RARE MARSH BIRD SURVEY

TULLY LAKE FLOOD PROTECTION PROJECT

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Report

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SUMMARY

Marsh bird and whip-poor-will surveys were conducted at Tully Lake Park (U.S. Army Corps of Engineers) in Royalston, Massachusetts, between May and July, 2008. Only two of the seven target marsh bird species were observed: American bittern and Virginia rail. The American bittern is listed as endangered in Massachusetts, and the Virginia rail has no special status. The most abundant wetland habitat type observed at marsh bird survey points was shrub swamp. The mean percent cover of shrub swamp at nine survey points was 49%. The four most common plant species observed at survey points were: meadowsweet, Northern arrow-wood, pickerelweed, and buttonbush. Management strategies that would benefit American bitterns at the Park include: (1) conduct surveys for bitterns every 3-5 years to monitor use of wetlands by foraging and/or nesting birds, (2) prevent degradation of wetland habitats from chemical pollutants, siltation, and eutrophication, (3) monitor and remove non-native, invasive plants found in wetlands, and (4) prevent disturbance to foraging and nesting bitterns.

No whip-poor-wills were observed or heard during the lone survey conducted in June. Dominant habitats at the six whip-poor-will survey points were pine/conifer/mixed forest and open habitats (lawn, fields, gravel pits, and others). The forest canopy at survey points was made up primarily of white pine, Eastern hemlock, maples, and oaks. Breeding whip-poor-wills prefer young forests with little or no underbrush, pitch pine and scrub oak communities, and shrublands. Although whip-poor-wills were observed historically at the Park, the forests do not appear likely to support breeding birds today. Management techniques that could be employed to favor this species are: prescribed burning, mowing of the understory, and creating openings in the tree canopy.

INTRODUCTION

Between May and July, 2008, wetlands at Tully Lake Park (U.S. Army Corps of Engineers), located in Royalston, Massachusetts, were surveyed for selected marsh birds. The objectives of the study were to: (1) conduct surveys of marsh birds and their habitats at Tully Lake Park; (2) document state-listed avian species observed during surveys, (3) conduct surveys and habitat assessments for whip-poor-wills (*Caprimulgus vociferus*), and (4) provide management recommendations for maintaining and protecting rare species and their habitats.

Throughout Massachusetts and other parts of their range, marsh birds are threatened by the loss and degradation of suitable wetland habitats from many factors, including urban sprawl, environmental contaminants, invasive species, and human disturbance. Substantial declines in the breeding populations of several species have occurred in the last half century (Eddleman et al., 1988; Gibbs and Melvin 1992a.b.c.d; Veit and Petersen 1993; Crowley 1994). The following five species are listed as endangered in Massachusetts: pied-billed grebe (*Podilymbus podiceps*), American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), and sedge wren (*Cistothorus platensis)* (http://www.mass.gov/dfwele/dfw/nhesp/species_info/mesa_list/mesa_list.htm). The status of the king rail (*Rallus elegans)* is threatened, and the common moorhen (*Gallinula chloropus*) is a species of special concern.

Marsh bird surveys focused on seven target species identified by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) (Chris Buelow, pers. comm.). The target species were: American bittern, least bittern, pied-billed grebe, common moorhen, king rail, sora (*Porzana carolina*), and Virginia rail (*Rallus limicola*). In addition, observations of sedge wren, marsh wren (*Cistothorus palustris*), and green heron (*Butorides virescens*) were requested.

Concern for whip-poor-will populations in New England has increased in recent years and resulted in a volunteer-driven survey for breeding birds designed by the Northeast Nightjar Survey and the Northeast Coordinated Bird Monitoring Partnership. Breeding whip-poor-wills have suffered from the loss of suitable habitats because of urbanization and the succession of shrublands and young forests to mature forests (Cink 2002; Foss 1994). Other threats to these birds are from vehicle collisions and possibly declining food supplies (Cink 2002). Whip-poor-will survey methodology followed the protocol designed by the Northeast Nightjar Survey, the Northeast Coordinated Bird Monitoring Partnership, and NHESP.

STUDY SITE

Tully Lake Park is operated by the U.S. Army Corps of Engineers and is located primarily in Royalston, Massachusetts, with smaller parcels in Orange and Athol. The park was established in 1947 to control floods in the Millers River watershed. Tully Lake Park encompasses 1,262 acres, and approximately 700 acres are wetlands (http://www.nae.usace.army.mil/recreati/tul/tulnat.htm). The park is located within the Worcester Monadnock Plateau Ecoregion. The soils tend to be acidic (Massachusetts Division of Fisheries and Wildlife, 2001). White pine, hemlock, and mixed hardwoods (maple, cherry, oak, and birch) comprise the major species of the forest (Trustees of Reservations 2005).

Wetlands at Tully Lake Park include shrub swamps, marshes, vernal pools, wooded swamp, lakes, ponds, and streams. Marsh bird surveys were conducted in the shrub swamp and emergent marsh situated adjacent to the East Branch of the Tully River between Rte. 68 to the north, and ending at the shrub swamp and deep marsh associated with the northern end of Long Pond. The survey area for whip-poor-wills was made up of forests and shrub upland scattered throughout the park.

METHODS

Marsh Bird Surveys

In April and May, wetland habitats at Tully Lake Park were assessed to determine their suitability for marsh bird surveys. Marsh birds use a variety of wetland types, including ponds and lakes, shallow and deep marsh, wet meadow, shrub swamp, and peat land. Wetlands were first identified and evaluated using aerial photography (Google Earth 2008). Wetland selection was based on type (marsh, shrub swamp, open water, floating plant) and location (small and isolated wetlands were not included). Wetland habitat types were then verified on foot and by boat. Survey points were established a minimum of 200 m apart. Survey points consisted of a circle with a diameter of 200 meters. All birds heard or seen within this area were recorded on data sheets designed specifically for marsh birds that were used in previous studies (Serrentino and Strules 2003a.; Long Point Bird Observatory and Environment Canada 1997).

Survey methods followed those provided by Chris Buelow, NHESP biologist (pers. comm.):

- The latitude and longitude of each survey point was determined with a GPS unit (Garmin GPS 12 XL) and delineated on USGS topographical maps and aerial photographs from Google Earth (2008).
- Weather conditions were recorded during surveys: air temperature, cloud cover, presence or absence of rain or fog, and wind speed. Surveys were not conducted under rainy conditions and/or when wind speeds were greater than 20-30 kph.
- Surveys occurred between the first of May and 10th of July.
- Surveys occurred in the morning between 0.5 hours before sunrise to three hours after sunrise.
- A compact disc (CD), provided by NHESP, with recordings of the vocalizations of seven marsh bird species was used: American bittern, least bittern, pied-billed grebe, common moorhen, king rail, sora, and Virginia rail. This recording was played at each survey point and consisted of a passive listening period of five minutes, followed by 30 seconds of playback of prerecorded vocalizations for each species. The playback ended with a one minute listening period.
- The entire recording was downloaded onto an Apple iPod Nano (Model no. A1236) and broadcast on a Yamaha USB powered speaker (Model no. NX-U10). A portable CD player (Sony Walkman Model no. D-E220) was used as a backup for the iPod Nano in the field. A digital sound level meter (RadioShack Model No. 33-2055) was used to verify that the sound levels of the marsh bird recordings were broadcast at a minimum level of 80-90 dB at one meter, as required by NHESP biologists.
- When a marsh bird was heard, the call type was recorded, the habitat where the bird was heard or seen was described, and its behavior was noted.
- The location of all target species observations were identified by GPS lat-long coordinates on USGS topographical maps (Terrain Navigator 2002) and Google Earth (2008).

Marsh Bird Habitat Assessments

At each marsh bird survey point, habitat assessments were conducted to identify the general features of each point (e.g., wetland permanency or hydroperiod, land use, human influences, general wetland type, etc.), and to determine the habitat preferences of marsh birds at Tully Lake Park. The protocol described in Long Point Bird Observatory and Environment Canada (1997) was followed with minor changes (Serrentino and Strules 2003a.).

The habitat assessment included a general description of the survey point. Wetland permanency or hydroperiod was divided into three categories: permanently flooded, semi-permanently flooded, and seasonally flooded. Land use type was described for the area adjacent to the sampling point. Human influences were identified that may have impacted marsh birds, such as stormwater or agricultural runoff, residential areas, cropland, and others.

The second part of the assessment involved identifying and quantifying the major wetland habitat types at each point. The percent cover of five types were visually estimated: (1) herbaceous emergent vegetation, (2) open water/floating plants, (3) trees (defined as greater than 5.0 m (16.5 ft) in height), (4) shrubs and saplings (defined as less than 5.0 m in height), and

(5) the amount of exposed mud, sand, or rock. In addition, the amount of floating plant cover observed in open water areas was described qualitatively as none, slight, moderate, dense, or unknown.

Because most marsh birds are associated with particular wetland plant species or communities, I identified up to eight common plants (woody, emergent, and floating plants) at each point using a visual estimation of cover. Only species that accounted for more than 5% of wetland cover were included. Observations of non-native, invasive plants were also included.

Whip-Poor-Will Surveys

Suitable habitats for whip-poor-will surveys were determined from historical observations and using aerial photographs (Google Earth 2008). Suitable habitats for whip-poor-wills include dry mixed or deciduous forest located adjacent to open areas, and with little or no ground cover (Cink 2002).

