hurricane events can produce 2-3 inches of rain per hour.

Annual rainfall occurs evenly over the entire year with August being the driest month during the growing season from April through September. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. Eighty-eight percent of the snowfall occurs from December through March. This makes for a “mud season” from March through April where runoff is high and ponding may occur because surface water runoff is very slow.

The original data used in developing the table below was obtained from the USDA-NRCS National Water & Climate Center climate information database. All the climate station monthly averages for maximum and minimum temperature and precipitation were then added together and averaged to make this table.

Table 3. Representative climatic features

Frost-free period (characteristic range)	117-140 days
Freeze-free period (characteristic range)	144-170 days
Precipitation total (characteristic range)	1,067-1,219 mm

Frost-free period (actual range)	98-146 days
Freeze-free period (actual range)	133-180 days
Precipitation total (actual range)	1,016-1,372 mm
Frost-free period (average)	126 days
Freeze-free period (average)	159 days
Precipitation total (average)	1,168 mm

Climate stations used

- (1) MADISON [USC00174927], Anson, ME
- (2) PORTLAND INTL JETPORT [USW00014764], Portland, ME
- (3) ACADIA NP [USC00170100], Bar Harbor, ME
- (4) BELFAST [USC00170480], Belfast, ME
- (5) NEWCASTLE [USC00175675], Newcastle, ME
- (6) WEST ROCKPORT 1 NNW [USC00179593], Rockport, ME
- (7) DOVER-FOXCROFT WWTP [USC00171975], Dover Foxcroft, ME
- (8) GARDINER [USC00173046], Gardiner, ME
- (9) JONESBORO [USC00174183], Addison, ME
- (10) LEWISTON [USC00174566], Auburn, ME
- (11) ORONO [USC00176430], Old Town, ME
- (12) BANGOR INTL AP [USW00014606], Bangor, ME
- (13) CORINNA [USC00171628], Corinna, ME
- (14) FARMINGTON [USC00172765], Farmington, ME
- (15) WATERVILLE TRTMT PLT [USC00179151], Waterville, ME
- (16) AUGUSTA STATE AP [USW00014605], Augusta, ME

Influencing water features

This site has no discernible surface-water inlet, and sources of water are from precipitation, overland flow, ground-water discharge from adjacent uplands, and shallow seepage from adjacent uplands (“interflow”). Water drains from these wetlands through intermittent or perennial streams, ground-water recharge, and (or) evapotranspiration. The water table is at the surface all times of the year and drainage is considered very poor. Permeability is moderately slow to moderately rapid in the organic surface layer, moderate or moderately slow in the Eg horizon, and slow or very slow below. The soil is intermittently ponded or has very slow surface runoff. Thirty-year rainfall averages between a low of 29 inches and a high of 64 inches per year. Most rain and snow occur between October and June.

This site is considered a “wetland” by USDA National Food Security Act and Corps of Engineers wetland delineation standards, as it meets all the hydric (seasonally water-saturated) soil, hydric plants, and wetland hydrology criteria. This site is considered either semi-closed, riverine-tidal, or mineral soil flat wetland under the Hydrogeomorphic Wetland Classification System.

Soil features

The soils of this site are very deep, more than 60 inches to bedrock, and characterized by high percentages of silt and clay and low or non-existent volumes of rock fragments, which are confined to the Oe, Eg, and Bg soil profile or on the surface. Forested sites typically have a surface layer of 12 inches of mucky peat or muck, which is derived primarily from woody fragments. The thickness of the organic matter on some sites can range from 20 to 40 cm (8 to 16 inches) thick. Parent material is silty and clayey glacio-marine, or glacio-lacustrine deposits.

Though the soil is commonly free of rock fragments, a few samples contained up to 1 percent gravel. Stones are usually absent from the surface, but in some areas stone cover can be as high as 3 percent.

The soils of this site are olive gray, very deep silt loams, silty clay loams, or loams, with silty clay loam, silty clay or clay in the deeper horizons. Redoximorphic features are distinct or prominent throughout the mineral profile. Stone fragments and bedrock sometime occur in the profile at the Eg and Bg horizons or outcrop on the soil surface, but

not to the extent that they impede the production of native vegetation. On unaltered sites, pit and mound topography maybe present, with drier or wetter soils present as minor components.

These soils have a non-acidic feature in that they have a pH that is 5.0 or more in 0.01M calcium chloride in at least some part of the control section (10 to 40 inches) of the soil profile.

The very poor drainage class, with intermittent ponding, and the silty and clayey soil textures have the most influence on plant community composition.

The major soil component that represents the soil features for this ESD is Biddeford mucky peat, a fine, illitic, nonacid, frigid Histic Humaquepts.

Figure 9. Marine Terrace Depression Reference Soil Profile

Table 4. Representative soil features

Parent material	(1) Organic material (2) Glaciolacustrine deposits (3) Glaciomarine deposits
Surface texture	(1) Clay (2) Loam
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Very slow
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–2%
Available water capacity (0-25.4cm)	Not specified
Soil reaction (1:1 water) (13-19.1cm)	Not specified
Subsurface fragment volume <=3" (0cm)	Not specified
Subsurface fragment volume >3" (0cm)	Not specified

Ecological dynamics

Caveat: The vegetation information contained in this section and is only provisional, based on concepts, and future projects support validation through field work. *] The vegetation groupings described in this section are based on the

terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer et al., 2003) and localized associations provided by the New York Natural Heritage Program (Edinger et al., 2014), Maine Natural Areas Program (Gawler and Cutko, 2010), New Hampshire Natural Heritage Program (Sperduto and Nichols, 2011), and Massachusetts Division of Fisheries and Wildlife (Swain, 2020)

The information contained in the State and Transition Model (STM) and the Ecological Site Description were developed using archeological and historical data, professional experience, and scientific studies. The information presented is representative of a very complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals and ecological processes are described to inform land management decisions.

The historic reference plant community phase of the Marine Terrace Depression site is perceived to be an uneven-aged mixing of southern temperate deciduous and northern boreal species, called the “Acadian Forest”. This forest consisted of long-lived, shade-tolerant species with small gaps and relatively infrequent severe disturbances. Due to the multiple (8) biophysical regions involved and the history of land use and management, which involved over 95 percent of the MLRA land area, a least disturbed climax plant community phase will be considered the reference state for this ecological site description. The least disturbed climax state is a mixed conifer-hardwood forest.

Before European settlement, which occurred in the early 1600s, the plant community phase on this site consisted of an uneven-aged mixing of southern temperate deciduous and northern boreal species. This forest consisted of long-lived, shade-tolerant species with small gaps and relatively infrequent severe disturbances, from 0.6 to 1.0 percent per area per year. Dominant tree species were hemlock and spruce with a scattering of pines and cedar with some ash and oak according to early settlement survey records (Barton et al., 2012). In forested wetlands along the mid- and downeast coast, dominant tree species included spruce, birches, and alder with smaller amounts of pine, fir, maple, oak, beech, and hemlock, which is similar to present-day vegetation composition (Barton et al., 2012). The pre-settlement forest stands were generally between 104 to 203 years old in the oldest stands. Pre-settlement natural disturbances were usually small, single-tree mortality events caused by wind or insect damage, rather than stand replacing events. Stand replacing events include huge fires on average every 1,461 years and major wind storms, such as hurricanes, on average every 3,289 years. Extensive insect outbreaks, such as the spruce budworm infestation, were recorded as occurring every 60 to 70 years (Barton et al., 2012). During present day times, these natural disturbances still occur within these intervals of time.

The reference state (1.1), northern white cedar/three-seeded sedge (*Thuja occidentalis*/ *Carex trisperma*) is forested. Because of the constant harvesting of the forest and the composition of the data collected from representative sites, it was not possible to differentiate between a possible more mature and younger phase. The reference plant community phase has many of the same attributes, including species composition and structure, as the historic reference plant community phase. The site has a moderate to dense canopy cover, 75 to 95 percent, of a stratified mixture of even-aged conifer and northern hardwood tree species. Northern white cedar (*Thuja occidentalis*) is the major tree component with other codominant or intermediate species such as red spruce (*Picea rubens*), which occurs as a dominant tree on coastal sites. Red maple (*Acer rubrum*) and balsam fir (*Abies balsamea*) are usually in the suppressed understory. Some sites may contain black spruce (*Picea mariana*), and tamarack (*Larix laricina*). Some sites contain only red spruce and/or red maple depending on the geographic location within the MLRA and previous forest management.

The understory vegetation is very sparse due to the dense overstory cover except for very small open areas, less than a 0.1 of an acre, where a wide variety of forbs, ferns, and shrubs grow. The ground cover occurs within a typical pit and mound microtopography. Under the dense conifer overstory, only small scattered shade-tolerant and moisture-loving plants grow. Many species of feather-moss grow over the ground, on dead wood, and the bottoms of trees. Tall shrubs are virtually non-existent in this dense, shady, understory. In the small open areas, taller shrubs, such as common winterberry (*Ilex verticillata*) and speckled alder (*Alnus incana*) are present along with small shrubs such as dwarf red raspberry (*Rubus pubescens*) and wild sarsaparilla (*Aralia nudicaulis*), which occurs on the mounds. Seedlings and saplings of red maple and balsam fir are typically found in small patches. Clumps of cinnamon fern (*Osmunda cinnamomea*) as well as sensitive fern (*Onoclea sensibilis*) are also commonly found. Forbs usually found include starflower (*Trientalis borealis*) and blue-bead lily (*Clintonia borealis*) on the mounds. Very few grass or grass-like plant species were found on this site. There were more sedges than grasses and both appeared in small clumps scattered sparsely throughout. Threeseeded sedge (*Carex trisperma*) was common to abundant. Leafy liverworts were prevalent in the pits and feather mosses were common at most sample sites on the mounds. On one site skunk cabbage (*Symplocarpus foetidus*) was abundant in the pools of water.

