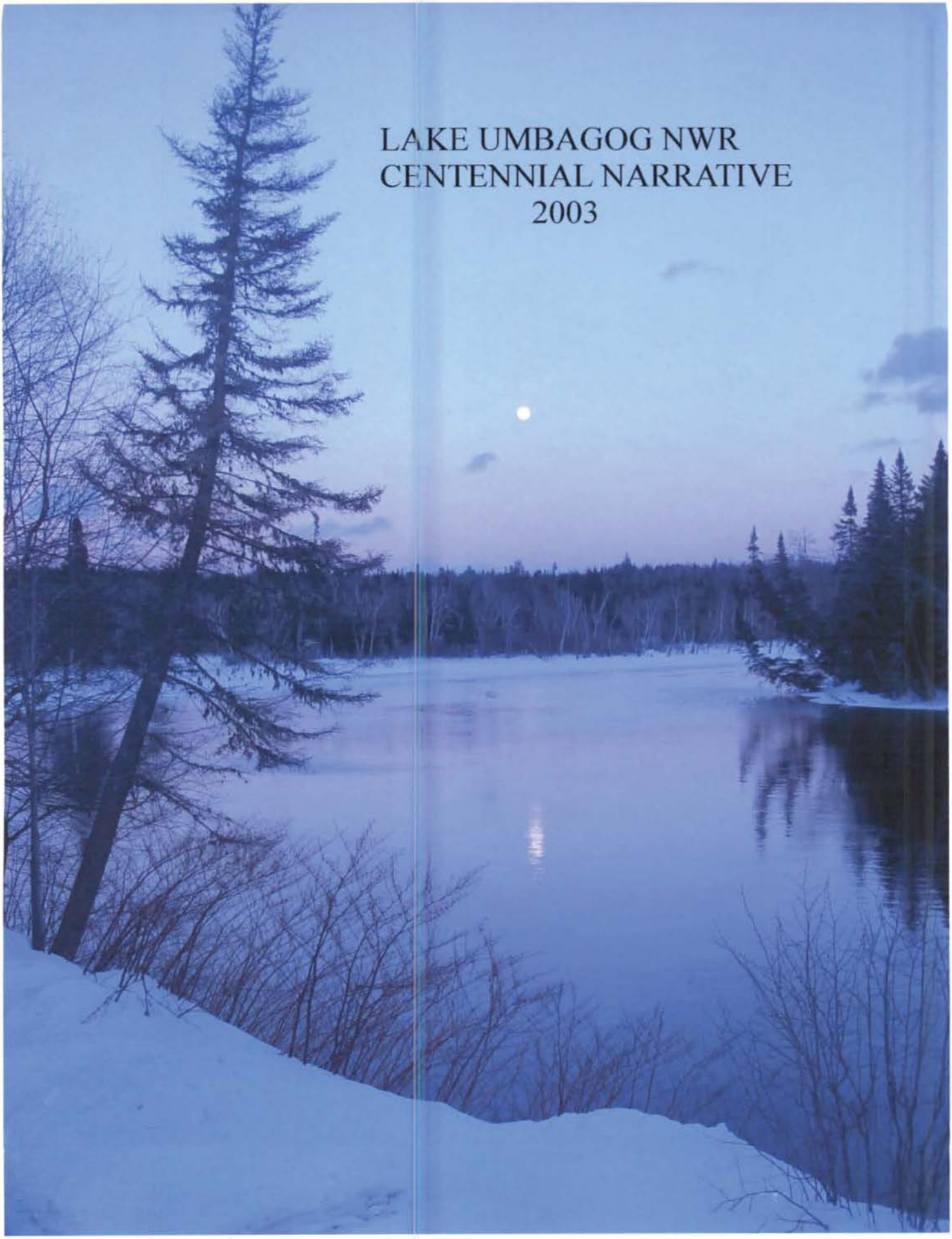


LAKE UMBAGOG NWR
CENTENNIAL NARRATIVE
2003

Centennial Narrative

"Highlighting the Status of
Lake Umbagog National Wildlife Refuge
In the year of the National Wildlife Refuge System Centennial
2003."

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A. Introduction

One hundred years ago, President Theodore Roosevelt set aside tiny Pelican Island to protect pelicans and other birds from market hunters. This act started what is known today as the National Wildlife Refuge System. This system of lands has since grown to over 93 million acres on over 570 National Wildlife Refuges. This narrative is designed to give the reader some general information on the first 11 years of the history of one of those Refuges, Lake Umbagog National Wildlife Refuge.

B. Refuge Administration

1. Personnel

The first Refuge Manager, Steve Breeser, transferred from Tietlin NWR to Lake Umbagog National Wildlife Refuge in 1992 to "get the ball rolling." He remained a one person station until 1994 with the addition of Refuge Operations Specialist Tamara Tisdale. After a long battle with leukemia, Steve Breeser passed away in 1996. The current office located on Rt. 16 was dedicated in his honor and memory.

Paul Casey took the helm as Refuge Manager later that year. Prior to his position as Project Leader at Lake Umbagog NWR, Paul was the Refuge Manager at Stewart B. McKinney NWR in coastal Connecticut. Paul transferred to Connecticut from his position as a Land Acquisition Biologist in the Region 5 Regional Office where he worked on the expansion of Montezuma NWR in New York. Prior to that position he was a Refuge Operations Specialist at the Long Island NWR Complex. Paul entered the Refuge System through the cooperative education program including experiences at the Parker River NWR in Massachusetts and the Great Swamp NWR in New Jersey.