Whip-poor-will survey protocol and habitat assessments followed the methods recommended by the Northeast Nightjar Survey and Northeast Coordinated Bird Monitoring Partnership in cooperation with NHESP and the Massachusetts Audubon Society, as follows:

- Surveys were conducted when the moon was at least 50% illuminated and above the horizon. These conditions occurred between two periods: May 15th and 28th and June 11th and 26th. A minimum of one survey was required between May 15th and June 26th.
- Survey points were located at least 0.5 mi apart and the latitude and longitude of each point was determined with a GPS unit. Locations of survey points were identified by GPS lat-long coordinates on USGS topographical maps (MaptechTerrain Navigator 2002) and aerial photographs from Google Earth (2008).
- Surveys began at least 15 min after sunset and ended no later than 15 min before sunrise.
- Appropriate weather conditions for surveys were the following: moon not obscured by clouds, precipitation light or non-existent, and wind speeds less than or equal to eight miles per hour.
- At each point the noise level was recorded. Observers listened for six minutes and recorded the number of different birds calling.
- The locations of all whip-poor-will observations (if any) were recorded on USGS topographical maps and aerial photographs.

Whip-Poor-Will Habitat Assessments

Whip-poor-will habitat assessments were described on the "*Massachusetts Whip-poor-will Route Description Form.* At each point, the following was recorded: a general description of the survey point, the number of houses visible, and the dominant three habitat types. Habitat types were separated into six categories: (1) pine/conifer/mixed forest, (2) developed (urban or residential area), (3) water, (4) hardwood forest, (5) open (fields, lawn, gravel pits), and (6) marsh or wetland.

Additional information was collected at each point, as requested by NHESP biologists (C. Buelow, pers. comm.), to provide managers with information on specific habitat parameters. At

each point, canopy cover was visually estimated and dominant tree species identified. Species composition of the shrub layer and ground cover were determined.

RESULTS

Marsh Bird Surveys

From studies of aerial photographs of Tully Lake Park (Google Earth 2008) and field verification of wetland habitat types on foot and by boat, I determined that the most suitable areas for marsh bird surveys were the extensive wetlands located between where the East Branch of the Tully River flows under Rte. 68, and the north end of Long Pond. This area (adjacent to the East Branch of the Tully River) was made up primarily of shrub swamp with smaller areas of deep and shallow marsh, and open water. Wetlands between the southern end of Long Pond and the Tully River boat launch off Doane Hill Road were not included in the survey because the habitat was not appropriate for marsh birds. Wetlands in this area were dominated by tall shrubs (greater than 1.0-2.0 m), trees, and snags of various sizes.

Nine survey points were established in the shrub and mixed shrub/emergent wetlands described above (Figures 1 and 2). Three points were surveyed on foot (EB1-EB3) and six by boat (LP1-LP6). Foot surveys were used when it was difficult to access an area by boat. Table 1 contains the latitude and longitude for the nine marsh bird survey points.

Of the ten target species, two were observed during surveys: American bittern and Virginia rail (Tables 2 and 3). The American bittern was observed on June 1st, at 0722 at survey point LP5, located adjacent to the East Branch of the Tully River (Bittern "B", Figures 3 and 4). The bird was first seen as it flew in to the survey point from the south and landed in a patch of mixed shrub/emergent wetland about 45 m southwest of the midpoint of LP5. The bird, a male, started calling (using the "pumping call") before we started the broadcast and continued calling in response to most of the marsh bird calls on the CD, including its own. The male continued calling off and on for approximately 30 minutes. Other than a short flight of approximately 8-10 m, it did not leave the general area where it landed. The habitat where the male was observed was dominated by shrubs with small amounts of emergents. Most of the shrubs were approximately 0.75 m tall, and included the following: meadowsweet (*Spiraea alba* var. *latifolia*), leatherleaf (*Chamaedaphne calyculata*), and Northern arrow-wood (*Viburnum dentatum* var. *lucidum*) (Figure 5). The dominant emergent species was tussock sedge (*Carex stricta*). We never heard or saw another American bittern after this observation. A "*Rare Marsh Bird Observation Form*" was filled out and sent to NHESP biologists after the sighting.

Earlier in the spring, an American bittern was observed on April 24th at 3:40 pm by another biologist working at Tully Lake Park (Bittern "A", Figures 3 and 4; S. Johnson, pers. comm.). These two sightings were approximately 600 m apart. The April sighting occurred at an abandoned beaver pond dominated by grasses and sedges, and with scattered pine and hemlock snags. There were no other bittern sightings at the Park for the remainder of the field season.

Virginia rails were observed during three surveys, in May, June, and July (Tables 2 and 3). On May 14th, one Virginia rail was seen and heard at point LP6 (Table 3). A bird was heard but not seen at this same point on June 1st. The last observations were on July 6th when two Virginia

rails were heard only at point LP5. I assumed that these two birds were probably a pair, because of the time of year and the observations of single birds at the adjacent point during previous surveys. The rails always responded to recordings with the "grunt" call, which is given by both sexes. The grunt call is the most frequently heard of the four major Virginia rail vocalizations (Courtney 1995). The habitat surrounding points LP5 and LP6 was composed of shrub-dominated wetland interspersed with sedges, grasses, and small pools (Figures 5 and 6).

Original data sheets from the three surveys that were conducted at Tully Lake Park for marsh birds are contained in Appendix A: Marsh Bird Data Forms and Marsh Bird Mapping Forms.

Marsh Bird Habitat Assessments

The most abundant wetland habitat type, based on areal coverage, observed at the nine marsh bird survey points was shrub and sapling (Table 4). Table 4 contains the percent cover of the five wetland habitat types recorded at each survey point. The mean percent cover for each habitat type was calculated to provide a more meaningful comparison among habitat types. The mean percent cover of shrub wetland was 49.4%. The amount of shrub cover at survey points varied from 25% at EB1 to 75% at EB3. Photographs of the wetland habitats occurring at several survey points are included in Figures 7, 8, and 9.

The emergent and open water/floating plant cover types occurred at almost equal areal coverage: 22.2% and 21.7% respectively. At the nine survey points, emergent cover varied from 15% to 35%, and floating plant cover ranged from 5% to 50%. Point EB1 contained the highest amount of emergent plant cover (35%). The highest amount of floating plant cover was observed at points LP1 and LP2, located at the north end of Long Pond. The percent cover of trees and snags was low or non-existent at most points. The mean percent cover was only 6.7%, with the highest amount of trees and/or snag cover recorded at EB2 (20%). I did not observe any areas of mud, sand, or rock. However, this habitat type may have been missed because of the large size of the points and the presence of dense stands of vegetation at most points.

The amount of floating plant cover observed in open water zones ranged from slight to moderate at seven of the nine points (Table 5). Point LP1, located at the northeast end of Long Pond, contained the densest amount of floating plant cover. The most commonly observed species were yellow pond lily (*Nuphar variegata)*, white waterlily (*Nymphaea odorata*), and pickerelweed (*Pontedaria cordata*).

Wetland permanency varied at most points from seasonal at the upland/wetland edge, to permanent where areas of open water occurred. Open water areas consisted of small pools, stream or river channels, and/or portions of Long Pond. At most survey points it was difficult to determine wetland permanency with a high degree of accuracy because areas of different water regimes were usually present within one point.

The most frequently observed wetland plants at the nine survey points, based on areal coverage, were meadowsweet (*Spiraea alba* var. *latifolia*), Northern arrow-wood (*Viburnum dentatum* var. *lucidum*), and buttonbush (*Cephalanthus occidentalis*) (Table 6). However, because I did not attempt to identify all the grasses and sedges to species at the nine survey points, these plants are included as a group in Table 6. When this group was identified to species, which occurred

at several points (EB2, EB3, LP2, LP5, and LP6), the most dominant were tussock sedge (*Carex stricta*), Canada bluejoint (*Calamagrostis canadensis*), and rattlesnake-grass (*Glyceria canadensis*). At other survey points, it was difficult to separate the areal coverage of individual species of grasses and sedges from larger and more robust plants (e.g., shrubs, ferns, tall flowering herbaceous plants) because rather than growing in monotypic stands, these emergents were intermixed with other plants.

Glossy buckthorn (*Frangula alnus*) was the most commonly observed invasive plant (Table 6). This plant was observed at points EB1 and EB2, growing adjacent to the river and trails, and at the upland/wetland edge. Although it occurred as a dominant species at only two points, it was also observed in smaller amounts at EB3 (with *Berberis* sp.), and at LP3 and LP5.

Maps of each survey point were produced to show the type and extent of major wetland habitats and features, e.g., trails, stream channels, large trees, etc. (Tully Lake Habitat Maps, Appendix B). Portions of some points (EB1-EB3, LP1, LP2, and LP6) contained varying amounts of upland or forested wetland habitat that was not used by marsh birds. This occurred because it was not always possible to situate the center of each point to maximize the amount of emergent or shrub wetland within the circle. Photographs of the wetland habitats present at the nine survey points are included in the compact disc. Appendix B contains the original Habitat Description Forms and Tully Lake Habitat Maps for the nine marsh bird survey points.