Natural disturbances include ice and wind storms, and insect infestations that cause small gaps in the canopy. These small open areas in the forest provide an abundance of small herbs, grasses, sedges, and shrubs as well as tree regeneration for a brief period of time. Many species of medium and small sized mammals, birds, and insects can have significant influence on the plant communities in terms of pollination, herbivory, seed dispersal, and creation of local disturbance patches, all of which contribute to plant species diversity.

Human disturbances are primarily restricted to timber harvesting due to the very poor drainage. Harvesting of this reference state has been continuous over the years since European settlement, with all harvesting occurring in the winter months due to the very poorly drained nature of the soil. spruce and pine were the desirable species to harvest, mainly for timber up until about 10 years ago, although northern white cedar was used for house roofs and siding because of its resistance to decay. Presently all types of trees, including standing dead trees, are harvested for their best use depending on their size and grade. Best use includes timber, pulp, cordwood, firewood, and biomass.

The ponded state (2.1) is a result of natural disturbances from beaver activity, which causes frequent ponding for long durations. This is considered a state and not a plant community phase of the reference state because the long duration would realistically be considered permanent. The nature of beaver and the particular laws regarding their control in Maine make the ponded state permanent. Beaver control has been on-going for multiple decades, but control has never been achieved. The hydrology is permanently altered to favor open areas of shrubs such as alder, grasses, and grass-like plants, such as tussock sedge. Yellow pond-lily (*Nuphar lutea* spp advena) was found at one sample site in a permanently ponded area.

A typical harvested state (3.1) consists of young red maple with a few gray, birch, balsam fir and sometimes black ash. Any larger trees remaining are of poor grade and some younger looking trees are actually older suppressed trees that may not respond to release. This state is usually harvested in the winter when the soil is frozen and is typically allowed to regenerate naturally back to the reference state over a long time period or may become a red maple swamp.

Reference, ponded, and harvested states may become infested with invasive plants such as purple loosestrife and Japanese knotweed. The flooded state (2.1) is particularly vulnerable to invasion from these two species. Brush management multiple times and planting of desirable native plants would be required to restore to a reference state.

A State and Transition Model for the Marine Terrace Depression Ecological Site (F144BY002ME) follows this narrative. Thorough descriptions of each state, transition, plant community, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances. It does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

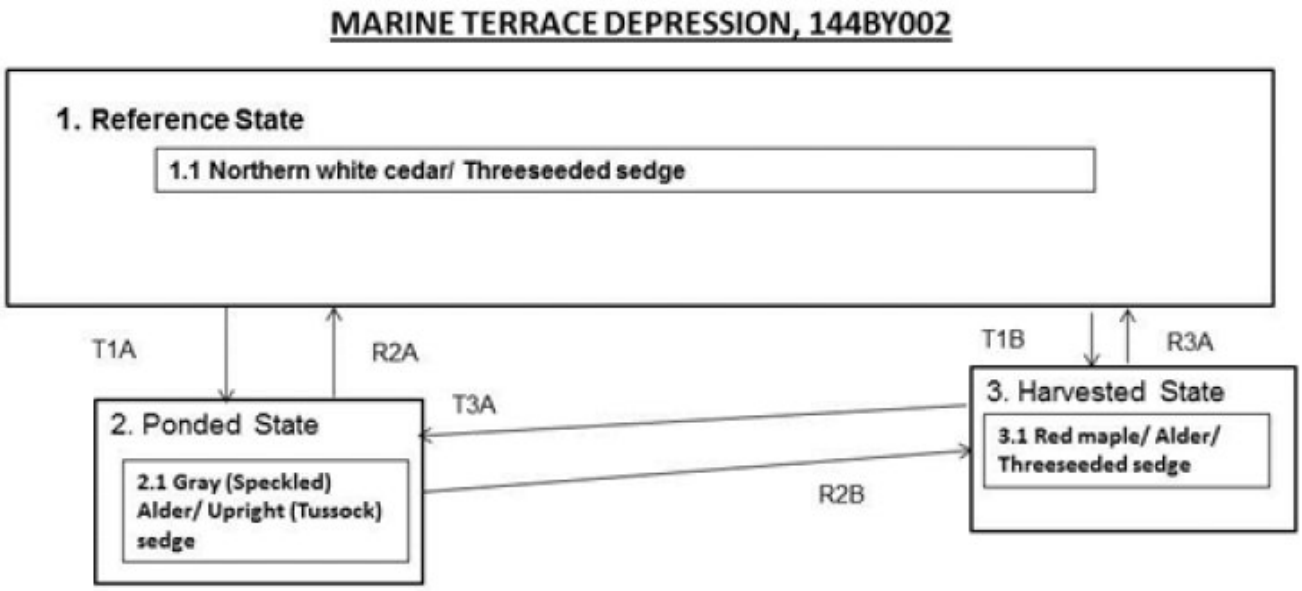

Figure 10. Marine Terrace Depression State and Transition Dia

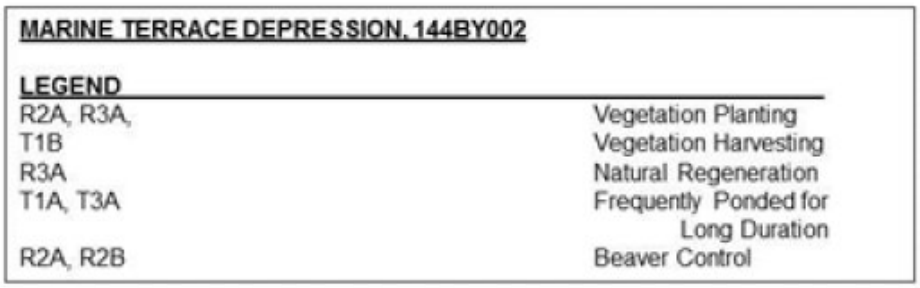

Figure 11. Marine Terrace Depression State and Transition Dia

State 1
Reference

The forested plant community phase (1.1) has a medium to dense canopy cover, averaging 85 percent and ranges from 75 to 95 percent. It consists of a stratified mixture of conifer and northern hardwood tree species. Northern white cedar (*Thuja occidentalis*) forms a canopy over other codominant or intermediate species such as red spruce (*Picea rubens*), except along the coast, red maple (*Acer rubrum*), gray birch (*Betula populifolia*), black ash (*Fraxinus nigra*), balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), and tamarack (*Larix laricina*). Some sites have more red spruce or red maple depending on their previous forest management or location. The understory may be sparse due to a dense conifer overstory cover except for small open areas, less than a 0.1 of an acre, where a wide variety of forbs, ferns, and shrubs grow. Under the dense conifer overstory, only small scattered shade-tolerant and moisture-loving plants grow. Plants include balsam fir regeneration, a few sedges, and many species of feather-mosses and leafy liverworts. The moss grows over the mounds, on downed dead wood, and the bottoms of trees throughout this site. Due to the dense, shady, understory tall shrubs are almost non-existent. In the small open areas, taller shrubs, such as speckled alder (*Alnus incana*), are present along with wild sarsaparilla (*Aralia nudicaulis*) and dwarf red raspberry (*Rubus pubescens*). Clumps of cinnamon fern (*Osmunda cinnamomea*) and small patches of sensitive fern (*Onoclea sensibilis*) are also common on the mounds. Small forbs usually found on hummocks include maystar (*Trientalis borealis*), blue-bead lily (*Clintonia borealis*), and bunchberry (*Cornus canadensis*). Eastern poison-ivy may also be present on some sites and should be avoided because it can cause severe dermatitis. On one sample site, skunk cabbage (*Symplocarpus foetidus*) was abundant in the pools of water. Very few grass or grass-like plant species were found on this site. There were more sedges than grasses and both appeared in small clumps on mounds scattered throughout. Typical sedges include three-seeded sedge (*Carex trisperma*).

Community 1.1

Northern white cedar/Threeseeded sedge (Thuja occidentalis/Carex trisperma)

Figure 12. Reference State

Figure 13. Reference State 2

Figure 14. Reference State 3

Figure 15. Reference State 4

Figure 16. Reference Plant Community Ground Cover

This is the reference community for the site. The description is based on historical descriptions, site index data, professional consensus of experienced ecologists, and analysis of field work. In reference condition this site is perceived to be a mixed conifer-hardwood forest. Due to the multiple (8) biophysical regions involved and the history of land use and management, a least disturbed climax state will be considered the reference state for this ESD. The least disturbed climax state is a mixed conifer-hardwood forest that has been harvested multiple times over the years. The reference plant community phase has a dominant tree community of northern red cedar or on some sites red spruce and/or red maple. Northern red cedar and red spruce are slower growing than red maple and where it has been heavily harvested, it has been shaded out by red maple. The intermediate canopy consists of red maple, gray birch, black ash, balsam fir, red and black spruce, and tamarack. Typical conifers are a mix of northern red cedar, spruce, tamarack and fir. Typical hardwoods are red maple, black ash, and a few birch species. Overstory canopy cover ranges from 75 to 95 percent. Because of the moderate to dense overstory, the understory consists of a few shade tolerant small shrubs, ferns and forbs such as three-seeded sedge. The ground surface is made up of pits and mounds with large patches of feather-mosses and leafy hornworts due to the moderate to dense shade and high moisture levels. There is a diverse and abundant amount of downed woody debris present. Hard and soft tree snags are typically present in abundance. The plant community can be restored from a harvest using appropriate brush management combined with either native regeneration, or if invasive species are a problem, a tree/shrub planting. It will be very difficult to restore a ponded state to a reference state because of the pervasive nature of beaver, but with removal of beaver dams and proper beaver control, sites may naturally return to the reference plant community over a long period of time.

