**SECTION 9. NATURAL RESOURCES**



1. **Mars Hill Natural Resources**

**Figure 90. Mars Hill Natural Resources**



1. **Wetlands and Vernal Pools**

The National Wetlands Inventory (NWI) is the inventory typically used to identify wetlands in the absence of a more detailed local wetland survey. NWI uses aerial photographs from the mid-1980’s to identify approximate wetland locations based on visible signs of wetland vegetation, hydrology, and geography. The NWI data and maps are not based on field wetland delineations and given the limits of aerial photo interpretation, is not a comprehensive mapping of wetland resources and typically under represents the presences of wetlands on the landscape. The presence of wetlands needs to be determined in the field prior to conducting activities that could result in wetland disturbance. According to the NWI, there are 2,580 acres of wetlands in Mars Hill, primarily located in the western 2/3 of the community.

***Runoff/floodflow*** wetlands provide natural stormwater control capabilities. As natural basins in the landscape, wetlands are able to receive, detain, and slowly release stormwater runoff. Wetland shelves along stream banks naturally regulate flood waters by providing an area for swollen stream flows to expand and slow, thereby, protecting downstream properties. The NWI assigns this function to wetlands that are contained in a known flood zone, are associated with surface water, and have a slope less than 3%.

***Erosion control/sediment retention*** wetlands act as natural sponges that can hold water, allowing suspended particles such as sediment to settle out. The dense vegetation in most wetlands helps to stabilize soil and slow water flows, thereby reducing scouring and bank erosion. The NWI assigns wetlands with a slope less than 3%, emergent vegetation, and close proximity to a river, stream, or lake to this function.

***Finfish Habitat*** wetlands have documented finfish populations, including wetlands adjacent to a river, steam, or lake.

***Plant/Animal Habitat*** wetlands provide habitat during some part of wildlife species life cycle. These wetlands contain open water or emergent vegetation, 3 or more wetland vegetation classes, and area within ¼ mile of a mapped significant or essential habitat, rare or endangered plant or animal occurrence, mapped significant or essential habitat, or rare or exemplary natural community.

***Cultural/Educational*** wetlands are within ¼ mile of a boat ramp or school because they are likely candidates for use as outdoor classrooms, or similar social benefit. Wetlands rated for other functions may also demonstrate cultural/educational values.

Wetlands serve a variety of functions, sometimes multiple functions – runoff/floodflow alteration and/or erosion control/sediment retention, finfish habitat and/or shellfish habitat, plant/animal habitat, and other functions. Wetlands with each of these functions exist In Mars Hill.

Riparian habitat is depicted using common regulatory zones including a 250-foot wide strip around Great Ponds (ponds ≥ 10 acres), rivers, coastline, and wetlands ≥ 10 acres and a 75-foot strip around streams.

Vernal pools are wetlands that are seasonally filled with water and provide important breeding habitat to many amphibian and invertebrate species. Vernal pools are a vital component of the forest ecosystem. Although a comprehensive statewide inventory and map of vernal pools has not been completed, vernal pools almost certainly are present in Mars Hill.[[1]](#footnote-2)

1. **Water Resources**

**Figure 91. Mars Hill Water Resources**

****

1. **Prestile Stream Watershed**

Christina Reservoir and 15.8 miles of Prestile Stream, which originates at the outlet of the Reservoir and terminates at the Mars Hill Dam, have both been listed as “impaired” by the Maine Department of Environmental Protection (DEP) because of nonpoint source (NPS) pollution carried in stormwater runoff as a result of historic and present day pollution. These water bodies have been placed on DEP’s 2008 303(d) list of impaired waterbodies because of failure to meet their statutory Class A water quality designations. Prestile Stream violates Maine’s standards for aquatic life and dissolved oxygen. Causes of impairment are a direct result of industrial waste discharge and water withdrawals in the 1950’s and 1960’s and inputs of the insecticide DDT through 1972. Several impoundments, including Christina Reservoir and Lake Josephine, were created to store and treat industrial wastes and provide water for processing plants. The Prestile Stream is also identified as one of the 27 highest priority watersheds among the 55 streams listed on DEP’s Nonpoint Source (NPS) Priority River & Stream Watersheds.

**Figure 92. Prestile Stream Subwatersheds**



Approximately 10% (4,345 acres) of the Upper Prestile Stream’s watershed (a total of 68 square miles – 43,434 acres) is in Mars Hill, containing portions of the Prestile Main Stem 1, Getchell Brook, and Prestile Main Stem 2 subwatersheds. The Upper Prestile Stream watershed terminates at the Mars Hill Dam, which is an important barrier in restricting the movement of smallmouth bass (not native to the drainage) farther upstream, which could negatively affect the native trout population.

