USDA Natural Resources Conservation Service

Ecological site F144BY001ME
Marine Terrace Flat

Last updated: 9/27/2024
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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.

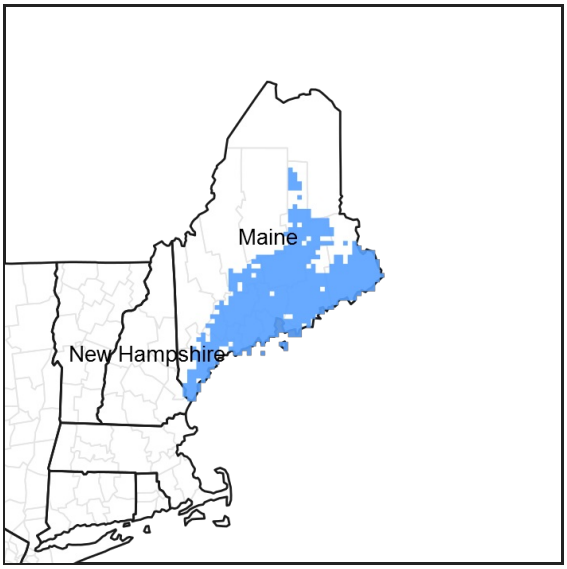

Figure 1. Mapped extent

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.

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Classification relationships

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 and exemplary natural communities. This site appears to be a “common” natural community type and the MNAP community that most closely resembles this site in vegetation is Red Maple-Sensitive Fern Swamp. Even though red maple was not the dominant overstory tree in the sample plots, it did occur in the main canopy and in the understory as regeneration. So, if the relic white pine and quaking aspen were removed, both communities might look very similar in composition. It does appear to be correlated with the Acadian Low-elevation Spruce-Fir-Hardwood Forest in the most eastern part and the Laurentian-Acadian Pine-Hemlock-Hardwood Forest: Typic in the central and interior parts as described by NatureServe’s Terrestrial Ecological System Classification. This site correlates most closely with 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). Some sites may correlate to the slope classification in the HGM Wetland System because of their specific location farther upslope, on a steeper slope in the range, or due to unique hydrologic influences.

Ecological site concept

This ecological site is found on the frigid, poorly drained, non-acidic, glaciomarine or glaciolacustrine deposits in coastal and central interior flat lowland terraces within the major river valleys, or on valley floors behind glacial moraines. This site does not flood or pond, but occurs adjacent to seasonally ponded, very poorly drained sites. The seasonally high “perched” water table is within 12 inches of the surface from October through June. The perched water table with moderate and moderately slow permeability and linear slope shape, typically provides for up to 4 inches of organic matter to accumulate on the surface in forested areas. Some of these areas may have up to eight inches of accumulated organic matter. Non-forested areas typically do not have recognizable organic horizons at the surface due to surface mixing during clearing for agricultural practices.

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). At some higher slopes in its range, it may correlate more closely to a slope wetland in the HGM classification system. Due to some micro-relief, pit and mound mostly, this site may occur as a major component of associations and complexes of wetter and drier soils on the landscape, but extensive areas are in consociations as well. The reference plant community is dominantly hydrophytic vegetation; it is transitional to the vegetation of the very poorly drained positions below it and the upland positions above it. Large white pine and quaking aspen, common on abandoned farmland in river valleys, are often found on this site and are upland species considered relics of a previously cleared state.

Associated sites

F144BY002ME	**Marine Terrace Depression** This site occurs adjacent to Marine Terrace Flat on the very poorly drained, but still hydric, areas.

Table 1. Dominant plant species

Tree	(1) *Pinus strobus* (2) *Fraxinus pennsylvanica*
Shrub	(1) *Rubus pubescens*
Herbaceous	(1) *Impatiens capensis*

Physiographic features

The ecological site is typically located on forested flats in MLRA 144B in Maine. Aspect is not a factor. Slope is typically from 0 to 3 percent, with some sites ranging up to a high of 8 percent slope, and depth to a seasonal high water table is usually less than 12 inches. Months when the highest water table is likely to occur include January, February, March, April, May, June, October, November, and December. These soils are not subject to flooding or ponding, but can occur adjacent to seasonally ponded, very poorly drained sites. These sites are found from 0 to 900 feet in elevation. Hydrologic group is D.

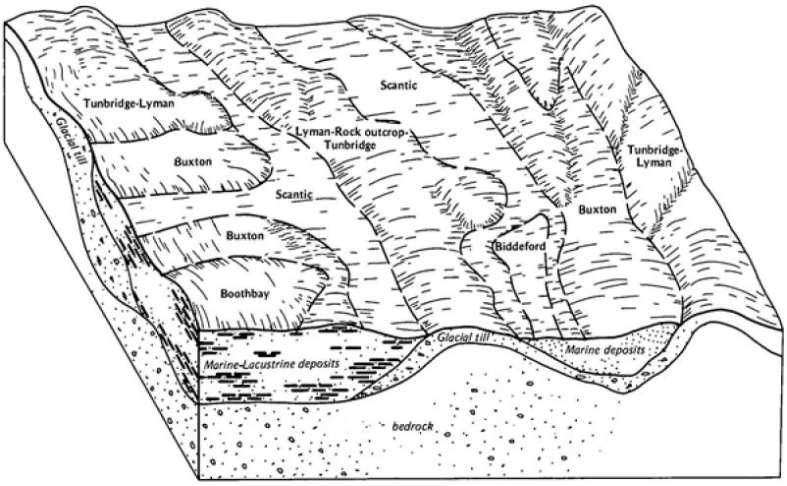

Figure 2. Marine Terrace Flat (Scantic) block diagram

Table 2. Representative physiographic features

Landforms	(1) Plains > Coastal plain (2) Plains > Lake plain (3) Upland > Marine terrace (4) Plains > Marine terrace
Flooding frequency	None
Ponding frequency	None
Elevation	2–274 m
Slope	0–8%
Water table depth	15 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid and temperate and is characterized by warm summers and cold winters. Precipitation generally is evenly distributed throughout the year. Near the coast, it is slightly lower in summer. In inland areas, it is slightly higher in spring and fall. Rainfall occurs during high-intensity, convective thunderstorms in summer. In winter, most of the precipitation occurs as moderate-intensity storms (northeasters) that produce large amounts of rain or snow. Heavy snowfalls commonly occur late in winter. Temperatures and the length of the freeze-free period increase from north to south and closer to the coast.

This major land resource area (MLRA) covers four states and may have substantial climate variability among locations: Maine (56 percent), New Hampshire (22 percent), Vermont (14 percent), Massachusetts (6 percent), Connecticut (1 percent), and New York (1 percent).

Table 3. Representative climatic features

Frost-free period (characteristic range)	132-148 days
Freeze-free period (characteristic range)	168-187 days

Precipitation total (characteristic range)	1,168-1,346 mm
Frost-free period (actual range)	128-163 days
Freeze-free period (actual range)	165-192 days
Precipitation total (actual range)	1,143-1,397 mm
Frost-free period (average)	141 days
Freeze-free period (average)	175 days
Precipitation total (average)	1,245 mm

Climate stations used

- (1) ACADIA NP [USC00170100], Bar Harbor, ME
- (2) LINCOLN SAN DIST WTP [USC00174683], Blue Hill, ME
- (3) PORT CLYDE [USC00176881], Tenants Harbor, ME
- (4) WEST ROCKPORT 1 NNW [USC00179593], Rockport, ME
- (5) EASTPORT [USC00172426], Eastport, ME
- (6) ROBBINSTON [USC00177238], Robbinston, ME
- (7) ELLSWORTH [USC00172620], Ellsworth, ME
- (8) BELFAST [USC00170480], Belfast, ME
- (9) WESTPORT ISLAND [USC00179547], Wiscasset, ME

Influencing water features

This site is influenced mainly by seasonal perched subsurface water. The dominant source of water is precipitation and inflow from surrounding landscapes. The water table is within 12 inches of the surface October through June. Permeability is moderate and moderately slow in the surface and subsurface horizons, and slow and very slow in the underlying material. Rainfall averages between a low of 31 inches and a high of 54 inches per year. Most rain and snow occur between October and June. Runoff class is low and medium. Water drains from these wetlands through overland flow, evapotranspiration, and seepage to ground water. 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 typically considered a “mineral soil flat” wetland under the Hydrogeomorphic (HGM) Wetland Classification System, but may be a "slope" wetland on higher slopes in its range.

