CENTER HARBOR

PRIME WETLANDS COMPLETION PROJECT

[Belknap County, NH]



Hale Swamp in Winter

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CONTENTS

Center Harbor Prime Wetlands Location Map	i
Executive Summary	ii-iii
Acknowledgments	iv
I. Overview	1
II. Office & Field Methods	1
A) Remote Resource Review	1
B) Roadside Surveys	2
C) Off-Road Surveys	2
D) Wetland Assessment	4
III. Results / Discussion of Findings	5
A) General Findings	5
B) Prime Wetland Descriptions	6
1. Paquette Wetland Complex #52	6
2. Hale Swamp #54-55	7
3. Leroux Wetland Complex #58a-d	8
4. Hawkins Pond #79-80	9
5. Johnson-Perkins Wetland Complex	¥88 10
IV. Conclusions & Recommendations	11
V. References	13
Figures	
General Location Map of Center Harbor Prin	me Wetlands <i>i</i>
Specific Prime Wetland Maps	
Paquette wetland Complex #52 10	llowing page 6
Hate Swallip #54-55	" Q
Hewkins Pond #79-80	° °
Johnson-Perkins Wetland Complex #88	" 10
Appendices (available at Town Offices with on A. Maps	riginal printed report)
General Location Map of Prime Wetlands Senara	[36" x 44"] te from report
B. Spread Sheets & Charts	
Prime Wetland FVI Summary Chart	B-1
Prime Wetland WVU Summary Chart	B-2
C. Wildlife and Plant Species Lists Nov 2008	– Mar 2009
Mammals	C-1 to C-2
Birds	C-3 to C-6
Plants	C-6 to C-27
D. Functional Value Specifications used in th	e NH Method D-1 to D-5
	D I 10 D 0

E. NH Method Wetland Assessment Sheets



SUMMARY

Between October 2008 and March 2009 a prime wetland assessment and completion project was conducted for the Town of Center Harbor, New Hampshire. An initial study performed by Barry Keith in 1978 provided background information on each of the five prime wetlands that were ultimately approved by town vote in 2006. Although the town authorized the designation of these wetlands as prime, no formal wetland assessment was completed nor were any maps or descriptions submitted to the state of New Hampshire. This project serves to finalize the submittal of maps and assessment sheets to the State Wetlands Bureau for formal approval by the Department of Environmental Services.

Digital geographic information system (GIS) files were reviewed along with any and all pertinent map and literature data associated with wetlands in the region. Aerial photographs (1998 digital orthophotoquads or DOQ's) were especially helpful in preparing initial field data sheets and in conducting aerial photograph interpretation (API) delineations of wetlands prior to fieldwork. Property permissions were sought with the assistance of the Center Harbor Conservation Commission, and written permission slips were recorded and marked on tax maps prior to conducting the field surveys on private property.

In advance of field-based delineations and assessments, roadside surveys served the purpose of identifying the location and extent of most of the prime wetlands in Center Harbor, as well as in providing the necessary data on stream and water body alignments, wetland control lengths (i.e. outflow restrictions for wetlands), and subwatershed data.

Off-road field surveys of wetlands began on December 15, 2008 at Hawkins Pond and the Johnson-Perkins Wetland Complex. Subsequent field visits took place on February 5, 7, 17, 18 and 25, 2009. Field delineations of all wetland edges were performed on roughly 92% of the wetland boundaries. This was completed by detecting changes in plant communities and changes in slope. Angle points along the wetland boundary were recorded using a hand-held Garmin 12XL global positioning system (GPS) unit with an averaging precision error of between 3.2 and 7.8 m (10.5 to 25.6 feet).

During field delineations notes were kept on all wildlife species, wetland cover types, property markers and bounds, wetland control lengths, educational sites, viewing locations, recreational activities, evidence of dredge and fills, historical sites, and exemplary natural communities. Prior field notes from surveys conducted in the area during 2001, 2002, 2006 and 2007 provided additional data on Hawkins Pond, Leroux Wetland Complex, and Hale Swamp. Owing to the time of year, soil testing was not possible, although prior surveys allowed for the estimation of soils types for each site.

Office –based assessments of each wetland followed the *Method for the Comparative Evaluation of Non-tidal Wetlands in New Hampshire*, or the 'NH Method' (N.H. Department of Environmental Services, 1991). The following functional values of wetlands were assessed:

- 1) Ecological Integrity
- 2) Wetland Wildlife
- 3A) Finfish Rivers and Streams
- 3B) Finfish Lakes and Ponds
- 4) Educational Site Potential
- 5) Visual/Aesthetic Quality
- 6) Water-based Recreation
- 7) Flood Control Potential
- 8) Groundwater Use Potential
- 9) Sediment Trapping
- 10) Nutrient Attenuation
- 11) Shoreline Anchoring and Dissipation of Erosive Forces
- 13) Historical Site Potential
- 14) Noteworthiness

Note that functional value #12, Urban Quality of Life, was not assessed owing to the rural character of Center Harbor in 2009.