In 1996, Tamara Tisdale left the staff of Lake Umbagog NWR for to get married and pursue a career in the private sector.

Elaine Barnett was hired as this station's first Maintenance Worker in 1998 and became one of only two women holding a similar position in Region 5. Prior to her employment with the USFWS, Elaine worked for the Department of Resources and Economic Development for the State of New Hampshire and the Wilhelm Reich Museum in Rangeley, Maine. Prior to that she worked for the U.S. Postal Service in her hometown of Wilson's Mills, Maine. The post office was in her childhood home that was built by her great-grandfather in 1898.

Dawn Meyers became a SCEP student, biological trainee in 1998. Dawn completed her commitment in 2000, and went on to graduate school and became a SCEP student, biological trainee at Canaan Valley NWR in WV. Dawn married and became Dawn Washington and has recently taken the job of Refuge Biologist at Aroostook NWR.

Laurie Wunder became the Refuge Operations Specialist in 1998. Laurie came to Lake Umbagog from Olympia, Washington where she worked for the Washington Department of Fish

and Wildlife and previously the US Forest Service's Olympic National Forest and the Pacific Northwest Research Station. Laurie transferred to the Wildlife Biologist position at the Refuge in 2002.

Betty Champagne was hired in 1999 as the Administrative Support Specialist. Betty's Federal job experience will total 30 years in January of 2004. Prior to Lake Umbagog, Betty has worked for Rachael Carson NWR in Wells, Maine, Scott Air Force Base in O'Fallon, IL, Plattsburg Air Force Base in Plattsburg, NY, McConnell Air Force Base in Wichita, KS, the Veteran's Administration in Gainsville, FL, NH Police Department Juvenile Division, Portsmouth, Department of the Navy in Vallejo, CA, Kansas State University Agronomy Department and initially, at the age of 19, the Department of the Army at the Pentagon in Washington, DC.

The staff grew further in 2001 with the addition of a Term Biologist, Jennifer Tietjen. Jennifer's professional career has taken her from a Biological Technician at the Great Smokey Mountains National Park to a Biological Technician at Padre Island National Seashore, to biological Technician at Hobe Sound NWR and finally a Wildlife Biologist at Lake Umbagog NWR. Jennifer has recently accepted a job as Refuge Manager of Tern Island for the Remote Pacific Islands National Wildlife Refuge Complex, and will leave the staff in the end of August.

Ian Drew joined the staff in 2002 as the Deputy Refuge Manager. Ian's prior work experience included work as a Refuge Operations Specialist managing the St. Lawrence Wetland and Grassland Management District (a staffed satellite office of Montezuma NWR). Ian managed the Hamilton County Soil and Water Conservation District in NY, worked as an Environmental Scientist for Stearns and Wheeler, LLC an Environmental Engineering Firm in Cazenovia, NY and initially as a Biological Technician for the USFWS New York Field Office in Cortland, NY where he worked for the Partners for Fish and Wildlife Program and split his time between Cortland and Montezuma NWR.

Seasonal Interns have been hired to accomplish various tasks beginning in 1999. Many biological surveys, public use activities and other tasks have been accomplished through hiring seasonal help. We are fortunate to have adequate refuge housing to provide housing and a meager stipend to accommodate this type of seasonal help. Interns hired to date include:

2003
Tiffany Wilson (Geographic Imaging/Biology)
Tara Howe (Public Use)
Katie Ingram (Public Use)
Mare Nazaire (Botany)

2002
Joseph "Guy" Merolle (Wildlife)
Jennifer Pruim (Public Use)
Lisa Bucci (Public Use)
Mare Nazaire (Botany)

2001
Joseph "Guy" Merolle (Botany)
Michael Gregg (Wildlife)
Kathleen Maguire (Public Use)
Mare Nazaire (Botany)

2000
Maria Neal (Public Use)
Melissa Sousa (Biology/Outreach)
Sean Flint (Wildlife)

We have also been fortunate to have a Youth Conservation Corps (YCC) program at Lake Umbagog NWR for the last 3 years. These energetic young people, ranging from age 15-18 and living within a drivable distance, have completed many tasks ranging from maintenance to public use and biology. The following documents the participants and leaders and gives a brief overview of the work accomplished by the YCC:

YCC History

1999
Richard Merrill (Group Leader)
Susan Allen
Joseph Briere
John Gagne
Chris Marcum
Brendan Whittaker

Twelve bird transects were developed over the summer. The work consisted of cutting trails and installing permanent markers to be used by ornithologists to record an accurate account of bird populations. Each transect was chosen because of its particular habitat and was approximately two to three miles long. Transects varied in difficulty, some taking two days to complete, other taking only one-half a day.

2000
Brenin Humphries (Group Leader)
Chris Marcum (Youth Leader)
Krystle Bouchard
Shauna Dineen
Stephen Lyons
Stacey Ruel

A fence was designed to screen the vehicles and heavy equipment at the maintenance yard near the Stranger House. Posts were leveled and set, the framing attached, and eight-foot panels carefully spaced and hammered into place. The process continued for several days through hot

sunny afternoons punctuated by sudden cloudbursts. This assignment called for long hours of dedicated teamwork but paid off with a monumental product of the season's labor – nearly two hundred feet of fence.