Soil features

The soils of this site are characterized by high percentages of silt and clay and low or non-existent volumes of rock fragments, which are confined to the A, Eg, and Bg soil profile or on the surface. The soils are poorly drained, and forested sites have thin (less than 20 cm thick) surfaces of highly decomposed organic matter derived primarily from woody fragments. Parent material is silty and clayey glaciomarine, or glaciolacustrine deposits.
Though the soil is commonly free of rock fragments, a few pedons contain up to 3 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, or silty clay loams, with silty clay loam, silty clay, or clay in the deeper horizons. The minimum relative value of clay in the surface mineral horizon is 25 percent and the maximum is 28 percent. The minimum relative value of clay in the top 20 inches is 25 percent and the maximum is 40 percent. Stone fragments sometime occur in the profile in the A, Eg, and Bg horizons. Bedrock sometimes occurs in the lower part of the soil profile, or as outcrops on the soil surface, but not to the extent that they impede the production of native vegetation. On unaltered sites, pit and mound topography may be present, with drier or wetter soils present as minor components.

The poor drainage class 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 ecological site description is Scantic silt loam, a

Fine, illitic, nonacid, frigid Typic Epiaquepts.

Figure 9. Representative Soil Profile

Table 4. Representative soil features

Parent material	(1) Glaciomarine deposits–metasedimentary rock (2) Glaciolacustrine deposits
Surface texture	(1) Silt loam (2) Silt
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Very slow
Soil depth	43–127 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–3%
Available water capacity (12.7-17.8cm)	Not specified
Soil reaction (1:1 water) (12.2-18.5cm)	Not specified
Subsurface fragment volume <=3" (0-5.1cm)	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 help guide land management decisions.

The historic reference plant community phase of the Marine Terrace Flat 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, mature, plant community phase will be considered the reference state for this ecological site description . The least disturbed, mature community phase is a mixed conifer-hardwood forest that has grown up from cleared open fields and pastures that were abandoned approximately 70 or more years ago.

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 of the land area per year. Three forested areas of similar composition occurred at the broad scale with even more variation at the local scale within each area. In the southern area of the state, forests contained more oak and pine. In the central area of the state, the dominant forest type was mixed hardwoods with some conifers. In the coastal areas, there were higher numbers of spruce in forest stands (Barton et al. 2012). 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 eastern 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). These forest stands were not especially filled with old trees either, being almost entirely less than 400 years old, and 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 extensive fires on average every 1,461 years and major windstorms, 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.

There appears to be only one plant community phase in the reference state. Because of the continual 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 a 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 dense canopy cover, 85 to 99 percent, of a stratified mixture of even-aged conifer and northern hardwood tree species. Large eastern white pine (*Pinus strobus*) or quaking aspen (*Populus tremuloides*) or a mixture of both, form a super-canopy over other co-dominant or intermediate softwood and hardwood species which form the main canopy.

Even though white pine and quaking aspen are upland (Facultative Upland wetland status or FACU), shade-intolerant species, they have taken advantage of wetter cleared areas that provide drier spots where they can out-compete other species for light and space. Thus, they are a relic of a previously cleared state. The actual reference state can be described predominantly as a mixture of either spruce-fir-red maple in the eastern part or red maple-hemlock in more southern parts of the MLRA. Hemlock and red spruce occurred on drier spots in plots as they both have a wetland status of FACU, similar to white pine and quaking aspen.

The understory is very sparse due to the dense overstory cover except for very small open areas, less than 0.1 of an acre, where a wide variety of forbs, grasses, sedges, ferns, shrubs, and tree regeneration grow. Under the dense overstory, only small, scattered shade-tolerant and moisture-loving plants grow, especially mosses, liverworts, and hornworts. In addition, trees have several different types of lichen growing on them, including Lungwort (*Lobaria pulmonaria*), which occur on older hardwood trees. Tall shrubs are virtually non-existent in this dense, shady, understory.

White pine and quaking aspen regeneration is conspicuously absent from the understory because of their shade intolerance.

Natural disturbances include ice and windstorms, 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 may have an influence on the plant community composition in terms of pollination, herbivory, seed dispersal, and

creation of local disturbance patches, all of which contribute to plant species diversity.

Human disturbances include timber harvesting and land clearing. Harvesting of this reference state has been continuous over the years since European settlement, with most harvesting occurring in the winter months due to the poorly drained nature of the soil. Spruce and pine were the desirable species to harvest, mainly for timber up until about 10 years ago. 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. A typical harvested alternative state consists of young red maple and gray birch with some fir, hemlock, poplar, and 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.

Some sites in agricultural areas have been cleared and maintained as pasture, hayland, and cropland. Small areas are cleared for silage corn or other row crops in order to “square off the field,” as part of a larger cleared upland cropped field. A cropland state may be drained or undrained. Larger cleared areas are used mainly for hay and pasture. In these hay fields, harvest is delayed or not completed if wet weather prevents access and pastures can become quite compacted from livestock.

Timber harvest areas and/or cleared areas may become infested with invasive plants such as European buckthorn in the overstory and bush honeysuckle and Japanese barberry in the understory.

A state-and-transition model diagram for the Marine Terrace Flat Ecological Site (F144BY001ME) 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 local weather events, small inclusions of other soils, and microrelief. 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