Field data was transferred to the NH Method data sheets in the office following the field surveys. GPS data was uploaded into ArcView 3.2 GIS project files and individual maps prepared according to the specifications of the NH Method. In April, all data was transferred to Arc9 GIS and the field boundaries checked against 2006 1-foot pixel color aerial photographs of the Lakes Region courtesy of NH GRANIT.

Map and field surveys indicated that Center Harbor's prime wetlands comprise approximately 217 acres, or 2.0% of the town. Each of the prime wetlands are located in the western part of town, with half of them occurring in the Squam Lakes watershed and half occurring in the Winnipesaukee watershed. Curiously, Hale Swamp was found to occur in both watersheds, although the exact point of separation was not discernible, hence the prime wetland was considered as one unit.

Twenty-three upland islands were found within the outer boundaries of the five prime wetlands, and a total of 223 NWI cover types were identified.¹ Most prime wetlands had less than 1% fill, although the Paquette Wetland Complex was largely created by previous dredging and filling activities. Hydric A soils exceeded 75% in each prime wetland, with a maximum of 95% at Hawkins Pond. Three of the five prime wetlands had perennial streams associated with them, and all five had permanently impounded water bodies.

At least 45 wetland cover types were identified, with palustrine emergent and scrub-shrub wetland being the most common. Bog and fen mats were found at Hawkins Pond and Hale Swamp, with the latter including an exemplary black spruce-larch-dwarf shrub bog natural community.

Although a comprehensive natural resource inventory of Center Harbor is currently underway, it appears that other wetland resources in Center Harbor may also demonstrate sufficiently "high and unspoiled character" to warrant future designation as prime wetlands. These areas are described in the following report.

¹ NWI or National Wetlands Inventory cover types followed Cowardin et al. (1979).

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Squam Lakes Conservation Society (for digital approximations of tax parcels) Lakes Region Conservation Trust (for conservation parcel data) NH Natural Heritage Program (for rare plant information) NH Fish & Game Department (for rare animal information)



Hale Swamp at approximate watershed divide

I. Overview

Between October 2008 and March 2009 a roadside and off-road survey was completed of the five prime wetlands that were designated by warrant article by Center Harbor residents in March of 2006. In spite of this designation, no formal assessment had been completed of these five high quality wetlands, and no final report was submitted for final approval to the State Department of Environmental Services' (NHDES) Wetlands Bureau. After initial discussions with the Center Harbor Conservation Commission (CHCC) in early October, work began on identifying which wetlands were designated as prime and what information had already been gathered on these wetlands. In 1978, Barry Keith had provided the town with a wetland map that was derived from hydric soils recognized by the (then) Soil Conservation Service in the 1977 Carroll County Soil Survey. In reviewing this map it was apparent that the exact location of the prime wetlands was not known. Moreover, there was insufficient data on the cover and soil types within each wetland, and no formal assessment of each wetlands lay on the ground and what their characteristics were in order to improve their ability to conserve the natural resources of the town according to the Center Harbor Master Plan.

II. Office and Field Methods

a. Remote Resource Review

The first step in completing the prime wetlands survey was to review existing maps and data contained in the CHCC files. This included the aforementioned wetland map by Barry Keith, the revised mylar map and print maps containing the best known location of the five prime wetlands as well as their designated numbers, a summary folder containing tabular descriptions of each wetland that was mapped, and some additional notes and sketches on the plant types of each proposed prime wetland completed by volunteers in the 1980's. Each approximate prime wetland location was compared against the latest version of the Center Harbor tax map, and the number of parcels and parcel owners tabulated where private property permission would need to be granted access on foot. The CHCC then sent out letters and liability waiver forms to each of the parcel owners so affected, as well as general promotional materials (articles and web statements) that advertised the upcoming field study.

Office work also included obtaining the pertinent GIS (Geographic Information System) data files from Complex Systems Research Center in Durham, NH, which houses the NH GRANIT GIS database. Most of the latter data had already been purchased by the author, although a CD set of 1-foot pixel color aerial photographs flown in 2006 and published in 2007 was obtained as well. The latter provided exceptional resolution of ground detail for each wetland area.

