Mayo Mill Dam

Riparian and Wetland Habitat Assessment

Piscataquis River

Town of Dover-Foxcroft, Piscataquis County, ME

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and

Inter-Fluve

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Cover Photo: Inter-Fluve scientist Kirstin Underwood about 1.5 miles above the Mayo Mill Dam, just upstream of the impoundment. Here, the Piscataquis River has a coarse-textured substrate (boulders, cobbles, gravel and sand) and alluvial features like point bars and alluvial beaches. It is expected that the thalweg (historic channel), now concealed by the impoundment, will be somewhat like this with the dam removed.

Introduction and Background

Inter-Fluve, under contract to The Nature Conservancy (TNC) and also working with the Atlantic Salmon Federation (ASF), is evaluating existing conditions and potential positive and negative environmental impacts that would result from the removal of the Mayo Mil Dam and restoration of the Piscataquis River to its historic (pre-dam) free-flowing condition. Alan Haberstock, PWS was contracted by Inter-Fluve to complete a study focused on the wetland and riparian habitats associated with the dam impoundment and channel directly downstream of the dam (study area). This included a survey for rare, threatened and endangered (RTE) plants.

The Piscataquis River is a major tributary to the Penobscot River. The confluence of these two major rivers is located approximately 35 miles east of Dover Foxcroft, in Howland, where a nature-like bypass was constructed approximately ten years ago to provide unobstructed fish passage to the lower portion of the Piscataquis River up to the Brown's Mill Dam in the Town of Dover-Foxcroft, less than a mile downstream of the Mayo Mill Dam. A third dam on the Piscataquis, the Guilford Dam, is located approximately 7.7 miles upstream of the Mayo Mill Dam.

The Mayo Mill Dam impoundment extends upstream about 1.5 miles. There are no perennial streams that enter the impoundment. One tributary, Dunham Brook, is tributary to the Piscataquis River immediately below dam on the north side (river left). Dunham Brook is piped for over 300 feet below Lincoln Street and under several commercial buildings and enters the Piscataquis River via a perched pipe.

The Mayo Mill Dam has a fish passage facility that passes anadromous and catadromous fish (e.g., Atlantic salmon (*Salmo salar*), American eel *(Anguilla rostrata*) under certain flow conditions. However, passage is impeded under certain flow conditions and behavioral impacts such as delayed migration occur in the existing condition. A primary goal of the removal is to improve fish passage and behavioral impacts. Resident cold-water fish (e,g., brook trout, *Salvelinus fontinalis*) are also blocked from freely passing in the existing condition and would find improved habitat and passage with the dam removed.

The Mayo Mill Dam impoundment widens the river above the dam and slows and warms river flows while reducing dissolved oxygen. The impoundment also negatively affects floodplain function by submerging much of the historic floodplain. The proposed project to remove the Mayo Mill Dam will restore and enhance aquatic organism connectivity, and natural riverine floodplain and wetland function.

Methods

The wetland and riparian habitat above the dam to approximately 0.1 miles above the upper limit of impoundment influence (about 1.6 miles upstream from the dam), and downstream of the dam for about 0.2 miles, were evaluated on foot and by canoe/kayak on July 2 and again on August 11, 2025 by Alan Haberstock, PWS (a Maine-based independent wetland scientist working as a sub-contractor to Inter-Fluve), with assistance from Inter-Fluve scientist Kirstin Underwood. Alan has been a certified Professional Wetland Scientist (PWS) through the Society of Wetland Scientists for more than 25 years and has more than 30 years of experience evaluating wetland, wildlife, riparian and in-stream habitat for stream and wetland restoration, dam removal and dam modification projects in Maine and the northeast.

On July 2, water levels were within the banks of the Piscataquis River slightly below ordinary high water levels, but slightly higher than typical base flows. On August 11, water levels were atypically low after a very dry summer. Observations of water-staining on rocks indicated more typical water levels. Debris wracks and ice scarring on trees indicated flood flows experienced in recent years. Generally, this type of investigation is best carried-out at or near base flow conditions as habitat at the immediate shoreline is more difficult to observe during overbank flows. Conversely, high-flow conditions can be observed through field indicators during base flow conditions. For example, ice scarring, debris wracks, soil

characteristics and plant communities indicate flood frequency and magnitude. The timing of the July 2nd visit was chosen to coincide with the flowering of targeted Rare, threatened or endangered (RTE) plant species.

The field investigations included assessing wildlife habitat, plant community composition, wetland types and functions, and soils/geology. Invasive species were also included in the field assessment and documented when observed. For soils, a spade was used to examine the soil profile for hydric soils characteristics and Natural Resources Conservation Service (NRCS) hydric soils indicators typical of the Northeast USDA Land Resource Region (such as depleted mineral soil horizon, oxidized rhizospheres, or organic or alluvial soils) were used.

A "Descriptive Approach" to wetland functions and values known as the “Highway Methodology Workbook Supplement: Wetland Functions and Values – A Descriptive Approach” published by the United States Army Corps of Engineers (USACE) in 1993 was used for the wetland functional assessment. This method incorporates both wetland science and human judgment. The evaluator first determines if a wetland is suitable for particular functions and values and why, followed by a determination of what functions and values are principal and why. The purpose of designating a principal function and value assists regulators and professionals in assessing impacts and net functional lift or impact. Functions and values can be principal if they are a significant component of a wetland ecosystem (function only) and/or are considered of special value to society, from a local, regional, and/or national perspective.

Prior to the first field visit, Inter-Fluve scientists prepared preliminary wetland maps using USFWS National Wetland Inventory (NWI) mapping superimposed on recent aerial photographs. These were ground-truthed during the field visits and adjusted according to field observations. Wetland mapping and reporting in this report uses the U.S. Fish & Wildlife Service (USFWS) Cowardin et al. (1979) classification system. This serves as the national standard for wetland classification and is used to classify wetlands identified on NWI maps. Using the Cowardin classification system, wetlands and deepwater habitats characterized in this report are as follows: Palustrine Emergent Marsh (PEM) where emergent grasses and forbs dominate, Palustrine Scrub-Shrub (PSS) where more than 30% of the vegetative cover is comprised of shrubs and saplings, Palustrine Forested (PFO) where trees comprise more than 30% of the cover, and Riverine Unconsolidated Bottom (RUB) where the impoundment creates sufficiently deep ponding that macrophyte (rooted vegetation) growth is restricted and the substrate is mud or mineral alluvium, and Riverine (R) where the back-water effect of the impoundment is negligible such as above the impoundment and below the dam (tailrace).