Forest overstory. Total canopy cover is moderate to dense, averaging 85 percent and ranges from 75 to 95 percent. Average basal area is 110 square feet per acre and ranges from 60 to 180 square feet per acre. The structure in this 70 to 100 year old mixed conifer-hardwood stand is complex, including a few scattered very large trees greater than 20 inch dbh and exceeding 60 feet in height. There is a co-dominant and intermediate layer in the 40 to 60 feet in height and a layer of suppressed trees less than 40 feet in height. The dominant tree community is either northern white cedar, red spruce, or red maple. The co-dominant or intermediate canopy consists of red maple, gray birch, black ash, balsam fir, red and black spruce, and tamarack. The red maple plant community mainly occurs along the southwestern coastal plain where the land has been disturbed continuously for decades.

The red spruce dominated plant community occurs along the mid-coast area. The northern red cedar dominated plant community occurs mainly in the inland river valleys and extreme downeast Maine.

Four high-intensity data plots were used in developing the vegetation tables. Composition tables are by height class so certain species may be repeated. Refer to the Inventory Data Reference section of this report for more information on the site locations and height strata used.

Forest understory. The understory is somewhat sparse where the canopy is denser, but can be very abundant in naturally occurring open areas. The understory ground surface typically consists of pits and mounds. The pits may have up to 4 inches of water in them. Ferns dominate on the hummocks, although sometimes tall shrubs, such as alder and winterberry, forbs, and/or grass and grass-like species are found. Some short shrubs such as wild sarsaparilla and dwarf red blackberry may be present. Typical forbs on the mounds include starflower, bunchberry, and blue-bead lily. More water-tolerant plants are found in the pits, including three-seeded sedge, skunk cabbage, and leafy hornworts. Where the canopy is densest, various feather-mosses, not sphagnum moss, are most abundant, with very few forbs, ferns, and shrubs. Most of the trees have some kind of lichen on them.

Four high-intensity data plots were used in developing the vegetation tables. Composition tables are by height class so certain species may be repeated. Refer to the Inventory Data Reference section of this report for more information on the site locations and height strata used.

Table 5. Soil surface cover

Tree basal cover	1-4%
Shrub/vine/liana basal cover	0-1%
Grass/grasslike basal cover	1%
Forb basal cover	1%
Non-vascular plants	45-85%
Biological crusts	0%
Litter	5-45%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0-15%
Bare ground	0%

Table 6. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0-1%
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	1-1%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	1-1%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-1% N*
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	1-1% N*
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	25-74 per hectare
Tree snag count** (hard***)	25-74 per hectare

*** Decomposition Classes: N - no or little integration with the soil surface; I - partial to nearly full integration with the soil surface.**

**** >10.16cm diameter at 1.3716m above ground and >1.8288m height--if less diameter OR height use applicable down wood type; for pinyon and juniper, use 0.3048m above ground.**

***** Hard - tree is dead with most or all of bark intact; Soft - most of bark has sloughed off.**

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-1%	0-1%	1-15%
>0.15 <= 0.3	–	1-30%	–	0-1%
>0.3 <= 0.6	–	–	1-5%	1-20%
>0.6 <= 1.4	–	0-1%	0-1%	–
>1.4 <= 4	–	1-20%	–	–
>4 <= 12	5-60%	–	–	–
>12 <= 24	30-80%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Ponded

The ponded state is a result of beaver activity. This state is frequently ponded for long durations. The description is based on historical descriptions, site index data, professional consensus of experienced ecologists, and analysis of field work. This state is perceived to be a mixture of shrubs, typically speckled alder (*Alnus incana*) and graminoids, such as tussock (upright) sedge (*Carex stricta*) with few if any mature trees because they have been drowned out or eaten by the beavers.

Community 2.1
Speckled Alder/Tussock sedge (Alnus incana/Carex stricta)

Figure 17. Ponded State

This is the frequently ponded for long duration plant community phase. The description is based on historical descriptions, site index data, professional consensus of experienced ecologists, and analysis of field work. This phase is perceived to be a mixture of shrubs and graminoids with few if any mature trees. All the plant species are hydrophytic.

Forest understory. This plant community phase is composed of tall shrubs such as gray (speckled) alder (Alnus incana) and white meadowsweet (Spirea alba), along with mostly grasses and sedges, such as upright (tussock) sedge (Carex stricta) and beaked sedge (Carex rostrata). It also contains a few forbs such as jewelweed (Impatiens capensis) and halberdleaf tearthumb (Polygonum arifolium). Sensitive fern (Onoclea sensibilis) is common. Yellow pond-lily (Nuphar lutea spp advena) was found in permanent pools of water on the site. All the plant species are hydrophytic.

Table 8. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	2-5%
Grass/grasslike basal cover	65-90%
Forb basal cover	1%
Non-vascular plants	0%
Biological crusts	0%
Litter	1-20%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	1-20%
Bare ground	0-1%

Table 9. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0-1%
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	0-1%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-1%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-1% N*
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0-1% N*
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0 per hectare
Tree snag count** (hard***)	0-25 per hectare

*** Decomposition Classes: N - no or little integration with the soil surface; I - partial to nearly full integration with the soil surface.**

**** >10.16cm diameter at 1.3716m above ground and >1.8288m height--if less diameter OR height use applicable down wood type; for pinyon and juniper, use 0.3048m above ground.**

***** Hard - tree is dead with most or all of bark intact; Soft - most of bark has sloughed off.**

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	2-5%	–	2-5%
>0.3 <= 0.6	–	0-1%	25-50%	0-1%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	25-50%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 3
Harvested

The harvested state is quite common in Maine. Most harvesting is by an individual tree or group selection method in

this MLRA and on this site. The reference forest has been harvested for the most desirable species, northern red cedar and spruce. The remaining forest stand consists of young red maple and gray birch with a few balsam fir, tamarack, and black ash. This state is most like the reference state in plant composition particularly in the understory if only small openings are created like for an individual tree selection harvest. Group selection harvests may make larger openings temporarily that will allow other species to grow for very short periods of time. If northern red cedar and red spruce are harvested in large quantities, the harvested state will become dominated by red maple and other faster growing species.

Community 3.1
Red Maple/Alder/Threeseeded sedge (Acer rubrum/Alnus spp./ Carex trisperma)

Figure 18. Harvested Plant Community

Figure 19. Harvested Plant Community 2

Figure 20. Harvested Plant Community 3

Figure 21. Harvested Plant Community Ground Cover

The harvested state is the most common plant community phase of this ecological site in Maine. Most harvesting is by an individual tree or group selection method in this MLRA and on this site. The reference forest has been harvested for the most desirable species, northern red cedar and red spruce. The remaining forest stand consists of young red maple as the dominant species, or co-dominant with tamarack or black spruce. The lower overstory consists of red maple, balsam fir, gray birch, black ash, tamarack, black spruce, and northern white cedar. Eastern white pine may be present on mounds at the edge of the drier sites. This state is most like the reference state in plant composition particularly in the understory if only small openings are created like for an individual tree selection harvest. Group selection harvests may make larger openings temporarily that will allow other species to grow for very short periods of time. If northern red cedar and red spruce are harvested in large quantities, the overstory will become dominated by red maple and other faster growing species. The understory will contain more shrubs and forbs. Feather-mosses and leafy liverworts are still present in abundance on the pit and mound microrelief. Downed woody debris is still quite high in this plant community phase. Hard snag trees are more abundant than soft snag trees.

Forest overstory. The harvested community phase typically has an average canopy cover of 70 percent with a range from 60 to 75 percent. Basal area ranges from a low of 40 square feet per acre to a high of 100 square feet per acre, and averages 60 square feet per acre. The overtstory typically consists of non-merchantable timber species and all undesirable species such as red maple and balsam fir. Black spruce, black ash, and tamarack may also be found in the intermediate overstory. Typically most of the overstory species on this site could be found in a wetland. Large white pine and white birch, more upland species, were also found at one sample site growing on hummocks or mounds at the drier edge of the site.

Forest understory. The understory is similar to the reference state, including the pit and mound microtopography. Because the canopy is less dense, it includes tall shrubs such as common winterberry (Ilex vericillata), highbush blueberry (Vaccinium corymbosum), hazel alder (Alnus serrulata),and speckled alder, as well as shorter shrubs such as white meadowsweet (Spirea alba), swamp rose (Rosa palustris), dewberry (Rubus hispidus), and dwarf red blackberry (Rubus pubescens). It also includes more grasses, such as rattlesnake mannagrass (Glyceria canadensis) and sedges, such as threeseeded sedge (Carex trisperma) and fringed sedge (Carex crinita), with less mosses. There are a larger variety of forbs as well, including small enchanted nightshade (Circaea alpina), gold-thread (Coptis trifolia), rough bedstraw (Galium asprellum), jewelweed (Impatiens capensis), and northern bugleweed (Lycopus uniflorus). Water arum (Calla palustris) is present in the pits while less hydric species such as bunchberry, blue-bead lily, and wild sarsaparilla grow on the mounds. Eastern poison-ivy, which may cause dermititis, was found on at least two sample sites. Feather mosses, on the mounds, and leafy liverworts, in the pits, were present throughout the site. There is a predominance of hydrophytic plant species.

