

ECOLOGICAL STUDY FOCUSED ON POST POND WATER LEVEL

November 2008



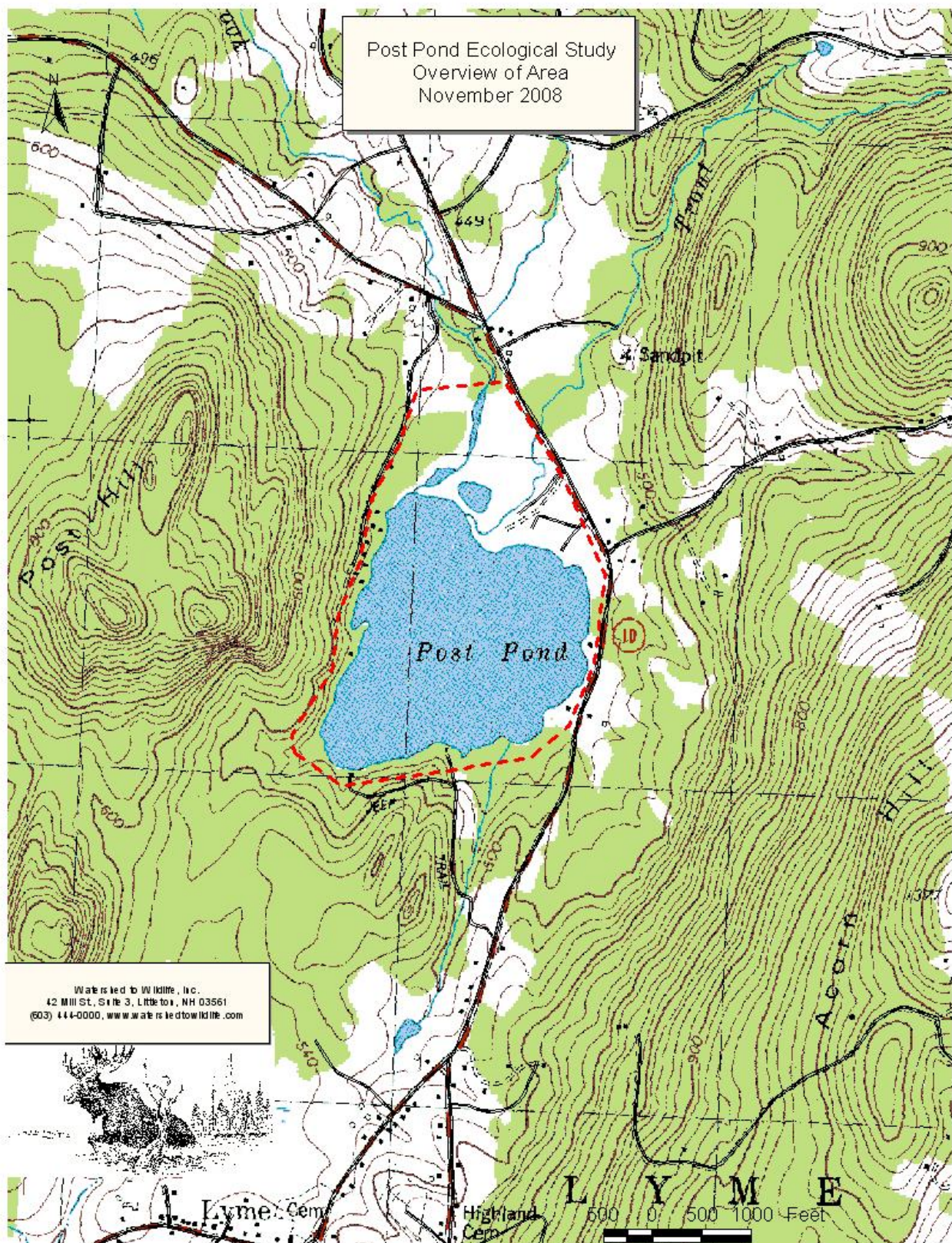
**Study Conducted for the
Lyme Conservation Commission**



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Introduction

The Post Pond Ecological Area, its associated wetland complexes, and adjoining uplands create a matrix of diverse exceptionally rich habitat for plants and animals. The main source of water for Post Pond is Trout Brook which flows west and southwest in a tortuous route. Trout Brook originates from the confluence of several small tributaries. It flows through Trout Pond, and is further supplied by Smith Mountain Brook as well as a stream flowing out of Lily Pond, located several miles northeast of Post Pond. There are several unnamed perennial tributaries that also feed into Post Pond providing cool, oxygenated water. The outlet of Post Pond contains a large wetland complex, and is part of the Chaffee Sanctuary. It contains both open water and emergent wetlands known as ‘Little Post Pond’, which are the headwaters of Clay Brook. Clay Brook flows northwest into the Connecticut River approximately three miles downstream from Little Post Pond.