This report both describes the existing condition and evaluates the proposed (dam-out) condition in terms of potential changes to wetland structure, function and extent, and possible changes to RTE species habitats.

Results

Wetland Characteristics and Extent

Appendix A (photos of existing wetlands), and Appendix B (wetland mapping with wetland types and extent) provide documentation of the existing wetland condition. Extensive floodplains and shoreline wetlands are lacking in the impoundment and tailrace. The majority of the impoundment transitions abruptly from open water (RUB) to upland forest and developed lands because of moderately steep

topography adjacent to the impoundment shoreline (photo 1). There is a lack of broad, flat areas above the ordinary high water mark for larger floodplain wetlands to develop.

NWI maps (used as base maps) showed only about 1.8 acres of forested wetland in the study area. NWI wetlands mapping tends to miss small, narrow and marginal wetlands. Field investigations in July and August added about 13.4 acres of forested wetlands that were missed by NWI maps. PFO wetlands are completely absent in the study area (Table 1). Much of the lower impoundment on the north shoreline (river left) has a narrow band of PEM, PSS and PEM/PSS along the immediate shoreline (Photos 2 and 3). The upstream portion of Academy Island is a PEM/PSS wetland (Photo 4). Two point bars with PSS and PEM occur on the south shoreline (river right) downstream of Academy Island (Photos 5-7). A crescent-shaped PEM occurs in the cove upstream of the dam on the south shoreline (river right) extending for several-hundred feet on either side of the public boat launch (Photo 8). Downstream of the dam, the banks are relatively steep and there are no wetlands. Along the immediate shoreline, below the dam, there is a preponderance of exposed bedrock within the scour zone of the river, much of which is exposed at base flows but inundated when river levels are high.

As summarized in Table 1, and shown in Appendix B, a total of 15.2 acres of vegetated palustrine wetland occur along the impoundment shoreline. There are 54.3 acres of aquatic habitat, all classified as Riverine Unconsolidated Bottom (RUB).

Table 1. Wetland Areas - Existing Condition

USFWS Wetland Type	Area (acres)
Vegetated Wetlands	
PEM	6.2
PEM/PSS	6.3
PSS	2.7
PFO	0.0
Total	15.2
Open Water/Aquatic Habitat	
RUB	54.3
Grand Total	69.5

Representative plant communities, soils characteristics, hydrology and habitat features of these wetlands are described below. Scientific names are used at first mention of a plant species.

The PEM wetlands (see photo 2 for typical PEM) occur primarily as relatively narrow bands along the immediate shoreline where there are shelves of alluvium and organic matter that are shallowly inundated at typical impoundment levels. Dominant and representative species in shallowly inundated marsh areas along the immediate shoreline include pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), cattail (*Typha latifolia*), three-way sedge (*Dulichium arundinaceum*), bulrushes (*Schoenoplectus,* spp), spikerush species (*Eleocharis, spp*), smartweeds (*Polygonum, spp*), and American bur-reed (*Sparganium americanum*). This marsh community typically transitioned to a diverse wet meadow with occasional shrubs. Representative species in this less-frequently inundated wet meadow PEM community included nodding sedge (*Carex gynandra*), fringed sedge (*Carex crinita*), water parsnip (*Sium suave*), Joe pyeweed (*Eupatorium maculatum),* blue-flag iris (*Iris versicolor*), sweet flag (*Acorus calamus*), Canada rush (*Juncus canadensis*), northern long sedge (*Carex folliculate*), tussock sedge

(*Carex stricta*), woolgrass (*Scirpus cyperinus*), rattlesnake manna grass (*Glyceria canadensis*), tall meadow rue (*Thalictrum polygamum*), marsh bellflower (*Campanula aparinoides*), white boneset (*Eupatorium perfoliatum*), swamp candle (*Lysimachia terrestris*), white flat-topped aster (*Doellingeria umbellata*), grass-leaved goldenrod (*Euthamia* graminifolia), small-flowered gerardia (*Agalinis paupercula*), cardinal flower (*Loblia cardinalis*), marsh St. Johnswort (*Triadenum virginicum*), square-stemmed monkeyflower (*Mimulus* ringens), hedge nettle (*Stachys palustris*), false nettle (*Boehmeria cylindrica*), stinging nettle (*Urtica dioica*), curly dock (*Rumex crispus*), smartweeds/water pepper (*Polygonum, spp*), arrow-leaved tearthumb (*Polygonum sagittatum*), deer-tongue grass (*Dichanthelium clandestinum*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), ostrich fern (*Onoclea struthiopteris*), and cinnamon fern (Os*munda cinnamomea*). Where shrubs occurred (<30% cover) the dominant species were willows (*Salix, spp*), silky dogwood (*Cornus amomum*), red osier dogwood (*Cornus sericea*), and elderberry (*Sambucus canadensis*).

Invasive species observed in the PEM habitat were yellow iris (*Iris pseudacorus*), reed canarygrass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*). Invasive species will be described in greater detail in the Invasives subsection of the results. Soils in the PEM habitats varied from Fluvaquents with a sandy alluvial parent material to organic soils in protected areas where organic matter decomposition is inhibited by persistent inundation/saturation.

