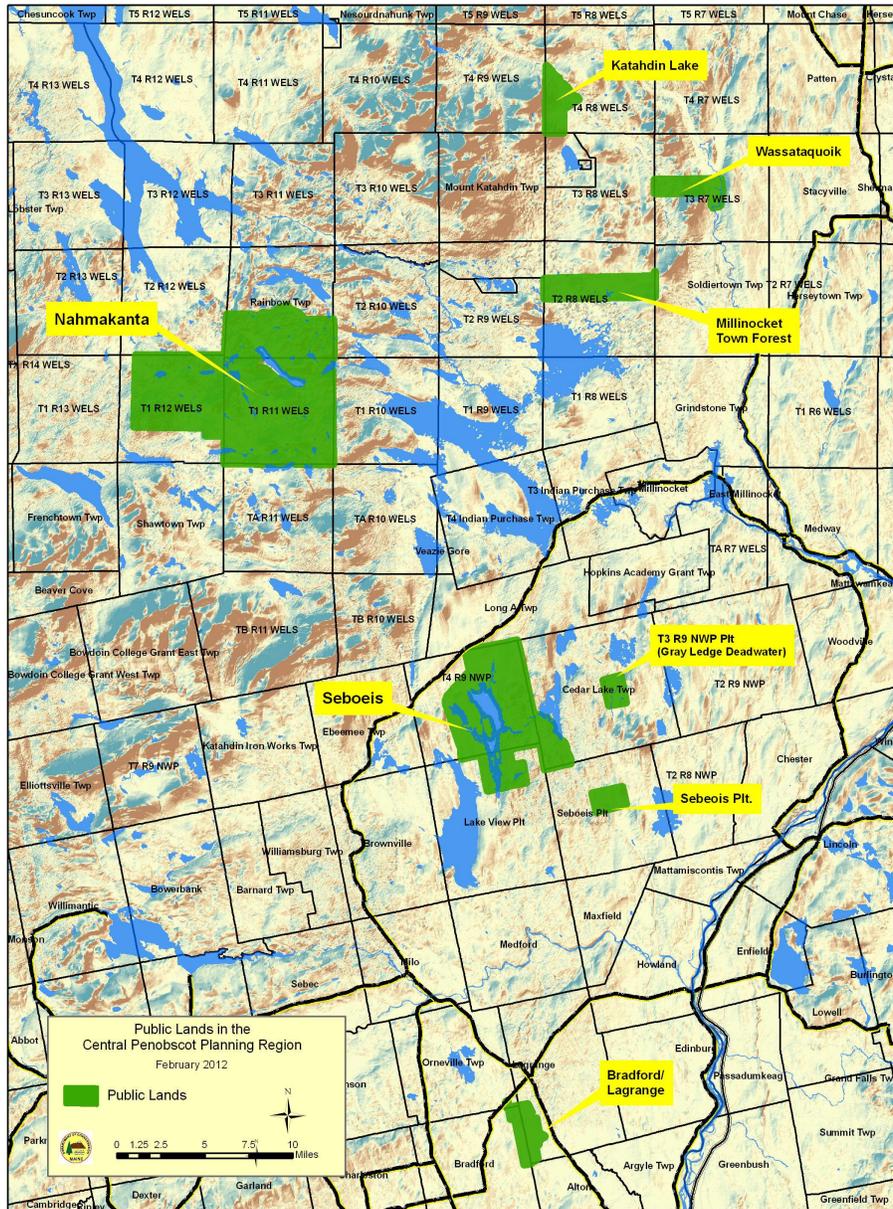


Natural Resource Inventory of Public Lands in the Central Penobscot Region: Regional Overview



Prepared by
Maine Natural Areas Program
for the Bureau of Parks and Lands
April 2012



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Preface

This regional Natural Resource Inventory was conducted for the Bureau of Parks and Lands (BPL) by the Maine Natural Areas Program (MNAP) as part of the Bureau's management planning process for its lands in the Central Penobscot Region. The primary purpose of this NRI is to identify and describe important natural resources that should be considered in the Bureau's management plan for the region.