The study area is within a 12,167-acre subwatershed (Clay Brook Subwatershed – Hydrological Unit Name – 12). The study area lies between Route 10 (western side) and the toe of slope (eastern side) of Post Hill. It is approximately one mile north of Lyme Center, and runs for approximately 4,000 feet in a northerly direction. A map of the study area is shown at the beginning of this report.

The Post Pond area is a popular recreation spot for fishing (including ice-fishing), boating, canoeing, kayaking, swimming and wildlife viewing, and bird-watching. There is a public boat landing, town beach (Chase Beach), athletic playing fields (Balch Field), tennis courts, and Lyme summer recreation programs at this site. There are several homes, camps, and two inns that center around and focus on enjoying the natural resources of this diverse area for human use.



These two pictures show the multi-faceted considerations for management of water levels on Post Pond: public access, use and housing; as well as rich, diverse wildlife habitat.

In the recent past years, there has been an increase in beaver activities in this area and different Town entities have dealt with this in a variety of ways. The biggest issue has been flooding caused by dam construction, resulting in an increase elevation of the water level in the immediate Post Pond study area. The conflicts between what is best for human uses of the area, and what might be best for the ecological system as related to the water levels in this area, are the driving force of this study.

Watershed to Wildlife, Inc. met with the Lyme Conservation Commission in March of 2008 at an open public meeting to discuss and better understand the need for this study, as well as the expected application of the findings.

Goals of this study are:

- 1. To evaluate the optimum water levels of this wetland complex from the perspective of the ecological system and;**
- 2. To suggest ways to retain the high values of the ecological system into the future.**

Methodology

Data used and collected for this study came from three different types of sources. They are listed and broken down below:

1. Previous recent studies:
 - a. Town of Lyme, NH - Natural Resource Inventory completed in 2007 by Watershed to Wildlife, Inc.
 - b. Post Pond Lyme, NH - Wetland Evaluation and Impact Assessment completed in 2006 by Normandeau Associates, Inc.
 - c. Mapping and detailed Elevations done by Pathways Consulting, LLC
2. Existing GIS digital data:
 - a. Natural Resource Conservation Service (NRCS) soils
 - b. Lyme tax maps
 - c. Historic USGS topographic maps
 - d. GRANIT coverages
 - e. U.S. Fish and Wildlife National Wetland Inventory (NWI)
3. Series of three field observation visits to the site
 - a. Spring visit during high water conditions (May 15, 2008)
 - b. Mid-summer visit during low water conditions (July 15, 2008)
 - c. Late summer visit as the growing season (2008) approaches its end (August 28, 2008)

Site visits were conducted by walking, kayaking, and/or canoeing for perspectives from as many different views as possible (aerial photography provided an overhead view). Although this study did not involve intensive botanical and animal surveys, anything observed during the site visits was recorded. Other studies have conducted thorough botanical inventories and can be obtained from the Town of Lyme. Casual impromptu conversations with people encountered during fieldwork - fishermen, bird-watchers, people simply enjoying the water and views from folding chairs, etc. - are also incorporated in the results of this study.

During each site visit, bench mark readings of water levels were recorded near the boat launching area, GPS points and digital photographs were taken, and field notes were recorded.

During the study, communication occurred via telephone and email correspondence with Matthew Stevens, the Chair of the Lyme Conservation Commission.

Results

Overall Observations and Components of the Study Area

Very little active beaver (*Castor canadensis*) sign was observed during the three site visits, with only a few small peeled sticks and a single track seen during the last field day. The most recent beaver dams, both downstream from Post Pond and Little Post Pond were beginning to deteriorate and breach due to lack of ‘mudding’ maintenance by beavers. Water levels fluctuated significantly between site visits: 2.7’ – May 15, 2008; 1.15’ – July 15, 2008; 1.3’ – August 28, 2008, without active influence by beaver. (Further water level details are provided under each individual site visit further in this report.) In addition to the current beaver dams in various stages of disrepair on Clay and Trout brooks, there are remnants of much older beaver dams suggesting a long history of beaver use and influence on Post Pond water levels.