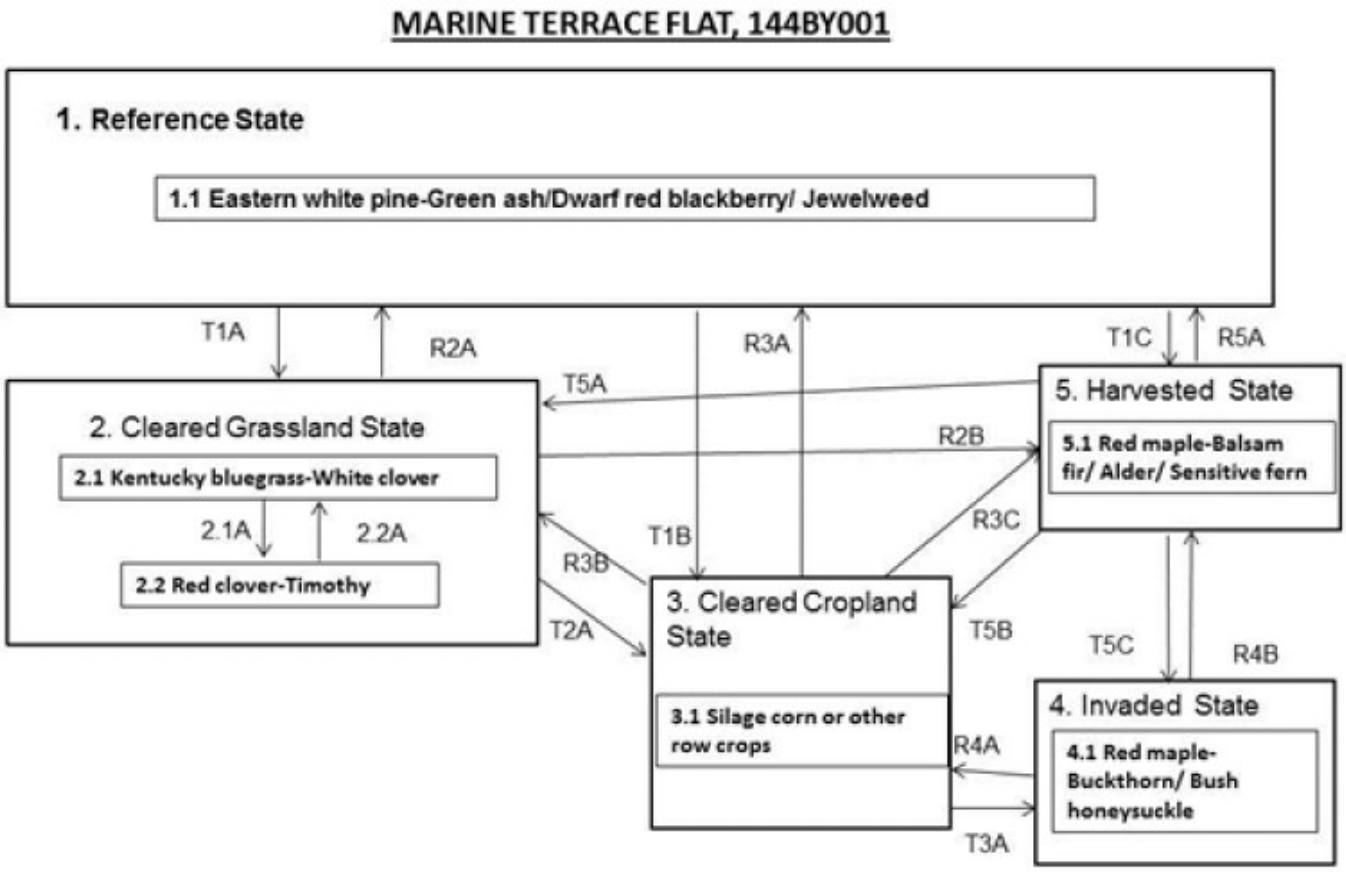

Figure 10. State-and-transition diagram for the Marine Terrac

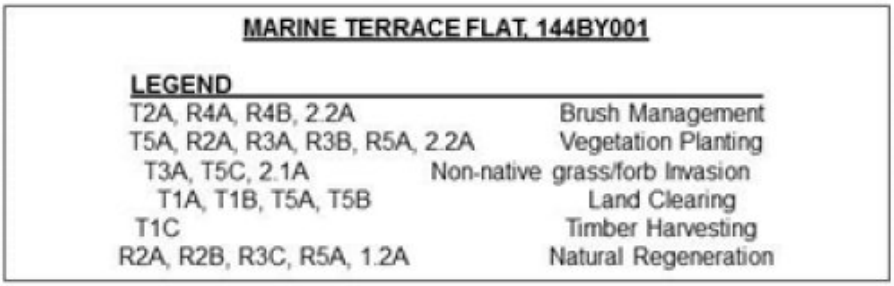

Figure 11. State-and-transition diagram legend for the Marine

State 1
Reference

The reference state has a dense canopy cover typical of older growth forests, averaging 92 percent and ranging from 85 to 99 percent. It consists of a stratified mixture of even-aged conifer and northern hardwood tree species. Large eastern white pine (*Pinus strobus*) or quaking aspen (*Populus tremuloides*), or a mixture of both, form a super-canopy. Both of these trees took advantage of open fields and pastures that were abandoned around the 1930s to out compete spruce and hemlock, which grow slower. Thus, they are a relic of a previously cleared state. They grow over the main canopy of a mixed softwood and hardwood combination of other co-dominant or intermediate species. The understory is sparse due to the dense overstory cover except for small open areas, less than a 0.1 of an acre, where a wide variety of forbs, ferns, and small shrubs grow with mosses, liverworts, and hornworts covering over 24 percent of the ground. Under the dense overstory, only small, scattered shade-tolerant and moisture-loving plants grow. The mosses, liverworts, and hornworts grow over the ground, on downed dead wood, and the lower parts of tree trunks throughout this site. Also, trees have several different types of lichen growing on them, including lungwort (*Lobaria pulmonaria*), which grows on older hardwood trees. Tree regeneration is very sparse and white pine and quaking aspen regeneration is absent. Due to the dense, shady understory, tall shrubs are almost non-existent. In the small open areas, small patches of taller shrubs and tree regeneration are present along with several types of subshrubs. Clumps and small patches of ferns and horsetail are also common. Few grasses or grass-like plants were found on this site. There were more sedges than grasses and both appeared in small clumps scattered throughout.

Community 1.1
Eastern white pine-Green ash/Dwarf red blackberry/Jewelweed

Figure 12. Reference State

Figure 13. Moss surface cover

Figure 14. Reference Soil Profile

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 mature state will be considered the reference state for this ecological site description. The least disturbed mature state is a mixed conifer-hardwood forest that has grown up from cleared native pasture that was abandoned approximately 70 to 100 years ago. The site has a dense canopy cover, averaging 92 percent and ranges from 85 to 99 percent. It consists of a stratified mixture of even-aged conifer and northern hardwood tree species that has grown up beneath relic white pine and quaking aspen from the earlier cleared state. Large eastern white pine (*Pinus strobus*) or quaking aspen (*Populus tremuloides*,) or a mixture of both, form a super-canopy over the main canopy of co-dominant or intermediate species such as green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), black ash (*Fraxinus nigra*), red spruce (*Picea rubens*), and black spruce (*Picea mariana*). Some sites contain eastern hemlock (Tsuga

Canadensis), northern white cedar (*Thuja occidentalis*), and/or yellow birch (*Betula alleghaniensis*). At one data collection site, at a central interior site, the inventory identified swamp white oak (*Quercus bicolor*) in the intermediate canopy and American hornbeam (*Carpinus caroliniana*) in the understory, which are quite uncommon species in Maine. The understory is sparse due to the dense overstory cover except for small open areas, less than a 0.1 of an acre, where a wide variety of forbs, ferns, small shrubs, and tree regeneration grow. Under the dense overstory, only small, scattered shade-tolerant and moisture-loving plants grow. Plants include balsam fir regeneration and many species of moss, but not white pine and/or quaking aspen. The ground surface is largely mosses, liverworts, and hornworts due to the dense shade and high moisture levels. The mosses, liverworts, and hornworts grow over the ground, on downed dead wood, and on the lower parts of tree trunks throughout this site. Also, trees have several different types of lichen growing on them, including lungwort (*Lobaria pulmonaria*), which often grows on older hardwood trees. Due to the dense, shady understory, tall shrubs are almost non-existent. In the small open areas, taller shrubs, such as common winterberry (*Ilex verticillata*) and speckled alder (*Alnus incana*), grow in small patches with green ash and balsam fir regeneration over subshrubs such as wild sarsaparilla (*Aralia nudicaulis*) and dwarf red blackberry (*Rubus pubescens*). Clumps of interrupted fern (*Osmunda claytoniana*) and cinnamon fern (*Osmunda cinnamomea*) as well as small patches of sensitive fern (*Onoclea sensibilis*) and woodland horsetail (Equisetum pretense) are also common. Forbs usually found include jewelweed (*Impatiens capensis*), starflower (*Trientalis borealis*), and jack-in-the-pulpit (*Arisaema triphyllum*). Eastern poison-ivy (*Toxicodendron radicans*) may also be present on some sites and should be avoided because it can cause severe dermatitis. Very few grasses or grass-like plants were found on this site. There were more sedges than grasses and both appeared in small clumps scattered throughout the site. Typical sedges include white-edged sedge (*Carex debilis*) and greater bladder sedge (*Carex intumescens*). The plant community can be restored over a long period of time from cleared land or invaded land using appropriate brush management combined with either native regeneration, or if invasive species are a problem, a tree/shrub planting.