The PSS wetlands (see photo 7 for typical PSS) occurred in the wetland habitat zone between the PEM and riparian upland forest or intermingled with PEM. Representative species were willows, sweetgale (*Myrica* gale), winterberry (*Ilex verticillate*), speckled alder (*Alnus incana*), arrowwood (*Viburnum dentatum*), withe-rod (*Viburnum nudum*), elderberry, silky dogwood, red osier dogwood, dewberry (*Rubus hispidus*), meadowsweet (*Spiraea latifolia*), and steeplebush (*Spiraea tomentosa*). Dominant herbs included Joe pyeweed and the invasive reed canarygrass. Vines thrived in this habitat zone including balsam apple or wild cucumber (*Echinocystis lobata*), groundnut (*Apios americana*), arrow-leaved tearthumb, virgin's bower (*Clematis virginiana*), and riverbank grape (*Vitis riparia*). Vines frequently covered the shrub canopy in a tangle, to the point where the habitat was nearly impenetrable. Soils in the PSS habitats were largely Fluvaquents or alluvial soils with an aquic moisture regime dominated by fine sand and silt.

The RUB (photo 9) is primarily ponded, unvegetated habitat with a mixture of soft (silt, organic matter) and sandy substrates. Coarser substrate (boulder/cobble/gravel/sand) occurs at the impoundment head and up into riverine habitat upstream of the impoundment and below the dam. Small pockets of aquatic bed are intermingled with the PUB in the impoundment, primarily in more protected, shallow-water areas. Typical species of these areas included pipewort (*Eriocaulon aquaticum*), white water-lily (*Nymphaea odorata*), spadderdock (*Nuphar lutea*), pondweeds (*Potamogeton, spp*), and water shield (*Brasenia schreberi*).

Riparian uplands adjacent to the wetlands and along the steeper shorelines were characterized by Inceptosol soils with a sandy loam texture. The parent material was glacial till and subsoils had high chroma colors indicating they are generally well oxygenated. The riparian forest surrounding the impoundment typically contained many snags and dead-and-downed trees partly as a result of occasional extreme flood events. Ice scarring was observed on trees near the shoreline. Lower portions of these riparian forest habitats flood infrequently for short durations. Typical tree species observed in these riparian forests were black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), gray birch (*Betula populifolia*), yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), and basswood (*Tilia americana*). The sapling/shrub stratum was mostly widely scattered saplings of canopy tree species, but invasive species such as invasive honeysuckle

(*Lonicera, spp*), barberry (*Berberis thunbergii*), buckthorns (*Rhamnus, spp*), and multiflora rose (*Rosa multiflora*) were found in canopy openings and near the shoreline where more light penetrated the canopy. Ferns often dominated the herb stratum, including interrupted fern (*Osmunda claytonia*), and spinulose wood fern (*Dryopteris carthusiana*). Starflower *(Trientalis borealis*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), and Indian cucumber (*Medeola virginiana*) dominated the herb stratum.

Wetland Functions

The wetland system adjacent to the impoundment was evaluated to have six (5) principal functions: sediment/toxicant retention, nutrient removal, shoreline stabilization, fish and shellfish habitat and wildlife habitat. A completed Wetland Function and Value Evaluation Form is included as Appendix C.

The wetland complex is densely vegetated with deep alluvial soils and flat areas adjacent to the river. This allows the wetlands to slow flood waters and allow sediments and associated nutrients/pollutants to settle-out providing important sediment/toxicant retention and nutrient removal functions. Roads, agricultural fields, and residential and commercial development upgradient from the wetlands, increases potential sources of sediment and pollutants and increases the importance of the wetlands in protecting the water quality of the Piscataquis River.

Shoreline stabilization is another principal function served by the subject wetlands. Areas of erosion (photos 10-12) were observed along some sections of the shoreline, especially where steeper slopes resulted in an abrupt transition from the PUB habitat to upland forest. A combination of wind, waves and overbank flows apply erosive energies onto the shoreline.

Cold-water fish species like brook trout (*S. fontinalis*), warm-water fish species like bass, *Micropterus* sp.) and sunfish (*Lepomis* sp.) and abundant aquatic macroinvertebrates, including mussels, inhabit the river. The river is adjacent to the subject wetlands, which provide food (*e.g.,* terrestrial insects), microhabitat (*e.g.,* large woody debris) and shade for the fish and aquatic macroinvertebrates. Important fish and shellfish habitat is provided even though the dam prevents connectivity to downstream areas in the present condition.

The emergent wetlands along the shoreline border the Piscataquis River, which is an optimal habitat juxtaposition for waterfowl and wading birds (photos 6 and 13). This habitat is ideal for many species of wading birds and waterfowl, aquatic furbearers and songbirds. The diversity of berry-producing shrubs (e.g., dogwoods and viburnums) and nutritious emergent marsh plants (e.g., pickerelweed and arrowhead) also contribute to the high-quality wildlife habitat function. The diverse native wetland plant community adjacent to the steam is productive and, in addition to providing important habitat features in the existing condition, is an important source of the seedbank that will help colonize the exposed impoundment following dam removal.

The wetland complex cannot store significant amounts of floodwater during overbank flows. The wetlands lack depressional features, away from the streambank (*e.g.,* old meander scars) that are able to retain floodwater and slowly release it into the soil profile to help attenuate peak flows and maintain base flows. This is a primary reason that floodflow alteration was not a principal function. Outwash deposits or stratified drift is not present, and groundwater recharge/discharge is not a principal function.

As discussed in the Potential Impacts section of this report, each of the functions provided by this wetland complex would be enhanced by dam removal, providing overall functional lift.

Wildlife

During the July 2nd field assessment an adult bald eagle (*Haliaeetus leucocephalus*) was observed flying over the upstream edge of the impoundment but no nests were observed. A common loon (*Gavia immer*) was also observed, but no nest or chicks were observed. A notable amount of adult Atlantic salmon (*Salmo salar*) were holding in the pool below the dam at the time of the wetland assessment, and this area was excluded from the survey.