Whip-Poor-Will Surveys

The area surrounding the Tully Lake Park Office (adjacent to Rte. 32) was identified as supporting a whip-poor-will population between the 1950s and 1970s (Dave Small, President, Athol Bird and Nature Club, pers. comm.). Because of this information, three survey points were established at and within 1.0 mi of the Tully Lake Park Office (Figure 10). Whip survey point 6 was located at the Park Office. Three additional points were set up north of Long Pond in upland forest and shrublands, an area identified as possibly supporting breeding whip-poor-wills (D. Small, pers. comm.). Of the six survey points, two were situated adjacent to hiking trails and four were next to roadways. Table 7 contains the latitude and longitude for the six whip-poor-will survey points.

One whip-poor-will survey was conducted on June 13th with two observers (P. Serrentino and A. Haro). The survey began at 20:40 and ended at 22:37, and occurred when the moon was not obscured by clouds. Weather conditions were appropriate for the entire survey (little or no wind, clear or mostly clear skies, and little or no noise). No birds were seen or heard at the six survey points or when traveling to points located on trails or roadways. No survey was conducted in May because weather conditions were never suitable when observers were available.

Given the excellent weather conditions and generally quiet night, it appeared that there were no whip-poor-wills in the area during the June survey. No other night-calling birds, e.g., rails or owls, were heard or seen. The original data sheets from the June whip-poor-will survey are included in Appendix C: Massachusetts Whip-poor-will Survey Forms.

Whip-Poor-Will Habitat Assessments

Of the three dominant habitats that were observed at each whip-poor-will survey point, pine/conifer/ mixed forest was present at the six points (Table 8). Open habitat (lawn, fields, gravel pits) occurred at five points; hardwood forest, water, and marsh/wetland at two points each, and developed habitat occurred at one point. Houses were visible at two of the six points. Appendix D contains a copy of the Massachusetts Whip-poor-will Route Description Form.

At the six survey points, white pine (*Pinus strobus*) was the most commonly observed species in the forest canopy (Appendix E: Habitat Information for the June Whip-Poor-Will Survey, 2008). Other tree species frequently found at survey points were Eastern hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), oak (*Quercus* spp.), and black cherry (*Prunus serotina*).

At five of the six survey points, the areal coverage associated with the shrub story was highly variable, both within a survey point and among survey points. Shrub species observed at WHIP1, and WHIP3-WHIP6 were barberry (*Berberis* sp.), blackberry (*Rubus* sp.), and saplings of Eastern hemlock, oak, maple, and white pine. Shrub areal coverage at WHIP2 (established under the power lines; Figure 10) was 80%. Common species in the shrub story at WHIP2 were white pine saplings and common juniper (*Juniperus communis*), with lesser amounts of meadowsweet and glossy buckthorn. No trees were present at this survey point.

Ground cover species areal coverage and composition varied from none under dense stands of hemlock or pine to 100% at WHIP2. Commonly encountered ground cover species at the six points were mosses, hay-scented fern (*Dennstaedtia punctilobula*), bracken fern (*Pteridium aquilinum* var. *latiusculum*), unidentified fern species, partridgeberry (*Mitchella repens*), blackberry, lowbush blueberry (*Vaccinium angustifolium*), and Canada mayflower (*Maianthemum canadense*).

DISCUSSION

Marsh Bird Surveys

This discussion will focus primarily on the American bittern, because of its status as an endangered species in Massachusetts. Information on Virginia rails will be included when appropriate. The following eight species were not observed at Tully Lake Park in 2008: least bittern, pied-billed grebe, common moorhen, king rail, sora, sedge wren, marsh wren, and green heron.

a. Population Status of Virginia Rails and American Bitterns in Massachusetts and the Region

Of the two species of marsh birds observed at Tully Lake Park, the Virginia rail has no special status in any New England state or New York (Table 9). This rail's Massachusetts state status according to NatureServe (version 7.0: http://www.natureserve.org/explorer/) is S4B, S4N: "**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors." This status refers to both the breeding and non-breeding populations in the state. In a three-year study of marsh birds conducted throughout Massachusetts from 1991-1993 (Crowley 1994), Virginia rails were one of the most commonly observed species. In

the Deerfield River watershed between 1999 and 2001, Virginia rails occurred at 46% of wetlands surveyed, more than any other marsh bird species detected during the study (Serrentino and Strules 2003b.).

During the first two years of the on-going Massachusetts Breeding Bird Atlas (Breeding Bird Atlas Explorer (online resource) 2008), Virginia rails were confirmed as breeding in 18 blocks. In the first Atlas, conducted from 1976 to 1980, this rail was confirmed in 31 blocks (Veit and Petersen 1993). Using the BBA data and the results of other studies, the population of breeding Virginia rails in Massachusetts appears stable. When the current Atlas is complete in 2011, a more reliable assessment of their breeding status will be possible.

The American bittern is listed as Endangered in Massachusetts, Rhode Island, and Connecticut, and has no special status in New Hampshire, Vermont, and Maine (Table 9). In New York, this bittern is designated a Species of Special Concern. NatureServe has assigned the breeding population of the American bittern in Massachusetts a rank of S2B: "**Imperiled**—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state" (version 7.0: http://www.natureserve.org/explorer/).

The results of recent studies of marsh birds conducted by Crowley (1994) and Serrentino and Strules (2003b.), show that American bitterns remain uncommon in large areas of their breeding range in Massachusetts. Bitterns were present in 24 of 177 (14%) wetlands surveyed state-wide (Crowley 1994). In the Deerfield River watershed, American bitterns were found in seven of 24 (29%) wetlands surveyed. In the first Massachusetts BBA, American bitterns were confirmed breeders in 19 blocks (Veit and Petersen 1993). During the current BBA, with preliminary results from 2007 and 2008, this bittern is confirmed in only four blocks, with most observations from the central and western part of the state (Breeding Bird Atlas Explorer (online resource) 2008).

b. Breeding Ecology

There were two sightings of American bitterns at Tully Lake Park: an unsexed bird on April 24th (Bittern A), and a male on June 1st (Bittern B). Bitterns usually arrive at their breeding grounds in mid-April (Veit and Petersen 1993), therefore, the April sighting may have been a newly-arrived bird. The June observation was of a male who was first seen and then responded to the playback of calls on the compact disc. The male's call seems to serve two functions: (1) to defend its territory, and (2) to advertise for a mate (Gibbs et al. 1992). Bitterns usually call more frequently early in the breeding season (e.g., May and June) and as a result are easier to detect during this time (Manci and Rusch 1988; Gibbs et al. 1992).

American bitterns nest in dense emergent vegetation, including cattails, bulrushes, or reeds. The female builds the nest (Bent 1926). The nest may be built over water on a deep platform of emergent vegetation or on the ground (Bent 1926; Baicich and Harrison 1997). Suitable areas of nesting habitat at Tully Lake Park were dense patches of sedges, cattails (*Typha latifolia*), and grasses, located primarily in the survey area.

There were only two observations of American bitterns at Tully Lake Park between April and early August. Because of the lack of additional sightings, it is unlikely that bitterns were breeding at the Park in 2008. Bitterns may have been using one of the wetland complexes located outside Tully Lake Park for nesting, and were foraging at the extensive wetlands within the Park.

Peak numbers of Virginia rails are usually observed in Massachusetts in late April, and egg dates range from May 12th to July 18th (Veit and Petersen 1993). This rail nests in a wide range of emergent vegetation, including cattails, bulrush, and grasses (Bent 1926; Courtney 1995). Nests are well-hidden and may be placed on the ground or built up over mud or water (Courtney 1995; Baicich and Harrison 1997). Virginia rail young are precocial. Rails were heard and seen at the survey area between June and July, and two birds were heard on July 6th. With suitable nesting habitat available at the study site, it is likely that at least one pair of Virginia rails was breeding at Tully Lake Park.

c. Habitat Use and Wetland Area

The American bittern uses a variety of wetland habitat types during the breeding season, based on the availability of nesting habitat, adequate food supplies, and possibly lack of human disturbance. Important habitat parameters in Crowley's (1994) state-wide study were wetlands with their greatest area made up of cattails and scrub vegetation. In Maine, bitterns were observed more frequently in large areas of emergents (sedges and cattails), and aquatic bed (Gibbs and Melvin 1990). The amount of edge between vegetated habitats and open water or aquatic bed was also important to bitterns. The American bittern observed at Tully Lake Park in June (Bittern B) was located in an extensive area of shrub wetland, and the habitat in the April sighting (Bittern A) was described as "an abandoned beaver pond"(S. Johnson, pers. comm.: NHESP Rare Species Sighting). The wetlands located between the north end of Long Pond and survey point EB1 contained a mosaic of different vegetation types and features in addition to shrub swamp: sedges and grasses, cattails, small areas of open water with or without floating plants, and stream channels of various widths and lengths. Figure 11 contains the range of wetland habitats available to American bitterns in the survey area and at two smaller wetlands located nearby.