Forest overstory. Total canopy cover is dense, averaging 92 percent and ranges from 85 to 99 percent. Average basal area is 150 square feet per acre and ranges from 110 to 240 square feet per acre. The structure in this 70 to 100 year old mixed conifer-hardwood stand is complex, including scattered very large trees greater than 20-inch diameter breast height (dbh) and exceeding 100 feet in height. There is a co-dominant and intermediate main canopy at 65 to 99 feet in height and a layer of suppressed trees less than 65 feet in height. The super-overstory or emergent tree community is a relic of a previously cleared state and consists of either eastern white pine or quaking aspen, or a mixture of both. The co-dominant or intermediate main canopy is dominated by various combinations of balsam fir, red maple, spruce, green ash, and hemlock, depending on the location in the MLRA. Other species that occur less frequently are black ash, northern white cedar, and yellow birch. In the central part of the state, swamp white oak, American hornbeam and/or Eastern hop-hornbeam may rarely occur in the intermediate and/or suppressed overstory. Hard and soft tree snags are typically present on this site. Four high-intensity reference plot sites were aggregated 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. Typical understory is composed of a few widely scattered small shade-tolerant species of tree regeneration, subshrubs, forbs, ferns and moss. Mosses, liverworts, and hornworts may comprise up to 55 percent of the ground surface cover with litter covering between 35 to 76 percent. Tree basal cover makes up most of the remainder. All sites have some downed woody debris, which varies from fine to coarse large in diameter breast height (dbh) with varying lengths up to 35 feet. Most of the trees have some kind of lichen on them. Any small open canopy areas are composed of tree regeneration, taller shrubs, subshrubs, and a wide variety of herbs and ferns. Four high intensity reference plot sites were aggregated 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	3-4%
Shrub/vine/liana basal cover	1%
Grass/grasslike basal cover	0-1%
Forb basal cover	1%
Non-vascular plants	12-50%
Biological crusts	0%

Litter	35-76%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
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)	0-1%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-2%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-1%
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0-1% N*
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	2-49 per hectare
Tree snag count** (hard***)	2-74 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	0-2%	–	–	0-4%
>0.15 <= 0.3	0-1%	0-3%	0-1%	0-7%
>0.3 <= 0.6	–	–	0-1%	0-5%
>0.6 <= 1.4	0-4%	0-1%	0-1%	0-3%
>1.4 <= 4	0-10%	0-1%	–	–
>4 <= 12	1-25%	–	–	–
>12 <= 24	8-23%	–	–	–
>24 <= 37	14-27%	–	–	–
>37	–	–	–	–

State 2
Cleared Grassland

The cleared grassland state consists of either non-managed or managed community phases. Both community phases are a transition from the forested reference state usually caused by human disturbance, namely land clearing. The Non-managed Community Phase 2.1 is part of the natural succession, and then periodic human disturbance, such as bush hogging and mowing, provides the mechanism to maintain this community phase. The Managed Community Phase 2.2 is usually a periodic replanting by farmers. This state has a higher probability of being developed for house lots in the southern and central parts of this MLRA.

Community 2.1
Kentucky bluegrass-White clover

Figure 15. Non-managed community phase.

This is a non-managed plant community phase which was cleared and natural and introduced regeneration was allowed to come in. It consists of a mix of native and introduced grasses and forbs, such as Kentucky bluegrass and white clover and is maintained in this phase by infrequent human disturbance to remove tall brush and trees only. A typical non-managed grassland state, either hay or pasture, is growing Kentucky bluegrass, white clover, with smaller patches of native sedges, forbs, and other native grasses.

Table 8. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	40-45%
Forb basal cover	40-45%
Non-vascular plants	0-1%
Biological crusts	0%
Litter	0-1%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	0-1%

Table 9. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0%
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	0%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0%
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0%
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0 per hectare
Tree snag count** (hard***)	0 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	–	–	–	0-1%
>0.15 <= 0.3	–	–	–	30-35%
>0.3 <= 0.6	–	–	40-45%	10-15%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Red clover-Timothy

Figure 16. Managed plant community phase.

This is a managed plant community phase, which was cleared and seeded down to a mixture of grasses and legumes. It may also be drained or undrained. It consists of a mix of native and non-native grasses and forbs, such as Timothy and red clover along with various other grasses and forbs that come up from the seed bank in the soil and is extensively maintained by numerous forage harvests, at least once or twice per year, or properly grazed by livestock in rotation. A typical managed grassland-hay state consists of red clover, latino white clover, birdsfoot trefoil, timothy, orchard grass, brome grass, various fescues, and perennial ryegrass.

Table 11. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	70-75%
Forb basal cover	20-25%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-1%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%

Bedrock	0%
Water	0%
Bare ground	0%

Table 12. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0%
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	0%
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0%
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0%
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0%
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0 per hectare
Tree snag count** (hard***)	0 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	–	–	–	–
>0.15 <= 0.3	–	–	3-5%	–
>0.3 <= 0.6	–	–	45-55%	20-25%
>0.6 <= 1.4	–	–	10-15%	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2

Kentucky bluegrass-White clover

Red clover-Timothy

This non-managed plant community phase may transition to a managed plant community phase by the addition of human-related inputs such as fertilizer, lime, reseeding with a non-native mixture of grasses and forbs, then more frequent forage harvesting and more appropriately managed grazing by livestock.

Conservation practices

Forage Harvest Management

Pathway 2.2A
Community 2.2 to 2.1

Red clover-Timothy

Kentucky bluegrass-White clover

This managed plant community phase may transition to a non-managed plant community phase by the reduction of forage harvesting and/or less frequent or elimination of grazing by livestock.

State 3
Cleared Cropland

The cleared cropland state consists mainly of corn silage grown by dairy farmers and is located in very small areas, less than an acre in size, in crop fields that are in mostly upland soils. This state has a higher probability of being developed into house lots in the southern and central parts of this MLRA, which would be impossible to restore.

Community 3.1
Silage Corn or other Row Crops

Figure 17. Cleared cropland state

The cleared cropland state consists mainly of corn silage grown by dairy farmers and is located in very small areas, less than an acre in size, in crop fields that are in mostly upland soils. This community phase may be drained or not drained.

State 4
Invaded

The invaded state consists of natural regeneration of a harvested state that had invasive species seed source and enough sunlight to allow invasive species to compete successfully against native species. The overstory canopy is more open and the understory structure and composition may be at first more diverse until invasive plants completely take over the understory and eliminate the native species.

Community 4.1
Red maple-Buckthorn/Bush honeysuckle

Figure 18. Invaded state.

The invaded community phase consists of a mixed wood forest that has been invaded by species such as buckthorn in both the overstory and understory, and bush honeysuckle in the understory. These species were allowed to grow uncontrolled and with no competition in areas harvested or cleared of desirable vegetation.