In 2002, the Central Aroostook Soil and Water Conservation District (CA-SWCD) brought together a 40-member Steering Committee to write a watershed management plan. This plan was completed in 2005. Its primary recommendations were funding and outreach, assessment and monitoring, and nonpoint source action.

In 2008, the Maine Department of Environmental Protection (DEP) contracted with FB Environmental Associates of Portland to conduct a *Total Maximum Daily Load (TMDL) Report of Prestile Stream (& Christina Reservoir)*. The Prestile Stream TMDL study was based on sampling data collected between 1999 and 2006. The Report found that elevated nutrient loading and sediment accumulation contributes to the excess algae growth in the stream, which consumes oxygen during respiration and depresses DO levels. Excess soil runoff provides sediment that contains a mixture of nutrients, inorganic and organic material that stimulates algal growth and contributes to the hyper-abundant populations of macroinvertebrates. Dissolved oxygen (DO) increase and temperature measurements decrease from north to south. Phosphorus, nitrogen, and sediment levels were elevated and macroinvertebrate populations do not meet state requirements for a Class A stream, indicating nutrient enrichment, sedimentation, and algal growth.

Agricultural land encompasses the largest land area in the watershed, making it potentially the greatest contributor of silt and nutrient enrichment to the Steam. Nutrients have also accumulated over time in bottom sediments of the slow flowing and ponded steam segments and may be periodically released into the water column. Other sources of NPS include bare agricultural land; removal of riparian vegetation; poorly designed and/or maintained roads and culverts including gravel/farm roads, paved roads, and logging roads; logging debris left in streams; use of fertilizers; and animal/pet waste.

| **Figure 93. Sediment, Nitrogen, and Phosphorus Loading Estimates and Recommended Reductions for Subwatersheds of Prestile Stream** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subwatershed** | **Name** | **Sediment (t/ha/yr)** | **Total N (kg/ha/yr)** | **Total P (kg/ha/yr)** | **Sediment % Reduction** | **Total N % Reduction** | **Total P % Reduction** |
|  | Reference Waterbodiesa | 0.02 | 4.80 | 0.21 |  |  |  |
| **1** | Christina Reservoir | 0.04 | 11.70 | 0.49 | 50% | 59% | 57% |
| **2** | Lake Josephine | 0.06 | 11.30 | 0.49 | 67% | 58% | 57% |
| ***3*** | ***Prestile Main Stem 1*** | ***0.10*** | ***13.44*** | ***0.54*** | ***80%*** | ***64%*** | ***61%*** |
| ***4*** | ***Getchell Brook*** | ***0.12*** | ***14.38*** | ***0.67*** | ***83%*** | ***67%*** | ***69%*** |
| **5** | Williams Brook | 0.08 | 17.81 | 0.63 | 75% | 68% | 67% |
| **6** | Clark Brook | 0.04 | 6.76 | 0.26 | 50% | 29% | 21% |
| **7** | Allen/Frost Brooks | 0.09 | 12.45 | 0.62 | 78% | 61% | 66% |
| **8** | Pretty/Rideout Brooks | 0.05 | 6.80 | 0.26 | 60% | 29% | 19% |
| ***9*** | ***Prestile Main Stem 2*** | ***0.10*** | ***11.27*** | ***0.50*** | ***80%*** | ***57%*** | ***58%*** |
|  | *Total* | *0.06* | *9.8* | *0.42* | *69%* | *51%* | *51%* |
| a Average of unit area loads for B Stream and Moose Brook. 1t/ha/year = 809.37 lbs/acre/year and 1kg/ha year = 0.892 lbs/acre/year.  Prestile Main Stem 1, Getchell Brook, and Prestile Main Stem 2 are those subwatersheds that are portions of Mars Hill. | | | | | | | |
| Source: F.B. Environmental Associates, *Total Maximum Daily Load (TMDL) Report: Prestile Stream (& Christina Reservoir)*, Aroostook County, ME, 2008 | | | | | | | |

The highest nitrogen loading among the watershed is in the Getchell and Williams Brook subwatersheds. The highest phosphorus loading is in the Getchell, Williams, and Allen/Frost Brook subwatersheds. Expansion of agriculture and development activities has the potential to increase runoff and associated pollutants.

