Results of a Three-year Waterbird Survey in the Deerfield River Watershed in Massachusetts

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INTRODUCTION

From 1999 to 2001, 24 wetlands in the Deerfield River watershed were surveyed for the Sedge Wren (*Cistothorus platensis*) and seven waterbird species: Pied-billed Grebe (*Podilymbus podiceps*), American Bittern (*Botaurus lentiginosus*), Least Bittern (*Ixobrychus exilis*), King Rail (*Rallus elegans*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), and Common Moorhen (*Gallinula chloropus*). The primary objectives of the study were to: (1) gather baseline data on waterbirds and their habitats; (2) identify biologically significant wetlands, for example, those that supported rare waterbirds and/or a high number of waterbird species; and (3) increase landowners' and citizen monitors' awareness of the value and diversity of wetland resources in their communities.

Several of the target species have special status in Massachusetts: the Pied-billed Grebe, American Bittern, Least Bittern, and Sedge Wren are Endangered; the King Rail is Threatened; and the Common Moorhen is a Species of Special Concern (Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife). In the Northeast the Pied-billed Grebe, American Bittern, and Sedge Wren have declined in portions of their breeding range in the last several decades (Gibbs and Melvin 1992a, b, d). The breeding populations of these three species, in addition to those of the Sora and Common Moorhen, have decreased in Massachusetts during the same period (Veit and Petersen 1993; Crowley 1994). The King Rail has disappeared from previously known breeding sites in Massachusetts (Veit and Petersen 1993). The status of the Least Bittern is difficult to assess because of its secretive habits; however, this species has probably also declined in Massachusetts and other parts of the Northeast (Gibbs and Melvin 1992c.; Veit and Petersen 1993). At the present time, the Virginia Rail appears stable in Massachusetts (Veit and Petersen 1993; Crowley 1994).

The loss and alteration of wetland habitats are often cited as the major cause of the decline of these wetland-dependent birds in Massachusetts, as well as throughout the Northeast. It has been estimated that from 1780 to the mid-1980s, Massachusetts lost approximately 28 percent of its wetlands (Dahl 1990). In addition to wetland loss and alteration, environmental contaminants, acidification, and human disturbance have also contributed to reductions in the breeding populations of these species (Eddleman et al. 1988; Gibbs and Melvin 1992a, b, c, d).

Two local watershed groups sponsored this project: the Green River Watershed Preservation Alliance and the Deerfield River Watershed Association (DRWA). The project was modeled, in part, on the Marsh Monitoring Project, an on-going program

that surveys waterbirds and amphibians in the Great Lakes basin (Weeber and Vallianatos 2000).

METHODS

Study Area: The waterbird study took place in the Massachusetts portion of the Deerfield River watershed. The Deerfield River drains a 1722 sq km (665 sq mi) area located in southern Vermont and northwestern Massachusetts. Twenty-four wetlands were surveyed in nine towns (Figure 1).