b. Roadside Surveys

While the CHCC was receiving and processing property access permission forms, I conducted a roadside survey of each prime wetland. This took place on November 14, 2008. All but the Leroux Wetland Complex was reachable (at least in part) by road. Much of the Paquette Wetland Complex was viewable along Route 3 just north of the Meredith town line. Hale Swamp was also visible from Route 3, both in the southern section near the junction of Waukewan Road and the northern section in the town of Holderness. Portions of the forested upper part of Hale Swamp were also visible from the Beaver Drive subdivision west of Route 3. The Johnson-Perkins Wetland Complex was visible at its outlet along McCrillis Hill Road, although only the riparian forest below the main beaver dam was visible. Finally, the Hawkins Pond prime wetland was quite visible along Piper Hill Road and Hawkins Pond Road, as well as from the public boat ramp access area owned by the NH Fish and Game Department. Although this survey was limited in scope, it did provide a GPS-based visual context to access points for each wetland.

c. Off-Road Surveys

Beginning on December 15, 2008, field surveys of each prime wetland was carried out on foot (or snowshoe). Since access to the open water portion of Hawkins Pond was available to the general public, this site was chosen as the first wetland to visit. One of the CHCC members had made personal calls and visits to several of the landowners abutting Hawkins Pond, and so the field survey went quite smoothly. A "job shadow" student from Moultonborough Academy and the aforementioned CHCC member accompanied me on this survey, wherein we spent most of the field time walking on the ice that comprised a lot of the Hawkins Pond prime wetland. Some portions of the pondshore were also walked in the accompaniment of one of the landowners. Ice fisherman were talked to about the quality of Hawkins Pond, and additional information



Sidney, a "job shadow" student, helped out during the first day

was gathered from Fish & Game personnel as well as personal records that were gathered during the Lake Waukewan Watershed Study for the town of Meredith in 2006-2007.

The second part of the field survey on December 15, 2008 was conducted at the Johnson-Perkins Wetland Complex, where just 65% of the private property area was permissible for access. The high student and I walked counterclockwise around the wetland edge beginning at McCrillis Hill Road as far as a property marker in the western part. We returned over the frozen marsh and ice back to the northeastern shore on our return. This wetland included some sloping, poorly drained forested swamps in the eastern part, which were sampled for hydric soils using a Dutch soil auger. The wetland control length was measured at the roadside where an unblocked culvert passed under the road.

The remaining field days took place after all of the permission slips and liability waiver forms were received from private residents. The latter allowed for the entirety of the remaining prime wetlands to be visited on foot. Field days were held on February 5, 7, 17, 18, and 25, 2009. The following table summarizes the dates of the road and off-road surveys.

CENTER HARBOR WETLAND INVENTORY - SURVEY INFORMATION										
CODE ¹	NAME	SIZE (ac)	RDSD ?	DATE 1	DATE 2	FIELD	DATE 1	DATE 2	DATE 3	DATE 4
				11/14/	02/18/		02/18/			
52	Paquette Wetland Complex	18.48	Y	09	09	Y	09			
				11/14/	02/05/		02/05/	02/07/	02/17/	02/25/
54-55	Hale Swamp	123.17	Y	09	09	Y	09	09	09	09
							02/25/			
58a-d	Leroux Wetland Complex	17.52	N	N/A		Y	09			
				11/14/	12/15/		12/15/			
79-80	Hawkins Pond	31.40	Y	09	08	Y	08			
	Johnson-Perkins Wetland			11/14/	12/15/		12/15/			
88	Complex	26.30	Y	09	08	Y	08			

Table 1. Summary of Roadside and Off-Road Surveys

Wetland delineations for the remaining prime wetlands were conducted during periods of deep snow and frozen ground and therefore did not allow for accurate soil analyses. Wetland boundaries were determined in the field according to the following parameters, in order of importance: 1) topographic breaks – e.g. just above the toe of the slope; 2) visible groundwater seepage that had melted the snowpack; 3) plant community changes; 4) presence of ice beneath the snow; and 5) specific plant indicator species. In the one area where a lack of naturally occurring plant communities prevented detection of the wetland edge according to these parameters, the 2006 1-foot color aerial photographs were used to determine where ground saturation was present or absent. This occurred at the edge of the Waukewan Golf Course at Hale Swamp.

¹ Note: There was some discrepancy in the number codes used for each prime wetland; maps produced for the RFP by the Squam Lakes Conservation Society had mislabeled numbers and wetland designations. An investigation into the actual map used in the warrant article produced a clarification of the size, numbering code and location of the Paquette, Hawkins Pond, and Johnson-Perkins Wetland Complexes as indicated above.

Wetland Assessment

The wetland assessment utilized the *Method for the Comparative Evaluation of Non-tidal Wetlands in New Hampshire* (NHDES, Ammann and Stone 1991), or the "NH Method," for evaluating the functions and values of each wetland. Although the use of this method for just these five prime wetlands precluded a comparison with the remaining wetlands in Center Harbor, the following description of each of these wetlands and their attributes underscores their importance as significant wetland resources in town.² An accompanying document (Appendix D) provides specific guidance on how the NH Method was employed during this project. Appendix E contains the completed data forms for each of the five prime wetlands.