The overall size of wetlands is important to American bitterns in some studies. In Maine, bitterns were more apt to be found in larger wetlands than small, especially those greater than 5.0 ha (Gibbs and Melvin 1990). However, bitterns preferred wetlands greater than 10 ha in a Massachusetts study (Crowley 1994). In the Deerfield River watershed (Massachusetts), bitterns were observed in wetlands between 3.0 and 13.5 ha with five of the seven wetlands in the 6.0 – 9.5 ha range. Gibbs and Melvin (1992b.) estimate that wetlands in the 2.5 – 5.0 ha range are the minimum size necessary to support a pair of breeding bitterns. The wetlands at Tully Lake Park where marsh bird surveys occurred contained approximately 50 ha of suitable, contiguous habitat for American bitterns.

American bitterns may be using the wetlands at Tully Lake Park for foraging, and are nesting in nearby wetlands (S. Melvin, NHESP, pers. comm.). I estimated the types and sizes of several wetlands located within 3.5 km of the Park, using MassGIS orthophotos taken in 2005 and Maptech Terrain Navigator (2002). Three wetland complexes located in Royalston (e.g., the

Little Pond area, Royalston State Forest, and Lawrence Brook; Figure 12) each contain between 5.0 and 22.0 ha of suitable habitat for nesting and foraging bitterns (primarily emergent wetland, with shrub wetland and open water/floating plants). In May, 2003, an American bittern was heard calling from wetlands located upstream of Coddings Meadow on Lawrence Brook (Trustees of Reservations 2005). The extensive shrub swamp and riverine habitats located north of Long Pond contain prime foraging areas for bitterns. Their diet is quite variable, and consists of insects, amphibians, small fish and mammals, and crayfish (Gibbs et al. 1992).

Virginia rails are characterized as habitat generalists, and are found in marshes dominated by robust emergents, with shallow pools and mudflats used for foraging on invertebrates (Courtney 1995). In studies conducted in Maine and Massachusetts, Virginia rails were more tolerant of shrub vegetation than other marsh bird species (Gibbs and Melvin 1990; Crowley 1994). These results may help explain why this rail is often found in wetlands with large areas of shrub wetland, which occurred at Tully Lake Park.

d. Management Recommendations

Management strategies that would benefit American bitterns at Tully Lake Park include the following:

1. Conduct surveys for bitterns every 3-5 years to monitor use of wetlands by foraging and/or nesting birds (Gibbs and Melvin 1992b.). To accurately assess the current population of bitterns at Tully Lake Park, conducting surveys for an additional one to two years would provide managers with more reliable baseline data on local marsh bird populations (Gibbs and Melvin 1992b.).
2. Prevent degradation of wetland habitats from chemical pollutants, siltation, and eutrophication (Day and Wilson 1978; Gibbs et al. 1992).
3. Monitor and remove non-native, invasive plants found in wetlands (Gibbs et al. 1992). Patches of glossy buckthorn were observed at several survey points. Although this plant's effect on bitterns is unknown, removing infestations now before they take over larger areas is strongly recommended.
4. Prevent disturbance to foraging and nesting bitterns (Gibbs and Melvin 1992b.). The Eurasian bittern (*Botaurus stellaris*) may be negatively affected by recreational boating at foraging sites in Great Britain (Day and Wilson 1978). American bitterns in Massachusetts avoided wetlands that were adjacent to developed areas (Crowley 1994).

Tully Lake Park is a popular destination for recreational boaters, hikers, and nature enthusiasts (Trustees of the Reservations 2005; P. Serrentino, pers. obs.). Without more information on American bittern use of the wetlands at the Park, it will be impossible to determine what, if any, negative effects are occurring from recreational activities. Currently, regulations at the Park require that dogs be on a leash. Leashing dogs decreases disturbance to marsh birds and wildlife in general. However, during several visits to the park, dogs were observed off-leash, so enforcement may be an issue. Erecting signs in appropriate areas, e.g., boat ramps, that educate visitors about marsh birds and their status in Massachusetts may help to prevent disturbance to nesting and foraging birds. Naturalist-led walks and lectures would also provide people with information on these secretive birds.

Whip-Poor-Will Surveys

Whip-poor-wills currently have no special status in Massachusetts, and their NatureServe Global Rank is G5 (Table 9). However, this species has a State Rarity Rank of S4, which is defined as "apparently secure: uncommon but not rare; some cause for long term concern due to declines or other factors" (Commonwealth of Massachusetts 2006). Whip-poor-wills are a Species of Special Concern in Connecticut, New Hampshire, Vermont, and New York, and have no special status in Rhode Island and Maine (Table 9). Veit and Petersen (1993) described the whip-poor-will as a "locally common breeder, but decreasing". Strongholds for the species remain outer Cape Cod, the islands of Nantucket and Martha's Vineyard, two sites in Plymouth, and the Montague Plains Wildlife Management Area (Veit and Petersen 1993; C. Buelow, pers. comm.). Since the 1960s whip-poor-wills have disappeared from highly developed areas and most of Berkshire County.

In addition to the loss of breeding habitat from urbanization, the decline in breeding whip-poor-wills in Massachusetts and the region is linked to the succession of shrublands and early successional forest to mature forest (Cink 2002; Foss 1994; Garlapow 2007). Because this species nests on the ground, an increase in mammalian nest predators, such as raccoons, skunks, and cats, may be contributing to their decline in some areas (Cink 2002). Concerns have also been raised about decreases in their primary food supply, e.g., moths, especially saturniid moths; however, evidence to support this hypothesis is lacking (Cink 2002).

The habitats used by breeding whip-poor-wills in Massachusetts and other parts of New England are young forest with little or no underbrush, pitch pine and scrub oak communities, and shrub lands (Veit and Petersen 1993; Foss 1994; Cink 2002). Equally important to breeding birds is the presence of open habitats adjacent to nesting sites that are used as foraging areas (e.g., powerline rights of way, burned areas, fields, and others). Whip-poor-wills favor habitats that have been disturbed by fire, insect infestations, and tree harvesting (Cink 2002; Garlapow 2007).

The forests at five of the six survey points at Tully Lake Park would not be characterized as early successional or young forests with uniformly dry soils and little or no underbrush. Canopy closure at survey points ranged from 85 – 100%, and some sites had streams or wetlands within or near the point. The amount of vegetative cover in the shrub story and on the ground varied from none to 100%. The forests at whip-poor-will survey points appeared to match the successional white pine forest community type described in Swain and Kearsley (2000).
The most suitable site for breeding whip-poor-wills at Tully Lake Park was most likely WHIP2, located at the powerline right of way; however, no birds were seen or heard at this point during the June survey. This point was located adjacent to the extensive shrub and emergent wetlands associated with the Tully River, and could have provided suitable foraging areas for whip-poor-wills. The five forested survey points were also situated next to open areas (e.g., grass and disturbed parking areas, gardens and lawns associated with houses, and recently cut areas near the park headquarters). These open areas may not have been large enough for foraging whip-poor-wills or lacked other important attributes.

I recommend conducting surveys for breeding whip-poor-wills for at least one more year to make sure that birds were not missed at Tully Lake Park. Adding additional survey points

would make sense if suitable whip-poor-will habitat was missed. Management techniques that favor this species are prescribed burning, mowing of the understory, and creating openings in the tree canopy (Garlapow 2007).

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Figure 1: Marsh Bird Survey Points at Tully Lake Park (Topographical Map), 2008. Points EB1-EB3 were surveyed on foot; points LP1-LP6 were surveyed by boat. USGS map is from MaptechTerrain Navigator (2002); Winchendon Quad (Royalston, Massachusetts).