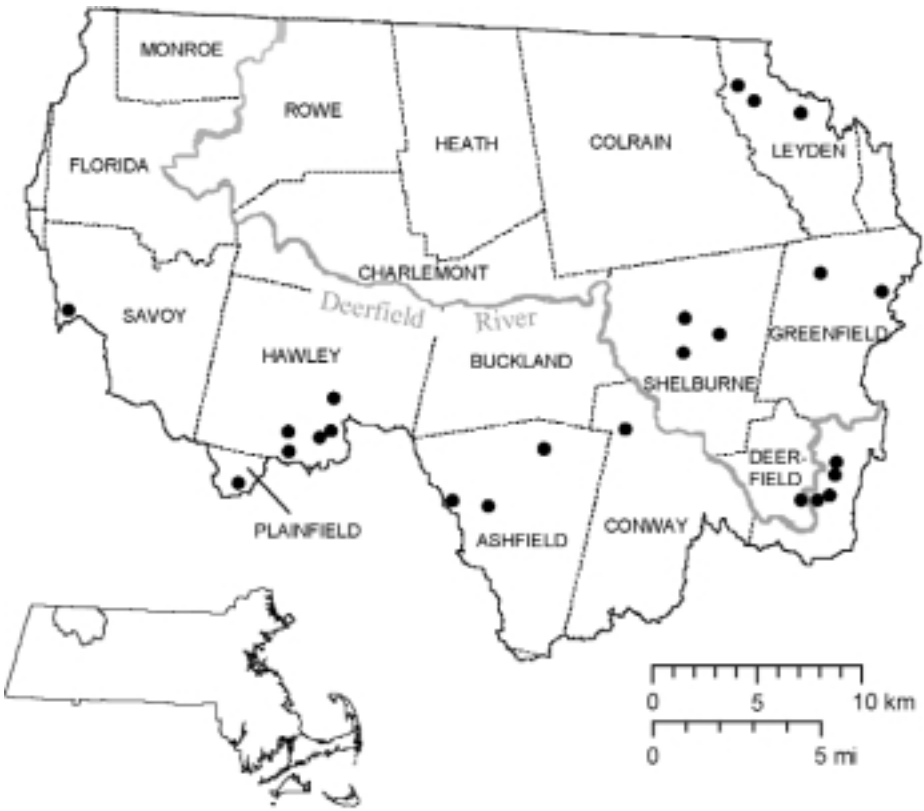

Figure 1: Location of wetland survey sites in the Deerfield River watershed, Massachusetts, 1999-2001. Twenty-four wetlands were surveyed in nine towns. Solid circles represent survey sites.

Wetland Evaluations: Wetlands had to meet several criteria to be included in the project. We chose sites that contained areas of suitable breeding habitat for the target species - emergent vegetation, such as cattails (*Typha* spp.), grasses (rattlesnake grass *Glyceria canadensis*, blue-joint *Calamagrostis canadensis*), sedges (tussock sedge *Carex stricta*, wool grass *Scirpus cyperinus*), and rushes (soft rush *Juncus effusus*). Shrub swamps were included because some waterbirds tolerate varying amounts of shrub vegetation (Forbush 1925; Gibbs and Melvin 1992b.). Other requirements

included safe access to sites for volunteer surveyors and permission from landowners to survey their wetlands.

We used aerial photo-interpretation to classify each wetland according to the type and amount of wetland habitat present. This information was used to determine if there was a relationship between the quantity and type of wetland habitat available, and the presence or absence of waterbirds at each site. Aerial photo-interpretation is defined as the process of identifying wetland habitats on aerial photographs using a stereoscope. The stereoscope magnifies the image and allows the photo-interpreter to see the landscape in three dimensions. Using this system, the habitat in each wetland was classified as deep marsh, shallow marsh, aquatic bed, shrub swamp, or open water. Deep marsh and shallow marsh are emergent wetlands primarily distinguished by differences in water depth (Swain and Kearsley 2000). Deep marshes average from 15 cm to 1.0 m deep (6 in to 3.3 ft), whereas shallow marshes are usually 15 cm (6 in) deep or less. Aquatic bed includes areas where the water surface is covered by the leaves and flowers of rooted or floating plants, e.g., water lilies (*Nuphar variegatum*, *Nymphaea odorata*), pondweeds (*Potamogeton* spp.), and water-shield (*Brasenia schreberi*) (Cowardin et al. 1979).

Shrub swamps are dominated by deciduous woody plants (meadowsweet *Spiraea latifolia*, willows *Salix* spp., speckled alder *Alnus rugosa*) (Cowardin et al. 1979).

Bird Surveys: The Sedge Wren and seven waterbird species were surveyed by broadcasting recordings of their songs and calls, and listening or watching for a response. This method was developed for species that reside in inaccessible habitats or where visibility is hampered by vegetation (Johnson et al. 1981), and for secretive species, such as rails, limpkins, and bitterns (Marion, O'Meara and Maehr 1981; Glahn 1974). Within each wetland, survey stations were placed at 200 m (656.2 ft) intervals. At each station, the observer broadcast calls of the eight target species for approximately eight minutes. The observer recorded all waterbirds seen or heard during the broadcast and a five-minute listening period following broadcast. This method allowed us to determine the relative abundance and distribution of waterbirds at each wetland (Crowley 1994; Johnson 1995).