|  |  |  |  |
| --- | --- | --- | --- |
| **Figure 94. Load Allocations and Waste Load Allocations for Pollutants in the TMDL** | | | |
| **TMDL = LA + WLA** | **Nutrients** | | **Sediment** |
|  | **Phosphorus Load (kg/ha/year)** | **Nitrogen Load (kg/ha/year)** | **Sediment Load (tons/ha/year)** |
| **Load Allocations (LA)** | 0.21 | 4.80 | 1.12 |
| **Waste Load Allocations (WLA)** | 0 | 0 | 0 |
| **Loading Capacity (TMDL)** | .021 | 4.80 | 0.02 |
| Source: F.B. Environmental Associates*, Total Maximum Daily Load (TMDL) Report: Prestile Stream (& Christina Reservoir)*, Aroostook County, ME, 2008 | | | |

Load allocations, representing nonpoint sources from activities including roadways and agricultural inputs were calculated in the Report and are provided in Figure 93. The Report recommends that additional assessments should include stream monitoring to develop standards for pre and post application comparisons, to gauge effectiveness of any BMPs or engineered design solutions. Load reductions provide a guide for restoration plans and engineered solutions that will lower the content of nutrients and sediment in the runoff reaching the Stream.

**Figure 95.**

Source: F.B. Environmental Associates. Total Maximum Daily Load (TMDL) Report: Prestile Stream (& Christina Reservoir), Aroostook County, ME. 2008.

According to the Report, “Cropland [which covers 6% or 20,028 acres of the watershed] is by far the largest estimated source of sediment and nutrients to Prestile Stream and its tributaries, accounting for a predicted 96% of the total sediment load within the Prestile Stream watershed…Cropland is also estimated to be the dominant source of phosphorus...while nitrogen loading is attributed to both groundwater and cropland.” The Report recommends a comprehensive subwatershed approach to manage “all potential nutrient and sediment sources with a major emphasis on implementing Best Management Practices [BMPs] on agricultural land.” Of particular concern is harvesting crops such as potatoes in the late fall, with no winter crop covering the bare ground until spring planting, leaving fields vulnerable to soil erosion from thunderstorms and heavy rain which carries nutrients and sediment to the Stream.

Other potential inputs stem from recreational activities such as ATV trails, poorly maintained septic systems, waterfowl, and the highly eutrophic Christina Reservoir “which has acted as a nutrient sink for decades.” In addition, there is concern that the former spraying of nutrient rich irrigation water from the Reservoir has saturated watershed soils, which eventually make their way into Prestile Stream. Approximately 6,088 acres (14%) and 610 acres (1%) of the watershed is wetlands and open water, respectively. These wetlands provide habitat for a number of unique plants and animals, and are considered one of the most productive waterfowl areas in the State – macroinvertebrates providing an important protein source for thousands of ducks and geese.

Based on DEP’s 2004 land cover data, larger areas of mixed forest are located in the southern portions of the watershed near Pretty and Clark Brooks and Young Lake. The rest of the Prestile Stream watershed is low intensity development (mix small buildings such as single family homes, farm out-buildings, large sheds, and streets and roads).

Following the 2008 TMDL Report, DEP was required to prepare a Watershed BMP for the impaired stream segment. The *Upper Prestile Stream Watershed-Based Management Plan*(WBMP) was published in 2009. The WBMP is different from a traditional watershed plan in that it requires 9 specific elements to achieve load reductions called for in the TMDL over a 5-15 year timeframe in order to restore the impaired waterbody. The WBMP also contains strategies for monitoring progress and financing implementation. The WBMP calls for:

* targeting subwatersheds with the greatest nonpoint source (NPS) loading,
* focusing NPS implementation efforts on agricultural land,
* improving the type and timing of water quality monitoring, and
* developing a sustainable funding and outreach plan.

The WBMP includes management objectives for outreach, funding, assessment, monitoring, and NPS action. The greatest NPS reductions are needed in the Getchell Brook (for phosphorus, nitrogen, and sediment), Prestile Main Stem 1 (sediment), Prestile Main Stem 2 (sediment), and Williams Brook (for phosphorus and nitrogen).