Table 11. Soil surface cover

Tree basal cover	1-4%
Shrub/vine/liana basal cover	1%
Grass/grasslike basal cover	0-1%
Forb basal cover	1%
Non-vascular plants	5-80%

Biological crusts	0%
Litter	1-85%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	1-10%
Bare ground	0-1%

Table 12. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0-1%
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	0-1%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-1%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-1% N*
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0-2% N*
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	25-49 per hectare
Tree snag count** (hard***)	0-74 per hectare

*** Decomposition Classes: N - no or little integration with the soil surface; I - partial to nearly full integration with the soil surface.**

**** >10.16cm diameter at 1.3716m above ground and >1.8288m height--if less diameter OR height use applicable down wood type; for pinyon and juniper, use 0.3048m above ground.**

***** Hard - tree is dead with most or all of bark intact; Soft - most of bark has sloughed off.**

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-5%	–	0-5%
>0.15 <= 0.3	–	0-1%	0-1%	0-5%
>0.3 <= 0.6	–	0-5%	1-30%	0-10%
>0.6 <= 1.4	–	0-5%	–	0-2%
>1.4 <= 4	–	5-10%	–	–
>4 <= 12	5-99%	–	–	–
>12 <= 24	0-85%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Transition T1A
State 1 to 2

The reference state may transition to a flooded state from the effects of beavers on the hydrology of a site. Beavers can cause a long term elevation of ponded water and the killing of nearby trees for food. This will eliminate trees and favor the growth of shrubs such as speckled alder, forbs, grasses, and grass-like plant species.

Transition T1B
State 1 to 3

The reference state transitions to a harvested state by the removal of some or all desirable woody vegetation. Hydrology may be moderately to severely altered by the addition of woody debris or gravel in forest access trails and roads in narrow linear locations throughout the site if done at the wrong time of year or at inappropriate times, such as during or after heavy rainfalls.

Restoration pathway R2A
State 2 to 1

The ponded state may transition to a reference state by the elimination of beavers and their dams, and allowing the return after many years of normal hydrology that will favor trees. Tree and shrub planting might also be used to speed up the process.

Conservation practices

Obstruction Removal
Tree/Shrub Establishment

Restoration pathway R2B
State 2 to 3

The ponded state may transition to a harvested state by the elimination of beavers and their dams, and allowing the return after many years of normal hydrology that will favor trees. Tree and shrub planting might also be used to speed up the process. This would only be an intermediate step towards a fully restored site and would not be commonly used.

Conservation practices

Obstruction Removal
Tree/Shrub Establishment

Restoration pathway R3A
State 3 to 1

The harvested state may be restored to the reference state by natural regeneration over a period of time or the planting of desirable vegetation which may shorten the period of time to full canopy status. Invasive species establishment and wildlife damage to plants must be controlled in order to fully restore the site.

Conservation practices

Brush Management
Tree/Shrub Establishment

Transition T3A
State 3 to 2

The harvested state may transition to a flooded state from the effects of beavers on the hydrology of a site. Beavers can cause a long term elevation of ponded water and the killing of nearby trees for food. This will eliminate trees and favor the growth of shrubs, forbs, and grasses.

Additional community tables

Table 14. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
arborvitae	THOC2	*Thuja occidentalis*	Native	6.1–19.8	40–80	12.7–38.1	–
red maple	ACRU	*Acer rubrum*	Native	12.2–18.3	20–40	12.7–63.5	–
red spruce	PIRU	*Picea rubens*	Native	9.1–19.8	5–40	12.7–50.8	–
arborvitae	THOC2	*Thuja occidentalis*	Native	4.6–12.2	10–30	10.2–25.4	–
tamarack	LALA	*Larix laricina*	Native	12.2–18.3	0–10	25.4–38.1	–
black spruce	PIMA	*Picea mariana*	Native	10.7–18.3	0–5	12.7–38.1	–
red spruce	PIRU	*Picea rubens*	Native	1.5–7.6	1–5	10.2–20.3	–
red maple	ACRU	*Acer rubrum*	Native	4.6–12.2	1–5	10.2–25.4	–
balsam fir	ABBA	*Abies balsamea*	Native	3–12.2	1–5	10.2–25.4	–
yellow birch	BEAL2	*Betula alleghaniensis*	Native	2.4–7.6	0–1	10.2–20.3	–
paper birch	BEPA	*Betula papyrifera*	Native	12.2–18.3	0–1	25.4–38.1	–
quaking aspen	POTR5	*Populus tremuloides*	Native	12.2–18.3	0–1	25.4–38.1	–

Table 15. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
threeseeded sedge	CATR10	*Carex trisperma*	Native	0.3–0.6	1–2
northern long sedge	CAFO6	*Carex folliculata*	Native	0.3–0.6	0–2
upright sedge	CAST8	*Carex stricta*	Native	0.3–0.6	0–1
Forb/Herb					
bunchberry dogwood	COCA13	*Cornus canadensis*	Native	0–0.2	1–10
skunk cabbage	SYFO	*Symplocarpus foetidus*	Native	0.3–0.6	0–2
bluebead	CLBO3	*Clintonia borealis*	Native	0–0.2	0–1
threeleaf goldthread	COTR2	*Coptis trifolia*	Native	0–0.2	0–1
parasol whitetop	DOUM2	*Doellingeria umbellata*	Native	0–0.2	0–1
rough bedstraw	GAAS2	*Galium asprellum*	Native	0–0.2	0–1
jewelweed	IMCA	*Impatiens capensis*	Native	0–0.2	0–1
twinflower	LIBO3	*Linnaea borealis*	Native	0–0.2	0–1
starflower	TRBO2	*Trientalis borealis*	Native	0–0.2	0–1
northern bugleweed	LYUN	*Lycopus uniflorus*	Native	0–0.2	0–1
Canada mayflower	MACA4	*Maianthemum canadense*	Native	0–0.2	0–1
mountain woodsorrel	OXMO	*Oxalis montana*	Native	0–0.2	0–1
violet	VIOLA	*Viola*	Native	0–0.2	0–0.1
sidebells wintergreen	ORSE	*Orthilia secunda*	Native	0–0.2	0–0.1
king of the meadow	THPU2	*Thalictrum pubescens*	Native	0.2–0.3	0–0.1
Fern/fern ally					
sensitive fern	ONSE	*Onoclea sensibilis*	Native	0.3–0.6	1–10

cinnamon fern	OSCI	*Osmunda cinnamomea*	Native	0.3–0.6	2–10
royal fern	OSRE	*Osmunda regalis*	Native	0.3–0.6	0–1
cinnamon fern	OSCI	*Osmunda cinnamomea*	Native	0.2–0.3	0–1
meadow horsetail	EQPR	*Equisetum pratense*	Native	0–0.2	0–1
crested woodfern	DRCR4	*Dryopteris cristata*	Native	0.3–0.6	0–0.1
eastern marsh fern	THPA	*Thelypteris palustris*	Native	0.3–0.6	0–0.1
Shrub/Subshrub					
gray alder	ALIN2	*Alnus incana*	Native	1.4–4	1–5
serviceberry	AMIN4	*Amelanchier ×intermedia*	Native	1.4–4	0–5
dwarf red blackberry	RUPU	*Rubus pubescens*	Native	0–0.2	0–1
wild sarsaparilla	ARNU2	*Aralia nudicaulis*	Native	0–0.2	0–1
prickly currant	RILA	*Ribes lacustre*	Native	0–0.2	0–1
bristly dewberry	RUHI	*Rubus hispidus*	Native	0–0.2	0–1
dwarf red blackberry	RUPU	*Rubus pubescens*	Native	0.2–0.3	0–1
wild sarsaparilla	ARNU2	*Aralia nudicaulis*	Native	0.2–0.3	1
creeping snowberry	GAHI2	*Gaultheria hispidula*	Native	0–0.2	0–0.1
partridgeberry	MIRE	*Mitchella repens*	Native	0–0.2	0–0.1
swamp rose	ROPA	*Rosa palustris*	Native	0–0.2	0–0.1
Tree					
red maple	ACRU	*Acer rubrum*	Native	0.2–0.3	2–15
red spruce	PIRU	*Picea rubens*	Native	1.4–4	1–10
balsam fir	ABBA	*Abies balsamea*	Native	0.2–0.3	2–10
arborvitae	THOC2	*Thuja occidentalis*	Native	0.2–0.3	1–2
balsam fir	ABBA	*Abies balsamea*	Native	1.4–4	1–2
red maple	ACRU	*Acer rubrum*	Native	1.4–4	1–2
arborvitae	THOC2	*Thuja occidentalis*	Native	1.4–4	0–2
black spruce	PIMA	*Picea mariana*	Native	0.2–0.3	0–2
balsam fir	ABBA	*Abies balsamea*	Native	0.6–1.4	0–1
striped maple	ACPE	*Acer pensylvanicum*	Native	0.6–1.4	0–1
red spruce	PIRU	*Picea rubens*	Native	0–0.2	0–1
black ash	FRNI	*Fraxinus nigra*	Native	1.4–4	0–1
green ash	FRPE	*Fraxinus pennsylvanica*	Native	1.4–4	0–1
balsam fir	ABBA	*Abies balsamea*	Native	0–0.2	0–1
Biological Crusts					
beard lichen	USNEA2	*Usnea*	Native	–	0–1
Nonvascular					
Bryophyte (moss, liverwort, hornwort)	2BRY	*Bryophyte (moss, liverwort, hornwort)*	Native	0–0.2	5–95