Beaver dam is unmaintained and breached, resulting in lower water levels in Post Pond. There was very little fresh beaver sign during three site visit in 2008.

The sinuosity of the streams is affecting the study area with erosion issues. This is particularly evident on the vehicle ‘pull off’ along Route 10 and Trout Brook just north of the athletic fields. The severity and proximity to the highway could be considered a safety issue threatening to erode a portion of Rte. 10. The town or state will need to be addressed in the near future. It is possible that some of the severity of this bank cutting is due to the stream reacting to the confinement of a culvert crossing Rte. 10 just upstream of this area. This may be further affected by the berm placed above and along the athletic field and a couple of

rocky stream bank locations just downstream. Though relatively small, old bridge crossings or former bank stabilization projects undoubtedly have an effect on the flow of this brook as well. Further evidence of the large amounts of sediment and erosion occurring along this section of Trout Brook was seen at its confluence with Post Pond where a delta of sediment deposits has formed out into the pond.



A potential safety concern: Trout Book is undercutting the bank along a pull-off on Route 10.

In addition to Trout Brook streambank erosion site described above, Rte. 10 follows along the east side of the study site of Post Pond for approximately 1,500 feet. In one 300-foot stretch, the toe of Rte. 10 is to the water's edge of Post Pond. Though there is approximately 5 feet of elevation difference, it is possible that exceptionally high water could have a direct effect on erosion of the road. Likewise, the road could have negative effects on the Post Pond water quality regardless of the water level.



Route 10's shoulder is very close to the edge of Post Pond at this location.

Review of the NRCS soils maps indicates that much of the athletic field was built on hydric soils (Map Units 534 - Binghamville Silt Loam and 731 Peacham and Ossipee soils). Field observation during this study suggests that some of this area, particularly in the southern end near Rte. 10 and the access road to the fields and boat launch, is wetlands with a high water table, perhaps not directly effected by the water level in Post Pond. Sallow sedge (*Carex lurida*), Soft rush (*Juncus effuses*), and other hydrophytes were observed growing in places of the mowed sections, with cattails (*Typha latifolia*), blue-joint grass (*Calamagrostis Canadensis*) colonies, speckled alder (*Alnus rugosa*), and willow (*Salix sp*) in adjacent land that was not mowed. Though the summer of 2008 was very rainy with a high water table until August, there appears to be more factors than a ‘wet’ summer would account for. There were ruts in some areas caused by mowing documented in each site visit with the south corner of the field, along Rte. 10 containing strips in the athletic field where water and dark organic soil was exposed. Drainage ditching have minimal effect as the elevation difference seems too slight to run the water out of the athletic field area, particularly in deep Peacham and Ossipee soil units known for their high water table and low transmissivity. This may be why this portion of the athletic field remained wet even when the benchmark stake recorded 1.15’ and 1.3’ water levels in Post Pond.



Ruts in the athletic field expose dark, organic, hydric soils, which remained very wet during all three site visits.

There are several homes, camps, and water access points around the shoreline of Post Pond. Due to the rugged topography and exposed ledge, the shoreline is stable and relatively unaffected by the water level of Post Pond. The composition of the exposed rock and ledge creates an interesting erosion pattern where the harder, granitic rock displays relatively slow

wear from the wave action and freeze/thaw cycles, while the softer calcareous rock displays pockets or pouch marks of erosion giving the shoreline a very irregular look.



The variation of weathering on this boulder illustrates the different chemical compositions and minerals that make up this rock.

It would appear that boat houses might be affected in low water situations, whereas the loss of yard and lawn would occur during high water situations. Too high and too low water levels would also effect the Town beach negatively: water levels too high cause flooding with no sandy beach area; and low water levels create muddy, shallow conditions, less desirable for swimming.



Houses, boat houses and public beaches are affected by greatly fluctuating water levels.