In general, the field analysis provided site specific information on the character of the wetland buffer, the number of occupied residences within 500 feet of the wetland boundary, the land use around and within the wetland, the nature of public access and proximity to schools, the viewing points from roadside and off-road points, the types of plant communities present, and the "wetland control length" or WCL. The latter is a term used in the method that describes the type of constriction to the downstream flow of waters passing through the wetland, such as a culvert, bridge, or beaver dam. These were measured in feet in the field, and used in the calculation of flood storage potential.

In terms of the size and lay-out of the overall wetland complex, the maps provided by the initial survey of soil types was used as a guide for where the edge of the prime wetland existed. Additional units of poorly drained soils, riparian areas feeding into the prime wetland, and impounded waters associated with the prime wetland were not mapped as part of the wetland if not specifically indicated in the voter-approved document. In this way, no additional areas not intended to be prime wetlands were added to the total. Thus, changes to the wetland lay-out and configuration primarily involved small additions and deletions according to hydrologic, plant community, and other changes described above.



The Leroux Wetland Complex included an upper watershed beaver swamp in pristine condition. Seven beaver dams along the perennial stream below this basin provide superb wildlife habitat in a remote section of Center Harbor.

² A complete wetland mapping project using the 2006 aerial photographs and roadside surveys is currently being undertaken as a part of a comprehensive NRI project for the town.

III. Results / Discussion of Findings

a. General Findings

Over 92% of the wetland boundary of the five, town-designated prime wetlands was surveyed between December 15, 2008 and February 25, 2009. 2064 GPS points were placed along the wetland edge, as determined using field observations of hydrology, plant community changes, and other features noted above. The following chart summarizes the size and location of each prime wetland.

CENTER HARBOR PRIME WETLAND INVENTORY - SIZE & LOCATION						
CODE	NAME	SIZE (ac)	SIZE - C.H.	TAX MAP #'s	NEAREST ROAD(S)	ZONING
52	Paquette Wetland Complex	18.48	18.48	Sheet 4	Route 3	RR,C
54-55	Hale Swamp	123.17	96.68	Sheet 3	Route 3, Waukewan Road	RR
58a-d	Leroux Wetland Complex	17.52	17.52	Sheet 1, 3	McCrillis Hill Road	RR
79-80	Hawkins Pond	31.40	31.40	Sheet 1	Hawkins Pond Road, Piper Hill Road	RR
88	Johnson-Perkins Wetland Complex	26.30	26.30	Sheet 1	Piper Hill Road	RR
	SUM	216.87	190.38			
	ZONING	RR = Rura Residentia				
C = Commercial						

Table 2. Prime Wetland Summary – Center Harbor

Thirteen functional values were calculated for each prime wetland using the NH Method of wetland assessment. Functional value indices (FVI's) ranged from 0 to 1.0 within each wetland, with a mean of .69 for Paquette Wetland Complex, .73 for Hale Swamp and Leroux Wetland Complex, .81 for Hawkins Pond, and .70 for Johnson-Perkins Wetland Complex. Wetland value units (WVU's, the calculation of acreage x functional value) ranged from 0 to 123.2, with the largest wetland, Hale Swamp receiving the highest set of scores owing to its large size. Charts in Appendix B summarize the results of the FVI and WVU scores for each prime wetland. The FVI summary on page B-1 includes a different color for each wetland across the 13 functions that were assessed. The WVU summary chart shows a line score for each wetland across the 13 WVU's. Note that Hawkins Pond shows a high finfish WVU because as the method requires, the entire water body adjacent to the wetland was used to calculate the WVU.

The following pages provide maps and a descriptive summary of each prime wetland.

CENTER HARBOR PRIME WETLANDS COMPLETION PROJECT PRIME WETLAND SUMMARY

PRIME WETLAND:	Paquette Wetland	Complex	<u>#</u> : 52		<u>ACRES</u> : 18.5
LOCATION: East sid	le of Route 3 abuttir	ng town line wi	ith Meredith (b	ehind Paquette Signs	5)
Elevation: 523 (B.N	1.) – 573 ft.	Flow Direction	on: South	<u>Ave. Slope</u> : 0 - 3	%
<u>% Forested</u> : 19.6	<u>% Emergent/Scrub</u>	-Shrub: 33.3	<u>% Open Wate</u>	er: 39.5 <u>%Upland Isla</u>	ands: 7.6

GENERAL LAND USE:Type: Rural Residential/CommercialZoning: RR/CPaquette Prime Wetland Complex is within a strip residential and commercial area of Center Harboralong Route 3. Route 3 has bisected the wetland complex from adjacent feeder streams on the west sideof the highway. Most of the wetland was created by gravel operations in the 1960's and 1970's. Most ofthe open water area is a result of former excavation. Various dump piles and mounds can be foundthroughout the wetland, and active trails can be found crossing through and along the edge of thewetland.