Table 16. Community 2.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
upright sedge	CAST8	*Carex stricta*	Native	0.6–1.4	25–50
reed canarygrass	PHAR3	*Phalaris arundinacea*	Native	0.6–1.4	10–35
beaked sedge	CARO6	*Carex rostrata*	Native	0.3–0.6	2–5
bluejoint	CACA4	*Calamagrostis canadensis*	Native	0.6–1.4	1–2
Forb/Herb					
jewelweed	IMCA	*Impatiens capensis*	Native	0.2–0.3	5–10
halberdleaf tearthumb	POAR6	*Polygonum arifolium*	Native	0.2–0.3	0–1
earth loosestrife	LYTE2	*Lysimachia terrestris*	Native	0.2–0.3	0–1
yellow pond-lily	NULUA	*Nuphar lutea ssp. advena*	Native	–	0–0.1
king of the meadow	THPU2	*Thalictrum pubescens*	Native	0.3–0.6	0–0.1
Fern/fern ally					
sensitive fern	ONSE	*Onoclea sensibilis*	Native	0.2–0.3	5–10
common ladyfern	ATFI	*Athyrium filix-femina*	Native	0.3–0.6	0–0.1
Shrub/Subshrub					
hazel alder	ALSE2	*Alnus serrulata*	Native	1.4–4	50–75
gray alder	ALIN2	*Alnus incana*	Native	1.4–4	25–50
white meadowsweet	SPAL2	*Spiraea alba*	Native	0.6–1.4	10–25
southern arrowwood	VIDE	*Viburnum dentatum*	Native	1.4–4	5–10
bristly dewberry	RUHI	*Rubus hispidus*	Native	0.2–0.3	2–5
redosier dogwood	COSES	*Cornus sericea ssp. sericea*	Native	0.6–1.4	1–2
Tree					
green ash	FRPE	*Fraxinus pennsylvanica*	Native	1.4–4	0.5–1

Table 17. Community 3.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
red maple	ACRU	*Acer rubrum*	Native	7.6–12.2	1–70	5.1–53.3	–
black ash	FRNI	*Fraxinus nigra*	Native	4.6–10.7	0–50	5.1–30.5	–
red maple	ACRU	*Acer rubrum*	Native	12.2–19.8	1–25	10.2–38.1	–
balsam fir	ABBA	*Abies balsamea*	Native	3–10.7	1–25	5.1–15.2	–
black spruce	PIMA	*Picea mariana*	Native	7.6–18.3	1–20	10.2–55.9	–
tamarack	LALA	*Larix laricina*	Native	6.1–12.2	1–10	5.1–20.3	–
arborvitae	THOC2	*Thuja occidentalis*	Native	6.1–12.2	0–2	25.4–45.7	–
eastern white pine	PIST	*Pinus strobus*	Native	7.6–12.2	0–1	5.1–20.3	–
paper birch	BEPA	*Betula papyrifera*	Native	7.6–10.7	0–1	5.1–10.2	–
gray birch	BEPO	*Betula populifolia*	Native	3–10.7	0–1	5.1–10.2	–
black spruce	PIMA	*Picea mariana*	Native	3–12.2	0–1	5.1–25.4	–
tamarack	LALA	*Larix laricina*	Native	9.1–19.8	0–1	25.4–30.5	–

Table 18. Community 3.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
rattlesnake mannagrass	GLCA	*Glyceria canadensis*	Native	0.3–0.6	2–25
upright sedge	CAST8	*Carex stricta*	Native	0.3–0.6	2–5
threeseeded sedge	CATR10	*Carex trisperma*	Native	0.3–0.6	2–5
fringed sedge	CACR6	*Carex crinita*	Native	0.3–0.6	0.5–1
white edge sedge	CADE5	*Carex debilis*	Native	0.3–0.6	0–0.1
northern long sedge	CAFO6	*Carex folliculata*	Native	0.3–0.6	0–0.1
Forb/Herb					
king of the meadow	THPU2	*Thalictrum pubescens*	Native	0.6–1.4	1–2
Canada mayflower	MACA4	*Maianthemum canadense*	Native	0–0.2	1–2
starflower	TRBO2	*Trientalis borealis*	Native	0–0.2	0.5–1
parasol whitetop	DOUM2	*Doellingeria umbellata*	Native	0–0.2	0.5–1
low rough aster	EURA10	*Eurybia radula*	Native	0–0.2	0.5–1
rough bedstraw	GAAS2	*Galium asprellum*	Native	0–0.2	0–0.1
parasol whitetop	DOUM2	*Doellingeria umbellata*	Native	0.3–0.6	0–0.1
harlequin blueflag	IRVE2	*Iris versicolor*	Native	0.2–0.3	0–0.1
water arum	CAPA	*Calla palustris*	Native	0–0.2	0–0.1
small enchanter's nightshade	CIAL	*Circaea alpina*	Native	0–0.2	0–0.1
jewelweed	IMCA	*Impatiens capensis*	Native	0–0.2	0–0.1
northern bugleweed	LYUN	*Lycopus uniflorus*	Native	0–0.2	0–0.1
bluebead	CLBO3	*Clintonia borealis*	Native	0–0.2	0–0.1
bunchberry dogwood	COCA13	*Cornus canadensis*	Native	0–0.2	0–0.1
earth loosestrife	LYTE2	*Lysimachia terrestris*	Native	0.3–0.6	0–0.1
Fern/fern ally					
sensitive fern	ONSE	*Onoclea sensibilis*	Native	0.3–0.6	2–5
cinnamon fern	OSCI	*Osmunda cinnamomea*	Native	0.3–0.6	2–5
meadow horsetail	EQPR	*Equisetum pratense*	Native	0–0.2	1–2
meadow horsetail	EQPR	*Equisetum pratense*	Native	0.2–0.3	0.5–1
Shrub/Subshrub					
gray alder	ALIN2	*Alnus incana*	Native	1.4–4	5–25
white meadowsweet	SPAL2	*Spiraea alba*	Native	0.3–0.6	2–5
white meadowsweet	SPAL2	*Spiraea alba*	Native	0.6–1.4	2–5
hazel alder	ALSE2	*Alnus serrulata*	Native	1.4–4	0–2
common winterberry	ILVE	*Ilex verticillata*	Native	1.4–4	1–2
highbush blueberry	VACO	*Vaccinium corymbosum*	Native	0.6–1.4	0–1
dwarf red blackberry	RUPU	*Rubus pubescens*	Native	0–0.2	0.5–1
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	0–0.2	0.5–1
swamp rose	ROPA	*Rosa palustris*	Native	0–0.2	0.5–1
bristly dewberry	RUHI	*Rubus hispidus*	Native	0–0.2	0.5–1
white meadowsweet	SPAL2	*Spiraea alba*	Native	0.2–0.3	0.5–1
wild sarsaparilla	ARNU2	*Aralia nudicaulis*	Native	0.2–0.3	0–0.1

wild sarsaparilla	ARNU2	*Aralia nudicaulis*	–	0–0.2	0–0.1
lowbush blueberry	VAAN	*Vaccinium angustifolium*	Native	0–0.2	0–0.1
Tree					
black spruce	PIMA	*Picea mariana*	Native	0–0.2	1–2
balsam fir	ABBA	*Abies balsamea*	Native	0–0.2	1–2
red maple	ACRU	*Acer rubrum*	Native	0–0.2	1–2
balsam fir	ABBA	*Abies balsamea*	Native	0.6–1.4	0–1
balsam fir	ABBA	*Abies balsamea*	Native	0.3–0.6	0.5–1
red maple	ACRU	*Acer rubrum*	Native	1.4–4	0–0.1
Nonvascular					
Bryophyte (moss, liverwort, hornwort)	2BRY	*Bryophyte (moss, liverwort, hornwort)*	Native	0–0.2	5–75

Animal community

Wildlife Habitat
General Information Reference Site
The moderate to dense canopy cover of the reference site provides for a deep litter layer, and a dark, cool, moist micro-environment on the forest floor, where animals are less subject to extremes in temperature, solar radiation, wind speed, humidity, rain through-fall, snow accumulation, and predation. In the dense conifer canopy, this site has less diversity of vertical structure, which is a very important wildlife habitat component. On the other hand, the larger amounts of dead standing and dead downed debris, which make small openings and unique habitat, improves the diversity of vertical structure.

This reference site typically occurs in a riparian zone, which is considered one of the most productive wildlife habitats in Maine. Greater availability of water to plants, in combination with the deeper soil, increases plant production and diversity, and generally produces more food and cover for wildlife. This site supports a higher concentration of animals, including tree-nesting waterfowl, such as wood duck, and other birds, as well as semi-aquatic animals such as beaver, mink, and moose. Larger trees in the overstory, when present, may provide important nesting and loafing sites for bald eagles and osprey. Upland mammals such as deer frequently use this site for travel corridors and feeding areas. In southern Maine's developing landscape, this site together with other wetland-type sites often form the nucleus of large forest blocks and a network of travel corridors that are critical to many species (Bryan 2004). This site may also provide early sources of green vegetation, earthworms, and insects to sustain early migrants such as robins and woodcock, especially after late snowfalls. This site may be important in the spring and early-summer diets of black bears, skunks, raccoons, and otters (Flatebo, Foss and Pelletier 1999).