Wading birds and waterfowl observed included great blue heron (*Ardea herodias*, photo 14), American black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), Canada goose (*Branta canadensis*), and blue-winged teal (*Spatula discors*). Belted kingfisher (*Megaceryle maxima*) were commonly seen fishing along the shoreline. Double-crested cormorants (*Nannopterum auritum*) were observed fishing in the impoundment (photo 15). Passerines observed include tree swallow (*Tachycineta bicolor*), chestnut-sided warbler (*Setophaga pensylvanica*), Canada warbler (*Cardelina canadensis*), American goldfinch (*Spinus tristis*), cedar waxwing (*Bombycilla cedrorum*), and red-winged blackbird (*Agelaius phoeniceus*). A ruby-throated hummingbird (*Archilochus colubris*) was observed in the vicinity of a patch of cardinal flower.

There are no Inland Waterfowl and Wading Bird Habitats (IWWH) mapped by MDIFW in or near the impoundment because the impoundment lacks extensive wetlands as a result of the moderately steep slopes at the shoreline that prevent the formation of hemi-marsh.

Active beaver sign was observed in the upper portion of the impoundment. White-tailed deer and raccoon sign were commonly observed along the shoreline.

Pickerel frog (*Lithobates palustris*), green frog (*Lithobates clamitans*), snapping turtle (*Chelydra serpentina*) and painted turtle were observed during the July 2 site visit. Pollinators were frequently seen feeding on the nectar of Joe pyeweed, white boneset and other flowering plants in the PEM and PSS habitats. During the August 11 site visit, dozens of stonefly exoskeletons were observed on rocks above the water surface (photo 16) in the riverine section above the impoundment (above the impoundment influence). None were observed in the impoundment. Stoneflies are indicators of good water quality.

Surficial Geology and Fluvial Geomorphology

The Mayo Mill impoundment lacks alluvial features such as point bars and alluvial beaches in the impoundment. An exception is Academy Island, which has examples of aggrading alluvial sand and eroding edges in different portions of the island. On river right, downstream of Academy Island, there are two PSS wetlands that have formed on recent (post-glacial) sandy alluvium.

Dynamic, water-sorted processes are more apparent above the impoundment where the Piscataquis River is free-flowing. Here, coarse materials such as sand, gravel and cobble were more common both as the river substrate and along the shoreline and point bars and alluvial beaches were common (photo 17).

Bedrock was observed at the site of the dam, along the shorelines for several hundred feet below the dam, and also in the upper impoundment, above Academy Island. The impoundment substrate is more coarse from Academy Island upstream.

The Piscataquis is relatively flashy in that there is a large differential between base flows and peak flows. Ice scarring and debris wracks (photo 18) were observed in the field more than 8 ft higher than base flow elevations in places. Along the impoundment, dynamic alluvial processes have been dampened by the dam. In the dam-out condition, it is expected that a riffle-pool-run morphology similar to areas upstream and downstream of the impoundment influence, will return.

Wetland soils were typically derived from a parent material of recent alluvium. They typically exhibited oxidized rhizospheres and low chroma (*i.e.,* 2 or less) chroma colors indicative of anaerobic conditions from persistent saturation in the subsoils.

Invasives

Reed canarygrass is, by far, the most abundant invasive in the existing wetlands. In places this species represents as much as 15-20% of the estimated cover (photo 19). Purple loosestrife was also observed within the PEM and PSS habitats, however this species was rarely seen as more than a small clump or individual stem. Purple loosestrife was estimated to comprise no more than 3% of the overall cover.

Japanese knotweed (*Falopia japonica*) was observed in several places. The largest stands were on the northern shoreline (river left) immediately downstream of the railroad trestle/recreational trail and immediately below the dam on river left (photos 20 and 21). These locations are included in the wetland maps in Appendix B. Japanese knotweed is not a wetland species but it can form spreading monocultures along upland portions of the shoreline and along wetland margins. Yellow iris tends to occur in small patches along the PEM wetlands on the shoreline.

Riparian uplands also contained honeysuckle (*Lonicera morrowii* and *Lonicera tartarica*), common buckthorn (*Rhamnus carthatica*), Japanese barberry and multiflora rose. These species were particularly common near farm fields, roads and developed areas.

Rare, Threatened and Endangered Species

Interfluve queried MNAP and MDIFW to see if any known records of rare plants occurred in the Mayo Mill impoundment or vicinity. Two rare sedges have been historically documented in the area. Elk sedge (*Carex garberi)* was historically documented on bedrock ledges below the dam. Clinton's bulrush (*Trichophorum clintonii*) has also been documented nearby on river shorelines. Neither species was observed during this field study.

A Maine Threatened orchid, shining ladies' tresses (*Spiranthes lucida*), was also historically (several decades ago) documented along river shorelines in the area, but had not been re-found more recently. A population of approximately 40 individuals was found in the study area during the July 2 field visit while they were in flower and could be identified with certainty. They are more difficult to locate when not in flower. A Special Plant Survey form was completed and submitted to the MNAP with the exact location conveyed. This report, because it is public and orchids are often illegally collected, does not specify the location of this population. Photos 22-23 are close-up photos of these State-Threatened orchids in flower on July 2 in small pockets of wet alluvium.

A second rare orchid was also documented in the study area on July 2 that was not specifically targeted during the survey as it had not been historically documented in the area. The Maine Special Concern orchid, pale green orchis (*Platenthera flava*), was documented while in flower. A population of about 45-50 individual plants was observed within a wet meadow community on alluvium. A Special Plant Survey form was completed and submitted to the MNAP with the exact location conveyed. As with the *Spiranthes lucida*, this report does not specify the location of this population. Photos 24-25 are close-up photos of these State-Special Concern orchids in flower on July 2. Interestingly, both species had already entered dormancy by the August 11 field visit. This was likely because of the drought conditions.

Two species of state-Threatened freshwater mussels, the Yellow Lampmussel (*Lampsilis cariosa*) and Brook Floater (*Alasmidonta varicose*), have been documented along the Piscataquis near the project study

area. A separate mussel survey and mussel protection/relocation plan is being completed as part of the project.

Impacts Analysis and Discussion

It is anticipated that the total area of vegetated wetlands (PFO, PSS, and PEM) would increase substantially in the dam-out condition. The majority of what is now impounded open water (RUB) will be restored to vegetated wetlands within the floodplain of the Piscataquis River. The rich alluvial sediments that have been inundated by the impoundment will be exposed and provide colonizing wetland plants with a rich substrate to initiate wetland succession. The seedbank will be abundant due to the existing upstream wetlands and wetlands along the impoundment margin dominated by native species (photos 3, 22-25, 33-34). As such, it is not anticipated that planting or seeding would be needed, except possibly in the construction area immediately around the dam.