Detailed watershed surveys, similar to one conducted in the Allen/Frost Brook sub watershed are needed in the other subwatersheds to identify specific needed improvements. Cooperation among landowners, local conservation groups, and state and federal agencies is what has been found to be needed to make remediation projects successful. Remediation efforts might include revegetating bare soil, planting shrubs along the stream, installing sediment detention basins to capture and filter sediments; managing erosion on agricultural land and roads; addressing inadequate ditches, poorly functioning culverts, among other improvements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Figure 96. Estimated BMP Efficiencies in the Prestile Stream By Pollutant Type** | | | |
|  | **Typical Pollutant Removal (percent)** | | |
| **BMP Type** | **Nitrogen** | **Phosphorus** | **Sediment** |
| **Vegetated Buffer Stripsa** | 54 | 52 | 58 |
| **Crop Rotations** | 7 | 40 | 55 |
| **Cover Crops** | 43 | 32 | 15 |
| **Terraces and Diversions** | 44 | 42 | 71 |
| **Pasture Land Management** | 43 | 34 | 13 |
| **Streambank Protection** | 65 | 78 | 76 |
| **Nutrient Managementb** | 19 | 28 | \* |
| **Livestock AWMSb** | 75 | 75 | \* |
| **Grassed Waterwaysc** | 30 | 30 | 48 |
| **Sediment Basinc** | 65 | 65 | 65 |
| aAlso called Filter Strips. b Includes Waste Storage Facilities. c Source: US EPA 1993 (median values). | | | |
| Source: F.B. Environmental Associates, *Total Maximum Daily Load (TMDL) Report: Prestile Stream (& Christina Reservoir)*, Aroostook County, ME, 2008 | | | |

According to the Report, the BMP efficiencies noted above are primarily based on information found in Evans et al[[2]](#footnote-3) with additional estimated efficiencies for grassed waterways and sediment basins from US EPA[[3]](#footnote-4).

While some have suggested that the Prestile Stream was misclassified as A in 1996 and is more appropriately classified B, according to FB Environmental Associates,” downgrading the classification of a waterbody is more difficult than upgrading and a re-class on the Prestile would require a Use Attainability Analysis, as defined under the Clean Water Act. This is a fairly arduous undertaking and EPA would probably require DEP to demonstrate that a TMDL has been fully implemented before any re-class would be seriously considered. The TMDL could therefore be viewed as a necessary step in any path towards the re-classification of the Prestile.”

**Figure 97.**



A habitat study of the Prestile Stream in 1989[[4]](#footnote-5) and a 2008 analysis of riparian buffers using 2004 land cover data and information and minimum setbacks in the State’s Shoreland Zoning statute (which limit development within 250 feet of the upland edge of freshwater wetlands and 75 feet of the high water line of streams) indicated that the majority (62%) of riparian buffers are good, leaving 38% of the buffers in need of improvement. See Figure 96.

Unfortunately the majority of Mars Hill stream corridor is described as having inadequate riparian buffers. The WBMP recommends placing a strong emphasis on improving shoreland vegetated buffers to meet or exceed existing state guidelines “requiring that development is limited to the removal of no more than 40% of existing woody vegetation in the 250 foot wide shoreland zone of great ponds, rivers, and non-forested wetlands greater than 10 acres, and development, and within 75 feet of freshwater streams.

The formal designations of impairment and completion of the TMDL make the Upper Prestile Stream eligible for federal 319 funding. Other potential sources of funding include the DEP, Maine Department of Transportation, USDA Natural Resource Conservation Service – Farm Bill, Maine Department of Conservation, US Fish and Wildlife Service, National Fish and Wildlife Foundation, and New England Grassroots Environmental Fund.

1. **Aquifers**

There are approximately 1.25 square miles of significant sand and gravel aquifers in the Upper Prestile Stream watershed. The largest section runs from the Presque Isle/Westfield town line, south to approximately 0.5 miles into Mars Hill.

1. **Potential Water Quality Threat**

There are five active underground storage tanks in Mars Hill. According to DEP’s database, seven underground tanks have been removed. There have been ten petroleum spills in Town, most in the vicinity of the Downtown and Prestile Stream.

The sites of the current and former landfills are indicated on Figure 90, also in close proximity to the Prestile Stream. There are two wastewater treatment facilities – one in Mars Hill north of the Downtown near the Prestile and one just over the border in Blaine. There are also two wastewater treatment outfalls – one to a tributary of the Prestile near the Westfield border and one on the boundary with Blaine.

1. **Critical Natural Resources**

The DEP identifies two endangered species in Mars Hill – Fries’ Pondweed (Potamogeton *filiformis*) and Slender Pondweed (Potamogeton *friesii* Rupr.), which are found in calcareous or brackish waters. While secure globally, these plants are listed as endangered in Maine because of scarcity of habitat.

There are several locations in Mars Hill that have been identified as significant wildlife habitat under the Maine Natural Resources Protection Act for inland waterfowl/wading birds, including areas near Rocky Brook, Brown Lake, the pond near Palmer Brook, an unnamed pond in the southwest part of town, and the area near the impoundment of Prestile Stream upstream of the Dam. These freshwater areas provide habitat for breeding, migration/staging, and wintering habitats for inland waterfowl or breeding, feeding, loafing, migration, or roosting habitat for inland wading birds. These areas, in combination with Christina Reservoir and Lake Josephine are among the most productive waterfowl areas in the State. Certain activities in these areas may require a permit from the Maine Department of Environmental Protection.