Forest overstory. Typical overstory is composed of undesirable tree species such as red maple and invasive species such as glossy buckthorn. The overstory canopy is more open with a cover range from 45 to 75 percent. Relic white pine also occur on this site. One high-intensity data plot was 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. Typical understory is composed of invasive species such as glossy buckthorn, bush honeysuckle, and/or Japanese barberry. These invasive plants thrive under the more open canopy along with the more typical tree regeneration such as red maple that is shade-intolerant. One high-intensity data plot was 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 14. Soil surface cover

Tree basal cover	1-2%
Shrub/vine/liana basal cover	1%
Grass/grasslike basal cover	1%
Forb basal cover	1%
Non-vascular plants	0-2%
Biological crusts	0%
Litter	75-87%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	0-1%

Table 15. 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%

Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0%
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0%
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0 per hectare
Tree snag count** (hard***)	0 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 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0%	0%	0%	0%
>0.15 <= 0.3	0%	1-7%	0%	1-4%
>0.3 <= 0.6	0%	15-17%	0-4%	1-1%
>0.6 <= 1.4	0%	10-16%	0%	0%
>1.4 <= 4	0%	10-16%	0%	0%
>4 <= 12	40-50%	0%	0%	0%
>12 <= 24	40-50%	0%	0%	0%
>24 <= 37	0%	0%	0%	0%
>37	0%	0%	0%	0%

State 5
Harvested

The harvested state is the most common state in Maine. Most harvesting is typically 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, Eastern white pine and spruce. The remaining forest stand consists of young red maple and gray birch with a few fir, hemlock, poplar, and ash. This state is most like the reference state in plant composition particularly in the understory if only small openings are created such as 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. In some instances, this state appears as a referenced state that has been "high-graded," or all large highly merchantable timber has been removed. This is very detrimental to the future forest and should be discouraged. In a few instances, this state appears as a reference state that has been clearcut or all merchantable woody vegetation has been removed. Clearcuts occur usually when the site is going to be developed, immediately prior to being sold, or when the landowner is interested in developing early successional wildlife habitat, such as for New England cottontail, American woodcock, ruffed grouse, moose, and/or white-tailed deer.

Community 5.1
Red maple-Balsam fir/Alder/Sensitive fern

Figure 19. Recently harvested state

Figure 20. Older harvested state.

The harvested community phase consists of non-merchantable desirable timber species, such as Eastern white pine and spruce, and all undesirable timber species such as balsam fir, Eastern hemlock, quaking aspen, green ash, and red maple. This is typical of a group selection harvest, the most widely used harvest method in this MLRA. The understory is similar to the reference state, but includes more shade-intolerant species and more vertical structure. Species include red maple and green ash tree regeneration, common winterberry, speckled alder, jack-in-the-pulpit, and starflower.

Forest overstory. Typical overstory consists of a mixture of older undesirable species such as red maple or young desirable species not ready for harvesting. It may resemble the reference state without certain large desirable species present. With a group selection harvest, which is typical in this MLRA, the overstory canopy cover ranges between 60 and 80 percent. One high-intensity data plot was 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. Typical understory consists of more shade-intolerant species, such as red maple and quaking aspen regeneration, along with balsam fir, and more shrubs, grasses, and forb/herbs. This is due to the more open canopy, and may be short-lived depending on the size of openings made during harvest. One high-intensity data plot was 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 17. Soil surface cover

Tree basal cover	2-4%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%

Non-vascular plants	30-44%
Biological crusts	0%
Litter	35-45%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	0%

Table 18. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	1-2% N*
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	1-2% N*
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-1% N*
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%
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	12-25 per hectare
Tree snag count** (hard***)	0 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 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0%	0%	0%	1-1%
>0.15 <= 0.3	0%	1-2%	0%	0%
>0.3 <= 0.6	0%	0%	0%	5-7%
>0.6 <= 1.4	0%	1-1%	0%	0%
>1.4 <= 4	0%	0%	0%	0%
>4 <= 12	0%	0%	0%	0%
>12 <= 24	85-91%	0%	0%	0%
>24 <= 37	0%	0%	0%	0%
>37	0%	0%	0%	0%

Transition T1A
State 1 to 2

The reference state transitions to a cleared grassland state by the removal of all vegetation including their roots. The hydrology may or may not be altered by improving the drainage with drainage tile or ditches. The ground is then leveled and non-native species are planted to make hayland or pasture. In some instances, the ground is leveled and left to early successional native and non-native species. Both plant community phases must be maintained by brush management, forage management, and/or prescribed grazing. The cleared grassland state has a higher probability of being developed into house lots, particularly in the southern and central parts of this MLRA.

Transition T1B
State 1 to 3

The reference state transitions to a cleared cropland state by the removal of all vegetation including their roots. The hydrology may or may not be altered by improving the drainage with drainage tile or ditches. The ground is then leveled and crops are planted. The cleared cropland state has a higher probability of being developed into house lots in the southern and central parts of this MLRA, which would be nearly impossible to restore.

Transition T1C
State 1 to 5

The reference state transitions to a harvested state by the removal of some or all desirable woody vegetation. Hydrology may rarely be altered by the addition of woody debris or gravel in forest access trails and roads in narrow linear locations throughout the site. This transition has occurred on a periodic basis since European settlement and will continue.

Restoration pathway R2A
State 2 to 1

This cleared grassland state may be restored to the reference state by natural regeneration over a long period of time or the planting of appropriate trees and shrubs, which also would be over a long period of time. Control of invasive plants may be needed.

Conservation practices

Tree/Shrub Establishment

Transition T2A
State 2 to 3

This cleared grassland state may transition to a cleared cropland state by the plowing and planting of silage corn or other row crop.

Restoration pathway R2B
State 2 to 5

This cleared grassland state may be restored to the harvested state by natural regeneration over a long period of time. Restoration efforts might include some planting of native trees and shrubs, but also may need control of invasive plants.

Conservation practices

Tree/Shrub Establishment

Restoration pathway R3A
State 3 to 1

The cleared cropland state may be restored to the reference state by field abandonment and natural regeneration over a long period of time or by planting the appropriate vegetation, which also would be over a long period of time. Control of invasive plants may also be needed.

Conservation practices

Tree/Shrub Establishment

Restoration pathway R3B
State 3 to 2

The cleared cropland state may be restored to the cleared grassland state by field abandonment and natural regeneration or by planting the appropriate vegetation, either native or non-native. Control of invasive plants may also be needed.

Conservation practices

Forage and Biomass Planting

Transition T3A
State 3 to 4

The cleared cropland state may transition to an invaded state if row cropping is discontinued.

Restoration pathway R3C
State 3 to 5

The cleared cropland State may be restored to the harvested state by field abandonment and natural regeneration over a period of time or by planting the appropriate vegetation, which also would be over a period of time. Control of invasive plants may also be needed.

Conservation practices

Tree/Shrub Establishment

Restoration pathway R4A
State 4 to 3

The invaded state may be restored to the cleared cropland state by clearing of all vegetation, including roots. Then soil would be plowed and planted with a row crop.

Conservation practices

Land Clearing

Restoration pathway R4B
State 4 to 5

The invaded state may be restored to the harvested state by clearing and/or controlling the invasive species to allow for natural regeneration to outcompete the invasive species, or to allow for the planting of desirable vegetation that would outcompete the invasive species. It might be necessary to control the invasive species in multiple years for this to be successful.

Conservation practices

Brush Management
Tree/Shrub Establishment

Restoration pathway R5A
State 5 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.

Conservation practices

Brush Management

Tree/Shrub Establishment

Transition T5A
State 5 to 2

The harvested state may transition to the cleared grassland state by the removal of all vegetation including their roots. The hydrology may or may not be altered by improving the drainage with drainage tile or ditches. The ground is then leveled and non-native species are planted to make hayland or pasture. In some instances, the ground is leveled and left to early successional native and non-native species. Both plant community phases must be maintained by brush management, forage management, and/or prescribed grazing. This is the same transition mechanism as for the reference state.

