

SPECIES PROFILE

Ringed Boghaunter

Williamsonia lintneri

Federal Listing: Not listed

State Listing: Endangered

Affected Species: NA

Global Rank: G3

State Rank: S1

Author: Kim A. Tuttle, NHFG

ELEMENT 1: DISTRIBUTION AND HABITAT

1.1 Habitat Description

Ringed boghaunters are restricted to sphagnum peatlands and the surrounding upland or mesic forests (Cairns 1998). Ringed boghaunters breed in acidic fens, which are weakly minerotrophic peatlands that receive some nutrients from groundwater springs, seeps, and streams (Lundgren 1999). In New England, breeding and larval habitats include dwarf shrub fens, graminoid-dominated fens, and sphagnum-filled pools or basins. Shrubs, robust sedges and rushes with persistent stems provide places for larvae to emerge in the spring. Aquatic species of Sphagnum are likely an important component of breeding areas and critical for overwintering (Lundgren 1999). Adults may require relatively intact upland forests to rest, develop, and feed before mating (Biber 2002).

1.2 Justification

The majority of ringed boghaunter populations in the United States are located in eastern Massachusetts, Rhode Island, and Wisconsin (NatureServe 2004). New Hampshire and Maine represent the northernmost extent of the known breeding range in the Northeast. Populations that remain in the eastern United States from southern Maine to New Jersey are vulnerable to development. In New Hampshire, ringed boghaunter populations are limited to the

southeastern portion of the state, where development pressure is greatest.

There may be more than 50 occurrences of ringed boghaunters in the United States and ongoing surveys will likely reveal new sites, but populations appear to be small with usually fewer than 50 adults (NatureServe 2004). Ringed boghaunters are at risk because of their unique acidic fen habitats that are not well understood. Another *Williamsonia* dragonfly, the ebony boghaunter (*Williamsonia fletcheri*), is found in similar sphagnum bog and fen habitats. Like the ringed boghaunter, it is not found in all sphagnum peatlands within its range and its particular habitat requirements remain unknown. The ebony boghaunter appears to be more common than the ringed boghaunter with 8 new sites found in New Hampshire in 2003 and 2004 (P. Hunt, ASNH, personal communication), but is listed as endangered in Maine and Massachusetts where it reaches the southern extent of its range.

1.3 Protection and Regulatory Status

The ringed boghaunter is listed as state endangered in the New Hampshire Endangered Species Conservation Act (RSA 212-A). Fill and Dredge in Wetlands; NHDES (NHDES) (RSA 483-A). See Peatlands profile for other state and federal protection pertaining to ringed boghaunters.

1.4 Population and Habitat Distribution

The ringed boghaunter has a patchy distribution throughout the Northeast. It has recently been documented in Wisconsin and Michigan (NatureServe 2004). In New England, the ringed boghaunter is known from sites in Maine, Massachusetts, Connecticut, New Hampshire, and Rhode Island. Rhode Island accounts for the majority of sites in New Eng-

land with at least 20 occurrences (NatureServe 2004). Only 2 or 3 sites occur in Connecticut (NatureServe 2004). A single breeding site in Maine was found in 1995 at a complex of 5 adjacent fens in southern York County after unsuccessful surveys at approximately 250 potential sites between 1988 and 1995 (Maine Inland Fisheries and Wildlife 2004).

Documented ringed boghaunter breeding locations in New Hampshire are restricted to 4 towns in the southeastern region of the state (Amherst, Litchfield, Kingston, and Durham). It is not known whether historic populations existed beyond this area. In 1990, an adult was collected in Barrington and placed in the Entomology Collection at the University of New Hampshire (UNH) at Durham, but no other details about the site have been located. Another adult was seen at Spruce Hole in Durham in the spring of 1990 by UNH entomology professor Donald Chandler. Spruce Hole is described as a classic kettlehole bog, which is not typical habitat for this species. Ginger Carpenter, the odonatologist at The Nature Conservancy (TNC) Rhode Island Field Office suggested that Spruce Hole might not have supported a breeding population (McCarthy 1995). An adult was seen in Dover south of the easternmost extension of the Bellamy Reservoir by Audubon Society of New Hampshire biologists Pam Hunt and Laura Deming on 4 June 2004. Also in 2004, a resting adult ringed boghaunter was observed at a small cattail marsh near the Massabesic Audubon Center in Auburn. Although these adult dragonflies were not necessarily seen at emergence sites, these observations suggest the presence of additional populations in other parts of the state (P. Hunt, Audubon Society of New Hampshire, personal communication).