Prime Wetland Description: The Paquette Prime Wetland Complex, (formerly known as the "Mug Wetland Complex" since it lies behind an establishment of this name), is a fairly small but critical upper watershed wetland along the perennial Hawkins Brook. This brook extends upstream beyond the wetland yet is significantly enlarged by several small tributaries as it courses through the prime wetland itself. Hawkins Brook runs southerly through the current Hawkins Brook Prime Wetland in Meredith and ultimately empties into Meredith Bay on Lake Winnipesaukee. Most of the substrate is sand and gravel (Endoaquents, wet), although many of the nine upland islands are composed of residual stones, boulders and stumps.

<u>Wildlife Habitat Description</u>: Beavers have taken up residence in this prime wetland, and have created a number of dammed pools and open wetland margins. This has increased the habitat value of the wetland, and besides favoring the regeneration of pine, has also provided an ample supply of hardwood stump sprouts and other low growth suitable for snowshoe hare. As a result, bobcat tracks were found in and around the wetland in spite of it being very near a major highway and several residences. Deer, fox, and raccoon sign is frequent, and a number of typical avian "edge species" such as house finches and house sparrows can be found. It is likely that some of the pools support breeding amphibians.

Rare & Endangered Species / Exemplary Natural Communities: None

- Increase in invasive species
 - Purple loosestrife, Phragmites, and buckthorn are all very common
- Degradation of water quality from commercial & residential development
 This wetland lies behind many residences, including one with a horse paddock
- Salt chlorides & sediment run-off into Hawkins Brook and Lake Winnipesaukee
 - Mostly from Route 3, but also from driveway salting for school buses
- Further fragmentation of habitat by snowmobile trail that crosses the central part

CENTER HARBOR PRIME WETLANDS COMPLETION PROJECT PRIME WETLAND SUMMARY

PRIME WETLAND:	Hale Swamp		<u>#</u> : 54-55	<u>ACRES</u> : 123.17
LOCATION: West si	ide of Route 3 north	of Waukewan	Road at height-of-land	l
Elevation: 665 – 67	'5 ft.	Flow Direction	on: South and North	<u>Ave. Slope</u> : 0 - 2%
<u>% Forested</u> : 7.8	<u>% Emergent/Scrub</u>	-Shrub: 76.0	<u>% Open Water</u> : 13.8	%Upland Islands: 2.4

GENERAL LAND USE:Type: Rural ResidentialZoning: RRHale Swamp lies west of Route 3 and so has been degraded to a certain degree in its southern-most and
northern-most parts. Otherwise, it lies mostly well away from the highway and has only a few scattered
residences along its edge. The Waukewan Golf Course is directly along its west side and has both filled
and dredged a portion of this wetland complex. The northwest side is very remote, and ample wildlife
sign can be found in this area. In contrast, since Hale Swamp includes a critical link of a state-maintained
snowmobile route, very little wildlife sign was found in its central corridor.³

Prime Wetland Description: Hale Swamp is the largest and most complex wetland in Center Harbor. It has a bog pond and associated hyperacid bog mat, extensive areas of leatherleaf, several emergent marshes with beaver impoundments, and lateral seepage wetlands that are forested. The golf course maintains an open edge on the west central side, yet the remaining buffer is largely forested in spite of scattered residences. Curiously, since Hale Swamp lies on a drainage divide, it drains in two directions. At its narrowest point in the central part – roughly 300 feet, water is stagnant and effectively ponded. At both the north and south ends there are intermittent drainages that exit the wetland; the former becomes Swainey Brook that leads into Squam Lake, and the latter becomes Hawkins Brook which runs into Lake Winnipesaukee.

<u>Wildlife Habitat Description</u>: This prime wetland has the highest wetland wildlife value of any wetland in Center Harbor. Although winter wildlife is somewhat impaired by recreational vehicles, the summer months provide ample habitat for wetland-dependent mammals, birds, amphibians and invertebrates. Beaver impoundments are frequent, deer, moose and bear trails are common, and nearly all of the animals recorded during the prime wetland survey were recorded in this area. Although the timing of the field survey precluded detection of any rare wildlife species, it is likely that several exist, such as wood turtle, Canada warbler, and ebony boghaunter.

Rare & Endangered Species / Exemplary Natural Communities: Black Spruce-Larch Swamp, Leatherleaf-Black Spruce Bog, Leatherleaf-Sheep Laurel Dwarf Shrub Bog

- Increase in invasive species
- Purple loosestrife and buckthorn are all very common; Phragmites (some)
- Salt chlorides & sediment run-off into north and south parts
 - Mostly from Route 3, but also from Beaver Drive
- Further fragmentation of habitat by snowmobile trail that traverses the central part

³ A total of 78 snowmobiles passed by in a four hour period on a Saturday.