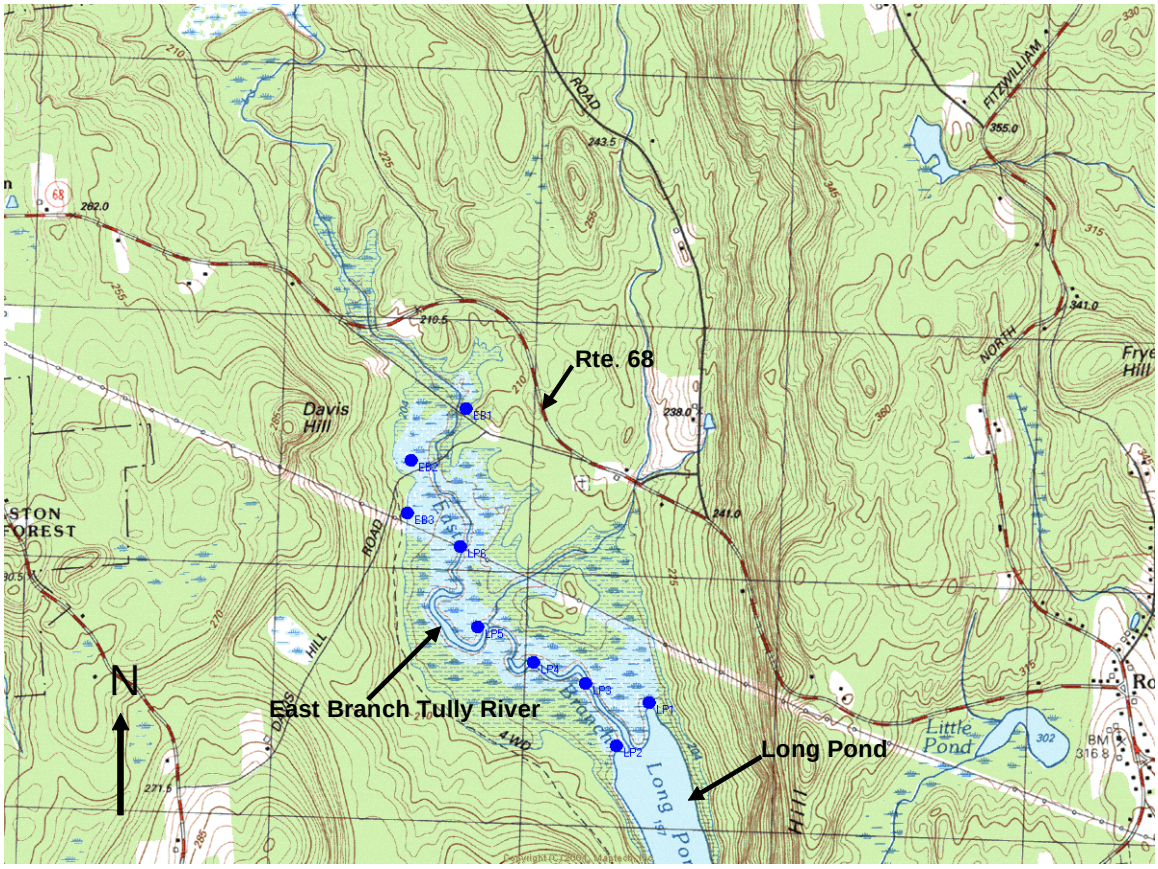


Figure 2: Marsh Bird Survey Points at Tully Lake Park (Aerial Photograph), 2008. Points EB1-EB3 were surveyed on foot; points LP1-LP6 were surveyed by boat. Aerial photograph was developed from Google Earth (2008) and MassGIS aerial survey data.

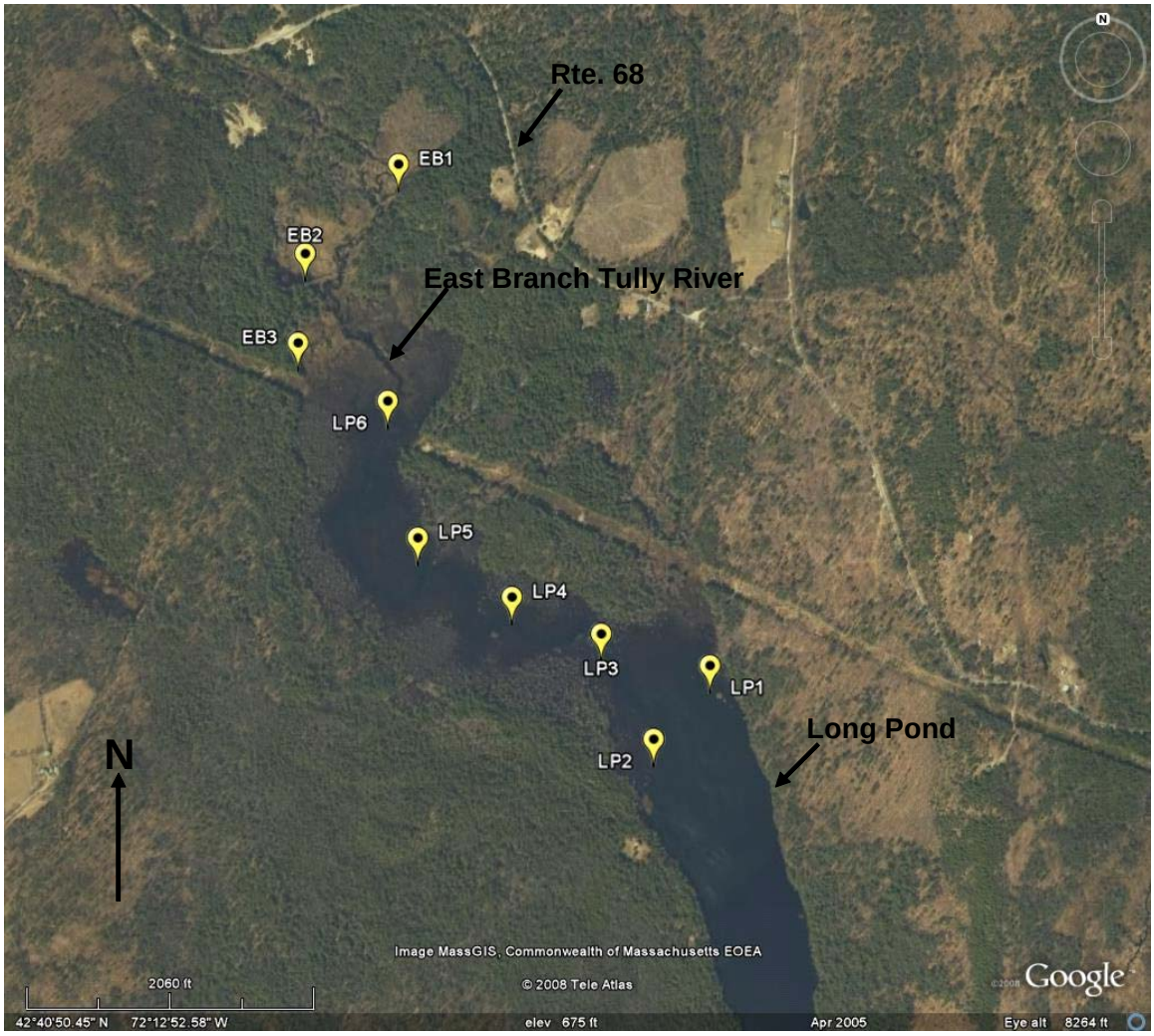


Table 1: Coordinates for the Nine Marsh Bird Survey Points, Tully Lake Park, 2008.

Survey Point	Latitude & Longitude
EB1	42 degrees, 41' 15.2" N; 72 degrees, 13' 11.1" W
EB2	42 degrees, 41' 8.4" N; 72 degrees, 13' 20.7" W
EB3	42 degrees, 41' 1.5" N, 72 degrees, 13' 21.4" W
LP1	42 degrees, 40' 37.1" N, 72 degrees, 12' 39.0" W
LP2	42 degrees, 40' 31.5" N, 72 degrees, 12' 44.8" W
LP3	42 degrees, 40' 39.5" N, 72 degrees, 12' 50.2" W
LP4	42 degrees, 40' 42.3" N, 72 degrees, 12' 59.4" W
LP5	42 degrees, 40' 46.8" N, 72 degrees, 13' 9.1" W
LP6	42 degrees, 40' 57.2" N, 72 degrees, 13' 12.2" W

Table 2: Results of Marsh Bird Surveys by Date: Tully Lake Park, 2008.

Survey Date	Survey Points	Target Species & Number Observed
14-May	LP1 - LP6	Virginia rail (1)
15-May	EB1, EB2	None
1-Jun	LP1 - LP6	American bittern (1), Virginia rail (1)
8-Jun	EB1-EB3	None
6-Jul	LP1 - LP6	Virginia rail (2)
8-Jul	EB1-EB3	None

Table 3: Observations of Target Marsh Birds at Tully Lake Park, 2008.

Date	Species Observed	Survey Point	Behavior
14-May	Virginia Rail	LP6	Bird was observed as it approached stream bank; responded with "grunt" call to the Virginia rail call on compact disk & to other species' calls
1-Jun	American Bittern	LP5	Bird flies in to point during playback; assumes alarm stance and alternately calls (using pumping call) and is silent for about 30 min
1-Jun	Virginia Rail	LP6	Bird responded with "grunt" call to sora and king rail calls; bird heard only
6-Jul	Virginia Rail	LP5	One bird responded to sora call on tape with "grunt" call; second bird joined in with "grunt" call & both called off and on for rest of survey

Figure 3: American Bittern Observations at Tully Lake Park (Topographical Map), 2008. The point labeled "Bittern A" was the location of S. Johnson's April 24th sighting; "Bittern B" is the location of the June 1st observation. USGS map is from MaptechTerrain Navigator (2002); Winchendon Quad (Royalston, Massachusetts).