3.5 Town Distribution Map

A map is provided.

1.6 Habitat Map

Known ringed boghaunter breeding sites were mapped. Peatland habitats were mapped for the CWCS (See Peatlands profile).

1.7 Sources of Information

NatureServe (2004) was used as a source for species status and ranking information. A survey by the

NHFG Nongame and Endangered Species Program conducted in 2004 and earlier New Hampshire Natural Heritage Bureau (NHNHB) surveys were used to determine the range of the ringed boghaunter in New Hampshire. The UNH Entomology Collection at Durham was the source of the Barrington record. Further information was taken from published literature, technical field reports, and personal communications. Pam Hunt (Audubon Society of New Hampshire) and M. Marchand (NHFG) provided comments on drafts of this document.

1.8 Extent and Quality of Data

The unique habitat requirements of the ringed boghaunter appear to limit its distribution. While there are only a few sites to monitor for this species, peatlands can be physically difficult to survey for larvae and teneral adults, especially if affected by high water levels in the spring. The early spring emergence of flying adults, well before the bulk of most dragonfly species, has probably caused this species to be overlooked. Growing interest in dragonflies by qualified amateur observers may reveal new breeding locations.

1.9 Distribution Research

Identifying suitable sphagnum peatland habitats and surveying them for exuviae and teneral adults in the spring will help identify new breeding locations for ringed boghaunters. In particular, searches are needed in suitable habitats near the South Berwick site in York County, Maine. A documented occurrence here would extend the distribution of the species in the state. Atlantic White Cedar (*Chamaecyparis thyoides*) swamps may provide ringed boghaunter habitat (Briggs 1994). It would be relatively easy to survey the limited number of known swamps in southern New Hampshire.

There is a need to create and maintain an Odonate database that is coordinated between NHFG, NHNHB, the New Hampshire Odonate Club, New Hampshire Audubon (P. Hunt), and universities (e.g., University of New Hampshire, Don Chandler). The collection and analysis of these data would allow a more systematic and scientific assessment of the condition of Odonates in New Hampshire. Directing observers to priority sites would enhance the probability of finding new occurrences of at-risk species.

ELEMENT 2: SPECIES/HABITAT CONDITION

2.1 Scale

The known breeding populations of ringed boghaunters in New Hampshire are few and restricted to sphagnum peatlands and adjacent woodlands. Individual sites and complexes of sites are appropriate conservation planning units.

2.2 Relative Health of Populations

The Durham Point Sedge Meadow site is the best-documented location of breeding ringed boghaunters in New Hampshire. While small, this population appears to be stable. A 1994 survey of the site by TNC found the minimum estimated population to be 41 individuals (McCarthy 1996). A NHFG survey in 2004 counted at least 41 individuals (exuviae and teneral adults). In most years, the numbers of individuals have been much less, but this may be the result of survey effort and timing that misses the period of peak emergence. The breeding site and surrounding woodland is owned and maintained by TNC. The sedge meadow lies adjacent to Durham Point Road and several adults were observed resting on the road pavement in spring 2004. Continuing residential development and the subsequent rise in traffic volume may increase the likelihood of road mortality to flying and resting adult dragonflies at this site.

Ponemah Fen in Amherst has not been consistently monitored to assess population trends. It had been considered the best site in New Hampshire for ringed boghaunters by TNC because of its large population size, amount of habitat, and relatively undisturbed wetland and surrounding upland (McCarthy 1996). A 1994 survey by TNC determined the minimum population size to be 61 individuals. The 1994 search was the most extensive known at Ponemah Fen, lasting approximately 2 hours by 3 observers (McCarthy 1995). Although much larger in size than any other occupied site, the surrounding upland is being developed rapidly. An adult ringed boghaunter was observed resting on pavement in a nearby driveway in a NHFG survey in 2004.