Center Harbor Prime Wetlands Completion Project

CENTER HARBOR PRIME WETLANDS COMPLETION PROJECT PRIME WETLAND SUMMARY

PRIME WETLAND:	Leroux Wetland Co	mplex	<u>#</u> : 58a-d	<u>ACRES</u> : 17.5	2
LOCATION: Upper	headwaters of Swair	ney Brook belo	w (south of) Pine H	ill in Holderness	
Elevation: 672 - 72	0 ft.	Flow Directio	o n: South	<u>Ave. Slope</u> : 0 - 3%	
<u>% Forested</u> : 17.1	<u>% Emergent/Scrub</u>	- Shrub: 58.3	% Open Water: 2	0.8 <u>%Upland Islands</u> : 3.8	

GENERAL LAND USE:Type: Rural ResidentialZoning: RRLeroux Wetland Complex forms the uppermost headwaters of Swainey Brook. This brook becomesperennial as it leaves the Leroux wetland. From here it passes through the north part of Hale Swampbefore descending along Route 3 and crossing northeasterly into Squam Lake. The northern buffer ofthis wetland lies on protected property in Holderness, and the town line passes roughly 60 feet to thenorth. Since this wetland is quite remote, there are only game trails and old skid trails present; thus,human activity both in the wetland and its buffer is scant.

Prime Wetland Description: Leroux Wetland Complex offers the most pristine environment of any prime wetland in Center Harbor. Although it is not large, it has great diversity of wetland types and a high degree of use by wildlife. Seven beaver dams cross the main drainageway below the upper basin, and several impoundments are connected by small reaches of Swainey Brook. At least one beaver dam impounds a large lateral drainage with an intermittent stream and sloping seepage wetlands. The lowest portion of the wetland complex is within view of the Waukewan Golf Course but is unaffected by it. The Hale Swamp snowmobile trail does not cross into the Leroux stream system or basin.

Wildlife Habitat Description: Moose, bear, deer, coyote, mink, otter, fisher, and raccoon are well represented in the Leroux Wetland Complex. Several game trails crisscross the principal drainage and run along the edge of the basins. A significant deer wintering area was found along the west side and good bear denning potential exists on Pine Hill. The south-facing, stony talus nature of the latter hill also makes it a good site for the potential use by breeding bobcats. Although no active nests were seen, it is likely that great blue heron have and will use this wetland system for nesting. Several species of waterfowl are no doubt present in the breeding season, and a number of neo-tropical migrants likely inhabit the forested buffers. All three stream salamanders are likely present, as well as all marsh-inhabiting amphibians.

Rare & Endangered Species / Exemplary Natural Communities: none

- Future logging damage to the narrow stream drainageways and upland buffer areas
- Additional pressure from possible rogue snowmobile trails
- Unmonitored taking of wildlife by trapping (especially beaver).

CENTER HARBOR PRIME WETLANDS COMPLETION PROJECT PRIME WETLAND SUMMARY

PRIME WETLAND:	Hawkins Pond		<u>#</u> : 79-8	8 0	<u>ACRES</u> : 31.4
LOCATION: Northw	vest Center Harbor a	adjacent to Pipe	er Hill Road (s	outh part of H	awkins Pond)
Elevation: 597 - 60	2 ft.	Flow Directio	<u>n</u> : North	Ave. Slo	pe: 0 %
<u>% Forested</u> : 3.6	<u>% Emergent/Scrub</u>)-Shrub: 83.8	<u>% Open Wat</u>	er: 12.6 <u>%Up</u>	land Islands: 0

GENERAL LAND USE:Type: Rural ResidentialZoning: RRHawkins Pond is a +/- 86-acre pond that is comprised of a series of leatherleaf-dominated bog mats in its
southern part. Hawkins Pond is an old mill pond that has been "improved" for floodwater storage and
warmwater fisheries by the NH Fish & Game Department. The 14-foot long dam maintains a spillway
elevation at 597 feet and has since the 1970's. The prime wetland portion that was designated by the
town includes the southeast and southwest bog mat and emergent wetland fringes to the pond proper.
These are south of the island and the created sand & gravel peninsula that nearly bisects the pond in the
central part. The pond is actively fished and used by non-power boats on a regular basis.

Prime Wetland Description: Hawkins Pond lies directly upstream of Winona Lake and Lake Waukewan, and therefore helps supply drinking water to residents of Meredith. The pond, although shallow, contains excellent water quality as attested by the diversity of vertebrate and invertebrate wildlife present. The bordering prime wetland fen mats form a crucial water quality regulating buffer to the pond, especially since there are a few residents nearby. Nearly all of the prime wetland is composed of a dwarf shrub and emergent fen mat, and no upland islands are absent. Although not entirely clear in the initial prime wetland maps, the open water between the two bog mats is currently included in the prime wetland area. The edge of the wetland is sharply demarcated from the partly developed upland.