Over 20 days of field work were conducted by MNAP staff (Andy Cutko, Emily Stone, Kristen Puryear, Nancy Olmstead, Justin Schlavin) during the summers of 2010 and 2011. Field work was preceded by landscape analysis performed using relevant GIS layers, aerial photos, and consultation with BPL staff. Additional field data were gleaned from previous visits to some of these areas by MNAP staff and other ecologists. In 1992, for example, a *'Landscape Analysis and Inventory of the Nahmakanta Management Unit'* was produced by Woodlot Alternatives. Additional field work was conducted at Nahmakanta in 1995 as part of a statewide assessment of the suitability of selected public lands as Ecological Reserves. Relevant components of those earlier studies are incorporated here. Field forms for all surveys are available at the MNAP office.

Acknowledgements

This NRI was a collaborative effort between MNAP and BPL staff. BPL staff with particular insights regarding the ecology, wildlife, and history of these areas includes Tom Charles, Joe Wiley, Doug Reed, Jay Hall, George Ritz, and others.

Executive Summary

The attached Natural Resource Inventories (NRIs) document the physical and ecological features of the Bureau of Parks and Land's properties in the Central Penobscot region. BPL parcels in the region total approximately 73,500 acres and include lands around Nahmakanta Lake, Seboeis Lake, Wassataquoik Stream, Seboeis Stream, and several smaller lots. This section of the report is a Regional Overview. Separate sections have been produced for the Nahmakanta Lake and Seboeis Lake Units, and the remaining six public land units are grouped together in a third section.

The BPL lands in the region range in elevation from 140 feet at Bradford/Lagrange to over 2,400 feet on Farrar Mountain in Nahmakanta and the flank of East Turner Mountain in the Turner Mountain parcel. The lands straddle two Maine Ecoregions, with most of the units characteristic of the Central and Western Mountains, while the Bradford/Lagrange unit lies within Maine's Central Foothills and Eastern Lowlands.

The region's geology and soils are varied. Bedrock of the Nahmakanta, Millinocket Lake, and Seboeis Units consists primarily of hard, resistant granite of Devoinian origin (Griffith 2008). Bedrock further to the southeast tends to consist of less resistant sandstones and mudstones. Glacial till and 'ribbed moraine' deposits (coarse-grained sand and gravel) underlie most of the Units, while denser glacial-marine, finer grained silts and clays cover the Bradford/Lagrange unit.

The region's undeveloped lakes and pristine rivers and streams are among its most prized natural assets, providing valuable fisheries and remote recreational experiences. Wassataquoik Stream, Seboeis Stream, and the East Branch of the Penobscot River all traverse the region's public lands before winding their way into the Penobscot River. These rivers include whitewater rapids, extensive floodplain forests, and valuable riparian wetlands.

BPL lands in the region contain a varied array of intact upland and wetland habitats characteristic of central and northern Maine. The majority of BPL's lands support mature forest, with over 93% of BPL's stands in either pole timber or sawtimber classes. This preponderance of mature forests contrasts somewhat with the broader region: in Piscataquis County as a whole, pole timber and sawtimber stands account for 64% of the overall forest (US Forest Service 2012). The lands encompass over 20 rare or exemplary natural communities and multiple rare plant and animal populations.

The nearly 43,000 acre Nahmakanta Unit is the largest public land tract in this planning region and is second only to Baxter State Park in acreage of state-owned lands. The Appalachian Trail bisects the Unit, and Nahmakanta is sandwiched between conservation lands owned by The Nature Conservancy and Appalachian Mountain Club. As a result, the Nahmakanta Unit is part of a landscape of nearly a half million acres of conserved forestland that extends along the renowned 'Hundred Mile Wilderness' of the Appalachian Trail. Approximately 10,000 remote acres east of Nahmakanta Lake are

managed as an Ecological Reserve, and the remaining acres consist of rolling to rugged terrain managed for dispersed recreation, wildlife, and managed forest products.