Bathymetry is a good indicator of where vegetated wetlands will develop. Predicted areas of wetland development are adjacent to and upgradient of the thalweg (historic channel) of the Piscataquis River to about the existing tree line at the impoundment edge at about the location of the current ordinary high water mark. The relatively flat bathymetry between the existing treeline and the thalweg will facilitate wetland development and floodplain function. It is anticipated that PEM and PSS wetlands will develop in the restored floodplain area between the thalweg (river shoreline) at the approximate 1-2-year flood level or the elevation at which flooding will occur nearly every year post-removal. PFO wetlands are predicted to develop in the floodplain above this, up to about the 5-year frequency flood elevation.

It is anticipated that the area of vegetated wetlands (PFO, PSS and PEM) will increase and possibly double, and that riverine (free flowing river) habitat will increase as well. Conversely, the area of RUB (impounded habitat) will decrease correspondingly. The hydrologic effect of dam removal is greatest immediately above the dam and diminishes steadily moving upstream.

As the area of vegetated wetlands increases and the riparian buffer between the Piscataquis River and roads and development increases, flood storage, nutrient removal and sediment retention functions will all be improved. As the dense vegetation in the wider riparian buffer filters and stores sediment (from both overbank flooding and stormwater runoff from the surrounding uplands including from roads, farms and developed areas) the river is better protected from sediment-bound nutrients/pollutants such as phosphorous that settle-out with the sediments in floodplain wetlands. The river is also better protected from dissolved nutrients/pollutants (e.g., nitrogen) that infiltrate wetland soils and come into contact with roots and soil particles.

The increased area of dense vegetation will not only protect water quality in the Piscataquis River but will enhance habitat for riparian wildlife. The restoration of unimpeded passage for migratory and resident fish will enhance habitat for piscivores such as eagles and kingfisher that will benefit from the restored fishery. The wider riparian buffer that will develop as plant colonization occurs on exposed impoundment substrates will also enhance the functioning of the study area as a wildlife corridor due to increased width and habitat area.

Some species such as common loons and diving ducks will not find favorable habitat for diving over much of the restored river so will likely experience a habitat loss from removal. So too will warmwater fish such as bass and sunfish as well as species like painted and snapping turtles that prefer slow, warm water and muddy substrates. Beneficiaries of enhanced habitat would include coldwater fish such as

brook trout and semi-aquatic species such as wood turtle that prefer cool, well-oxygenated streams. A wide variety of species including passerines and riparian specialists like mink and otter will benefit from the wider riparian corridor and juxtaposition with the free-flowing Piscataquis River.

Impoundments tend to increase the residence time of the average water molecule, allowing water temperature to increase and reducing DO. Water temperature and DO would both be expected to improve (cooler, more oxygenated water) as a result of the dam removal. Aquatic macro-invertebrates that require well-oxygentated and clean water such as the stonefly (photo 16) observed in the free-flowing river section above the impoundment would be expected to find improved habitat with the dam out. On the other hand, aquatic macro-invertebrates that prefer impounded waters and are tolerant of lower DO and higher temperatures, such as mosquitoes, midges and leeches, would be expected to decline with the dam removed.

The two rare orchid species (Maine Threatened *Spiranthes lucida* and Maine SC *Platanthera flava*) would find improved habitat in the proposed condition. In the dam-out condition there will be more opportunity for pockets of alluvium subject to annual riverine disturbances (flooding and ice floes) that will erase competition (e.g., reed canarygrass, woody plants, etc..) and provide space for these species to establish. In the existing condition, shoreline banks are often steep and there is little opportunity for alluvial wetland communities to develop. MNAP will be consulted with regard to these rare plants. The habitat of the documented *Spiranthes lucida* population location would be little changed in the proposed condition. The hydrology of the *Platanthera flava*, however, would change. As possible and recommended by MNAP, an attempt could be made to relocate a portion of this population to an appropriate location. Such efforts might involve an attempt to transplant in the dormant condition (fall).

Perhaps the greatest concern with respect to potential riparian and wetland habitat impacts from dam removal is invasive wetland plant colonization. Even relatively pristine sections of the river corridor upstream of the impoundment contain purple loosestrife, reed canarygrass and Japanese knotweed, so eradication is not possible. Invasive wetland and riparian plants often take advantage of disturbances and exposed soils to gain a foothold and spread. Monitoring and control is one possible strategy to mitigate this potential impact. Given the widespread presence of reed canarygrass upstream, this may be the single greatest wetland invasive of concern. Japanese knotweed, which is already present along the impoundment and tailrace shoreline, is also of concern, particularly at the construction site where exposed and disturbed soils will be unavoidable during construction. The construction footprint should be monitored and herbicide used as necessary to control invasives so that the area of direct disturbance itself is not a catalyst for spread. Upstream of the area of indirect impact (changed hydrology but no earthwork), meander surveys and hand-pulling may be a useful approach to limiting the spread of invasives. Limited and controlled herbicide use informed by monitoring is a mitigation tool available as needed.

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Appendix A

Photos

Photo 1. Shoreline wetlands are uncommon in the impoundment due to the relatively abrupt slopes at the impoundment edge. This portion of the impoundment typically transitions from PUB to upland forest abruptly. There is a relatively unfragmented upland riparian forest along most of the southern shoreline (pictured), but the northern shoreline is mostly fragmented with residential and commercial development.

Photo 2. This photo shows a typical narrow strip of PEM wetland along the northern shoreline. Pickerelweed dominates the lower portion of the photo. Yellow iris (invasive) and a native wildflower, water parsnip (white flower) are visible in the upper part of the photo. These wetlands are not extensive but do form long, continuous narrow bands along portions of the shoreline, especially the northern shoreline (river left) in the lower half of the impoundment.