Quite a few of these sites are narrow and linear in shape because they occur in riparian areas, rather than wide patches as in typical floodplain forests, so they may have more "edge" to them. These wetland edges attract a different variety of wildlife than larger expanses of wetland forest.

Due to the general location and soil features of this reference site, it is less at risk of being converted to non-forested uses. Animal species most at risk from forest conversion are habitat specialists. Amphibians and reptiles that require this type of habitat are at risk for loss and severe reductions of species on these sites throughout MLRA 144B. Mammals that require this type of habitat, such as New England cottontail, are at risk for loss and severe reductions of species, especially on these sites in southern parts of MLRA 144B.

Rare Species
Western reference sites in Maine often provide habitat in which the state-threatened spotted turtles hibernate. If wet mossy mounds are present, four-toed salamanders, a species of special concern, may breed and over winter in this site. It should be noted that rare plants and natural plant communities have no legal status for protection in Maine.

Vernal and Ephemeral Pools
At this reference site, the water table is located at or above the ground's surface (less than 6 inches) all year. It has occasional long periods of ponding (standing water) and a tendency to be interspersed or adjacent to water. This

standing water is known as vernal (springtime) and ephemeral pools, respectively, and they do not contain fish. Many frogs and salamanders require such temporary habitat specifically for breeding and egg-laying. Types of amphibians and reptiles often vary from one site to another due to differences in adjacent habitat type, canopy cover, and past land use. They also provide drinking sites for many birds and mammals and often provide unfrozen sites around which early spring arrivals of woodcock can probe for food (Hobson, Barclay and Broderick 1993). At this site reptiles and amphibians breed or feed. Other fauna includes aquatic insects, and other invertebrates such as fairy shrimp, fingernail clams, and snails. Mink, great blue heron and wood turtle visit these sites to feed, and numerous upland species of birds and mammals visit vernal pools to drink, bathe, and forage. A typical home range area for amphibians and reptiles is a 500-foot radius around the pool. This reference site provides a moist forest floor with loose, deep litter, downed woody debris, and patches of canopy shade which are important for dispersal, migration, foraging, and hibernation of amphibians breeding in vernal pools. These pools only occur in the forested states of this site.

Hummock and Hollow Microtopography
Hollows occur where trees with shallow roots have uprooted and pulled up soil and the hummocks develop from the rotting tree roots, stumps and logs. This pit and mound structure influences the moisture, temperature, organic matter, and nutrients, which leads to a more diverse animal community. This feature occurs in the mature reference state, and may be retained if harvested sustainably.

Snag and Cavity Trees
In Maine, the total number of live and snag (dead) cavity trees (=15.0 inches dbh) increased in 2008 by almost 3.1 million trees while the total number of live and snag trees (=21.0 inches dbh) increased by more than 1.05 million on Maine's forest land. The number of live and snag trees (=21.0 inches dbh) increased on a per-acre basis in Cumberland, Sagadahoc and Androscoggin Counties (USDA Forest Service 2010). This reference site typically has at least two or three large standing dead trees (snags) and cavity trees (live or partially-live trees) that can be used by a variety of birds and mammals for perches, nest and roost holes, dens, and foraging sites. See Wildlife Specific Information for the Reference Site to review individual wildlife species requirements on type and size of snags and cavity trees. Spruce and red maple are the major species used because they provide the appropriate size class at this site. Large snags and cavity trees generally last longer and can be used by both large and small birds and mammals. Larger snags also provide more thermal insulation, protection from predators, perches, and will persist longer in the forest (Flatebo, Foss and Pelletier 1999). The state of decay is important as well and this site typically had more hard snags.

Downed Woody Debris
The multiple characteristics of downed woody debris on this reference site, including physical distribution, size, amount, and degree and stage of decay provide habitat for a wide variety of animals, macro-organisms (e.g. earthworms and beetles) and micro-organisms (e.g. millipedes, ants, springtails, mites, nematodes, and mycorrhizal fungi). The larger debris which occurs on this site, depending on the stage and degree of decay, provides shelter and foraging sites for a wide variety of amphibians, reptiles, birds, and mammals. It also is used by many other organisms, including microscopic bacteria and fungi. On this site, the downed woody debris provides a source of cover, particularly winter cover. This is good because there is a lack of substantial understory plants due to the moderate to dense canopy cover. Most of Maine's forests have more than 500 cubic feet per acre of coarse woody debris (USDA Forest Service 2010).

Harvested sites may contain more of the finer-size downed woody debris and less coarser-size debris. If it has been harvested for biomass/whole-tree harvest, it will have virtually no downed woody debris at all.

Flooded sites will also not have any downed woody debris, but will provide other types of suitable habitat for macro- and micro-organisms.

Forest Litter and Moss
This reference site typically has an abundance of forest litter and moss which provides foraging and shelter sites for a variety of amphibians, reptiles, birds, and small mammals. Harvested sites will have a little less moss, somewhat less litter, and possibly some bare ground so this type of habitat will be reduced and have a less diverse amount of wildlife using it. Flooded sites will have little to no moss and no forest litter to provide habitat for wildlife, may provide aquatic type habitat for some species, such as little green herons.

Gaps in the Forest Canopy

This reference site typically contains small (< 0.1 Acre) natural gaps in the canopy due to the death of large mature trees. In these temporary natural openings, sun-loving plant species can grow and provide more complex vertical structure to the site which attracts more wildlife, especially small birds.
Gaps occur in the harvested state, but they are usually greater than 0.1 acre in size. The harvested state will provide a larger area of young trees and shrubs that will temporarily attract wildlife that require a younger forest for food and cover. Wildlife such as moose and woodcock are attracted to these sites for their preferred food.

Wildlife Specific Information for the Reference Site

The following species are described because they may typically use this ecological site for foraging or cover. Information on each species provides a very brief description of what parts of this site they use and why. Most of the information, unless otherwise indicated, is from DeGraaf and Yamasaki (2000) New England Wildlife: Habitat, Natural History and Distribution and in DeGraaf et al. (2007) Technical Guide to Forest Wildlife Habitat Management in New England.

Amphibians & Reptiles: This site provides the cool, moist forested habitat that supports a variety of amphibians and reptiles. Amphibians need to keep their critical skin moisture. Salamanders and their prey, notably invertebrates, may use downed woody debris, moss, and organic matter (duff) on this site extensively. In particular, they are three-dimensional habitat users, going down through the various soil horizons using root channels and moist areas below ground. The small forest openings or gaps which contain down woody debris associated with woodland pools, ponds and other wet spots may be used by turtles for basking.

Spotted salamander (Ambystoma maculatum) – This site may be preferred breeding habitat and utilized in winter because it prefers mesic mixed woods with semi-permanent water for breeding.

Four-toed salamander (Hemidactylium scutatum) – This site may be primary habitat because this species of state special concern prefers an abundance of sphagnum moss. It lays its eggs in mossy cavities and adults live in wooded or open areas adjacent to forested wetland sites with sphagnum depressions, sphagnum ponds, sphagnum drainageways, swamps, or bogs.

Spotted turtle (Clemmys guttata) – This state-threatened species utilizes this site only in the non-breeding season to hibernate. This species spends most of its time working across upland habitats adjacent to forest/non-forest wetlands as well as time in water.

Birds:
Wood duck (Aix sponsa) – This site may be preferred breeding habitat if trees are at least 16 inches dbh with large cavities and 4 inch diameter entrance holes. This species needs breeding and feeding habitat from saplings through large sawtimber size classes of hardwoods in riparian areas. It utilizes mast and fruit for feeding during breeding season, oak mast in fall, and sedge seeds in winter and spring.

Red-shouldered hawk (Buteo lineatus) – This site may be preferred breeding and feeding habitat from sawtimber to large sawtimber size class forests. This species prefers cool, moist, mature mixed wooded wetlands in riparian areas. It utilizes closed canopy hardwood overstory for breeding and for feeding it utilizes more open conditions such as canopy cover of > 70% with some 16% to 30% canopy cover.

Wild turkey (Meleagris gallopavo) – This site may be utilized for winter cover and feeding.

Eastern screech owl (Megascops asio) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat. This species need cavity trees with minimum dbh of 12 inches in riparian mixed wood and lives in forests of all tree size classes.

American woodcock (Scolopax minor) – This species require moist woodlands in early stages of succession such as the harvested state at this site, in thickets of alder, willow or maple, brushy edges of woods adjacent to dry open woods and fields for foraging. They prefer fertile, moist soil that contains earthworms for foraging and diurnal cover with forest openings, including blueberry fields and non-forested areas for courtship activities and nocturnal roosting. They do not winter in Maine except rarely along the coast.

Barred owl (Strix varia) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat. This species prefers cool, damp lowlands, and cavity trees with minimum dbh of 18 inches in riparian mixed wood areas, such as this site, as well as older northern hardwoods, swamp hardwoods, and pine/oak/red maple forest types.

Ruby-throated hummingbird (Archilochus colubris) – This site may be preferred breeding and feeding habitat, especially in the sawtimber and large sawtimber size classes of mixed woods. It also utilizes the seedling to sapling size classes where flowers, preferably red, are present. This includes jewelweed a common species at this site.

Downy (Picoides pubescens) and hairy (Picoides villosus) woodpeckers – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat. These two species may utilize mixed wood riparian areas of all tree size classes, such as this site, as well as other forest types.