Following the above protocol, we surveyed wetlands three times between May 1 and July 15, from 0.5 hr before sunrise until 4.5 hr after sunrise (Gibbs and Melvin 1993). Surveys were not conducted during rainy weather or if wind speeds were greater than 20-30 kph (13-18 mph).

RESULTS

Bird Surveys: Three of the eight target species were never observed or heard during the project: King Rail, Common Moorhen, and Sedge Wren. A Pied-billed Grebe was heard calling at the Shelburne-C site in April 2000; however, it was never detected during subsequent surveys of the same area. The Virginia Rail was the most commonly encountered species, occurring at a high of 30.8 percent of stations in 2000 (Table 1). This rail, observed at 11 wetlands during the three-year study, was the most widely distributed waterbird (Table 2). The American Bittern was detected at seven

				Waterbird Species			
Year	No. of Wetlands Surveyed	No. of Stations Surveyed	Percent of Wetlands Surveyed 3X	American Bittern	Least Bittern	Virginia Rail	Sora
1999	20	31	0	3.2	3.2	16.1	9.7
2000	24	39	75.0	12.8	5.1	30.8	12.8
2001	24	39	83.3	23.1	7.7	23.1	7.7

Table 1: The number of wetlands and stations surveyed per year, percent of wetlands surveyed three times, and percent of stations at which each waterbird species was detected during the three-year study. Note: The number of stations does not equal the number of wetlands surveyed because some wetlands contained more than one station.

	Number of Years Each Species Present at Wetland					
Wetland	American Bittern	Least Bittern	Virginia Rail	Sora	Total Number Species Present	Number of Years Wetland Surveyed
Shelburne - C	2	3	3	3	4	3
Conway - A	2		1	1	3	2
Shelburne - B	1		3		2	3
Hawley - E	2		2		2	3
Hawley - A	1		2		2	3
Deerfield - B	1		1		2	3
Deerfield - E			2	1	2	2
Deerfield - C			2		1	3
Hawley - D			1		1	3
Greenfield - A			1		1	3
Plainfield - A			1		1	3
Shelburne - A	1				1	2
Total Number of Wetlands Where Species Was Observed	7	1	11	3		

Table 2: Wetlands where waterbirds were observed, 1999-2001, including number of years each species present at a wetland, total species observed per wetland, and number of years each wetland was surveyed.

wetlands and was the second most frequently encountered species (occurring at a high of 23.1 percent of stations in 2001). The Sora and Least Bittern were rarely detected. The Sora was encountered at 7.7 - 12.8 percent of stations during the three-year study, whereas the Least Bittern was detected at 3.2 - 7.7 percent of stations. As expected, these latter two species were found at comparatively few wetlands.

To determine which wetlands were the most valuable to waterbird populations at the study area, each site was evaluated according to the following parameters: (1) total number of waterbird species present; (2) total number of breeding seasons that a species was observed at a site; and (3) total number of adult birds of each species detected. Seven wetlands supported two or more species of waterbirds (Table 2): two

sites in Shelburne, Hawley, and Deerfield, and one site in Conway. At four wetlands (Shelburne-B, C, Conway-A, Deerfield-E), at least one waterbird species was observed every year the site was surveyed.

We estimated the number of adult birds present at each wetland. A minimum of one adult (of any of the target species) was observed at least once in three years at four sites: Shelburne-A, Plainfield-A, Greenfield-A, and Hawley-D. Between one and three individuals of any species were present each year at six sites: Deerfield-B, C, E, Hawley-A, E, and Conway-A. Shelburne-C supported the highest number of individuals, ranging from eight to eleven each year.

Wetland Habitat Evaluations: Statistical analyses showed that the amount of shallow marsh, aquatic bed, and shrub habitats was significantly correlated with the total number of species observed at wetlands. In other words, more species of waterbirds were likely to be found at wetlands with a greater proportion of the habitat consisting of shallow marsh, aquatic bed, and shrub habitats rather than deep marsh and open water. When the same analysis was performed comparing the total area of all wetland habitats (e.g., the sum of all the wetland habitats found at each site) and the number of species observed, there was a significant positive relationship. As the total size of a wetland increased, the number of waterbird species present increased.