Three-Way Basin in Litchfield is a complex of basins in a residential neighborhood. The largest number of ringed boghaunters in the complex was documented at the Brenton Street Basin by NHFG in

2004. Despite high water conditions, two people collected 20 ringed boghaunter exuviae in a 45-minute search. The vegetation within and at the edge of this fen remains undisturbed and the large, unfragmented woodlands of Litchfield State Forest to the south may provide refuge and foraging areas for flying adults. The Brenton Sreet Basin may function as a source population for the other smaller basins in the complex that are surrounded by residential development.

Garden Street Fen in Litchfield, located north of Three-Way Basin, is less than 0.4 ha (1 ac). In a survey by TNC in 1994, 3 people found 10 exuviae and 1 teneral adult in a 50-minute search (McCarthy 1995). Until recently, access to the fen for surveys had been somewhat restricted, so the relative health of this population remains unknown.

At the Pow Wow River / Webster Wildlife Area in Kingston, a teneral male was observed in 2000. The site was revisited by NHFG in 2004 when 1 adult was observed resting at the edge of an inactive gravel pit near the entrance to the Webster Wildlife Area. Further efforts are required to adequately survey these extensive aquatic and wooded habitats.

2.3 Population Management Status

Past NHNHB surveys, beginning in the early 1990s, focused on peatlands that contain both Sphagnum and open water. A major peatlands inventory, begun by NHNHB in 1997, identified more potential ringed boghaunter sites. Suitable wetlands north of known locations were identified and partially surveyed in 1998, especially around the New Hampshire border near an adult ringed boghaunter record in Fryeburg, Maine, (Cairns 1998). The NHFG Non-game and Endangered Species Program and TNC have conducted other surveys.

2.4 Relative Quality of Habitat Patches

In 1994, TNC acquired the Durham Point Sedge Meadow and most of its watershed to protect and manage the sedge meadow specifically for the conservation of ringed boghaunters (McCarthy 1996). Contaminated runoff entering the wetland from the adjacent Durham Point Road may threaten the health of this small habitat.

Larger sphagnum peatlands surrounded by intact wetland or upland forests appear to have the most

potential for the long-term persistence of ringed boghaunters. Ponemah Fen and Three-Way Basin (especially Brenton St. Basin) may be of sufficient size and quality to offset the negative effects of adjacent residential development if further upland habitat losses are slowed. The proximity of Three-Way Basin to the large area of woodlands in Litchfield State Forest enhances the long-term viability of this population. The long-term biological cost of adult road mortality and increased predation by domestic animals and subsidized predators is not known. Land fragmentation from residential development around the Garden Street Fen may affect the future viability of this site.

The Pow Wow River / Webster Wildlife Area may be capable of maintaining a viable ringed boghaunter population because of its large size and protected status.

2.5 Habitat Patch Protection Status

TNC owns and protects the Durham Point Sedge Meadow property. Ponemah Fen is privately owned and parcels of the remaining woodlands are distributed among various private owners. The Three-Way Basin Complex is held in several private ownerships, but the Division of Forests and Lands of the State of New Hampshire own the nearby woodlands of Litchfield State Forest. The Litchfield Conservation Commission recently protected the Garden Street Fen. The Pow Wow River / Webster Wildlife Area is owned by the NPNHF.

2.6 Habitat Management Status

Habitat management for the ringed boghaunter is limited to the Durham Point Sedge Meadow and consists of cattail removal to maintain some open water in this small peatland. It is unknown whether this activity has benefited the species.

2.7 Sources of Information

Ringed boghaunter inventory and monitoring reports of New Hampshire sites contain survey data and conservation concerns. Pam Hunt of ASNH and Sara Cairns of NHHNB provided information regarding the protection status of known breeding sites, as well as habitat quality indicators.