Site Visit #1- May 15, 2008

During the site visit on May 15th, there was light rain and overcast conditions – 55 – 60 degrees. Water level of Post Pond was at the 2.7 feet mark. Field Biologists observed minimal recent dieback in vegetation when the water level was 6 to 8 inches higher. Evidence is particularly obvious walking the trails in Chaffee Wildlife Sanctuary and in Little Post Pond, where sedimentation and water marks were noted 6 to 8 inches above the water level on several species of sedges, and shrubs. At the 2.7-foot water level plant life appeared to be healthy and thriving at all strata, although too early in the season for most aquatic species.



May 15, 2008 Site visit. The left photo shows the water level at the marker and the right photo shows water stained leaves indicating that water levels had been higher recently.

Some of the species observed are listed below:

- arrowwood (*Viburnum recognitum*)
- alder (*Alnus rugosa*)
- meadow sweet and steeple bush (*Spiraea latifolia*, *S. tomentosa*)
- osprey (*Pandion haliaetus*) (hunting)
- great blue heron (*Area herodias*)
- loons (*Gavia immer*)
- killdeer (*Charadrius vociferous*)
- red-wing blackbirds (*Agelaius phoeniceus*)
- tree swallows (*Tachycineta bicolor*)
- mergansers (*Mergus merganser*)
- royal fern (*Osmunda regalis*)
- willows (*Salix sp.*)
- blue flag (*Iris versicolor*)
- bog rosemary (*Andromeda glaucophylla*)
- raccoon (*Procyon lotor*) tracks
- white-tail deer (*Odocoileus virginianus*) tracks on lower beaver dam
- Canada geese (*Branta Canadensis*)
- blue vervain (*Verbena hastate*)
- bobolinks (*Dolichonyx oryzivorus*)
- muskrat (*Ondatra zibethicus*) huts, dropping, feeding sign

- pileated woodpecker (*Dryocopus pileatus*)
- ovenbird (*Seiurus aurocapillus*)
- wild columbine (*Aquilegia canadensis*)
- unidentified hawk
- fish surfacing and feeding
- veery (*Catharus fuscescens*)
- beaver (*Castor Canadensis*) – fresh sign in southwest corner of Post Pond
- white pine (*Pinus strobus*)
- eastern hemlock (*Tsuga canadensis*)
- cedar (*Thuja Occidentalis*)
- kingfisher (*Ceryle Alcyon*)
- river otter (*Lutra canadensis*) - fed on fresh water mussels
- mink (*Neovison vison*)
- muskrat (*Ondatra zibethicus*)
- tussock sedge (*Carex stricta*)

Other notes from the May 15th site visit are noted below their associated photograph.



The lower beaver dam on Clay Brook has deteriorated due to lack of active beaver maintenance, but still controls the water level in the study area with respect to the spring high water table and runoff effects.



Trout Brook along the Rte. 10 pull-off area just north of Balch field has meandered on this reach causing severe erosion. It is a safety concern for the highway.



The southeastern section of the athletic field along Rte. 10 is extremely wet at this time of year and contains several hydrophytic species of plants. Because of the small elevation change, the man-made ditch alone will not resolve this issue.



In addition to Trout Brook, six small tributaries were located entering Post Pond. Please refer to the attached map in the back of this report.



Several beaver lodges of varying vintage were documented in the study area.

Site Visit #2 - July 15, 2008

The second site visit was sunny, clear, and approximately 75 degrees. The water level at the Post Pond Marker was 1.15 feet. It was observed that some dieback in vegetation was occurring since Site Visit #1 due to lower water conditions. Aquatic plant species and obligate wetland vegetation such as pickerel weed (*Pontederia cordata*), water lilies (*Nuphar variegatum* & *Nymphaea odorata*), royal fern (*Osmunda regalis*) were obviously drying up and dying.



The left photo shows the water level at the marker in Post Pond, and the right photo shows the effects of lower water levels on some of the plant species.

Two fishermen came by the boat launch hoping to catch trout. They stated that they had fished Post Pond for 35 years and that it was poor fishing when the water was this low. They caught species ranging from smelt (*Osmeridae*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), eastern chain pickerel (*Esox niger*), yellow perch (*Perca flavescens*), brook trout (*Salvelinus fontinalis*), and rainbow trout (*Oncorhynchus mykiss*), as well as other common fish species. They also stated that low water levels caused problems with water quality and e-coli in the past.