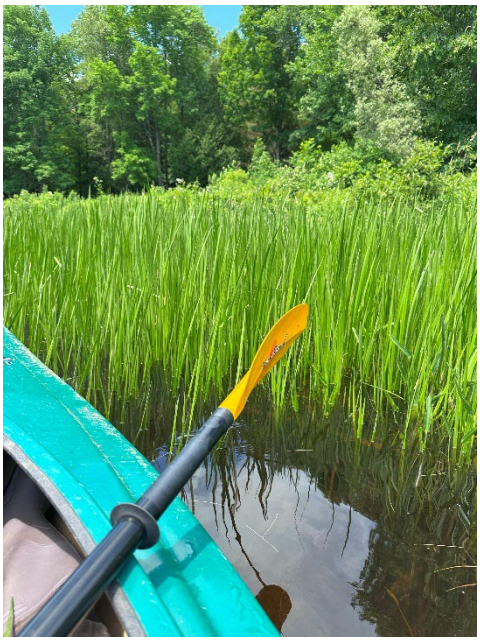


Photo 3. This PEM wetland was dominated by sweet-flag. It was inundated on July 2 and exposed on August 11. Water levels were nearly 2 feet lower in the lower part of the impoundment during the August field work and these same plants were growing on exposed soils.

Photo 4. Photo facing upstream showing the upstream tip of Academy Island. The island soils are alluvial. The photo shows an alluvial beach (wet meadow PEM) but PSS with species like elderberry and willow also occurs just behind the photographer on higher ground.

Photo 5. River right about 0.2 miles downstream of Academy Island. The PEM is dominated by pickerelweed, arrowhead, burreed, marsh purslane, three-way sedge and smartweeds. Elderberry, willows and silky dogwood dominate the PSS. The emergent zone was exposed in August and inundated in July.

Photo 6. PSS wetlands are not extensive in the impoundment. At higher water levels (as pictured on July 2), this wetland is valuable for wildlife habitat. Waterfowl find good forage and cover here. Wetlands such as this (uncommon now) are expected to be more extensive post-removal.

Photo 7. This is a small PSS located about 0.2 miles upstream from the public boat launch on river right in the lower portion of the impoundment.

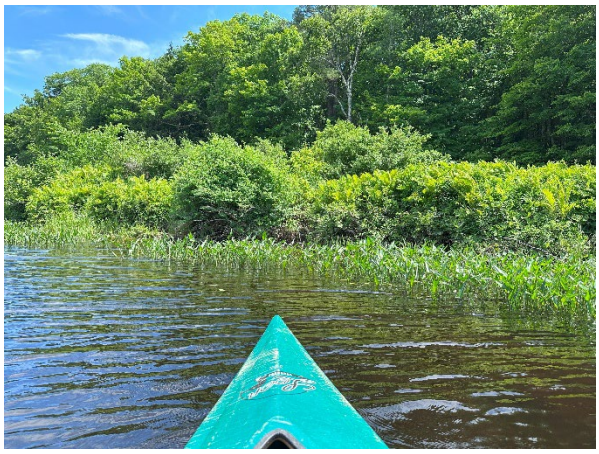


Photo 8. PEM surrounding the public boat launch on river right a few hundred feet upstream from Route 7. Pickerelweed, broad-leaved cattail and burreed were dominant species. Much of this cove will likely transition to palustrine wetlands with the dam out.

Photo 9. Facing upstream in the lower portion of the impoundment showing the typical shoreline condition (abrupt transition to upland forest). Most of the PUB (impoundment) lacks aquatic or wetland vegetation. In a few protected, shallows, aquatic vegetation like pondweeds (*Potamogeton, spp*) were observed.

Photo 10. Shoreline erosion was commonly observed along the impoundment shorelines. This is the northern shore of Academy Island. Exposed small roots indicate that this section of the island likely experienced erosion during a recent winter flood event. Visible in the photo are several slumped sections with wetland vegetation such as sensitive fern. The alluvial soils on this island are non-cohesive and easily erode.

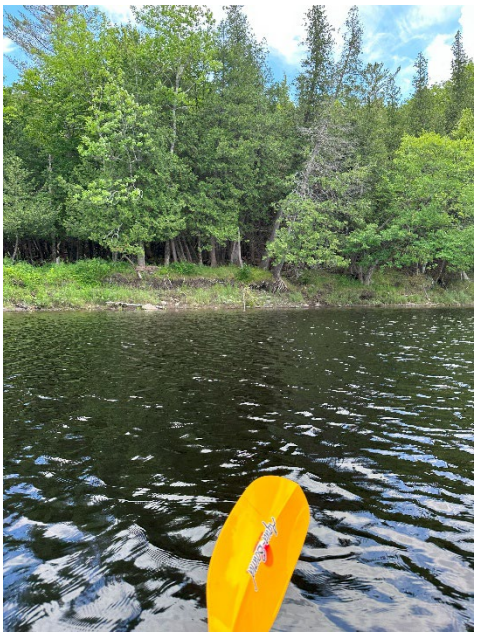
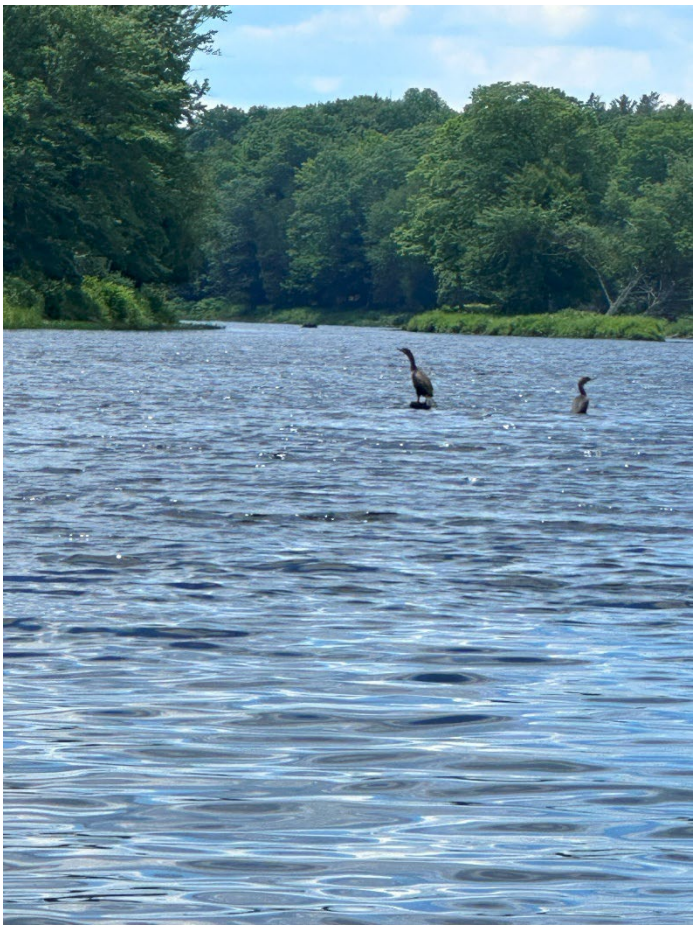