Pileated woodpecker (Dryocopus pileatus) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat. This species need mature mixed forest with trees with column of decayed wood at least 18 inches dbh in riparian areas and hardwood swamps, such as this site, but may use upland stands of northern hardwood, pine/oak/red maple forest types.

Black-capped chickadee (Poecile atricapillus) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat. This species prefers large sawtimber size class in mixed wood riparian areas, hardwood swamps, such as this site, and northern hardwood forest types. They nest in small diameter trees with punky rotten cavities.

Winter wren (Troglodytes hiemalis) – This site may be preferred breeding and feeding habitat in the sawtimber or large sawtimber size class forests. This species prefers moist, mixed or coniferous woodlands with down logs and low woody vegetation. It utilizes this site for winter cover and feeding when this site is located in riparian areas.

Veery (Catharus fuscescens) – This site may be preferred breeding and feeding habitat in the sapling through large sawtimber size classes when in riparian areas and where there are more small gaps that provide an understory of low trees and shrubs. This species prefers moist mixed woodlands with an understory of low trees and shrubs that act as cover.

Hermit thrush (Catharus guttatus) – This site may be preferred breeding habitat if it is located in lowland, damp coniferous or mixed forests adjacent to woodland edges and brushy pastures and cool north-facing slopes.

Wood thrush (Hylocichla mustelina) - This site may be preferred breeding and feeding habitat in the sapling through large sawtimber size class forests. This species prefers cool, moist, mature deciduous or mixed forest in riparian areas.

Ovenbird (Seiurus aurocapillus) – This species utilizes this site for breeding and feeding and prefers mixed woods of all tree size classes. It usually is found in closed-canopy, mature deciduous or mixed woods, but often among pines. Open forests with little underbrush and an abundance of fallen leaves, logs, and rocks are preferred. Forest stand thinning may reduce ovenbird abundance until the canopy closes (Johnston 1970).

Northern waterthrush (Parkesia noveboracensis) – This site may be preferred breeding and feeding habitat in the sawtimber and large sawtimber size classes of mixed woods. This species prefers cool, shaded, wet ground with shallow pools in riparian areas. Their preferred nest site is in a cavity on the ground: among roots of fallen trees, at the base of a moss-covered stump, or under a mossy log.

Mammals:
Virginia opossum (Didelphis virginiana) – This site may be preferred habitat in mixed wood riparian areas of all tree size classes, because it is commonly found in wet woods near rivers and swamps. They are omnivores and eat a wide variety of fruits, insects, small animals and snakes. They usually den in an abandoned burrow, tree cavity, hollow log, or brush pile near water (Llewellyn and Dale 1964). They have been known to dwell near human habitation.

Shrew (Sorex spp) – These species utilize this site for breeding, feeding and over-wintering in mixed wood riparian areas of all tree size classes. Masked shrew (S. cinereus) prefers damp deciduous and coniferous woodlands with

grasses, rocks, logs, or stumps for cover and nesting near bogs and other moist areas that have high humidity. The northern water shrew (S. palustris) may also utilize this site.

Star-nosed mole (Condylura cristata) – This species lives in wet lowland areas such as this site, because it prefers low wet ground near bodies of water, swamps, wet meadows, occasionally wet spots in fields or low-lying woods, and is carnivorous. It digs shallow surface tunnels for foraging; often, these tunnels exit underwater. It is active day and night and remains active in winter, when it has been observed tunneling through the snow and swimming in ice-covered streams.

Beaver (Castor Canadensis) – Although beaver are aquatic mammals, feeding and cover habitat depend on hardwood of all tree size classes from this site. They consume bark of deciduous trees especially aspen, balsam poplar, alder, willow, birch, and maple, and use sticks of wood to make their dams and lodges. Hardwood twigs are also stuck in the mud below water level near lodges for a winter food cache.

Southern red-backed vole (Myodes gapperi) – This species prefers moist deciduous, mixed, or coniferous forests among mossy rocks, logs, tree roots, or other cover. It favors damp situations in coniferous or mixed woods such as this site. Highest densities are found in subclimax communities (Cameron 1958:46). It uses young clearcuts in deciduous or coniferous woodlands (Kirkland 1978) and mixed forest (Lovejoy 1975). It likes to be near water sources such as springs, brooks or bogs with debris cover (fallen trees, stumps, rocks, slash).

Woodland jumping mouse (Napaeozapus insignis) – This site may be preferred breeding, feeding, and winter cover habitat in sapling through large sawtimber size class forests. This species prefers moist cool mixed woodland, loose soils, and herbaceous cover in riparian areas. It prefers jewelweed seeds which is a common species on this site. It also feeds quite a bit on fungus of all kinds. It does not feed in winter because it hibernates.

Gray fox (Urocyon cinereoargenteus) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat in sapling to large sawtimber size class forests. This species may utilize sites in mixed wood riparian areas.

Black bear (Ursus americanus) – This site may be preferred breeding and feeding habitat. This species utilizes mixed wood riparian areas of all tree size classes. These sites are important spring time foraging locales for early spring ephemeral plants.

Raccoon – (Procyon lotor) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat in mixed wood riparian areas of all tree size classes. Higher populations are found in lowland deciduous or mixed forests abundant with water and marshes. It may commonly be found in wetlands near human habitation.

Mink (Neovison vison) – This site may be preferred breeding, feeding, winter cover, and winter feeding habitat in all tree size classes in mixed wood riparian areas because they are considered aquatic foragers. It favors forested wetlands with abundant cover such as thickets, and windfall trees.

Fisher (Martes pennant) – This species prefer continuous forest and have been found in extensive conifer or mixed forests with canopy cover of greater than 80%, such as this site, and will avoid areas with less than 30% coverage. Fishers are more likely to be found in mature forests with larger diameter trees. They also like large amounts of large downed woody material. They favor wetlands (alder) and mixed softwood-hardwood forest types (Kelly 1977:77).

White-tailed deer (Odocoileus viginianus) – This site may be utilized for breeding and feeding habitat in mixed wood riparian areas of all tree size classes. During winter months when snow depth exceeds 16 inches (40.6 cm) deer will "yard" in stands of conifers, especially northern white cedar, forming a central resting area with trails packed through the snow. This species requires dense cover for winter shelter and adequate browse, which this site may provide when in an older growth phase of the harvested state.

In parts of the eastern United States, some negative effects of high deer densities have been noted, such as forest degradation from over browsing by the deer. In northeastern hardwood forests, high-density deer populations affect plant succession, particularly following clear-cuts and patch cuts. In vegetative succession without deer, annual herbs and woody plants are followed by commercially-valuable, shade-tolerant species. When deer consume earlier-succession plants, this allows in enough light for nutrient competitors to invade. Since slow growing tree

species, such as northern white cedar, need several decades to develop root systems sufficient to compete with faster growing species, removal of the canopy prior to that point amplifies the effect of deer on successful vegetative succession (McShea 1997).
There is also concern, especially in the southern part of MLRA 144B, over the facilitative effect high deer populations have on invasions of exotic plant species. In a study of eastern hemlock forests, browsing by white-tailed deer caused populations of three exotic plants to rise faster than they do in the areas which are absent of deer. Seedlings of the three invading species rose exponentially with deer density, while the most common native species fell exponentially with deer density, because deer were preferentially eating the native species. The effects of deer on the invasive and native plants were magnified in cases of canopy disturbance (Eschtruth and Battles 2008).

Moose (Alces alces) – This site may be utilized for breeding and feeding habitat in mixed wood riparian areas of all tree size classes. This species prefers second-growth boreal forests (i.e. harvested state of this ecological site) interspersed with semi-open areas and swamps or lakes that offer cover and aquatic plants for food. Older growth stands of balsam fir and white birch, and intermediate-aged aspen stands are preferred cover habitat. They prefer browsing on forbs and other non-grasses, and the new growths from deciduous trees such as white birch, trembling aspen and striped maple, among many others. During summer they prefer to feed in or near the harvested state of this ecological site, adjacent to shoreline areas where they browse on tender leaves, twigs and bark of deciduous trees, and semi-aquatic and aquatic vegetation. They also graze on grasses, lichens, mosses, mushrooms, and herbaceous plants. Their winter diet is restricted to conifer (especially balsam fir) and hardwood twigs.

Harvested State
The harvested state may provide cover and food for a variety of wildlife that depend on a partially forested wetland habitat. This may include wildlife species that need younger trees and shrubs for cover, such as the American woodcock and other early-successional birds, and those that prefer younger trees and shrubs for food, such as moose.

These sites may be managed for the American woodcock (Scolopax minor) because they provide foraging sites due to the non-stony nature and dampness of the soil, particularly in areas where young alder is growing. These sites are managed for woodcock in the Moosehorn National Wildlife Refuge by keeping the forest in a younger-aged state (Short et.al. 1997).

Flooded State
The flooded state may provide some critical wildlife habitat for early-migrating birds. In the southern and central part of this MLRA, the flooded state has a much higher likelihood of having the beaver controlled and the site be developed into house lots now or in the near future. Conservation of these types of open areas is key to a variety of wildlife species.

Domestic Livestock:
Some farms may use the forested states for grazing livestock. Grazing forests, particularly wetland forests in Maine, is highly discouraged. Compaction and over-grazing can be a major issue and cause degradation of water quality particular close to sources of water. These wetlands should not be used for any kind of domestic livestock grazing. Purple loosestrife is an invasive species that might take over the flooded state especially at those sites closer to human habitation.