2001
Richard Merrill (Group Leader)
Aaron Bourassa
Julie Ruel
Aron Swift
Drew Vaillancourt
Maleia Wentworth

Newly designed pitfall traps were installed this year to replace the first traps installed two summers ago. Each pitfall trap array was strategically placed in seven sites on the Refuge. Each pitfall trap site consisted of two arrays thirty meters apart. The array consisted of three rays beginning two meters from a common point. The ray began with a pitfall trap sixteen inches deep attached to five meters of silt fence and ending with another pitfall at the other end. These were precisely laid out so that comparison studies between areas could be made.

2002
Richard Merrill (Group Leader)
Jennie Burnier
Nicole Cote
Thomas Freedman
Jake Goodreau
Emily Richardson
Sean Sweatt

Over a distance of one-third a mile, a trail was cut out of the forest without damaging any vegetation along the sides. The trail is constructed of a level, packed base of crushed stone, approximately seven feet wide, bordered by pressure-treated two by four lumber. At the end of the trail is an observation platform for viewing waterfowl. The platform is twelve feet wide and twelve feet deep with three large viewing ports. This area can be used by handicapped visitors in wheelchairs or just the casual ornithologist who wants to take photos from the safety and seclusion of a hidden platform.

2003
Kristin Donaldson (Group Leader)
Andrew Hartig
Albert LeClerc
Jessica Smith
Tiffany Sweatt

Three camps acquired and demolished by the Refuge at Little Berlin were cleaned up over several weeks' time. Large articles such as cement blocks and wood pilings were stacked by the

roadside and small refuse such as glass and insulation was dumped into holding tanks on the properties. Foundations were vigorously raked over with topsoil. They were then leveled even with the surrounding areas. It is anticipated that native plant species will recolonize these areas so future generations will not be able to discern these once disturbed areas with pristine ones.

2. Funding

Annual budget appropriations are highly variable, and commensurately affect our staffing levels. **Table 2-1** summarizes budget and staffing levels from 1997 to 2002. Fluctuations reflect funding for special projects, moving costs for new employees, and equipment purchases. Most of the annual budget appropriation is dedicated; very little discretionary funding is available.

Table 2-1. *Refuge staffing levels and budgets: 1992–2003*

Fiscal Year	*Operations*	*Maintenance*	*Full-time Staff*	*Seasonal Staff*
1992	$ 0	$0 (covered by Regional Office)	1	0
1993	$ 58,859	$ 34,000	1	0
1994	$ 82,146	$ 14,000	1.5	0
1995	$113,077	$194,700 (office rehab)	2	0
1996	$117,798	$ 15,500	1	0
1997	$ 96,200	$ 19,100	2	0
1998	$138,900	$ 93,300	2	0
1999	$306,300	$ 73,800	3.6	1
2000	$361,800	$ 91,000	4.4	1
2001	$261,300	$ 33,000	4.4	1
2002	$478,700	$223,000	6	0
2003	$414,788	$354,250	5.9	0

3. Volunteer Program

Lake Umbagog NWR is proud and appreciative if its volunteers. Only a small group of local volunteers have been involved in the operation of the Refuge. A Friends of Lake Umbagog NWR group was formed in 1998 but consists mostly of people from 2-3 hours away. This group takes part in annual bird surveys and other biological events throughout the year. The Friends group contributes to the Wildlife Festival every year and holds a work day the next day. The friends group is now consists of about 200 people.

4. Facilities

The Refuge office is located in Wentworth Location on State Route 16, approximately 5 ½ miles north of the Town of Errol, NH. The building was built in 1996 as the administrative headquarters and a public contact station. In addition to our staff, the office also hosts a Regional Biologist whose duties cover activities throughout USFWS Region 5. Staff currently

exceeds office space and visitor contact area and displays are minimal. A small cabin immediately adjacent to the office serves as flow over office space (particularly for seasonal interns) a GIS lab, a Biology lab and storage.

The office is located on the bank of the Magalloway River, a major tributary to Umbagog Lake. The river is popular for canoeing, kayaking and boating, making the Refuge a popular place to stop. A parking lot, boat launch and picnic table are located at the Refuge office to allow for public access and provide for efficient Refuge operation. Docks are placed in the river during ice-free months to moor Refuge boats. This year we have received money to begin construction of a maintenance shop and are currently obligating money to a design, build construction firm through a GSA contract.

Aside from the office complex, current Refuge facilities include: the "Potter Farm," the "Stranger House," the "Carmen House" complex, the "Coffin House" and the "Costello House." Except for the "Potter Farm", the these facilities exist north of the Refuge Office on Rt. 16 in Wentworth Location, NH and Magalloway, ME. The "Coffin" and "Costello" houses are considered Refuge Quarters and are used to house temporary employees and seasonal interns and/or individuals performing research on the Refuge.

The "Carmen House" complex consists of a larger house that is used as quarters to house volunteers and researchers on a short-term basis. The house could also be used as a dormitory for seasonal interns. The house is attached to a large 2-stall garage that is used as storage for Refuge equipment. A small cabin also exists on the property.

The "Stranger House" has been used as the primary dormitory facility for seasonal interns. The foundation was no longer structurally sound, and the building was moved this Spring to a new foundation constructed about 80 feet west of its original location. Under the same contract, the attached barn that had served as the Refuge storage and maintenance facility was demolished since it was not structurally capable of being moved with the house.

The "Potter Farm" consists of a large farmhouse overlooking Umbagog Lake and a large barn. The fields associated with this property are used as the site of the "Take Me Fishing" event last year and is the property where this time capsule is buried.