At roughly 15,600 acres, the Seboeis Lake Unit contains about 20 miles of shore frontage (nearly the entire shoreline) on the 8-mile long Seboeis Lake and over two miles of frontage on Endless Lake. Seboeis is a popular destination for fishing, boating, snowmobiling, and camping. The interior forestland, on level to gently rolling terrain, has a long history of forest management and supports a mixture of forest types, with roughly equal mixes of softwood and hardwood. Aside from the lake itself, the most notable ecological features within the Unit are a series of kettlehole wetlands, red pine stands, and sand beaches at Sand Cove at the northern end of the Lake.

The 5,061 acre Millinocket Lake Forest Unit, a recent state acquisition, is a rectangular-shaped parcel that contains part of the state's largest 'ribbed moraine' – a post-glacial feature of undulating sand and gravel ridges that alternate with shrub-dominated wetlands. This area supports an extensive stand of red pine forest that has been at least partly sustained by fire. Much of the remaining land has been heavily harvested within the last decade.

The other smaller Public Lands in the region include:

- the ~2,100 acre Wassataquoik Unit, which contains an Ecological Reserve around an outstanding system of floodplain forest at the confluence of Wassataquoik Stream and the East Branch of the Penobscot River;
- the ~2,500 acre Turner Mountain Forest Unit, supporting intact forest that slopes down from the east flank of Turner Mountain to Wassataquoik Stream;
- the ~2,100 Bradford/Lagrange Lot, which is softwood-dominated forestland on level to gently rolling, somewhat poorly drained soils characteristic of the Penobscot Valley.
- the ~930 acre T3 R9 lot (Gray Ledge Deadwater), which features a 350-acre open wetland complex along Seboeis Stream.
- the ~1,130-acre Seboeis Plantation Lot, which encompasses gently rolling terrain that slopes down to the West Branch of Seboeis Stream.

These lots are used primarily for forest management and dispersed recreation, such as hunting and fishing.

Central Penobscot Regional Overview

The lands within Maine's central Penobscot planning region lie at the junction of two of Maine's ecological sections (Figure 1). Nahmakanta, Wassataquoik, the Millinocket Lake Unit, and Turner Mountain Unit are within Maine's Central and Western Mountains section, a region characterized by rugged terrain and bisected by the spine of the Appalachian Trail as it heads toward Mt. Katahdin. Seboeis and the smaller tracts to the southeast are within Maine's Central Foothills and Eastern Lowlands section, a landscape of lower hills and flats, extensive wetlands, and glacial marine soils.

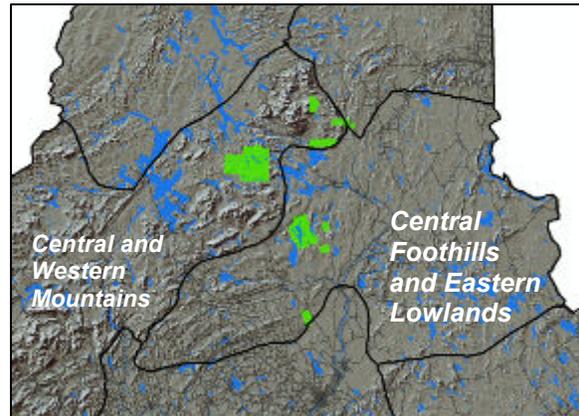


Figure 1: Location of BPL's Central Penobscot Lands within the context of Maine's Ecological Sections.