Transition T5B
State 5 to 3

The harvested state transitions to a cleared cropland state by the removal of all vegetation including their roots. The hydrology may or may not be altered by improving the drainage with drainage tile or ditches. The ground is then leveled and crops are planted. This is the same transition mechanism as for the reference state.

Transition T5C
State 5 to 4

The harvested state may transition to an invaded state if larger openings provide the needed advantage to the invasive species so they can outcompete the native vegetation for light and other required resources.

Additional community tables

Table 20. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
balsam fir	ABBA	*Abies balsamea*	Native	4.6–22.9	5–55	7.6–25.4	–
eastern white pine	PIST	*Pinus strobus*	Native	13.7–35.1	0–46	30.5–101.6	–
balsam fir	ABBA	*Abies balsamea*	Native	1.5–12.2	10–45	5.1–20.3	–
quaking aspen	POTR5	*Populus tremuloides*	Native	24.4–35.1	0–35	22.9–35.6	–
red maple	ACRU	*Acer rubrum*	Native	16.8–30.5	5–25	5.1–15.2	–
red maple	ACRU	*Acer rubrum*	Native	6.1–19.8	1–15	7.6–22.9	–
quaking aspen	POTR5	*Populus tremuloides*	Native	9.1–19.8	0–15	25.4–33	–
hophornbeam	OSVI	*Ostrya virginiana*	Native	4.6–13.7	0–15	10.2–17.8	–
black ash	FRNI	*Fraxinus nigra*	Native	1.5–16.8	0–10	5.1–10.2	–
arborvitae	THOC2	*Thuja occidentalis*	Native	3–18.3	0–10	15.2–27.9	–
swamp white oak	QUBI	*Quercus bicolor*	Native	2.4–25.9	0–8	12.7–25.4	–
swamp white oak	QUBI	*Quercus bicolor*	Native	1.5–7.6	0–8	2.5–5.1	–
black spruce	PIMA	*Picea mariana*	Native	4.6–13.7	0–8	15.2–20.3	–
green ash	FRPE	*Fraxinus pennsylvanica*	Native	3–6.1	0–5	2.5–5.1	–
American hornbeam	CACA18	*Carpinus caroliniana*	Native	2.4–7.6	0–5	2.5–5.1	–
eastern white pine	PIST	*Pinus strobus*	Native	12.2–19.8	0–5	12.7–15.2	–

Table 21. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
white edge sedge	CADE5	*Carex debilis*	Native	0.3–0.6	0–1
melic mannagrass	GLME2	*Glyceria melicaria*	Native	–	0–1
greater bladder sedge	CAIN12	*Carex intumescens*	Native	–	0–1
northern shorthusk	BRAR9	*Brachyelytrum aristosum*	Native	0.8–0.9	–
button sedge	CABU7	*Carex bullata*	Native	–	–
common rush	JUEF	*Juncus effusus*	Native	0.4–0.5	–
Forb/Herb					
jewelweed	IMCA	*Impatiens capensis*	Native	0–0.9	1–10
starflower	TRBO2	*Trientalis borealis*	Native	0–0.1	0–4
Jack in the pulpit	ARTR	*Arisaema triphyllum*	Native	0.1–0.3	0–1
Canada mayflower	MACA4	*Maianthemum canadense*	Native	0–0.1	0–1
tall buttercup	RAAC3	*Ranunculus acris*	Introduced	0.1–0.6	0–1

partridgeberry	MIRE	*Mitchella repens*	Native	0–0.1	–
common dandelion	TAOF	*Taraxacum officinale*	Introduced	0–0.1	–
heartleaf foamflower	TICO	*Tiarella cordifolia*	Native	0–0.1	–
whip-poor-will flower	TRCE	*Trillium cernuum*	Native	0–0.1	–
low rough aster	EURA10	*Eurybia radula*	Native	0–0.2	–
white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	Native	0–0.2	–
common marsh bedstraw	GAPA3	*Galium palustre*	Native	0–0.1	–
purplestem aster	SYPU	*Symphyotrichum puniceum*	Native	0–0.8	–
Fern/fern ally					
woodland horsetail	EQSY	*Equisetum sylvaticum*	Native	0.1–0.3	0–25
cinnamon fern	OSCI	*Osmunda cinnamomea*	Native	0.2–0.6	0–7
sensitive fern	ONSE	*Onoclea sensibilis*	Native	0.1–0.3	2–5
interrupted fern	OSCL2	*Osmunda claytoniana*	Native	0.2–0.6	0–3
common ladyfern	ATFI	*Athyrium filix-femina*	Native	0.2–0.6	–
Shrub/Subshrub					
dwarf red blackberry	RUPU	*Rubus pubescens*	Native	0–0.2	1–4
bunchberry dogwood	COCA13	*Cornus canadensis*	Native	0–0.1	0–4
gray alder	ALIN2	*Alnus incana*	Native	0.6–1.5	0–3
wild sarsaparilla	ARNU2	*Aralia nudicaulis*	Native	0.2–0.3	1–2
American fly honeysuckle	LOCA7	*Lonicera canadensis*	Native	0.1–0.2	0–1
bristly dewberry	RUHI	*Rubus hispidus*	Native	0–0.1	0–1
southern arrowwood	VIDE	*Viburnum dentatum*	Native	0–0.2	0–1
silky dogwood	COAM2	*Cornus amomum*	Native	0–1.5	0–1
southern arrowwood	VIDE	*Viburnum dentatum*	Native	0.1–0.6	0–1
American red raspberry	RUID	*Rubus idaeus*	Native	0.2–0.9	–
lowbush blueberry	VAAN	*Vaccinium angustifolium*	Native	0–0.2	–
twinflower	LIBO3	*Linnaea borealis*	Native	0–0.1	–
Tree					
balsam fir	ABBA	*Abies balsamea*	Native	0.6–3	2–20
green ash	FRPE	*Fraxinus pennsylvanica*	Native	0.6–1.1	1–5
balsam fir	ABBA	*Abies balsamea*	Native	0–0.1	1–5
eastern hemlock	TSCA	*Tsuga canadensis*	Native	1.2–2.1	0–5
black ash	FRNI	*Fraxinus nigra*	Native	0.6–0.9	1–5
American hornbeam	CACA18	*Carpinus caroliniana*	Native	1.2–3	0–2
red maple	ACRU	*Acer rubrum*	Native	0.3–0.6	1–2
green ash	FRPE	*Fraxinus pennsylvanica*	Native	0–0.2	1–2
red maple	ACRU	*Acer rubrum*	Native	0–0.2	1–2
quaking aspen	POTR5	*Populus tremuloides*	Native	0.6–1.1	0–2
green ash	FRPE	*Fraxinus pennsylvanica*	Native	1.2–2.1	0–1
American hornbeam	CACA18	*Carpinus caroliniana*	Native	0.1–0.2	0–1
red spruce	PIRU	*Picea rubens*	Native	1.2–4.3	0–1
quaking aspen	POTR5	*Populus tremuloides*	Native	0.1–0.2	0–1
black ash	FRNI	*Fraxinus nigra*	Native	0.1–0.2	0–1
American beech	FAGR	*Fagus grandifolia*	Native	0.9–1.5	

American beech	FAGR	*Fagus grandifolia*	Native	0.9–1.5	–
eastern white pine	PIST	*Pinus strobus*	Native	0–0.1	–
swamp white oak	QUBI	*Quercus bicolor*	Native	0–0.1	–
northern red oak	QURU	*Quercus rubra*	Native	0–0.1	–
Vine/Liana					
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	0.1–0.3	0–5
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	0–0.1	–
Nonvascular					
Bryophyte (moss, liverwort, hornwort)	2BRY	*Bryophyte (moss, liverwort, hornwort)*	Native	0–0.1	10–55
delicate thuidium moss	THDE10	*Thuidium delicatulum*	Native	0–0.1	0–1