5. Equipment

The Refuge currently owns and operates many pieces of equipment.

i. Vehicles
   a. 2003 4wd Chevrolet 2500 HD Pickup
   b. 2002 4wd Chevrolet S-10 Pickup
   c. 2002 4wd Chevrolet 2500 HD Pickup
   d. 2000 4wd Chevrolet 2500 Suburban
   e. 1999 4wd Chevrolet 2500 Suburban
   f. 1992 4wd Chevrolet 2500 Suburban

g. 1987 4wd Camo Army Excess Pickup
h. 1986 4wd Camo Army Excess Pickup

ii. Farm and Heavy Equipment
a. 2002 John Deere 90hp 4wd tractor
b. 2001 John Deere 30hp 4wd tractor
c. 1976 20 ton 4x6 International Harvester Dump Truck (Army Excess)
d. 1979 FWD Snowplow (Army Excess)
e. 1980 SMI Snowblower (Army Excess)
f. 1980 John Deere 410 Backhoe (Army Excess)
g. 1983 International Dump Truck
h. 1972 Huber Grader

iii. Boats and Light Equipment
a. 2002 18 foot Pontoon Boat w/50hp Honda
b. 2001 24 foot Tritoon Boat w/90hp Honda
c. 1999 14 foot aluminum Lund w/15hp Honda
d. 1997 16 foot aluminum Lund w/50hp Honda
e. 1971 14 foot aluminum w/9.9hp Honda
f. 2002 Kawasaki ATV (2)
g. 2002 Ski-doo Tundra Snowmobile(2)

6. Refuge Management Information System projects

Current Refuge operating and maintenance needs are tracked via computer databases linked through the internet to the regional office in Hadley, MA and our headquarters in Washington, DC. RONS stands for "Refuge Operating Needs System" and MMS stands for "Maintenance Management System." We also track real property and personal property through similar databases.

Our current MMS list by priority order includes:
i. Develop Magalloway River fishing and canoe access site
ii. Develop visitor services at the Potter Farm
iii. Replace 1992 Suburban
iv. Replace Refuge Office
v. Replace JD 410 Backhoe
vi. Replace International Harvester Dump Truck
vii. Replace garage/storage building
viii. Replace FWD snowplow
ix. Replace road grader
x. Remove recently purchased seasonal camps
xi. Rehabilitate Potter Farm entrance road
xii. Repair bank stabilization at office
xiii. Replace snowmobile

xiv. Rehabilitate parking lot at office
xv. Replace International dump truck
xvi. Replace 14' boat
xvii. Rehabilitate Stranger house roof
xviii. Rehabilitate Potter Farm building
xix. Replace SMI snowblower
xx. Replace tractors
xxi. Replace boats

Our current RONS list in priority order includes:

i. Hire a Law Enforcement Officer
ii. Hire and Outdoor Recreation Planner
iii. Hire a Maintenance Worker for habitat management
iv. Hire a Biologist
v. Hire a Fire Resource Specialist
vi. Study and Assess Public Use
vii. Develop a canoe interpretative trail
viii. Assess and improve water management
ix. Install a radio system
x. Restore bank and habitat near Chappel Road
xi. Develop visitor services at Potter Farm
xii. Develop habitat maps
xiii. Enhance and manage fisheries
xiv. Initiate forest management
xv. Expand refuge outreach
xvi. Rare and endangered species surveys
xvii. Survey and post refuge boundary
xviii. Refuge contaminant survey
xix. Cultural resources survey

C. Planning

The refuge is currently involved in writing a Comprehensive Conservation Plan (CCP). This plan is a full Environmental Impact Statement that will chart management activities for the next 15 years. Pubic comment was solicited beginning in July of 2002 and a "core group" of State and Federal Biologists, Planners and Managers has been meeting to discuss how Lake Umbagog can provide the best possible fish and wildlife habitat and what types of public use are appropriate on the Refuge. This has been a large challenge that should lead to a Draft CCP by late Fall of this year. We hope to have a finalized CCP by next summer/fall.

D. Partnerships

Lake Umbagog National Wildlife Refuge has been involved in partnerships since its inception and we are proud of the accomplishments this partnership has made. The original Environmental

Assessment published in 1991 states "Protection of the important habitats within the Umbagog area will require cooperative effort involving the participation of the States of New Hampshire and Maine, timber companies, conservation organizations, private landowners, local towns and the Service, using various protection methods to maintain the values of this wetland ecosystem for the future." Many partnerships had already been realized when this was published and there was commitment from the listed parties to help conserve this area.

These partnerships have been realized over a little more than a decade. The State of New Hampshire purchased 1000 acres of shoreline and critical habitat, the State of Maine purchased an easement along the Rapid River of approximately 800 acres, the Society for the Protection of New Hampshire Forests owns Big Island, Audubon Society of New Hampshire has a 200 acre conservation easement and actively researches avian populations as it has done since 1980, the Loon Preservation Committee monitors common loons during the breeding season, Florida Power & Light (and previously Union Power) meets with biologists every winter to set water level plans for the upcoming breeding season and finally, the Service has acquired 17,800 acres in easement and fee title.

Lake Umbagog NWR works closely with the Umbagog Area Chamber of Commerce to put on an annual Umbagog Wildlife Festival that draws 800-1000 people annually into Errol to learn about and celebrate wildlife.