The Physical Landscape: Geology, Soils, and Hydrology

Maine's Central Penobscot Region is a rugged and remote landscape defined by mid-elevation peaks, broad valleys, and numerous lakes, streams and rivers. Public lands in this region range in elevation from 140' to over 2500'. The Region is not as mountainous as the Western Mountains, yet the terrain is more rolling and rugged than the lower, flatter Eastern Lowlands to the east. The region has a complex geologic history, with some metamorphosed phyllites and slates along with intrusions of granite, including a large pluton (uplifted granitic bedrock) that extends from Nahmakanta northward through Mt. Katahdin (Maine Geologic Survey 2002, Griffith 2008). The oldest bedrock in the region is of Devonian origin, formed roughly 400 million years ago.

In more recent times, the last glaciation roughly 12,000 years ago compressed the earth, molded the terrain, and draped a residue of till and gravel across the landscape. The glacier's compression of the land drew the ocean northwestward; at its greatest inland extent, the ocean extended as far west as the present day Bradford/Lagrange unit. The preponderance of poorly drained glacial-marine silts and clays in this area reflects this past inundation.

In the rest of region, soils tend to be coarse-loamy and moderately acidic, formed typically in dense glacial till. Several of the public land units within the region include part of Maine's largest 'ribbed moraine' – a glacial deposit formed as a series of alternating dry ridges and wet troughs.

The majority of the region's soils are classified as spodosols, which are cool, moderately acidic, and comparatively low in fertility. In some locations pelite and sandstone have weathered to form more silty, poorly drained soils including those in the Telos-Monarda–

Monson complex. In these locations, dense, unsorted till deposit can form an almost impenetrable barrier on top of the bedrock.

Monson-Elliottsville-Ricker soils occur on higher elevation ridges and side slopes, such as Farrar Mountain in Nahmakanta. These are stony, well to excessively drained soils. At mid-elevations, such as the eastern side of Nahmakanta, soils are typically deeper series of the Colonel Dixfield Lyman group. Soils of the Brayton – Dixfield - Peacham group underlie most of Seboeis and Bradford/Lagrange. These sandy loams tend to be poorly drained or even wet throughout much of the year. In some areas such as the north end of Seboeis Lake and parts of the Millinocket Lake Unit, ice-contact glaciofluvial deposits such as eskers and stream alluvium drape the landscape. Soils derived from these deposits tend to be well to excessively drained gravels, sands, and sandy loams.

All of the public land units are within the Penobscot River watershed, and they drain into the Penobscot from a variety of tributaries, including the Wassataquik Stream and the East Branch of the Penobscot, Nahmakanta Stream, and Seboeis Stream. At just over 1,000 acres, Nahmakanta Lake is one of the largest lakes entirely within state lands in central Maine.

The climate of the Central Penobscot region is transitional between that of Maine's Western Mountains and Eastern Lowlands. Compared to the Western Mountains, summers are slightly milder, winters are slightly colder, and the frost-free season (approximately 100 days) averages 10 days longer. Mean maximum July temperature is 77° F and mean minimum January temperature is 1° F. Average annual precipitation is 38" while average annual snowfall is 120", among highest in the state (McMahon 1990).

Wetlands in the region are most commonly evergreen forested swamps (primarily spruce-fir swamps and bogs), although shrub swamps (dominated by alder, sweet gale and/or meadowsweet) and sedge meadows are also common along slow moving streams and beaver meadows. Marshes provide open grassy habitat that is critical for many wildlife species (including pied-billed grebe, American bittern, northern harrier, sedge and marsh wrens, muskrat, mink and moose). Nearly every major stream in the region has small beaver-enhanced wetlands along parts of its length. Larger wetland complexes (mixtures of several different types) occur along some slow-moving, meandering rivers with wide low floodplains, such as Seboeis Stream and the East Branch of the Penobscot River.