Table 22. Community 2.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
red fescue	FERU2	*Festuca rubra*	Native	0.3–0.6	25–30
redtop	AGGI2	*Agrostis gigantea*	Introduced	0.6–0.9	3–5
Kentucky bluegrass	POPR	*Poa pratensis*	Introduced	0.3–0.8	3–5
timothy	PHPR3	*Phleum pratense*	Introduced	0.6–0.9	1–2
switchgrass	PAVI2	*Panicum virgatum*	Native	0.6–0.9	0–1
common rush	JUEF	*Juncus effusus*	Native	0.3–0.9	1
woolgrass	SCCY	*Scirpus cyperinus*	Native	0.8–0.9	0–1
yellow foxtail	SEPU8	*Setaria pumila*	Introduced	0.6–0.9	0–1
shortbeak sedge	CABR10	*Carex brevior*	Native	0.3–0.6	0–1
Forb/Herb					
red clover	TRPR2	*Trifolium pratense*	Introduced	0.2–0.5	10–15
white clover	TRRE3	*Trifolium repens*	Introduced	0.2–0.3	8–10
purplestem aster	SYPU	*Symphyotrichum puniceum*	Native	0.2–0.9	3–5
common plantain	PLMA2	*Plantago major*	Introduced	0.2–0.3	3–5
oxeye daisy	LEVU	*Leucanthemum vulgare*	Introduced	0.3–0.9	0–3
common yarrow	ACMI2	*Achillea millefolium*	Native	0.3–0.9	1–2
common dandelion	TAOF	*Taraxacum officinale*	Introduced	0.2–0.3	1–2
tall buttercup	RAAC3	*Ranunculus acris*	Introduced	0.3–0.9	1–2
Norwegian cinquefoil	PONO3	*Potentilla norvegica*	Native	0.2–0.5	0–1
bull thistle	CIVU	*Cirsium vulgare*	Introduced	0.3–0.9	0–1
common blue violet	VISO	*Viola sororia*	Native	0–0.2	0–1

Table 23. Community 2.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
timothy	PHPR3	*Phleum pratense*	Introduced	0.6–0.9	20–25
reed canarygrass	PHAR3	*Phalaris arundinacea*	Native	0.6–1.2	10–15
orchardgrass	DAGL	*Dactylis glomerata*	Introduced	0.6–0.9	5–10
yellow foxtail	SEPU8	*Setaria pumila*	Introduced	0.6–0.9	3–5
switchgrass	PAVI2	*Panicum virgatum*	Native	0.6–0.9	3–5
red fescue	FERU2	*Festuca rubra*	Native	0.3–0.6	3–5
broom sedge	CASC11	*Carex scoparia*	Native	0.2–0.8	0–1
Forb/Herb					
red clover	TRPR2	*Trifolium pratense*	Introduced	0.2–0.5	10–15
oxeye daisy	LEVU	*Leucanthemum vulgare*	Introduced	0.3–0.9	5–10
white clover	TRRE3	*Trifolium repens*	Introduced	0.3–0.6	8–10
giant goldenrod	SOGI	*Solidago gigantea*	Native	0.6–0.9	3–5
black medick	MELU	*Medicago lupulina*	Introduced	0.2–0.3	1–2
common plantain	PLMA2	*Plantago major*	Introduced	0.2–0.3	1–2
longleaf starwort	STLO	*Stellaria longifolia*	Native	0.2–0.3	0–1
bull thistle	CIVU	*Cirsium vulgare*	Introduced	0.3–0.9	0–1
bird vetch	VICR	*Vicia cracca*	Introduced	0.3–0.9	0–1
tall buttercup	RAAC3	*Ranunculus acris*	Introduced	0.3–0.9	0–1
spotted geranium	GEMA	*Geranium maculatum*	Native	0.3–0.6	0–1

Table 24. Community 4.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
green ash	FRPE	*Fraxinus pennsylvanica*	Native	4.6–11.6	10–15	5.1–10.2	–
black ash	FRNI	*Fraxinus nigra*	Native	4–9.8	10–15	5.1–10.2	–
red maple	ACRU	*Acer rubrum*	Native	3.7–9.1	10–15	5.1–7.6	–
tamarack	LALA	*Larix laricina*	Native	9.1–14.3	10–15	25.4–30.5	–
glossy buckthorn	FRAL4	*Frangula alnus*	Introduced	4.3–6.1	10–15	2.5–10.2	–
eastern white pine	PIST	*Pinus strobus*	Native	7.6–17.1	8–10	17.8–63.5	–
red maple	ACRU	*Acer rubrum*	Native	4.6–12.2	8–10	10.2–17.8	–
red spruce	PIRU	*Picea rubens*	Native	3.7–8.8	2–5	5.1–12.7	–

Table 25. Community 4.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
button sedge	CABU7	*Carex bullata*	Native	0.2–0.6	0–1
white edge sedge	CADE5	*Carex debilis*	Native	0.2–0.6	0–1
greater bladder sedge	CAIN12	*Carex intumescens*	Native	0.2–0.6	0–1
melic mannagrass	GLME2	*Glyceria melicaria*	Native	0.3–0.6	0–1
Forb/Herb					
white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	–	0.2–0.5	0–1
starflower	TRBO2	*Trientalis borealis*	Native	0–0.2	0–1
Fern/fern ally					
sensitive fern	ONSE	*Onoclea sensibilis*	Native	0.3–0.6	0–1
woodland horsetail	EQSY	*Equisetum sylvaticum*	Native	0–0.2	0–1
Shrub/Subshrub					
Tatarian honeysuckle	LOTA	*Lonicera tatarica*	Introduced	0.6–1.8	5–10
Washington hawthorn	CRPH	*Crataegus phaenopyrum*	Native	1.5–4.6	8–10
silky dogwood	COAM2	*Cornus amomum*	Native	0.2–0.6	3–5
dwarf red blackberry	RUPU	*Rubus pubescens*	Native	0–0.2	1–2
Tatarian honeysuckle	LOTA	*Lonicera tatarica*	Introduced	0.3–1.5	1–2
gray alder	ALIN2	*Alnus incana*	Native	1.2–1.5	0–1
white meadowsweet	SPAL2	*Spiraea alba*	Native	0.3–0.9	0–1
silky dogwood	COAM2	*Cornus amomum*	Native	1.2–1.8	0–1
rose	ROSA5	*Rosa*	Native	0–0.2	0–1
Tree					
glossy buckthorn	FRAL4	*Frangula alnus*	Introduced	0.3–0.9	8–10
glossy buckthorn	FRAL4	*Frangula alnus*	Introduced	2.4–3.7	2–3
red maple	ACRU	*Acer rubrum*	Native	0–0.2	1–2
balsam fir	ABBA	*Abies balsamea*	Native	0–0.2	0–1
balsam fir	ABBA	*Abies balsamea*	Native	0.6–1.8	1
red maple	ACRU	*Acer rubrum*	Native	0.9–1.8	1
green ash	FRPE	*Fraxinus pennsylvanica*	Native	2.1–4.6	1
balsam fir	ABBA	*Abies balsamea*	Native	0.6–0.9	0–1
northern red oak	QURU	*Quercus rubra*	Native	0–0.2	0–1
Nonvascular					
Bryophyte (moss, liverwort, hornwort)	2BRY	*Bryophyte (moss, liverwort, hornwort)*	Native	0–0.1	0–1