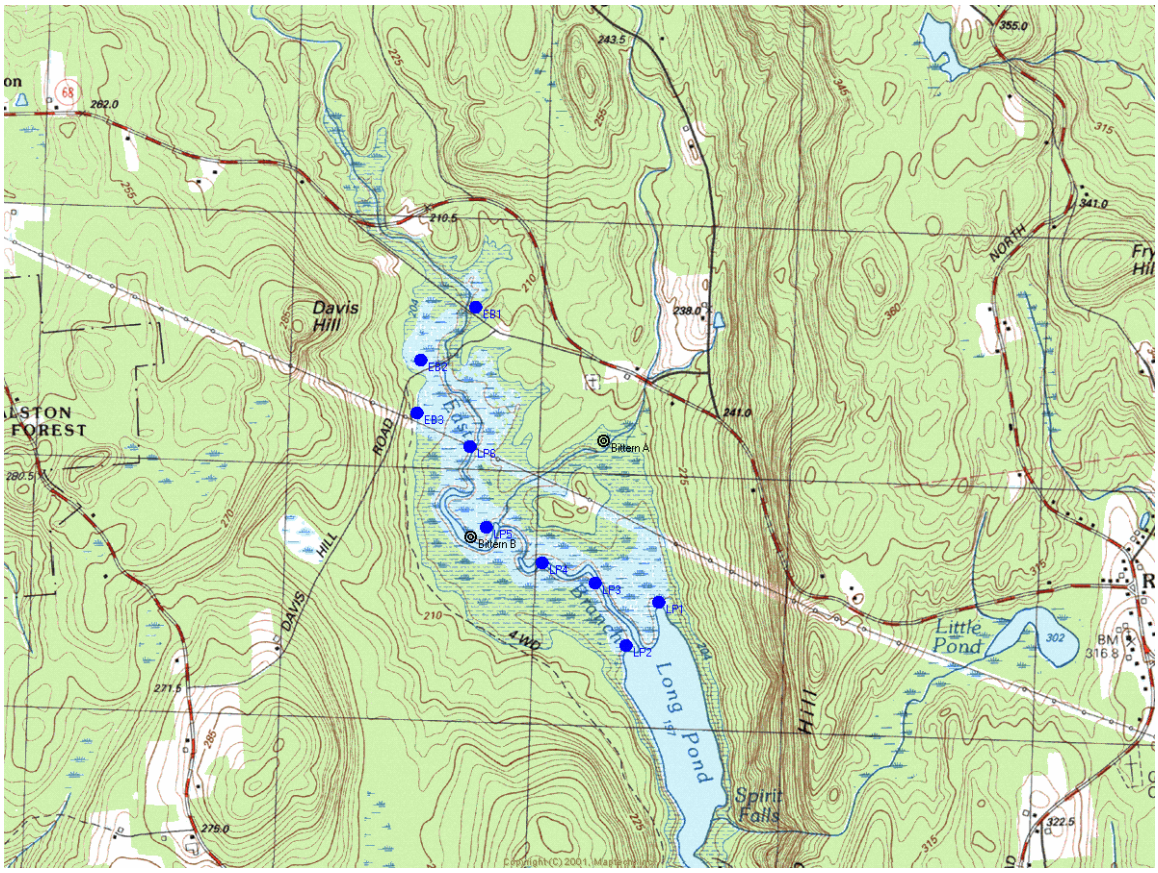


Figure 4: American Bittern Observations at Tully Lake Park (Aerial Photograph), 2008. The point labeled "Bittern A" was the location of S. Johnson's April 24th sighting; "Bittern B" is the location of the June 1st observation. Aerial photograph was developed from Google Earth (2008) and MassGIS aerial survey data.

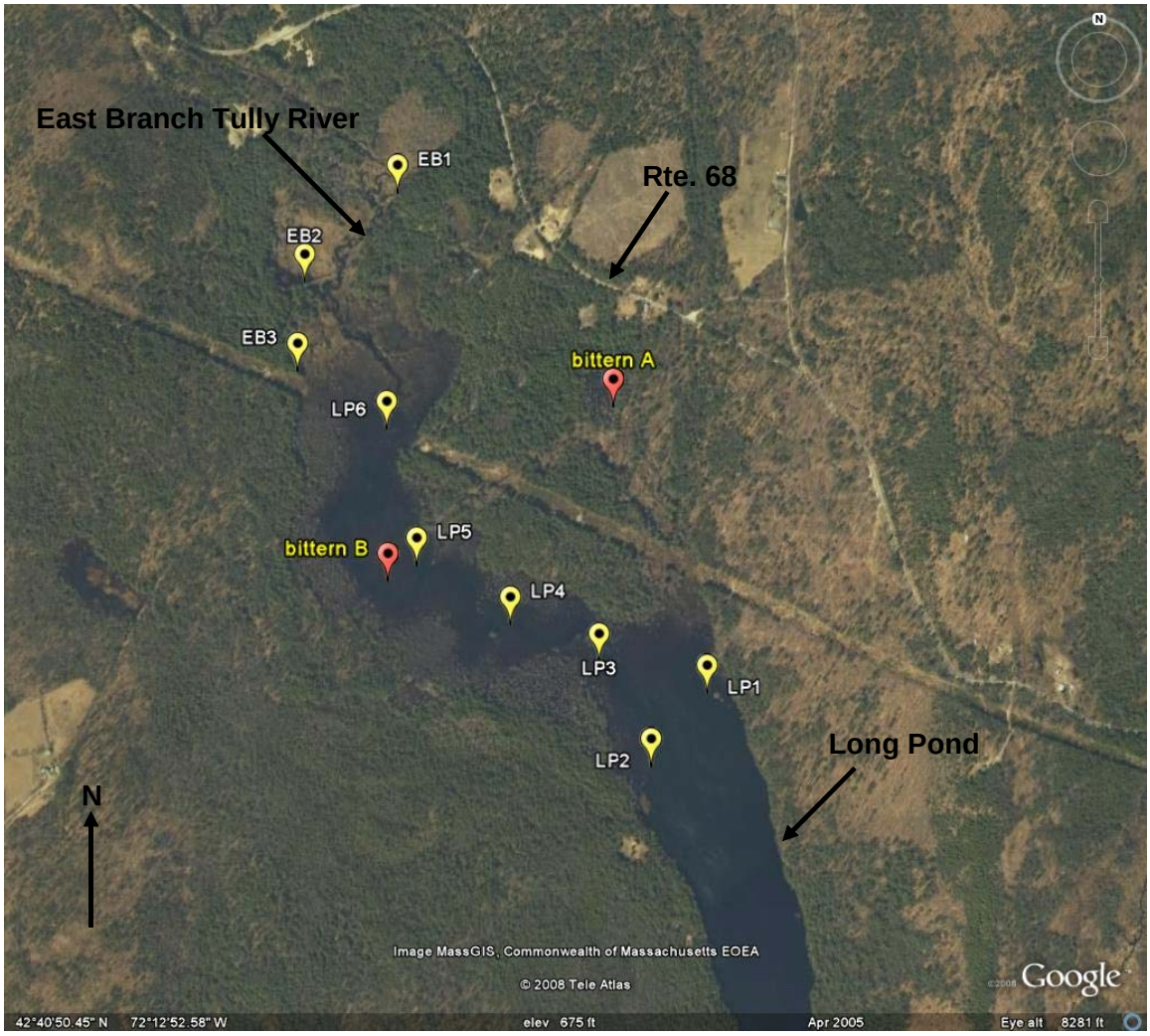


Figure 5: Photograph of Survey Point LP5, Tully Lake Park. View of point LP5 looking southwest toward sighting of male American bittern; observed on June 1st, 2008. Plant species at sighting were: meadowsweet, Northern arrow-wood, leatherleaf, and tussock sedge. A pair of Virginia rails was observed at this point on July 6th, 2008. Photograph taken on June 1, 2008.

Figure 6: Photograph of Survey Point LP6, Tully Lake Park. View of mixed shrub and emergent wetland habitats where a Virginia rail was observed on May 14th and June 1st, 2008. Plant species at sighting were: Northern arrow-wood, meadowsweet, *Eupatorium* sp., and tussock sedge. Photograph taken on June 1, 2008.

Table 4: Percent Cover of Major Wetland Habitat Types for Marsh Bird Survey Points and Mean Percent Cover for each Habitat Type, Tully Lake Park, 2008.

Survey Point	Herbaceous Emergent	Open Water/Floating Plants	Mud, Sand, or Rock	Trees & Snags (>5 m)	Shrubs & Saplings (< 5 m)
EB1	35	15	0	10	40
EB2	30	25	0	20	25
EB3	15	5	0	5	75
LP1	25	45	0	0	30
LP2	15	50	0	5	30
LP3	15	15	0	10	60
LP4	17	15	0	3	65
LP5	17.5	20	0	2.5	60
LP6	30	5	0	5	60
Total Percent Cover for Each Habitat Type	199.5	195	0	60.5	445
Mean Percent Cover for Each Habitat Type	22.2	21.7	0	6.7	49.4

Figure 7: Photograph of Survey Point EB1 Looking North/Northwest. Wetland habitat types were open water, emergent, and shrub swamp, with snags occurring primarily in the middle of the point. Common plants were: meadowsweet, tussock sedge, grasses, Northern arrow-wood, and bur-reed. Photograph taken on June 8, 2008.

Figure 8: Photograph of Survey Point LP1, Situated at the Northeast Corner of Long Pond, Looking West. Wetland habitat types were shrub swamp and open water/floating plants. The open water in the photograph was covered with yellow water-lily, white water-lily, and pickerel-weed later in the growing season. Photograph taken on June 1, 2008.

Figure 9: Photograph of Survey Point LP4 Looking Northwest. Wetland habitat types were shrub swamp and open water. The emergent species are mixed within the shrubs. The river channel is the East Branch of the Tully River. Common plants were: meadowsweet, buttonbush, tussock sedge, Canada bluejoint, and winterberry. Photograph taken on June 1, 2008.

Table 5: Floating Plant Species and Amount of Cover Observed at Marsh Bird Survey Points, Tully Lake Park, 2008.