A school of Yellow perch - look closely



Children enjoying swimming at the beach

Some of the species observed during the July 15th site visit are include:

- pickerel weed
- white and yellow lily pads,
- Canadian Rush (*Juncus canadensis*)
- woolgrass (*Scirpus cyperinus*)
- watersheild (*Brasenia schreberi*)
- common loon
- Canada geese
- several painted turtles (*Chrysemys picta*)
- many fish species
- buttonbush (*Cephalanthus occidentalis*)
- wild rose (*Rosa rugosa*)
- purple loosestrife (*Lythrum salicaria*) – an invasive
- monkey flower (*Mimulus ringens*)
- bladderwort (*Utricularia vulgaris*)
- royal fern
- bur-reed (*Sparganium sp.*),
- blue-joint grass
- willow
- star grass (*Hypoxis hirsute*)
- sand piper (*Actitis macularia*)
- Concord grapes (*Vitis riparia*)
- Alder
- poison ivy (*Rhus radicans*)
- staghorned sumac (*Rhus typhina*)
- elderberry (*Sambucus canadensis*)
- golden rod (*Solidago patula*)
- ostrich fern (*Matteuccia struthiopteris*)
- red oak (*Quercus rubra*)
- cedar wax wings (*Bombycilla cedrorum*)



Drainage ditch at very low water



The athletic field remains wet



All six of the small tributaries continue to flow, suggesting that they are all perennial streams. Two are shown here.



The streambank erosion on Trout Brook has not worsened during the summer rains, but vegetation has not stabilized the bank, particularly where it is undercut.

Site Visit #3 - August 28, 2008

The last site visit was in late August. Weather conditions started out with foggy conditions but cleared quickly. Temperatures started at about 60 degrees, but warmed up to over 80 degrees during the day. The water level of Post Pond was at the 1.3 foot mark. It is apparent that the low water level is detrimental to many plant species. Many mudflat type areas and almost a 'bathtub ring' look. The day was incredibly quiet in regards to birds and people, indicating that summer is over.



The water level during August 28th site visit



Blackbirds relatively quiet but starting to flock

Many plant species either in late bloom or with fruit. Abundant soft mass all along the wetlands and much of the shoreline.



Abundant soft mass on this dogwood



Water smartweed showing it is late summer

Some of the species observed include:

- hawkweed (*Hieracium sp.*)
- minnows flashing in Trout Brook
- cattails, sallow sedge, soft rush, blue-joint grass in the athletic field
- pickerelweed
- soft-stemmed bulrush (*Scirpus validus*)
- pond lilies
- arrowwood
- joe pie weed (*Eupatorium maculatum*)
- woolgrass
- rattlesnake grass (*Glyceria Canadensis*)
- crows (*Corvus brachyrhyncos*)
- darkeyed juncos (*Junco hyemalis*)
- blackbirds (*Icteridae* family)
- catbird (*Dumetella carolinensis*)
- many small fish (possibly yellow perch)
- loons

- mallards (*Anas platyrhynchos*)
- black ducks (*Anas rubripes*)
- teal (*Anas discors*)
- Pond weed (*Potamogeton*, sp)
- watershield (*Brasenia schreberi*)
- royal fern
- many mussel shells
- hatpin (*Eriocaulon septangulare*)
- 3-way sedge (*Dulichium arundinaceum*)
- flycatcher (*Sayornis phoebe*),
- many warblers (*Parulidae* family) – all quiet
- water smartweed (*Polygonum amphibium*)
- tussock sedge
- bur-reed,
- osprey heard calling
- sandpiper
- muskrat – huts, grass feeding, droppings, bank dens
- beaver tracks up Trout Brook
- purple loosestrife – an invasive
- belted kingfisher
- painted turtles
- buttonbush,
- eel grass (*Vallisneria Americana*) (also know as tape grass or wild celery) with its spiral female flower to the water surface
- 2 great blue herons
- broadwing hawk (*Buteo platypterus*)
- several whirligig beetle hatches (Family *Gyrinidae*),
- dragon and damselflies (*Odonata*, sp)
- abundant algae growth, most abundant was brown jelly mass, (similar to frog egg mass after hatch)
- bindweed (*Convolvulus sepium*)
- sumac
- goldenrod (*Solidago*, sp)



Algae – low water, late summer



Eel grass/tape grass/ wild celery female flowers



The athletic field continues to hold water and grow wetland plant species.