<u>Wildlife Habitat Description</u>: This open marsh and bog mat wetland is principally used by beaver, muskrat, mink, otter, various waterfowl species and an abundance of aerial insects, notably dragonflies and damselflies. Since the prime wetland lies downstream of the Bear Pond outflow brook, there are ample nutrients to supply a greater plant and wildlife diversity than would otherwise be present. A number of warmwater fish are caught by anglers in the pond proper, although the open water within the prime wetland likely contains the same species, including chain pickerel, largemouth bass, yellow perch, pumpkinseed sunfish, brown bullhead, golden shiner, lake chub, and possibly dace.

Rare & Endangered Species / Exemplary Natural Communities: none

- Salt loading from Piper Hill Road adjacent to southwest side
 - Small concern overall since the fen mat acts as an effective buffer
- Increased water pollution pressure from residences nearby
 Nitrates and phosphates levels should be watched
- Stabilized water level due to dam
 - This should be lowered periodically to oxygenate the benthos
- Introduction of variable milfoil by boats

Center Harbor Prime Wetlands Completion Project

CENTER HARBOR PRIME WETLANDS COMPLETION PROJECT PRIME WETLAND SUMMARY

PRIME WETLAND:	Johnson-Perkins Wetland Comple	ex <u>#</u> : 87-88	<u>ACRES</u> : 26.3
LOCATION: Northv	vest Center Harbor adjacent to Mc	Crillis Hill Road (eas	t of Hawkins Pond)
Elevation: 615 - 63	0 ft. Flow Direction	<u>on</u> : Northeast	<u>Ave. Slope</u> : 0 - 1 %
<u>% Forested</u> : 26.9	% Emergent/Scrub-Shrub: 56.7	<u>% Open Water</u> : 16	5.4 %Upland Islands: 0

GENERAL LAND USE:Type: Rural ResidentialZoning: RRJohnson-Perkins Wetland Complex is a beaver-mediated wetland in the upper headwaters of the
perennial brook that flows northeasterly into White Oak Pond and Squam Lake. The upper part of the
watershed lies on the north slope of McCrillis Hill, and is largely residential. A few fields and orchards
surround some of the residences but on the whole it is mostly forested. Two residences border the
wetland but at a distance that makes the interior portion fairly remote. Aside from the road at the outlet
and bordering driveways, no trails, dumps, or other evidence of human use was visible in the part
surveyed in the field.

Prime Wetland Description: The Johnson-Perkins Prime Wetland consists primarily of beaver marsh and adjacent scrub-shrub wetlands. Lateral drainages enter the wetland from the northwest, west, and southeast, each of which is intermittent and sloping. This prime wetland has a high percentage of forest cover largely on account of these lateral drainage systems. Although there are no upland islands within the survey portion of the wetland, an apparent esker ridge enters from the south and bisects the main body of the wetland. From a distance this ridge looked naturally composed of rounded stones and cobbles. The lower portion of the open marsh contains a long beaver dam, although several lateral seepages below the dam maintain a forested wetland condition all the way to McCrillis Hill Road.

<u>Wildlife Habitat Description</u>: This is another beaver-dominated marsh wetland with ample sign of muskrat, otter, mink, snowshoe hare, deer, moose, fisher, and raccoon. Atop the long beaver dam a set of juvenile bobcat tracks were found in December. Since the west edge of the wetland is bordered by undeveloped woodland the greatest concentration of wildlife sign was found in this area. Periodic inundation by beavers upon their return from extirpation resulted in the death of several large white pines in the northern part; these trees are highly senescent at this point, and are therefore unsuitable for occupation by great blue herons. Some very large hardwood and softwoods trees were found along the western wetland edge; these are currently affording excellent denning sites for cavity nesters.

Rare & Endangered Species / Exemplary Natural Communities: none

- Some possible introduction of invasive plants from nearby disturbance
- Unauthorized trapping of beavers from the main marsh area
- Fragmentation of excellent wildlife habitat on the west side by future development

IV. Conclusions and Recommendations

This prime wetlands completion project resulted in the accurate mapping and assessment of the five prime wetlands that were designated by the town of Center Harbor in 2006. Excellent cooperation from both the Center Harbor Conservation Commissioners and the private landowners whose properties border the five prime wetlands allowed for nearly complete coverage during the field survey portion. With the exception of Hale Swamp, each of the prime wetlands was fairly small and therefore easily surveyed and assessed. Very few changes in acreage resulted from the field mapping of the wetland edge, since both expansions and deletions were taken in by the GPS-based mapping revisions. Recommendations for seeking town approval to significantly modify portions of the existing prime wetlands are included below.