	Species and Amount of Floating Plant Cover			
Survey Point	None	Slight	Moderate	Dense
EB1			*Potamogeton sp.; Nuphar variegata*	
EB2		*Nuphar variegata*		
EB3	X			
LP1				*Nuphar variegata; Nymphaea odorata; Pontedaria cordata*
LP2			*Nymphaea odorata; Pontedaria cordata*	
LP3		*Nuphar variegata; Pontedaria cordata*		
LP4			*Potamogeton sp.; Nuphar variegata; Pontedaria cordata*	
LP5			*Potamogeton sp.; Nuphar variegata; Pontedaria cordata*	
LP6		unknown species		

Table 6: Percents of Most Common Wetland Species Recorded at Marsh Bird Survey Points Based on Areal Coverage, Tully Lake Park, 2008.

	Marsh Bird Survey Point										
Plant Species or Group	EB1	EB2	EB3	LP1	LP2	LP3	LP4	LP5	LP6	Total	Mean
Spiraea alba	35	20	40	10	0	10	25	35	40	215	23.9
Sedges & Grasses	25	40	10	15	10	15	15	25	20	175	19.4
Viburnum dentatum	5	10	15	10	10	20	10	0	10	90	10
Pontederia cordata	0	0	0	35	40	0	5	10	0	90	10
Cephalanthus occidentalis	0	0	0	10	20	15	15	5	0	65	7.2
Sparganium sp.	5	20	0	0	0	0	0	0	5	30	3.3
Alnus incana	0	0	10	5	5	0	0	0	5	25	2.8
Ilex verticillata	0	0	0	0	0	15	10	0	0	25	2.8
Osmunda regalis	0	0	0	0	5	5	5	0	0	15	1.7
Eupatorium sp.	0	0	0	0	0	0	0	0	15	15	1.7
Frangula alnus	5	5	0	0	0	0	0	0	0	10	1.1
Nuphar variegata	0	0	0	10	0	0	0	0	0	10	1.1
Utricularia sp.	0	0	0	0	5	0	0	0	0	5	0.6
Acer rubrum	0	0	0	0	0	5	0	0	0	5	0.6
Myrica gale	0	0	0	0	0	5	0	0	0	5	0.6

Figure 10: Whip-Poor-Will Survey Points at Tully Lake Park, 2008. Survey points Whip1 and WHIP2 are adjacent to hiking trails, and Whip3-WHIP6 are located adjacent to roadways. USGS map is from Maptech Terrain Navigator (2002); Winchendon Quad (Royalston, Massachusetts).

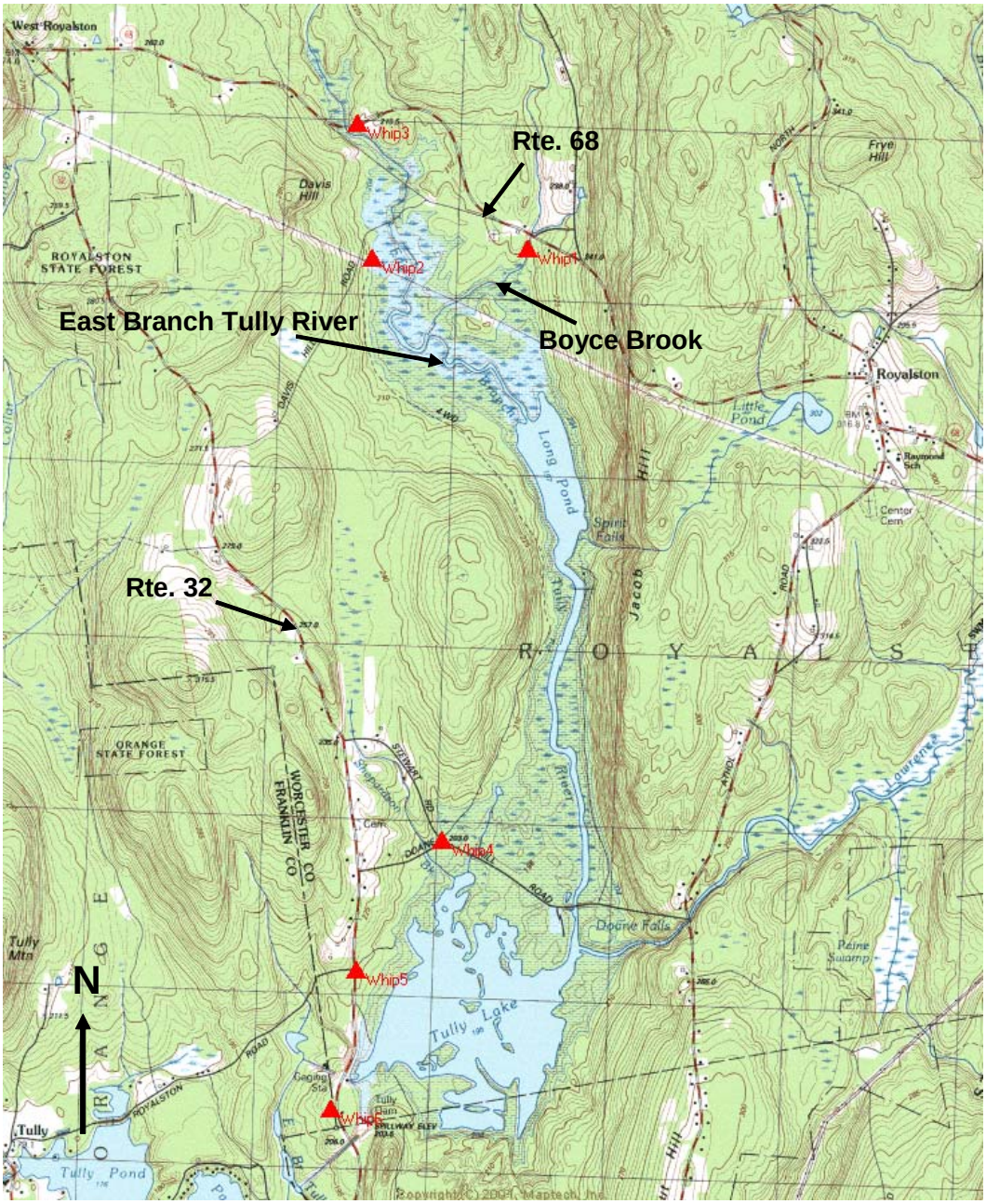


Table 7: Coordinates for the Six Whip-Poor-Will Survey Points, Tully Lake Park, 2008.

Survey Point	Latitude & Longitude
WHIP 1	42 degrees, 41' 2.9" N; 72 degrees, 12' 43.8" W
WHIP 2	42 degrees, 41' 1.0" N; 72 degrees, 13' 22.9" W
WHIP 3	42 degrees, 41' 26.5" N; 72 degrees, 13' 25.2" W
WHIP 4	42 degrees, 39' 13.3" N; 72 degrees, 13' 3.7" W
WHIP 5	42 degrees, 38' 49.3" N; 72 degrees, 13' 25.4" W
WHIP 6	42 degrees, 38' 23.6" N; 72 degrees, 13' 31.7" W

Table 8: Results of Habitat Descriptions at Six Whip-Poor-Will Survey Points, Tully Lake Park, 2008. *Dominant Three Habitats: The open category includes fields, lawn, and gravel pits; the developed category includes urban and residential areas.

Survey Point	Dominant Three Habitats*	No. of Houses Visible from Point	No. of Birds Observed
1	water, forest (pine/conifer/mixed) & hardwood forest	0	none
2	forest (pine/conifer/mixed), marsh/wetland, & open	0	none
3	forest (pine/conifer/mixed), marsh/wetland, & open	0	none
4	forest (pine/conifer/mixed), water, & open	0	none
5	open, forest (pine/conifer/mixed) & hardwood forest	2	none
6	open, forest (pine/conifer/mixed) & developed	3	none

Table 9: Status of Ten Marsh Bird Species and the Whip-Poor-Will in New England and New York State, 2008.

	Status of Species by State						
Species	MA	RI	CT	NH	VT	ME	NY
Pied-billed Grebe	E	E	E	E	SC	none	T
Green Heron	none	none	none	none	none	none	none
American Bittern	E	E	E	none	none	none	SC
Least Bittern	E	T	T	SC	SC	E	T
Virginia Rail	none	none	none	none	none	none	none
King Rail	T	C	E*	none	none	none	T
Sora	none	C	none	none	SC	none	none
Common Moorhen	SC	SH	E	none	none	T	none
Whip-Poor-Will	none	none	SC	SC	SC	none	SC
Sedge Wren	E	none	E	E	E	E	T
Marsh Wren	none	C	none	none	none	none	none

Definitions of state status categories:
E: endangered
T: threatened
SC: special concern
C: concern (ranking is equivalent to special concern)
E*: refers to breeding population only
SH: state historic (1970)

The following list contains the websites where the state status of marsh bird species and whip-poor-wills were found.