Hydrological functions

Water Budget
This reference site receives water from precipitation, surface inflow, and ground water inflow. It loses water to interception, evapotranspiration, surface outflow, and ground water outflow. Both inputs and outputs vary by the time of year.
This site is considered a forested wetland and has an apparently "perched" water table that provides multiple hydrologic functions including the capacity to maintain variations in water storage levels, including variations in depth and duration over a year. The reference site will maintain its characteristic water level fluctuations if it is not hydrologically modified. Water table monitoring (with wells) over long time periods to independently characterize seasonal and inter-annual variations in water level in an unaltered reference state have not been conducted. This site also dampens the effect of excess runoff and floodwaters. It helps to minimize downslope flooding, filtering runoff and protecting water quality, maintaining cool water temperatures for fish, providing the energy base of the

aquatic food chain in the form of fallen leaves, and providing logs that create cover for invertebrates. It acts as a sediment trap by erosion from upslope or upstream.

Extensive tree cutting and operation of heavy equipment in these areas, if not on frozen ground, can change their drainage characteristics and degrade their wildlife habitat and plant productivity and diversity values. Following harvest, changes in the distribution of organic matter may have long-term effects on soil fertility and productivity by altering the properties of the organic matter. This in turn may increase evaporative losses of moisture. It might take up to 18 years to recover from this degradation. Harvesting on frozen ground or snow cover, and using low-pressure tires is recommended to minimize rutting and disturbance of soil structure and hydrology.

Because this reference site is considered a “wetland” according to Section 404 of the Clean Water Act, some forestry activities are exempt from regulation, including normal silvicultural activities, such as plowing, seeding, cultivating, minor drainage, and harvesting of forest products as part of an on-going operation. The construction and maintenance of forest roads and mechanical site preparation are exempt where they are in compliance with Best Management Practices. BMPs include 1) minimize soil disturbance during shearing and raking; 2) avoid excessive soil compaction; 3) arrange windrows to limit erosion and overland flow; 4) prevent disposal or storage of logs or debris in streamside management areas; 5) maintain natural contour of the harvest/planting site; and 6) minimize offsite water quality impacts.

Recreational uses

This site is typically not used for recreation except for hunting and winter activities such as cross-country skiing and snowmobiling. These activities usually do not cause any environmental damage because they are done when the ground is frozen and plants are not growing. There has been an increased interest in ATV use, which usually occurs on snow-less areas and could cause severe damage, such as soil compaction and extreme rutting. Pedestrian and motorized vehicle access, including ATVs should be limited when the ground is not frozen. This will reduce the chances of soil compaction, rutting, and that wildlife will be killed and their habitat trampled. It will also reduce the disruption of vegetative succession and the development of distribution corridors for exotic/invasive plants.

Wood products

In Maine, most all species of trees have a commercial market in-state or out-of-state. This reference site may provide a variety of wood products including sawlogs (veneer, boltwood, studwood, palletwood, etc.), pulpwood, biomass chips, and firewood/pellets. (Maine Forest Service 2013). All tree species that grow on this site can be marketed for biomass and firewood and usually this is the whole tree, but sometimes it can be just the tops and branches.

Softwood sawlogs have a larger market than hardwood sawlogs in Maine. The red spruce on this site is the most desirable species for sawlog products, but this site is not a highly productive site because of the very poor drainage and clayey nature of the soil. Hardwood pulpwood has a larger market than softwood pulpwood. Other species growing on this site have a variety of markets. For example there are markets for: black and red spruce and balsam fir for pulpwood, sawlogs, and studwood, northern red cedar for boltwood, pulpwood, and sawlogs, red maple for sawlogs and veneer, and ash species for sawlogs. Some typically non-commercial species from this site, including gray birch (*Betula populifolia*) may also provide enough wood volume to be used for biomass (USDA Forest Service 2010).

Other products

This reference site may provide black ash, which is used by Native American tribes to make baskets or northern white cedar which is used to make cedar-strip canoes. It might also provide herbs and fruits used by native peoples and others. One example is jewelweed which is a medicinal used to provide relief for poison ivy dermatitis. Moss harvest may also occur, but this could be detrimental if over-harvested.

Other information

Carbon Sequestration:

In Maine, approximately 50 percent of a living tree's biomass is found in its main bole. The below-ground portion of the stump and coarse roots may store approximately 17 percent of the living biomass. The tops and limbs contain another 12 percent. The above-ground portion of the stump contains only 3 percent of the total. Saplings amount to approximately 14 percent of the living aboveground biomass. A tree's foliage accounts for approximately 4 percent. On this site, biomass of spruces and northern white-cedar is primarily in saw log-size trees. By contrast, most of the tree biomass in balsam fir, red maple, and ash are contained in pole-size and sapling-size trees. (USDA Forest Service 2010) Carbon in the mineral soil under Maine's forests is not strongly correlated to forest-type group. This is true for the surface soil (0-10 cm), the shallow subsoil (10-20 cm), and the sum of the two. Mineral soil carbon is higher in the southern and central parts of 144B.
This reference site may provide a somewhat higher amount of total carbon sequestered due to the higher concentrations of larger diameters and standing dead trees, particularly in the southern part of 144B.
The greatest portion (> 48 percent) of the stored carbon on this site is found below ground in the soil organic matter. Live tree pools in above- and belowground biomass account for another 30 percent of the total. Another 22 percent is contained in standing dead trees, down woody material, understory plants, and the forest floor litter. (USDA Forest Service 2010)

Diseases and Pests:

This reference site has enough diversity that disease agents and insect pests are presently not of any major concern. The Emerald Ash Borer may be of future concern if it reaches Maine because it could decimate the ash species which are a component of this site.

Fire Hazard Potential:

The fuel loadings of down woody material (time-lag fuel classes) are not exceedingly high in Maine (USDA Forest Service 2010). Only in times of extreme drought would these low amounts (< 800 ft3 per acre) of fuels pose a fire hazard in Maine's forests.

Inventory data references

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

The data contained in this document is derived from analysis of inventories and ecological interpretation from field evaluations. Four high intensity inventories (see Other Inventory Data References table below for locations) were conducted for the forested reference state. One high intensity inventory was completed for each of the alternative states and phases. All high intensity inventories used the Relevé method for overstory and understory canopy cover estimates. A plot 20 meters by 20 meters was used for all forested states and was located on as homogeneous a site as possible with respect to vegetation, soils, landscape variables, and disturbance. Ecotones or breaks/transitional areas between distinct plant communities were avoided by using at least a 75 foot buffer. A 10 BAF sub-plot in the center of the plot was used for overstory basal area. No site index (SI) was performed on any of the plots, because none of the sites met SI criteria. SI criteria not met include: No sites contained at least 5 trees of a species that were approximately 50 years old and have a site index curve from the NRCS National Register of Site Index Curves, or landowner permission was not received to core trees. One existing SI record was available for this site. Heights and dbh are in English units.

Selection of representative sampling sites was determined subjectively by using expert knowledge from soil survey staff as well as identifying potential sites through the use of several GIS layers including soil survey maps and the NatureServe Northeast Terrestrial Habitat GIS layer. A technical meeting was held and the Technical Team determined that at least 12 vegetation data points should be completed at the medium intensity level and 3 or 4 sites of those sampled should be completed at the high intensity level for use in developing the representative state and transition model (STM) and ecological site description. Sites were distributed throughout the MLRA 144B area in Maine to obtain the most range of variability. Ten sites were completed and four reference sites were used in aggregate for populating the vegetation tables in this report. One high-intensity plot was used for each alternative state and phase.

Vegetation Composition Tables may contain multiple listings of tree species due to the use of a Stratum Height System. The system is: 0.5 - 1.6 ft., >1.6 - 3.3 ft., >3.3 - 6.5 ft., >6.5 - 16 ft., >16 - 33 ft., >33 - 65 ft., >65 - 100 ft., >100 ft.

Type locality

Location 1: Androscoggin County, ME	
Latitude	44° 12′ 32″
Longitude	70° 12′ 44″
General legal description	Androscoggin Riverlands State Park, Turner, ME

Other references

Comer, P., D. Faber-Langendoen, R. Evans, S. Grawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schultz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Gawler, S. and A. Cutko. 2010. Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems. Maine Natural Areas Program, Maine Department of Conservation, Augusta, Maine.

NatureServe. 2021. NatureServe Explorer: An online encyclopedia of life [web application]. NatureServe, Arlington, Virginia. https://explorer.natureserve.org/. (accessed 10 July. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. Agricultural Handbook 296

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. (accessed 11 Aug. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Climate Research Station Data. Available online. (accessed 23 June. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for [MLRA 141, Maine]. Available online. (accessed 14 Oct. 2021).

Sperduto, D.D. and William F. Nichols. 2011. Natural Communities of New Hampshire. 2nd Ed. NH Natural Heritage Bureau, Concord, NH. Pub. UNH Cooperative Extension, Durham, NH.

Swain, P. C. 2020. Classification of the Natural Communities of Massachusetts. Massachusetts Division of Fisheries and Wildlife, Westborough, MA

USNVC [United States National Vegetation Classification]. 2017. United States National Vegetation Classification Database V2.01. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. Available The U.S. National Vegetation Classification (usnvc.org) (accessed 2 July. 2021).

Contributors

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Approval

Nels Barrett, 9/27/2024

Acknowledgments

Nels Barrett and Nick Butler provided considerable review of this ecological site concept.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	09/27/2024
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of**

values):

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