2.8 Extent and Quality of Data

The quality of ringed boghaunter reports is very good. Expert observers conducted all surveys and the identification of ringed boghaunter exuviae and adults is relatively easy. The early seasonal hatch and flight period in May eliminates confusion with the majority of dragonfly species whose flight periods begin weeks or months later.

The condition of ringed boghaunter populations in New Hampshire is not well understood. Inconsistency in surveying efforts between years and sites make it difficult to compare between and within populations. Site conditions, especially water levels, greatly influence monitoring results. The flight period for this species is short and early, and exuviae are delicate and easily dislodged from the stems of emergent vegetation by wind or high water. Therefore, the absence of individuals during a single survey does not prove the habitat is unoccupied.

2.9 Condition Assessment Research

The status of the species and its habitat should be regularly monitored because the number and distribution of breeding locations are limited. Additional surveys following up on sightings of flying adults are needed to determine the locations of source populations, particularly at Auburn and Dover sites. Continued surveys for likely wetland habitats are essential to determine and update the status of this species in New Hampshire.

Research is needed to determine the water quality parameters of occupied wetland habitats and to understand the extent of woodland use, including adult dispersal ranges.

A standardized methodology is needed to compare ringed boghaunter populations between years and sites. A consistent survey methodology could reduce the survey effort required to monitor the species (e.g., semi-annual schedule).

ELEMENT 3: SPECIES AND HABITAT THREAT ASSESSMENT

3.1.1 Altered Hydrology

(A) Exposure Pathway

The dredging and filling of peatlands and related hy-

drologic alterations is considered the greatest threat to ringed boghaunter populations, specifically to breeding and larval habitat. In New Hampshire, most of the known locations are protected from dredging and filling, but the long-term effects of altered hydrology by adjacent residential development are uncertain. High water levels and springtime floods in peatland habitats can drown or dislodge teneral adults. Conversely, culvert installation may lower the water or drain small sites adjacent to roads. Low water may expose ringed boghaunter larvae and teneral adults to increased avian and mammalian predation or make the sites unsuitable for aquatic Sphagnum. It is not known whether any small sites have been lost to dredging or filling in the past.

(B) Evidence

While ringed boghaunters do not require permanent standing water to survive, likely because of similar adaptations documented in other Odonates, the length and timing of the hydroperiod at breeding sites may be important for long-term persistence (Biber 2002). The 2-month period between the time ringed boghaunters oviposit in early May and the time of seasonal dry-down may be critical to larval development. Larvae that are not well developed may succumb to desiccation at sites that dry too quickly (Biber 2002).

3.1.2 Development (Habitat Loss and Conversion)

(A) Exposure Pathway

Adult ringed boghaunters use upland woodlands surrounding breeding sites.

(B) Evidence

Agricultural, residential, or commercial development may eliminate or disrupt the upland areas that may be required by adult ringed boghaunters to rest, develop, and feed (Biber 2002). The dispersal distances and extent of upland habitat use are not well known.

3.1.3 Transportation Infrastructure

(A) Exposure Pathway

Ringed boghaunter populations appear isolated from each other, partially because of their habitat distribution. Local populations may become more isolated

because of development and roads. Little is known regarding dispersal distances for this species. Adult ringed boghaunters are low flyers that can be found resting on sunny surfaces on the ground or asphalt, which exposes them to vehicle mortality. Ringed boghaunters may not be able to recolonize vulnerable smaller sites near roads or other development if catastrophic events destroy a local population.

(B) Evidence

The proximity of the Garden Street Fen to the complex of sites at Three-Way Basin in Litchfield may ensure viable populations if one or more locations need to be recolonized in the future. However, if the Durham Point Sedge Meadow population were lost, the closest known New Hampshire breeding site is in Kingston or possibly Dover. Surveys for ringed boghaunters in Maine may locate additional York County breeding sites closer to the Durham location.

3.1.4 Altered Natural Disturbance (Natural Succession)

(A) Exposure Pathway

The loss of open water through succession or the proliferation of invasive plants such as cattail may crowd out the aquatic Sphagnum and emergent vegetation needed by ringed boghaunters. Fertilizers and leachfield runoff in residential areas may hasten succession.