E. Land Acquisition

The Refuge has an active land acquisition program to continue purchasing property within the approved acquisition boundary from willing sellers. A majority of the large land parcels have been purchased and small seasonal and permanent lots are purchased as money and willing sellers allow. The process of purchasing a piece of land can take anywhere from 2-3 months to over 3 years depending on priorities and funding, and can leave a private landowner frustrated. Private conservation groups like the Trust for Public Land and the Society for the Protection of New Hampshire Forests occasionally step in to purchase the property in a timely manner with the intent to sell it to the USFWS for inclusion in the Refuge.

Land acquisition began in on 12 November 1992 with the purchase of the 128-acre Kronk property commonly referred to as the Potter Farm. The Refuge currently owns 17,800 acres.

F. Public Use

In response to public comment, the establishing Environmental Assessment stated that the Refuge "...would allow for appropriate traditional wildlife-oriented public uses, such as wildlife observation and photography, hiking, hunting, and fishing." These uses have been continued even though no formal plans have been approved except for a Hunting Plan.

People coming to the area enjoy its rich diversity and wildlife in many ways. Boating, especially canoeing and kayaking, is immensely popular and is on an increasing trend. Fishing is also popular and on the increase. About ten years ago, a sportsman took it upon his/her self to

introduce small-mouthed bass into Lake Umbagog. The bass flourished and have dominated the fishery. Fishing pressure and techniques have shifted from trolling to casting in shallow waters which is having an impact on wildlife which needs further study to determine the impact of this type of recreation on wildlife, especially nesting waterbirds. Hunting is popular for ruffed grouse, white-tailed deer, moose and waterfowl.

More could be done for the general public in terms of environmental education and interpretation. We hope that we can hire an Outdoor Recreation Planner in the near future to accomplish outreach and education goals. The current visitor contact station is inadequate for educating the public and new facilities are needed. We have established partnerships with the Town of Errol and the Greater Umbagog Area Chamber of Commerce in a plan to provide visitors with a one-stop information shop where they will easily be able to differentiate between state and federal lands and recreation resources and private opportunities. Plans are also in the works to establish a larger visitor's center.

I. Refuge Biological Program

Prior to 1999, most of the biological work carried out on the refuge was done by outside organizations, such as the New Hampshire Fish and Game Department, Audubon Society of New Hampshire, and the Loon Preservation Committee, (a special project of the Audubon Society of New Hampshire). The Audubon Society of New Hampshire began monitoring osprey in the Umbagog area in 1980, and the Loon Preservation Committee began loon monitoring in 1976.

The initial objective of the fledgling refuge biological program was to gather baseline data on refuge wildlife and plant communities. In 1999, the refuge joined a region-wide effort to monitor landbirds, marshbirds, and anurans, following consistent Region 5 protocols. Region 5 was one of the first U.S. Fish and Wildlife Service regions to develop regional biological survey protocols. In 2001, the refuge joined an inter-agency (U.S. Fish and Wildlife Service, National Park Service, U.S. Geological Survey, Patuxent Wildlife Research Center) effort to monitor vernal pool and stream salamanders throughout the northeast, under the auspices of the Northeast Amphibian Research and Monitoring Initiative.

Wildlife surveys were carried out by refuge staff and contractors, with the help of student interns, graduate students, and volunteers.

Landbirds

In 1998, 11 landbird monitoring transects (156 point count stations) were set-up throughout a variety of habitats on the New Hampshire side of the refuge. These transects were surveyed for the first time during the spring of 1999. Transects were surveyed once, annually, between 1999-2003. Landbird surveys were carried out by expert birders Bob Quinn (1999-2000) and George Gravitas (2001-2003), with the assistance of volunteers Sandy and Mark Turner. The majority of transects were located in early-mid seral northern hardwood forest, mixed hardwood-conifer forest, and riparian habitat types. Vegetation surveys were also carried out at each transect point

in order to assess species-habitat relationships. The most frequently detected species (in order of relative abundance) were:

Species	Relative Abundance (% of Total Observations)
Red-eyed vireo	13.9
Ovenbird	7.4
Hermit Thrush	5.1
Magnolia Warbler	4.7
Winter Wren	4.3
Black-capped Chickadee	3.9
White-throated Sparrow	3.4
Black-throated Blue Warbler	3.2
Black-throated Green Warbler	3.2
American Crow	3.0
Northern Parula	2.7
Common Yellowthroat	2.6
Veery	2.4
Yellow-rumped Warbler	2.3
Swainson's Thrush	2.1

Thirty-two of the 44 priority bird species of conservation concern listed by Partners in Flight for Area 28: the eastern spruce-hardwood forest, occur on Lake Umbagog National Wildlife Refuge.

Marshbirds

Three survey routes were established in 1999 (24 points total), located along Leonard Marsh, Harper's and Sweat Meadows, and the Dead Cambridge River. Each route was surveyed 3 times annually between 1999 and 2003, with the assistance of volunteer expert birders from the Audubon Society of New Hampshire (Sandy and Mark Turner, and David Brown). Survey protocol included a passive listening period at each point count station, followed by a tape-recorded broadcast of the calls of the target species. Primary target species included: Virginia rail, sora, yellow rail, pied-billed grebe, common snipe, American bittern, least bittern and common moorhen. Secondary target species included: belted kingfisher, alder flycatcher, marsh wren, sedge wren and black tern. Target species detected on the survey routes included (in rank order):

Relative Abundance (% of Total Observed)
56.1
22.0
9.3
6.9
2.4

1.9
1.3
0.3

The table below lists species in order of abundance, in each of the refuge's major wetland complexes:

Leonard Marsh	**Chewonki Marsh**	**Harper's Meadow**	**Sweat Meadow**	**Dead Cambridge**
Common snipe*	Common snipe*	Common snipe*	Common snipe*	Alder flycatcher*
Virginia rail*	Virginia rail	Virginia rail*	Virginia rail*	Common snipe*
American bittern*	Pied-billed grebe	American bittern*	Alder flycatcher	Virginia rail
Sora	Marsh wren	Belted kingfisher	Sora	American bittern
Pied-billed grebe		Pied-billed grebe	Belted kingfisher	Belted kingfisher
Alder flycatcher		Sora		
		Alder flycatcher		

Species are listed from most frequently observed to lowest (top to bottom).
* = species with highest abundance/complex

Anuran Call Count Survey

Beginning in the spring of 1999 and continuing through 2002, 18 points on 4 transects were surveyed for calling frogs and toads. Leonard Marsh, Harper's Meadow, Sweat Meadows, the Magalloway River, and the Dead Cambridge River were all surveyed. Routes are surveyed 3 times per year, at night. A call count index value was recorded for each species detected as follows:

Index Value	Calling Activity
0	No anurans calling
1	Individuals calling, calls not simultaneous. Individual calls can be counted
2	Calls of individuals can be distinguished, but there is some call overlap

3 Full chorus, calls continuous and overlapping

Species detected in each wetland complex are listed in the table below:

Anuran species observed (1999-2002) during anuran call count surveys; organized by wetland complex.
Species are ordered from most frequently encountered to lowest frequency from top to bottom.

Leonard Marsh	**Chewonki Marsh**	**Harper's Meadow**	**Sweat Meadow**	**Dead Cambridge**	**Magallowway River**
Spring peeper*	Spring peeper*	Spring peeper*	Spring peeper*	Spring peeper*	Spring peeper*
Green frog*	Green frog*	Green frog*	Green frog*	Green frog*	Green frog*
Bullfrog*	Bullfrog*	Bullfrog*	Bullfrog*	American toad*	Mink frog*
Northern leopard frog	Northern leopard frog	American toad	American toad	Gray treefrog	American toad
Wood frog	Wood frog	Gray treefrog	Pickerel frog	Mink frog	Bullfrog
Pickerel frog	Pickerel frog	Pickerel frog	Gray treefrog	Pickerel frog	Wood frog
American toad	American toad	Northern leopard frog	Northern leopard frog	Bullfrog	Pickerel frog
Mink frog	Mink frog	Wood frog	Mink frog		
		Mink frog	Wood frog		

* = species detected at greatest number of survey points/transect

Vernal Pool Survey

This survey , carried out at 4 vernal pools on the refuge, was begun in 2001 and continued annually through 2003. The focus of the survey was on productivity of breeding wood frogs and spotted salamanders. Two of the pools were located close to a road (Route 16), while 2 were

located away from roads. These data, when pooled with data from other refuges and national parks participating in the survey, may allow us to identify effects of roads on vernal pools.

Stream Salamander Survey

The stream salamander survey was also begun in 2001 and continued through 2003. Four small streams were included in this survey. The most commonly detected salamander was the northern two-lined salamander. Additional species detected included: dusky salamander, northern redback salamander, and spring salamander.

Loons

A maximum of 31 loon territorial pairs were recorded around Lake Umbagog and on the Magalloway and Androscoggin Rivers in 2000. Mean number of occupied territories has hovered around 25 in recent years, although there has been an apparent decrease in the number of occupied territories over the last 2-3 years (down to 16 in 2002). Banded birds from Umbagog have been recovered off the coast of Massachusetts (Nantucket, Martha's Vineyard) and Maine (Booth Bay south to Wells). Some birds are on territories by mid-May (particularly on the rivers). Earliest nest initiation dates for Umbagog loons are around May 20th. During most years, the majority of nests are established between June 5- June 20th. Hatching generally occurs between July 5- July 20th. The most productive loon territories (located primarily on the north end of Umbagog), have been on the Magalloway River, and in Harper's and Sweat Meadows. Three dead loons were recovered in 2002, all attributable to lead poisoning from ingestion of lead fishing sinkers. One of the dead loons was found to have antibodies for West Nile virus, although this was not established as the cause of death. Beginning in 2002, the sale of lead sinkers weighing 1/2 ounce or less was prohibited in Maine waters, although possession of lead sinkers was not prohibited. In New Hampshire, the use of lead sinkers weighing 1 ounce or less is prohibited, although the sale of lead sinkers is still permitted.

Blood samples from Lake Umbagog loons have been analyzed for methyl mercury and have been found to contain moderate levels (lower than other reservoirs in the Rangeley Lakes chain). Highest mercury concentrations on the refuge have been found in loons nesting on the Magalloway River and in the southeastern section of Umbagog. Lowest levels of mercury have been found in birds on the Androscoggin River. Mercury levels have been found to be higher in males than in females. The Magalloway River comes out of Lake Aziscohos, which has exceedingly high mercury levels. Aziscohos is only 17 km. upstream of Umbagog.

State of New Hampshire campsites at Black Island Cove and Sunday Cove were closed from May 13- July 1, 2001 in order to protect nesting loons from human disturbance. In 2002, Sunday Cove and Black Island Cove campsites were again closed during the nesting season and the location of campsites in Leonard Pond were moved to minimize disturbance. Campsites at Thurston Cove and Tidswell Point were also closed during this period.