The Biological Landscape: Forest Types, Plants, and Animals

Within the Central Penobscot Region, forest stands of spruce and fir are common on ridge tops, while northern hardwoods and mixed stands of spruce and northern hardwood are common on mid-slopes. In some areas, such as east of Nahmakanta Lake, there are scattered stands of Red Pine White Pine forest and more extensive patches of Aspen-Birch forest that originated after fires early in the last century. BPL lands in the region lack the true sub-alpine habitats that occur further southwest along the Appalachian Trail in the Region. In lowlands and on poorly drained soils, spruce-fir forests intergrades with

northern white cedar swamps and spruce-larch bogs. Cedar is frequent along streams, wetlands, and lakeshores, but it rarely forms larger natural communities as it does farther north. With a few notable exceptions (e.g., Gray Ledge Deadwater), open wetlands tend to be small and associated with lakeshores or beaver impoundments.

In general, the forests in the Central Penobscot region are older and higher in volume than forestlands in the region. According to the BPL stand type data, only 6.1% of BPL's stands in the region are in the seedling/sapling size class, compared to nearly 36% of the stands in this class in Piscataquis County (US Forest Service 2012) (Figure 2).

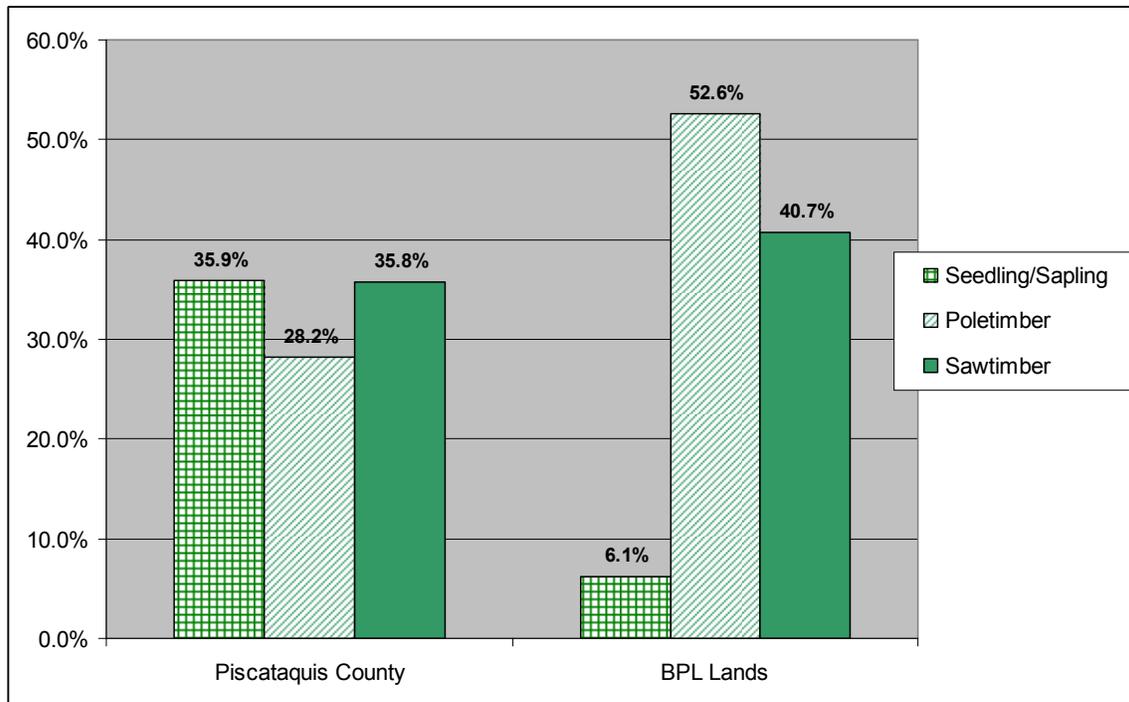


Figure 2: Forest size class on BPL lands in the Central Penobscot Region and Piscataquis County

Natural Disturbance Regimes

The disturbance regimes in the Central Penobscot region are many of the same disturbances at work in other regions in the state. Primary disturbance factors are wind, insects (e.g., spruce budworm), ice storms, and fire. Forest canopy dynamics are primarily driven by single and multiple tree (small and medium gap) disturbances, encouraging gap-phase regeneration in patches of an acre or less. Larger disturbances such as spruce budworm, tornados, ice storms, and thunderstorm downbursts affect the region infrequently, creating widespread pit-mound topography, larger gaps up to dozens or even hundreds of acres, and abundant coarse woody debris (Ruffner, 1982). At higher elevations wind disturbance often results in an abundance of mountain ash (*Sorbus decora* and *S. canadensis*) and elderberry (*Sambucus* spp.).