Photo 11. Bank undercutting and shoreline erosion from ice, high flows, and wind waves was commonly observed along steeper shoreline sections.

Photo 12. Several-hundred feet of shoreline is visible in this photo taken along river right upstream of Academy Island on August 11 (lower water levels). Below the tree-line, the fines have been eroded from the shoreline by wind waves, ice and flood flows leaving behind coarser material.

Photo 13. On July 2nd, this wetland located on river right between the public boat launch and Academy Island was inundated. Black duck (hidden by bulrush and pickerelweed in this photo), were observed foraging/hiding in the emergent vegetation.

Photo. 14. Mature great blue heron hiding in the pickerelweed near the public boat launch. This water level is low (August drought).



Photos 15 and 16. Double-crested cormorants fishing below Academy Island. Stonefly exoskeletons on rock above the impoundment where the river runs freely. Stoneflies are an indicator of good water quality.

Photo 17. Upstream of the impoundment, a complex in-stream habitat with a riffle-pool morphology and alluvial beaches and point bars was observed. This is the reference condition for the dam removal.

Photo 18. A mature red oak on Academy Island with major ice scars (facing upstream) and flood debris caught in the lower branch. This photo indicates that recent floods have reached as high as 10 feet above the water level on July 2, 2025 at Academy Island.

Photo 19. Cardinal flower was fairly common above the impoundment where it was more riverine. In this photo, it is battling with the invasive purple loosestrife.

Photo 20. Japanese knotweed (riparian invasive) on river left just downstream from the historic trestle (current recreational trail).

Photo 21. Japanese knotweed growing in the tailrace, river left, in downtown Dover-Foxcroft, just below Main Street. The Japanese knotweed occupies the entire area from the ordinary high water mark to the retaining wall.

Photo 22. Shining ladie's tress in flower. Two characteristics that make this Maine-Threatened orchid fairly straightforward to identify are the yellow blotch on the protruding flower lip and phenology (this is the only Spiranthes in Maine that flowers in late June and first week of July). This population was likely surveyed at least 1-2 weeks after the onset of flowering. Note the spent flowers along the lower portion of the floral spike. There is another shining ladie's tress in the upper left of the photo where all the flowers are going to seed (15 or so other individuals in the population were past peak flowering).

Photo 23. Another example of a shining ladies' tress where the top half of the floral spike is still in flower. Note the purple loosestrife plants in this community. Some of them were pulled. This plant community was growing on wet alluvium.

Photo 24. A patch of several pale green orchises growing in wet alluvium. Marsh bellflower, swamp candles, sensitive fern and deer-tongue grass were found in this community.

Photo 25. Close-up showing the large, modified, lower petals (spurs) that distinguish this rare orchid.

Photo 26. Stonefly exoskeletons found in the free-flowing river upstream from the impoundment. Stoneflies are indicators of good water quality and in the long-term would be expected to benefit from dam removal.

Photo 27. Turtlehead is a welcome native wildflower that occurs along the shoreline of the river above the impoundment.

Photo 28. Small-flowered gerardia is common on the shores of Admiral Island. This native wildflower likes to grow in alluvial parent material.

Photo 29. Bank beaver use the non-cohesive alluvial material (easy to dig into) on the south side of Academy Island to build winter homes into the bank.

Photo 30. Cardinal flower and royal fern against a patch of reed canarygrass river right in the upper impoundment.

Photo 31. The upper portion of the impoundment (above Academy Island) has a much rockier substrate in the river as well as bedrock outcrops and larger rocks on the shoreline.