DISCUSSION

Comparison of Historic and Current Distribution and Status of Waterbirds in the Deerfield River Watershed: In the discussion below, we compare our results with historic observations (Bagg and Eliot 1937; Griscom and Snyder 1955), *Birds of Massachusetts* (Veit and Petersen 1993), and a recent waterbird survey conducted throughout Massachusetts by Crowley (1994). From 1991 through 1993 Crowley, and other observers, surveyed 177 freshwater and brackish wetlands throughout the state. Five wetlands in the Deerfield River watershed were included in Crowley's surveys, and four of those sites were included in our study (Deerfield-A, B, E, and Shelburne-B).

During this project, we detected four of the eight target waterbirds: American Bittern, Least Bittern, Virginia Rail, and Sora. Four species were never observed during the survey period (May 1 to July 15): Pied-billed Grebe, King Rail, Common Moorhen, and Sedge Wren. Given the rarity of these species in Massachusetts, it was not surprising that we did not detect them during our study. At the time of Bagg and Eliot's publication, Pied-billed Grebes were considered rare and local in the Connecticut River valley. During the field work for the Massachusetts Breeding Bird Atlas (BBA, unpublished), observations of this grebe were confined to coastal areas and Berkshire County (Veit and Petersen 1993). Crowley (1994) found Pied-billed Grebes at three of 177 wetlands statewide, with all reports from Worcester County. Our only record of a Pied-billed Grebe occurred at a wetland in Shelburne prior to the start of surveys. This bird was most likely a migrating individual, given the time of year (April 4) and the lack of subsequent observations. Pied-billed Grebes nest in beaver ponds, waterfowl impoundments, marshes, and emergent areas bordering large lakes and reservoirs (Andrle and Carroll 1988; Gibbs and Melvin 1992a).

Massachusetts is at the northern periphery of the King Rail's breeding range, which accounts in part for the species' rarity in our area. Bagg and Eliot (1937) did not report any nesting observations of King Rails in the Deerfield River watershed, and there has been no confirmed breeding in Massachusetts since 1979 (Veit and Petersen 1993). No King Rails were found in the Deerfield River watershed during Crowley's study (Crowley 1994).

From the early to mid-1900s, the Common Moorhen was characterized as rare and local (Bagg and Eliot 1937; Griscom and Snyder 1955). Veit and Petersen (1993) considered this species an "uncommon to rare local breeder; decreasing," and in fact, there has been no confirmed breeding of the Common Moorhen in the Deerfield River watershed since 1970 (Veit and Petersen 1993; Crowley 1994). This waterbird prefers breeding habitat similar to that of the Pied-billed Grebe: dense stands of emergent vegetation for nesting, with areas of aquatic bed and open water for foraging (Laughlin and Kibbe 1985; Andrle and Carroll 1988; Foss 1994). Although several wetlands in the watershed appeared to match the Common Moorhen's habitat preferences, it was never observed during the study.

Bagg and Eliot (1937) described the breeding habitat of Sedge Wrens as "wet meadows with long grass and many bushes," and the wren was characterized as local in its distribution, but not necessarily rare. A historic nesting site in the Deerfield River watershed was "The Bars" in Deerfield (located south of Old Deerfield). During the Massachusetts BBA, breeding Sedge Wrens were confirmed at only two sites, both in Hampshire County (Veit and Petersen 1993). Crowley (1994) did not include the Sedge Wren in his statewide study. Many of the sites that we surveyed were probably too wet for this species; however, several wetlands were bordered by suitable breeding habitat (e.g., wet meadows and abandoned fields).