Fire

In recent decades budworm, wind and ice damage have been more frequent and important than fire, although within the last two centuries fire played a larger role in shaping the region's forests. Naturally occurring fires are rare in the region. In pre-settlement northern hardwoods, the principal cause of fuel formation leading to fire was broad-scale, storm-driven windthrow of catastrophic proportions, resulting in fire rotations of more than 1,000 years. In mixed stands of northern hardwood and spruce, fire may be slightly more frequent but is nonetheless on the order of several hundred years (Hill and Reitz 2008).

In lowland conifer stands such as spruce flats, fire disturbances may be severe and affect large patch sizes, at more frequent (150- to 300+ year) return intervals. On moderate to deeper spoils, fires in the spring tend to favor a regeneration pathway to early successional aspen-birch. While these hardwoods mature in 60-70 years, mortality is heavy throughout the life of the stand and very few trees make it to the maximum life span of over 100 years. These stands eventually become dominated by shade tolerant spruce and fir which bide their time in the understory (Figure 3). This was the likely scenario for some of the large Nahmakanta fires in the early 1900s, while other burned areas with poor soil development (such as those in the Turtle Ridge area) favor a pathway directly to spruce.



Figure 3: Typical post-fire succession in the Central Penobscot region?; softwood regeneration replaces pioneer species (aspen and birch)

Insects

Insect outbreaks are one of the most frequent and influential natural disturbances in lowland spruce-fir forests. Pests such as spruce budworm and spruce bark beetle pulse in 50 to 100 year cycles, creating large patches of dead and dying trees up to dozens of acres in extent. Historically, budworm outbreaks have occurred two to three times per century, with the most recent occurrence in the 1970s and 1980s. While the scale of budworm damage covers millions of acres, the intensity varies considerably according to the balsam fir component of each stand (balsam fir is the preferred food of the budworm). At higher elevations farther west in the Central Mountains, the effects of spruce budworm are often interrelated with the effects of wind and weather damage. These effects combine to create patchy openings and blowdowns. In some areas, past high-grade removal of white pine and red spruce or heavy clearcutting may have increased the severity of budworm outbreaks by promoting fir growth.

Beech bark disease is an introduced forest pathogen that results when the beech scale insects (*Cryptococcus fagisuga*) create wounds that are later infected by fungi (*Nectria* spp.), causing cankers to form. In badly infested stands, most mature trees are infected, causing significant mortality in forest canopies but not deterring regeneration. Many

hardwood strands in the region show signs of beech bark disease, in particular sites on dry or poor soils lacking a healthy complement of maple and yellow birch.

Wildlife

The natural communities of the Central Penobscot region provide habitat for a number of common wildlife species. In addition to mammals found in many areas of the state such as black bear, moose, and beaver, the region provides habitat for species with more boreal affinities such as American marten and lynx. Similarly, the region provides habitat for boreal bird species in addition to species more broadly associated with conifer forests such as northern parula, yellow-bellied flycatcher, and black-throated green warbler (DeGraff and Yamasaki 2001).

Spruce grouse, gray jay, boreal chickadee, bay-breasted warbler, Cape May warbler, snowshoe hare, pine marten, and moose characterize the colder conifer sites in this region. Ruffed grouse, pileated woodpecker, mourning warbler, Nashville warbler, red-eyed vireo, pine grosbeak, smoky shrew, northern flying squirrel, fisher, and white-tailed deer characterize the hardwood-conifer sites in this region. Eastern woodland caribou, mountain lion, and timber wolf were extirpated through land-clearing activities and European settlement that preceded agricultural development in the early to mid-nineteenth century. Coyotes, bobcats, black bears (seasonally) and humans are the largest predators today.