The past two years have seen an apparent decline in the number of nesting loons on Umbagog. In 2002, only 16 territorial pairs of loons were observed on the lake. This represents a 48% decline in the number of pairs recorded in 2000. Cause(s) of the decline have not been established. Comparable declines were not observed on nearby lakes during the same time period. In 2003, 16 loon pairs nested on the lake and 19 territorial pairs were observed. Six loon chicks survived to fledge in 2003.

Osprey

Approximately 23 nest site locations have been recorded for osprey within the refuge acquisition boundary, over the past 20 years. Eight nests have been recorded in Leonard Marsh, 3 in Harper's Meadow, 3 along the Androscoggin River, 3 in the Mt. Pond Drainage, and 2 in the vicinity of Whaleback Ponds. Active nests during the past 5 years have been concentrated in Leonard Marsh, Harper's Meadow, Sweat Meadow, and Whaleback Ponds. The majority of nests have been in white pine, with occasional use of red spruce, larch, balsam fir, or hemlock. Most nest sites have been in snags.

During the past 10 years there has been a gradual decline in the number of active osprey nests in the townships surrounding Lake Umbagog. In 1993-1995 an average of 19 active osprey nests were recorded for this area (25 young fledged/yr). During 2000-2002 the average was 9 active nests and 9.3 young fledged/yr. In 2003, 11 nests appeared to be active, with 10 confirmed young.

In 2002, osprey nests on the refuge represented 21% of the known osprey nest sites in New Hampshire and 13% of the successful osprey nests in New Hampshire.

The majority of nesting trees have had predator guards placed around the bottom of the tree. At least 3 sites on the refuge are without predator guards.

Bald Eagles

Bald eagles were absent from Lake Umbagog between 1949 - 1989. In 1989, a pair of eagles established a nest in a live white pine tree on an island in Leonard Pond on Lake Umbagog, near the confluence of the Magalloway and Androscoggin rivers. This nest was continuously occupied from 1989-1993 and from 1994-2002. From 1990-2002, the nest produced an average of 1.2 chicks/ year. During that 12 year period, nest failures occurred 4 times (i.e. no chicks were fledged), in 1994, 1997, 2000, and 2002. By 1992 the original nest tree had died, but nesting continued in the snag that remained. A mate change apparently occurred in 2001(new male). In 2002, the Leonard Pond nest was dismantled by the eagle pair, but the eagles continued to remain in the vicinity. In 2003, the original banded female eagle failed to return to the nest and 2 unbanded adult eagles were observed hanging around the traditional nest tree, but did not nest.

In 2000, a second eagle pair established a nest on the east side of Lake Umbagog, in a white pine tree on Tidswell Point, approximately 1/2 mile inland from the lake. This nest produced 2 chicks in 2000, 1 chick in 2001, 1 chick in 2002, and 2 chicks in 2003.

It is likely that the Umbagog eagles remain in the general vicinity of Umbagog year-round. The former banded adult male has been confirmed on or near the lake every month of the year except January.
A resident of nearby Wilson's Mills has set up a winter eagle feeding station, and has reported a banded eagle with bands matching the 1994-1999 Leonard Pond male on a number of occasions.

The Leonard Pond eagles generally seem to forage around the north end of the lake, from Errol Dam, to the Rapid River, and southeast to Tyler Cove. The Tidswell Point eagles have been observed primarily around the southern end of the lake.

Breeding Chronology for Leonard Pond Eagles Nest:

Nest building/ maintenance:	March
Onset of incubation:	April 1-17
Hatch of eggs:	May 6-22
Fledging of young:	July 30- Aug. 17
Dispersal of fledglings:	mid-September - early October

Although the lake supports only 2 breeding pairs of eagles, a variable number of immature eagles are also observed from time to time on the lake and rivers.

Access to the Leonard Pond nest is restricted via buoys and signs placed about 500 ft away from the nest. Buoys are left out from shortly after ice-out through the end of October (ice-out on Umbagog averages around May 2nd). Predator guards were installed on both the Leonard Pond and Tidswell nest trees.

In addition to the above region-wide surveys and long-term loon and raptor monitoring efforts, the refuge also initiated a number of refuge-specific surveys during the period 1999-2003, including surveys for terrestrial amphibians and small mammals, mid-sized carnivores, bats, plant community mapping, and waterfowl surveys.

Terrestrial Amphibians, Small Mammals, Bats

In 1999, the refuge began a study comparing different methods of surveying for terrestrial amphibians. The study compared pitfall traps with drift fences, coverboards, funnel traps, and call counts. Three replicates of the study design were set up in each of two habitat types (riparian and northern white cedar swamp). Species composition of the two habitat types (all methods combined) are listed below:

Mammals (1999-2002):

	Relative Abundance (% of Total Captures in each Habitat)	
Species	**Riparian**	**No. White Cedar**
Masked shrew	40.5	40.8
Southern red-backed vole	22.5	22.4
Northern short-tailed shrew	14.4	2.0
Smokey shrew	3.6	-
Pygmy shrew	-	4.1
Meadow jumping mouse	1.8	
Water shrew	-	4.1
Southern bog lemming	.9	8.2
Eastern chipmunk	.9	-
Total # Species	7	6

Amphibians (1999- 2002)