There are also numerous locations of high value habitat for the Gulf of Maine priority trust species. These feature categories of wildlife identified as the highest value habitat predicted by the US Fish and Wildlife Service Gulf of Maine Program’s Habitat Suitability Model. The analysis evaluated existing field data and scientific literature for 91 species of fish, wildlife, and plants important to the Gulf of Maine watershed and ranked the landscape based on potential habitat for each species. Important habitats in Mars Hill include grasslands/shrub/bare ground and forested areas.

The priority list of trust species in Mars Hill denotes high value habitat with the potential to support the American bittern, American black duck, American woodcock, Bald eagle, Baltimore oriole, Bay-breasted warbler, Blackburnian warbler, Blackpoll warbler, Black-throated blue warbler, Buff-breasted sandpiper, Canada warbler, Cape May warbler, Chestnut-sided warbler, Common snipe, Eastern meadowlark, Kildeer, Northern flicker, Northern goshawk, Northern harrier, Olive-sided flycatcher, Osprey, Peregrine falcon, Pied-billed grebe, Red-shouldered hawk, Scaup (greater and lesser), Solitary sandpiper, Upland sandpiper, Veery, Whimbrel, Wood duck, Wood thrush, American eel, and Atlantic salmon.

The Prestile Stream and its tributaries through the watershed and several streams within Mars Hill support a self-sustaining, wild brook trout sport fishery. Public access to these resources is available formally through the Park and informally across private lands throughout large portions of the community. The Maine departments of Conservation, Transportation, and IFW provide programs to help municipalities secure and develop public access opportunities. Mars Hill’s trout population may be negatively impacted by water quality degradation, discussed above, as well as degradation of physical habitat (i.e., number and depth of holding pools).

1. **Large, Unfragmented Blocks of Undeveloped Land**

The State’s Beginning with Habitat Program identifies 12 large blocks of undeveloped land that are not broken up by roads and extensive development. Together they include approximately 17, 874 acres, some spilling over into Westfield and Blaine. Figure 89 notes potential locations that could connect undeveloped blocks of land and likely riparian crossing locations for wetland dependent species moving between waterways and wetlands divided by roads.

Undeveloped habitat blocks are areas with relatively little development that provide opportunity for meaningful habitat conservation. These areas remain are likely to include habitat conditions of a quality that could be expected to support most terrestrial species know to occur in the area.

Unplanned growth is one of the most significant threats to large, unfragmented blocks of undeveloped land.

Data depicting high value plant and wildlife habitats and critical natural resources is available to all Maine towns through the Beginning with Habitat program. Data is regularly updated and the Town should work closely with the Maine Department of Inland Fisheries & Wildlife and the Beginning with Habitat Program to develop and implement approaches that protect the Town’s natural resources, visit the Beginning with Habitat Online Toolbox (http://www.beginningwithhabitat.com/toolbox/about\_toolbox.html), and periodically request updated information in the future to ensure that land use decisions are based on the best available information.

1. **Issues and Implications**
2. Should the Town work with local farmers to try to devise a solution to sediment loss from uncovered fields between the fall harvest and spring planting?
3. Should the Town prepare a strategy to improve and expand riparian buffers along Prestile Stream?
4. Should the Town undertake a watershed survey to identify priority areas for efforts to improve water quality of the Prestile?
5. Should the Town seek state, federal, and private funds to support efforts to improve water quality of the Prestile?

1. For more information about vernal pools, see *Conserving Maine’s Significant Wildlife Habitats: Vernal Pools.* <http://maineaudubon.org/publications-resources/?utm_source=website&utm_medium=globalmenu&utm_campaign=SiteNavTracking> and <http://www.maine.gov/dep/land/nrpa/index.html>. [↑](#footnote-ref-2)
2. Evans, B.M., David W. Lehning and Kenneth J. Corradini. 2008. AVGWLF Version 7.1 User’s Guide. Penn State Institutes of Energy and the Environment, Pennsylvania State University, University Park, PA. March 2008. [↑](#footnote-ref-3)
3. US Environmental Protection Agency. 1999. Regional Guidance on Submittal Requirements for Lake and Reservoir Nutrient TMDLs. US-EPA Office of Ecosystem Protection, New England Region, Boston, MA> [↑](#footnote-ref-4)
4. Basley, D.J. and J.S. Lucas (1989), *Prestile Stream Strategic Plan for Fisheries Management*, Maine Department of Inland Fisheries and Wildlife, April, 1989 [↑](#footnote-ref-5)