Common loons, bald eagles, ospreys, and otters commonly use the many large lakes, rivers, and flowages. Beech is the primary source of hard mast; oak is a secondary hard mast source. Historically, Atlantic salmon were found in the major rivers (Penobscot and Kennebec) of this region. Restoration of Atlantic salmon to the Penobscot is underway. No Federally listed threatened and endangered species are unique to this Section.

Open wetlands and ponds created by beavers are common in the region. Successive generations of beavers will often move or down a stream, impounding new areas while abandoning others. These abandoned ponds typically slowly fill with sediment and gradually transition from marshy wetlands back to uplands. By creating and abandoning impoundments along the stream course, beavers create a mosaic of habitats for other plant and wildlife species.

The only known rare animal populations within BPL lands in the region are bald eagles at Seboeis Lake, and several populations of the creeper (a freshwater mussel) in various streams. There is an active nest at Seboeis Lake and is not within operable forestland. Existing BPL management practices for riparian systems are sufficient for conservation of the rare mussel.

The Human Landscape: Land Use History

In pre-colonial times, major river corridors such as the Penobscot were heavily used by Native American populations. People often traveled down the river to the coast for the

summer and returned inland for the winter. Because of the region's remote location, European settlement occurred in the latter part of the 18th century -- much later than for coastal areas of Maine.

Some of the river valleys in the lower and central Penobscot watershed were cleared for subsistence farming because of the excellent alluvial soils. As those lands were taken by the first settlers, new migrants settled up the slopes of the hills and mountains, where they encountered more challenging glacial till soils. Much of the early forest clearing for farming provided materials for building, and waterpower on rivers and streams provided power to saw logs into lumber. Farmers in this region typically farmed in the summer and logged in the winter, although the remoteness made it extremely difficult to move wood products out of the region into other markets.

Timber harvesting at Nahmakanta and Seboeis date back multiple generations, and the current mix of hardwoods and softwoods reflect that history. Abundant water power provided energy for the first saw mills, and mills were located at the outlets of both Endless and Seboeis lakes. For much of the last century, large, vertically integrated forest products companies owned much of the land. That long-term, stable model was transformed beginning in the 1980s with the sale of many of the lands, including the state's trade for part of Nahmakanta with the Great Northern Paper Company.

Very little 'old growth' remains in the Central Penobscot region, and what is left is primarily on other conservation lands, such as The Nature Conservancy's Debsconeags Lakes parcel. According to the forest inventory data, only about 1% of the forest stands in Piscataquis County have a stand age over 140 years old.

There has been a moderate increase in recreational use in recent decades in the region because of the demand for remote hiking, boating, fishing, and hunting experiences. Recreational use has been fostered by Nahmakanta Lake Camps, the Chewonki Foundation's Fourth Debsconeag Wilderness Camps, and the creation of new campsites and hiking and motorized trails.

Summary Acreage Information

Unit	Total Acreage	Forested Wetland Acreage	Open Wetland Acreage	Total Wetland Acreage	Wading Bird Habitat	Deer Winter Areas
Nahmakanta	43,249	95	2,057	2,152	1,645	485
Seboeis Lake	15,959	212	2,109	2,321	2,295	332
Millinocket Lake Forest	4,625	134	1,041	1,175	1,501	0
Turner Mountain Forest	2,474	8	167	175	374	0
Bradford/Lagrange	2,164	55	182	237	100	383
Wassataquoik	2,136	16	489	505	86	0
Seboeis Pt	1,136	37	79	115	142	0
T03 R09 NWP Plt	934	21	305	326	435	0
TOTAL ACRES	72,720	577	6,429	7,006	6,579	1,200

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