Bagg and Eliot (1937) described the American Bittern as uncommon during the breeding season in the Connecticut River valley. Griscom and Snyder (1955), however, regarded it as "a common summer resident in suitable freshwater marshes at lower altitudes throughout the state." According to Veit and Petersen (1993), the American Bittern is an "uncommon breeder and declining." Although there were sightings of this species in the Deerfield River watershed during the Massachusetts BBA, breeding was not confirmed. We detected American Bitterns at 29 percent of wetlands during the three-year study, compared to 5 percent of wetlands in Crowley's 1994 statewide survey. Crowley found American Bitterns at one site in the Deerfield River basin (Deerfield - E). We did not observe this species at Deerfield - E during our study, however, possibly because we were unable to gain access to the entire wetland.

Bagg and Eliot (1937) described the Least Bittern in the Connecticut River valley as "probably regular but very rarely observed," and both Forbush (1925) and Griscom and Snyder (1955) believed that this bittern was probably often missed during the breeding season because of its extremely secretive habits. Veit and Petersen (1993) described the Least Bittern as "rare and local" during the breeding season. Historic and recent breeding records have been confined primarily to the area east of

Worcester County. Crowley (1994) found Least Bitterns at twelve sites statewide, with no sightings in the Deerfield River watershed. Although we did not try to confirm breeding, one or two adults were present at Shelburne - C during the entire three-year study.

Although Virginia Rails have always been common in Massachusetts (Forbush 1925; Bagg and Eliot 1937; Griscom and Snyder 1955), Griscom and Snyder (1955) concluded that they were declining due to loss of wetland habitat. Veit and Petersen (1993) characterized the Virginia Rail as the most common breeding rail in the state. Virginia Rails were detected at 61 percent of wetlands during Crowley's 1994 statewide survey, including four sites in the Deerfield River watershed. During our study this rail was found at 46 percent of wetlands and was the most frequently observed waterbird. We found Virginia Rails at three of Crowley's four sites.

Bagg and Eliot (1937) described the Sora as "rare in spring and breeding still more rarely" in the Connecticut River valley, and Griscom and Snyder (1955) considered the Sora locally common during the breeding season but declining. Soras were not often detected during our study. These rails were found at 13 percent of sites, which was similar to Crowley's (1994) results: 15 percent of wetlands statewide. Although Crowley (1994) found Soras at two sites in the Deerfield River watershed, we were only able to verify Soras at one of Crowley's two sites. However, we detected Soras at two sites that Crowley did not survey. During our study, the largest number of adult Soras was observed at Shelburne - C, where at least two or three pairs were present. Our findings are consistent with Veit and Petersen's (1993) characterization of the Sora as a rare breeding bird in Massachusetts. Most of their sightings during the breeding season were from localities in eastern Massachusetts (but not Cape Cod).

Waterbirds and Wetland Habitat Evaluations: In the Deerfield River watershed, wetlands that were more valuable to waterbirds tended to be larger and contained greater amounts of shallow marsh, shrub, and aquatic bed habitats than those that had fewer waterbird species. Larger wetlands are thought to support more species because they usually contain several types of wetland habitats and varying water depths (Brown and Dinsmore 1986; Gibbs and Melvin 1990). The greater diversity of habitat types and water depths provides a greater number of species with sites for nesting, foraging, and raising young. At our study site, waterbirds were found in wetlands ranging in size from 2.73 to 13.43 ha (6.74 to 33.17 ac). The mean size of the twelve wetlands where waterbirds were detected was 6.94 ha (17.14 ac). North Shelburne, at 13.43 ha (33.17 ac), contained the highest number of species and individuals of each species.

Future Recommendations: Because of the many threats faced by these rare and secretive waterbirds, it is imperative that we continue to monitor these species in the Deerfield River watershed. Eddleman et al. (1988) and Gibbs and Melvin (1992b, c) recommend that waterbird surveys occur at regular intervals to ascertain regional population trends. During our three-year study, many wetlands exhibited changes in water depth, flooding period, and vegetation composition, primarily because of beaver

activity. In the long term, the presence of beavers may result in the creation of additional suitable habitat for waterbirds by encouraging the growth of emergent vegetation and increasing the amount of open water. We hope to resurvey these wetlands in approximately five years to determine whether changes in waterbird species' distribution and abundance and wetland habitat types and adjacent land use have occurred.

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