At 123.17 acres, Hale Swamp was clearly the largest, most complex, and most valuable wetland in Center Harbor. It was noteworthy that 22% of the prime wetland lay outside of the town of Center Harbor. For this reason, it would behoove the CHCC to encourage a similar form of protection to the remaining portion of Hale Swamp in Holderness. Both wildlife and human users of the prime wetland do not appear to adhere to political boundaries, and potential for disproportionate development in the buffer zone of Hale Swamp along Route 3 is high. The fairly recent addition of a small lot subdivision along the east side of Hale Swamp is a testament to the potential degradation that can occur in the already compromised buffer area along Route 3. Notably, the highest concentration of bear sign (e.g. clawed trees) was in this area of the swamp.

The Paquette Prime Wetland Complex presents an interesting contrast to the pristine nature of the Leroux and Johnson-Perkins Wetland Complexes. Largely created by previous excavation of gravel and sand, this wetland nonetheless provides a valuable "line of defense" against the encroachments along Route 3. While I have argued that the Hawkins Brook Prime Wetland that lies immediately downstream in Meredith should be "declassified" as a prime wetland, the Paquette wetland still exhibits some remarkable wetland qualities as attested by the high ratings it received for wildlife, flood storage, sediment trapping and nutrient attenuation. In spite of the compromised nature of the portions adjacent to Route 3, the Paquette wetland has the greatest chance of attenuating nutrient and sediment releases associated with the highway and the residential and commercial development nearby.

The Leroux Wetland Complex offers the best rationale for permanent conservation protection of any private property in and adjacent to a prime wetland in Center Harbor. Its remote nature, it highly evident wildlife value, and its adjacency to a forever wild conservation easement in Holderness is a strong basis from which to support its long-term protection. This wetland provided excellent flood storage with its series of beaver dams, and therefore helps mitigate downstream flood-associated damage to both the Waukewan Golf Course and the residences along Swainey Brook on Route 3. Its largely unforested nature also suggests that this may be an appropriate site for expanding the forever wild easement area nearby.

Johnson-Perkins offers critical flood storage opportunity much as it did during its heyday as a mill pond above the McCrillis Mill. It is perfectly situated to desynchronize floodwaters coming off of McCrillis Hill

prior to crossing McCrillis Hill Road. The forested portion below the beaver dam acts an additional break for ice-laden meltwaters in spring. Its flood storage capacity would not be as effective if beavers were trapped out or otherwise extirpated from the open water areas of the wetland. Conserving the riparian zone as it enters into this wetland is another strategy that may help ensure long-term flood storage value.

Hawkins Pond is an actively used recreational site that offers "waterfront value" to the residents along Piper Hill and Hawkins Pond Road. Although it is sparsely populated, any additional development, for instance along the northeast shoreline, may shift this very sensitive system towards eutrophication, that is, towards a condition where nutrient inputs from residences and roadways outstrip the buffering capacity of the wetland to oxidize or otherwise lock up these nutrients. Although fairly diverse, bog mats are not known for their buffering capacity, especially since they act as "islands" in an otherwise aquatic system. The shallow depth of Hawkins Pond is also prone to diminishing water clarity and nutrient uptake since shallow water vegetation tends to respond quite rapidly to nutrients by producing excessive growth. The current water quality monitoring program should be enhanced to provide regular measurements of total nitrogen and total phosphorus throughout the year in order to better understand the delicate balance that currently exists between human activity and water quality.

Recommendations

- 1) Encourage compatible prime wetland protection in Holderness for Hale Swamp
- 2) Focus conservation efforts on the undeveloped lots along Beaver Drive and Meadow Drive
- 3) Limit further logging damage to the northeast part of the Hale Swamp prime wetland buffer
- 4) Consider re-routing the snowmobile trail away from the bog mat and open water area in the southern part of Hale Swamp
- 5) Permanently protect the land around the Leroux Wetland Complex in its entirety
- 6) Focus conservation efforts on the forested buffer zone between the Johnson-Perkins and Hawkins Pond Prime Wetlands to allow for unmitigated wildlife passage and to prevent water quality degradation to the eastern side of Hawkins Pond
- 7) Encourage NH Fish & Game to consider a once-in-ten year drawdown of Hawkins Pond to mimic natural cycles and re-oxygenate benthic substrates
- 8) Increase water quality monitoring of nitrogen and phosphorus in Hawkins Pond
- 9) Expand the area of prime wetland designation at Hawkins Pond to include the entire pond and inflow wetlands north of Piper Hill Road
- 10) Expand the number of prime wetlands in Center Harbor to include the following:
 - a. Snake River
 - b. Chamberlain-Reynolds / Heron Cove
 - c. Newman Trust wetland on Center Harbor Neck

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