Bindweed in flower, sumac, goldenrod, lush riparian growth on opposite side of Trout Brook erosion site near Rte. 10 pulloff; vegetation will need some active help to stabilize the streambank beside Rte. 10.



Left photo: All of the small perennial streams feeding into Post Pond maintain a good flow.
Right photo: Well marked normal water level

Other Factors

According to the Natural Heritage Bureau (NHB), a department of DRED that maintains a dynamic database of rare plant and animal species and exemplary plant communities in the State, there are documented rare plant species within the Post Pond area. Some species are aquatic and require marsh/fen habitat, some species require wetland habitat, and still other species require riparian habitat; all are directly associated to water based conditions.

The NH Loon Preservation Committee documents and tracks the productivity of every nesting pair of loons throughout the State of NH, including a successful nesting pair of loons in 2007 for the Post Pond area. This was the first nesting pair of loons known to use Post Pond and Little Post Pond since the area was first monitored in 1985. This event is attributed at least in part, to the higher water levels of the full beaver maintained dam on Clay Brook. This year – 2008 – loons were observed attempting to nest in Little Post Pond. However the attempt failed. The Loon Preservation Committee believes that the lack of recruitment may be attributed at least in part, to the lower water levels with the breached unmaintained beaver dam on Clay Brook (Loon Preservation Committee, 2008)

Conclusions and Recommendations

Based on these three documented ‘snapshots in time’, it is clear that the Post Pond area contains sufficient diverse and rich habitat to consistently rank very high as an ecological system, much of which is water-based. This supports the findings of the Normandeau report’s field documentation and ranking evaluation using the “*Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire*”. This was also an area that stood out in the *Natural Resource Inventory for the Town of Lyme, NH* written in 2007 by Watershed to Wildlife, Inc., with a great deal of expert assistance from the Town of Lyme residents and the Lyme Conservation Commission. This is no surprise to the residents of Lyme who have several long-term observation studies ongoing, some of which have years of supporting documentation.

Beaver (*Castor canadensis*) activities over the past two years have highlighted a focus on water levels for Post Pond, Little Post Pond, sections of Trout and Clay brooks. Trapping, shooting, installation of ‘beaver deceivers’ and methods to control the water height at beaver dams have been employed in attempts to deal with beaver activities. Field visits indicate that this area has a long history of beaver activity perhaps over hundreds of years and given the rather large watershed area, including a direct connection to the Connecticut River, will play a role in the Post Pond area for many years to come. The natural cyclic patterns of beaver movement within a watershed tied directly to availability of food sources, e.g. hardwood saplings and trees, aquatic vegetation, and other herbaceous riparian plant life, occur but are not fully understood or predictable.

These factors all play a role in the value and understanding of the Post Pond area ecosystem and what people determine is ‘best’ for the ecosystem as human use demands move forward into the future.

Overall with the current configuration of beaver dams, even in disrepair, this study indicates that the water levels recorded in Post Pond reflect the general height of water in Little Post Pond, a portion of Trout Brook, and a portion of Clay Brook. This encompasses approximately 134 acres of open water, riparian zones, and wetland complexes. Water levels below 2 feet appear to have a negative effect on the ecosystem as a whole, which is directly reflected by the plant life. Conversely, water levels above 3 feet tend to flood and cause dieback of existing zones of vegetation. In either of these scenarios, the relatively stable vegetation colonies that have developed over many years and subsequently the habitat use by wildlife species, undergo stressful situations and are forced into accelerated change.

Though based on observations during a single year of seasonal shifts (excluding winter conditions), it appears that the overall ecosystem was functioning at its best when the water level was at the 2.7 foot mark. This can be translated to interpret that though water levels will likely fluctuate during spring runoff, summer evaporation, and fall rains; but ideally would not fall below 2.0 feet nor rise above 3.0 feet.

Beaver activities will undoubtedly be a factor over time for this area and devices to control excessive swings in the water levels will most likely be required on an ‘as needed’ basis. This will require expertise by the Town, NH-DES, NH DOT, and the NH Fish & Game department- we recommend that the Town continue and maintain a dialogue with these entities in preparation for future situations.

A more complex issue might be a period in time when the beaver dams have completely deteriorated, and water levels fall and stay below the 2-foot mark. Continued down cutting and channelization of Clay Brook could also contribute to these conditions. In this situation, the Town may want to consider ways to maintain higher water levels in the future for the Post Pond area.

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MAP