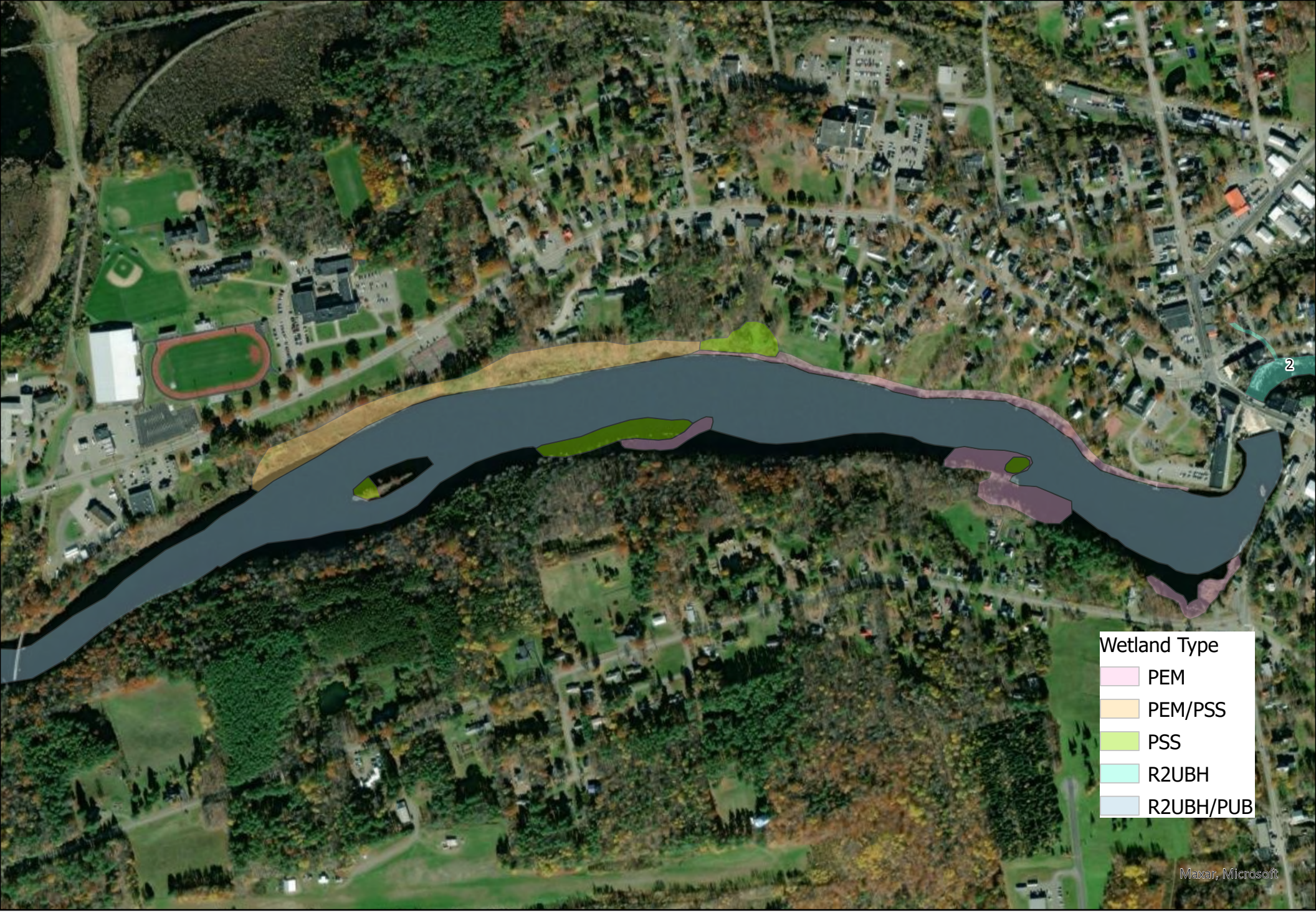
Photo 32. View of the upstream end of Academy Island looking downstream. This photo was taken in August when water levels were down as a result of the drought. Many of the wetland plants on the sandy alluvium on the upstream end of this island were desiccating or senesced early.

Photo 33. Photo of an orchid that is senescing in August (likely early due to drought). It appears to be a small purple-fringed orchid. It is growing on the shoreline below the dam in wet alluvial material.

Photo 34. Cardinal flower growing with stunted blue vervain. Possibly, a wet May followed by a drought stressed some of the shoreline plant community.

Appendix B

Wetland Maps



Wetlands in Mayo Mill Impoundment

Dover-Foxcroft, Piscataquis County, Maine

0 250 500 1,000 1,500 2,000

Feet

N

Appendix C

Wetland Function-Value Evaluation Form

Wetland Function-Value Evaluation Form

Shoreline Wetland System in Mayo Mill Dam Impoundment

Total area of wetland _____ Human made? _____ Is wetland part of a wildlife corridor? Yes or a "habitat island"? _____

Adjacent land use Developed Near Dam, Generally Un-developed Riparian Corridor Upstream of Downtown Dover-Foxcroft Distance to nearest roadway or other development Adjacent

Dominant wetland systems present PEM, PEM/PSS Contiguous undeveloped buffer zone present Fairly Contiguous Upstream of Town

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Piscataquis River

How many tributaries contribute to the wetland? On river Wildlife & vegetation diversity/abundance (see attached list)

Mayo Mill

Wetland I.D. Impoundment

Latitude 45° 10' 58" Longitude 69° 14' 04" W

Prepared by: AFM Date 7/2/25

Wetland Impact: Type Dam Removal Area _____

Evaluation based on: Office _____ Field ✓

Corps manual wetland delineation completed? Y _____ N ✓

Function/Value	Suitability Y / N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	N	7, 15		No Stratified drift
Floodflow Alteration	Y	9, 10, 11, 12, 13, 18		Narrow bands of wetlands (PEM) along shoreline cannot store floodwaters due to shelf configuration
Fish and Shellfish Habitat	Y	4, 6, 7, 8, 10, 12, 14, 17	X	Small fish observed in emergent wetlands during high water (July 2, 2025)
Sediment/Toxicant Retention	Y	1, 3, 4, 5, 8, 10, 11, 16	X	Dense vegetation helps to slow stream velocities and filter sediments
Nutrient Removal	Y	3, 4, 5, 7, 8, 9, 10, 11	X	Dense emergent vegetation and organic soil layers observed
Production Export	Y	1, 2, 5, 6, 7, 11, 12		Ducks feeding in wetlands, pollinators utilize wetlands
Sediment/Shoreline Stabilization	Y	1, 4, 5, 8, 9, 10, 11, 12, 13	X	Dense vegetation helps hold together shoreline soils
Wildlife Habitat	Y	2, 3, 5, 6, 7, 8, 11, 12, 13, 18, 19	X	Native emergent vegetation like pickerel weed & arrowhead = high quality forage for waterfowl
Recreation	N	5, 6, 9, 10, 11, 12		
Educational/Scientific Value	N	1, 5, 12,		Wetlands lack public access from land
Uniqueness/Heritage	Y	3, 11, 12, 13, 15, 22, 19, 24		Endangered Atlantic Salmon in River, two rare orchids use shoreline wetlands
Visual Quality/Aesthetics	Y	2, 3, 4, 8		Some of the wetland visible from Rt. 7 & Downtown Dover-Foxcroft
ES Endangered Species Habitat	Y			
Other				

Notes:

* Refer to backup list of numbered considerations.