Massachusetts: http://www.mass.gov/dfwele/dfw/nhesp/species_info/mesa_list/mesa_list.htm

Rhode Island: http://www.rinhs.org/wp-content/uploads/ri_rare_animals_2006.pdf

Connecticut: http://www.ct.gov/dep/cwp/view.asp?a=2702&q=323472&depNav_GID=1628

New Hampshire: http://www.wildlife.state.nh.us/Wildlife/Nongame/endangered_list.htm

Vermont:
http://www.vtfishandwildlife.com/library/Reports_and_Documents/nongame_and_Natural_Heritage/species_lists/Birds%20of%20Vermont.pdf

Maine:
http://www.state.me.us/ifw/wildlife/species/endangered_species/sedge_wren/index.htm
http://www.state.me.us/ifw/wildlife/species/endangered_species/bird_list.htm:
http://www.maine.gov/ifw/wildlife/groups_programs/comprehensive_strategy/pdfs/appendix4.pdf

New York: http://www.dec.ny.gov/animals/7494.html

Figure 11: Suitable Wetland Habitats for American Bitterns at Tully Lake Park, 2008. Outlined areas encompass the range of wetland habitats available to American bitterns at Tully Lake Park. Wetland A contains survey points EB2 and EB3, and LP1 to LP6. Suitable habitats in this area were shrub and emergent wetlands, open water, and floating plants. Bittern B was observed in Wetland A. Wetland B contains survey point EB1. Wetland C is the wetland where Bittern A was observed; it was made up of emergent wetland with scattered snags. Wetland D is located outside of Tully Lake Park; it appears to contain suitable habitat for bitterns (e.g., open water and emergent wetland).The aerial photograph was developed from MassGIS color orthophotos, taken in 2005 (http://maps.massgis.state.ma.us/massgis_viewer/index.htm).

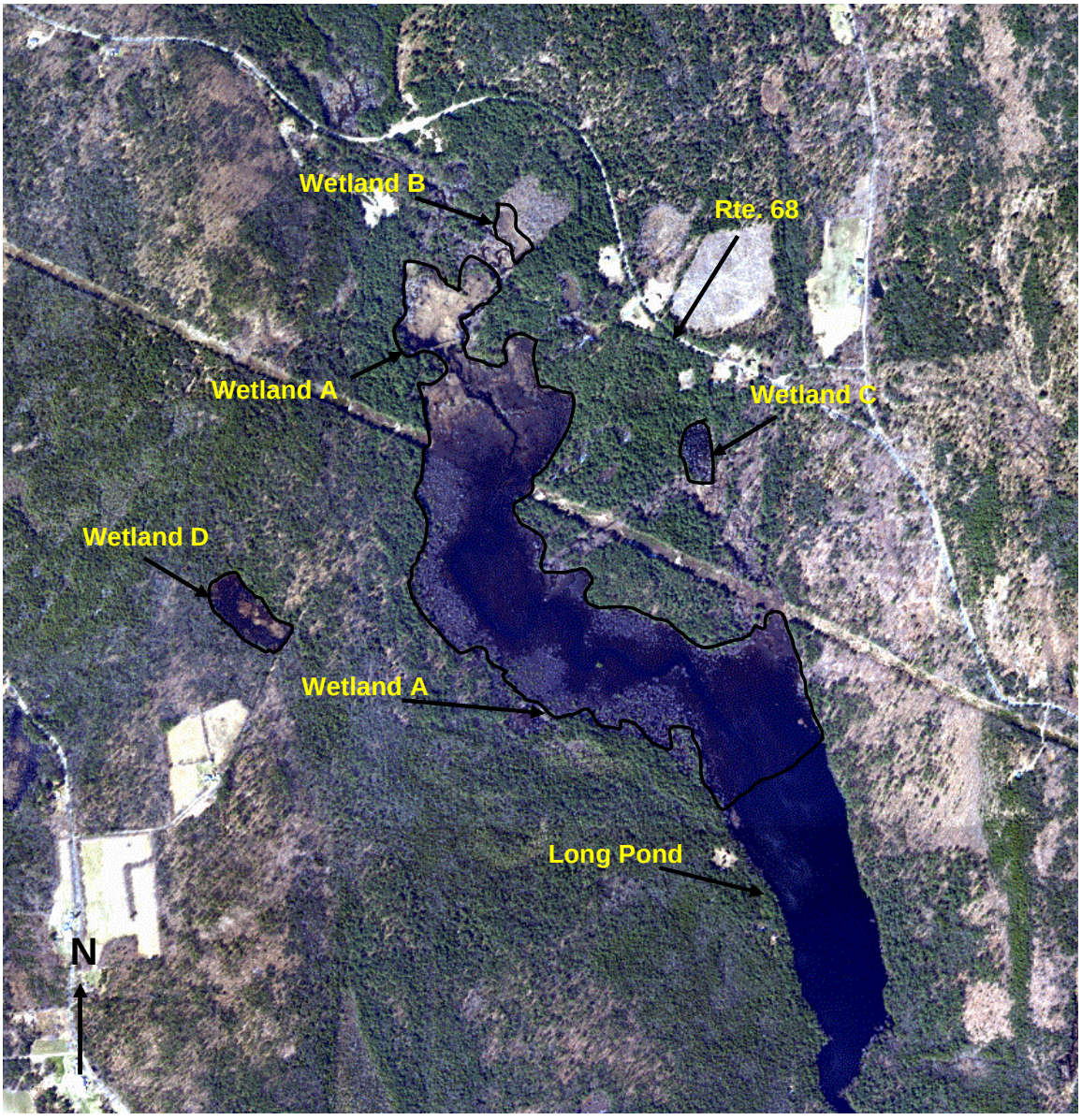
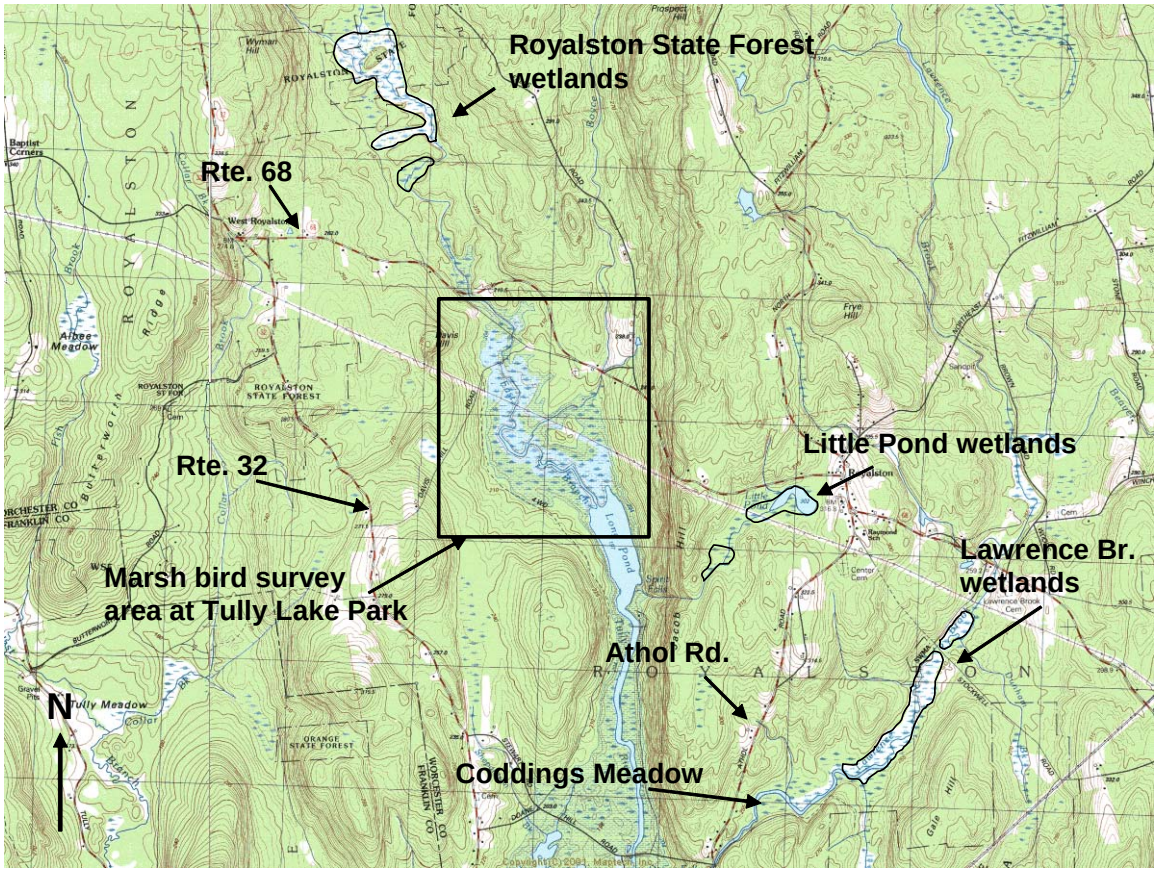


Figure 12: Wetland Habitats Located Adjacent to Tully Lake Park, 2008. Outlined areas are wetlands located within 3.5 km of the Tully Lake marsh bird survey area that contain suitable habitats for American bitterns. These areas include Royalston State Forest, and the Little Pond and Lawrence Brook areas. USGS map is from Maptech Terrain Navigator (2002); Winchendon Quad (Royalston, Massachusetts).



APPENDICES

Note: These are included separate from the report.

Appendix A: Marsh Bird Data Forms and Marsh Bird Mapping Forms with Bird Species Codes
Appendix B: Habitat Description Forms and Tully Lake Habitat Maps
Appendix C: Massachusetts Whip-poor-will Survey Forms
Appendix D: Massachusetts Whip-poor-will Route Description Form
Appendix E: Habitat Information for the June Whip-Poor-Will Survey, 2008
Appendix F. Resumes for Patricia Serrentino and Alexander Haro