Table 26. Community 5.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
quaking aspen	POTR5	*Populus tremuloides*	Native	9.1–15.2	25–35	20.3–40.6	–
arborvitae	THOC2	*Thuja occidentalis*	Native	2.1–13.7	25–30	12.7–30.5	–
balsam fir	ABBA	*Abies balsamea*	Native	7.6–12.2	8–10	5.1–15.2	–
red maple	ACRU	*Acer rubrum*	Native	7.6–13.7	8–10	5.1–25.4	–
eastern hemlock	TSCA	*Tsuga canadensis*	Native	3–15.5	1–2	25.4–38.1	–
red spruce	PIRU	*Picea rubens*	Native	9.1–12.2	1–2	5.1–15.2	–
eastern white pine	PIST	*Pinus strobus*	Native	7.6–10.7	1–2	5.1–7.6	–

Table 27. Community 5.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
melic mannagrass	GLME2	*Glyceria melicaria*	Native	0.2–0.5	0–1
button sedge	CABU7	*Carex bullata*	Native	0.2–0.3	0–1
white edge sedge	CADE5	*Carex debilis*	Native	0.2–0.3	0–1
greater bladder sedge	CAIN12	*Carex intumescens*	Native	0.2–0.3	0–1
deertongue	DICL	*Dichanthelium clandestinum*	Native	0.2–0.3	0–1
Forb/Herb					
starflower	TRBO2	*Trientalis borealis*	Native	0–0.2	3–5
bunchberry dogwood	COCA13	*Cornus canadensis*	Native	0–0.2	1–2
Canada mayflower	MACA4	*Maianthemum canadense*	Native	0.2–0.3	1–2
white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	Native	0.2–0.3	0–1
Fern/fern ally					
cinnamon fern	OSCI	*Osmunda cinnamomea*	Native	0.3–0.6	1–2
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	0.3–0.6	1–2
woodland horsetail	EQSY	*Equisetum sylvaticum*	Native	0.2–0.3	1–2
Shrub/Subshrub					
common winterberry	ILVE	*Ilex verticillata*	Native	0.3–1.5	0–1
common winterberry	ILVE	*Ilex verticillata*	Native	0.2–0.3	0–1
Tree					
quaking aspen	POTR5	*Populus tremuloides*	Native	0.2–0.3	1–2
red maple	ACRU	*Acer rubrum*	Native	0.2–0.3	0–2
Nonvascular					
Bryophyte (moss, liverwort, hornwort)	2BRY	*Bryophyte (moss, liverwort, hornwort)*	Native	0–0.1	40–45

Animal community

Wildlife Habitat General Information

Reference Site
The dense canopy of the reference site provides for a deeper litter layer, and a darker, cooler, moisture microenvironment on the forest floor, where animals are less subject to extremes in temperature, solar radiation, wind speed, humidity, rain throughfall , snow accumulation, and predation. Because of the dense 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 semiaquatic animals such as beaver, mink, and moose. Large pines, 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 one of the ecological sites most 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 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 sphagnum hummocks are present, four-toed salamanders, a species of special concern, may breed and overwinter 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, with its water table located at or just below the ground's surface (less than 12 inches) between October and June and its tendency to be interspersed or adjacent to depressional ecological sites, standing water may be visible only for a day or two, up to a few weeks after snowmelt or immediately following heavy rains. 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.

Pit and Mound Microtopography
Pits occur where trees with shallow roots have uprooted and pulled up soil and the mounds 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 only occurs in the mature reference state, and may be retained, if harvested sustainably.

Snags and Cavity Trees
In Maine, the total number of live and snag 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 forestland. 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 one or two 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. White pine and quaking aspen 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 has more soft 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, macroorganisms (e.g. earthworms and beetles) and microorganisms (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. Many other organisms, including microscopic bacteria and fungi, also use this site. 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 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.

Cleared sites will also not have any downed woody debris and thus would not provide any suitable habitat for macro and microorganisms.

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 and Invaded sites will have a lot 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. Cleared sites will have no moss and a very reduced amount or no forest litter to provide habitat for wildlife.

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 and invaded states, but they are usually greater than 0.1 acre in size. The harvested and invaded states 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 skin moist. 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 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 wetlands 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 and 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 diameter breast height (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 inclusions for breeding; and for feeding it utilizes more open conditions such as canopy cover of greater than 70 percent with some 16 to 30 percent coverage.

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 diameter breast height (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 diameter breast height (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 an indicator species for 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 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 diameter breast height (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 an indicator 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 utilized for breeding, feeding, winter cover, and winter feeding habitat in sapling to large sawtimber size class forests. This species utilizes sites in mixed wood riparian areas, but is not limited to hardwood swamps. It can climb trees.

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 is commonly found in wetlands and/or uplands 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. They are aquatic foragers. They favor 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 percent, such as this site, and will avoid areas with less than 30 percent 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, 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 a harvested state that has not been cut recently.

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 such as oak and maple. When deer consume earlier-succession plants, this allows in enough light for nutrient competitors to invade. Since slow growing tree species 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 need a partially forested habitat. This may include wildlife species that need younger trees and shrubs for cover, such as the American woodcock and other early successional birds, those that prefer younger trees and shrubs for food, such as moose, and those species that need this type of cover and forage such as New England cottontail.

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).

Cleared State
The cleared state may provide some critical wildlife habitat for early-migrating birds or some grassland birds. In the southern and central part of this MLRA, the cleared states and phases have a much higher likelihood of being developed into house lots now or in the near future. Conservation of these types of open areas is essential to a variety of wildlife species.

Domestic Livestock:
Some farms use the cleared grassland and forested states for grazing livestock. Grazing forests, particularly wetland forests in Maine, is highly discouraged. Grassland states provide some native and non-native pasture and hay. Compaction and overgrazing can be a major issue in pasture unless prescribed grazing conservation practice is implemented. Hayland can become very “weedy” with non-desirable species outcompeting desirable grasses and legumes because farmers are unable to cut the hayland on a regular schedule due to the wetness. Purple loosestrife is an invasive species that might take over a cleared grassland state that is not regularly harvested.

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 a 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 (BMP). 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 all-terrain vehicle (ATV) use, which usually occurs on snowless areas and could cause some damage, such as soil compaction and 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, 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 and 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 white pine on this site is the most desirable species for sawlog products, but this site is not a highly productive site for white pine because of the poor drainage and clayey nature of the soil. The average statewide price per million board feet (MBF) for white pine sawlogs in 2011 was $161(Maine Forest Service, November 15, 2012). Hardwood pulpwood has a larger market than softwood pulpwood. White pine may also be sold for pulpwood, which sold for $4 per MBF in 2011. Other species growing on this site have a variety of markets. For example: quaking aspen may be marketed for pulpwood, sawlogs, and veneer; 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 as well as white oak for sawlogs.

Some typically non-commercial species from this site, including gray birch (Betula populifolia), and rarely American hornbeam (*Carpinus caroliniana*) and eastern hop-hornbeam (Ostrya virginiana), 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. Examples include jewelweed which is a medicinal plant used to provide relief for poison ivy dermatitis, and acorns which can be ground into a paste for food. 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 belowground portion of the stump and coarse roots store approximately 17 percent of the living biomass. The tops and limbs contain another 12 percent. The aboveground 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, white pine, hemlock, and northern white-cedar is primarily in saw log-size trees. By contrast, most of the tree biomass in balsam fir, red maple, aspen, the ashes, and beech 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 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 key 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 cubic feet per acre) of fuels pose a fire hazard in Maine's forests.

Table 28. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
eastern white pine	*PIST*	57	58	96	98	56	–	–	

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

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Contributors

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Approval

Nels Barrett, 9/27/2024

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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):

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

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

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

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:

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

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

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

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:**

17. **Perennial plant reproductive capability:**