	Relative Abundance (% of Total Captures in each Habitat)	
Species	**Riparian**	**No. White Cedar**
Wood frog (*Rana sylvatica*)	63.0	7.7
Green frog (*Rana clamitans*)	9.6	7.0
Spotted salamander (*Ambystoma maculatum*)	8.0	.7
Blue spotted salamander (*Ambystoma laterale*)	4.6	.7
Mink frog (*Rana septentrionalis*)	3.4	-
American toad (*Bufo americanus*)	2.9	75.4
Spring peeper (*Pseudacris crucifer*)	2.5	3.5

Pickerel frog (*Rana palustris*)	1.7	-
Eastern newt (*Notophthalmus viridescens*)	1.3	1.4
Dusky salamander (*Desmognathus fuscus*)	-	.7
Bullfrog (*Rana catesbeiana*)	.4	-
Total Number of Species	10	8

Mist-netting for bats was carried out during the summers of 2000-2001, with the following results:

Location	**Habitat Type**	**Species Detected**
Magalloway River (Day Flat)	Floodplain forest	Little brown bat
Mile Long (east)	Mixed forest-hardwood forest	Northern long-eared bat Little brown bat Hoary bat
Sturtevant Cove (Umbagog Lake)	Mixed Forest-Hardwood Forest	Little brown bat Hoary bat
Dead Cambridge River	Emergent marsh-Wet meadow-shrub swamp	Little brown bat Northern long-eared bat

Waterfowl

The refuge carried out only a few limited fall surveys for waterfowl during the period 2000-2002. New Hampshire Fish and Game also surveys waterfowl on Lake Umbagog annually, just prior to the opening of duck season. A general survey of refuge birds was carried out in 1999 and 2000 by Bob Quinn. As part of this survey, some observations were recorded of breeding waterfowl on the refuge. The following table lists waterfowl known to breed on the refuge, as well as the more common migrants:

Species	Breeds	Migration Only
Canada goose	X	
Wood duck	X	
American black duck	X	

Mallard	X	
Blue-winged teal	X? (uncommon)	
Green-winged teal	X (uncommon)	
Ring-necked duck	X	
Common goldeneye	X	
Hooded merganser	X	
Common merganser	X	
Snow goose		X
Surf scoter		X
White-winged scoter		X
Bufflehead		X

The most common breeding species seem to be American black ducks, common mergansers, hooded mergansers, and ring-necked ducks. Ducks are most commonly observed in backwaters along the Magalloway and Androscoggin Rivers, Leonard Pond, Leonard Marsh, Harper's Meadow, Sweat Meadow, Chewonki Marsh, outlet of Lake Umbagog, and to a lesser extent in: Tyler Cove and in the vicinity of the outlet of the Dead Cambridge River.

A 1940 waterfowl survey by New Hampshire Fish and Game reported golden eye and common mergansers as common ducks on the Androscoggin River above the Errol dam, and golden-eye, black duck and wood ducks as the most common species in Harper's Meadow. Sweat Meadows was identified as prime black duck habitat. The most common duck reported on the Magalloway River was the golden-eye, followed by common mergansers, wood duck, and black duck. The Magalloway was evaluated as providing relatively poor nesting habitat for black duck, however. The most common ducks on Lake Umbagog in 1940 (in order of abundance) were: golden-eye, black duck, common merganser, wood duck, hooded merganser, and blue-winged teal. All of these species were recorded as nesting species. According to this report, waterfowl were even more abundant during the 1920's. During that time (1920s), local hunting clubs planted wild rice around the lake. In 1940, emergent vegetation around the lake (presumably Leonard Marsh, Chewonki) produced an average of 1 duck per 1.5-2 acres.

The following species were taken by hunters using the 6 refuge duck blinds in 2000:

Species	Total # Taken*
American black duck	9
mallard	6
common merganser	4
ring-necked duck	8
blue-winged teal	2
green-winged teal	4
bufflehead	2
wood duck	4
scaup	4
snipe	1
Canada goose	3
Total	47

*Results from 11 hunters

Bag checks carried out by New Hampshire Fish and Game during the late 1980's indicated hunting success rates of 1.8 birds per hunter on Umbagog. The most commonly taken species were black duck, wood duck and ring-necked duck. A total of 40 hunters were checked on Umbagog in 1986.

Mid-sized Carnivores

Surveys for mid-sized carnivores were carried out during the winters of 2001-2002, using baited camera stations. Species detected included fisher, marten, and bobcat.

Management Issues

Some major management issues facing the refuge at this time include the following:

1. How are current annual lake and river water regimes, which are managed for hydropower production, impacting aquatic ecosystems?

2. How has the introduction of smallmouth bass during the early 1990's affected the lake system?

3. How is the increasing level of public use (particularly by canoeists and kayakers) affecting breeding water birds?

4. Are we really experiencing a continuing decline in our loon and osprey populations, and if so, what is the cause?

The Future

Although the refuge was initially established primarily for the conservation of wetlands and migratory birds, recent land acquisitions have included substantial parcels of upland forest. Future refuge management may place more emphasis on upland migratory bird species. Through the CCP planning process, the Refuge is studying an additional 100,000 acres for potential acquisition. If completed, the Refuge would expand to over 72,000 acres of both upland and wetland resources and become the largest Refuge in the Northern Forest.

The refuge is scheduled to become a northern forest "Land Management and Research Demonstration" (LMRD) refuge beginning in 2004. The emphasis of the LMRD will be on management of forest habitats for wildlife, thus taking the refuge in an entirely new direction.