(B) Evidence

Ringed boghaunters are one of the first odonates to emerge in New Hampshire in the spring, often in the first week of May. Sites that lack old stems and new spring shoots of emergent vegetation, such as *Carex* and *Dulichium*, are not likely to be suitable breeding sites (Lundgren 1999). Aquatic species of Sphagnum seem to be an important component of breeding areas (Lundgren 1999). Cattails have been removed at Durham Sedge Meadow to maintain open water.

3.2 Sources of Information

Mike Marchand (NHFG) and Pam Hunt (Audubon Society of New Hampshire) reviewed threats. Scientific literature was used for evidence in the threat assessment.

3.3 Extent and Quality of Data

Since the known breeding sites for ringed boghaunter in New Hampshire are few and accessible, current conditions at each location are noted. The effects of altered hydrology on ringed boghaunter populations is not well understood or documented.

3.4 Threat Assessment Research

Continued monitoring of individual boghaunter breeding sites for habitat and population conditions.

ELEMENT 4: CONSERVATION ACTIONS

4.1.1 Protection of ringed boghaunter sites, Habitat Protection

(A) Direct Threats Affected
Development (Habitat Loss and Conversion)

(B) Justification

- 1) Protecting and managing ringed boghaunter sites will reduce the impact of development on this species.
- 2) Ringed boghaunter populations depend on the survival of breeding adults. Removing threats to increase adult emergence and successful breeding will help ensure long-term viability.
- 3) Known ringed boghaunter sites have been mapped and are afforded additional protection under the New Hampshire Endangered Species Conservation Act.
- 4) Ringed boghaunter sites are few and isolated. All sites are located in southern New Hampshire where development pressures are high. Every ringed boghaunter breeding site needs to be protected quickly with adequate adjacent woodland to prevent population extirpation.
- 5) Locations of new ringed boghaunter breeding populations should be prioritized for land protection.

(C) Conservation Performance Objective
Protect all known ringed boghaunter breeding sites and adjacent woodlands. The minimum extent of upland use by adults needs to be determined for the purpose of protection. Undiscovered breeding sites are at the greatest risk. These locations, especially those

that are extremely small in size, may go undetected during the wetland review process and may be subject to damage from filling or logging before protection. New occurrences of adult ringed boghaunters need to be located in a timely fashion.

(D) Performance Monitoring
Continue ringed boghaunter inventories to monitor established sites and identify new sites for protection. Maintain a database of known ringed boghaunter sites, unprotected lands, and landowner contact information.

(E) Ecological Response Objective
Protect peatland breeding sites and an ample wooded buffer to help maintain viable populations of ringed boghaunters in New Hampshire.

(F) Response Monitoring
Monitor breeding sites for population stability and colonization of nearby suitable peatland breeding habitat.

(G) Implementation
Secure protection for Ponemah Fen and any remaining adjacent woodlands and the Three-Way Basin Complex, especially the larger Benton Street Basin. Work with appropriate conservation partners to secure easements or purchase land outright. Use occupied sites to prioritize landscape level habitat protection.

(H) Feasibility
The NHFG is limited in its ability to protect land through easement or purchase. Protection efforts may rely on the involvement of conservation commissions and planning boards, particularly in Amherst and Litchfield.

4.1.2 Communicate to landowners, abutters, town administrators and departments, local conservation organizations and commissions about ringed boghaunter status and habitat, Education and Outreach.

(A) Direct Threats Affected
Development (Habitat Loss and Conversion), Altered Natural Disturbance (Natural Succession)

(B) Justification

- 1) Most people, including natural resource professionals, are unaware of the presence of a state-endangered dragonfly in New Hampshire.
- 2) Sites are primarily adjacent to residential development. Removing threats associated with residential development through education will help increase the probability of long-term survival of local ringed boghaunter populations.
- 3) Efforts will be directed towards specific locations where ringed boghaunter populations have been documented.
- 4) Sites are at immediate risk from uninformed actions by private individuals and those authorized by public agencies (i.e., application of lawn chemicals near peatlands and mosquito control larvicides).
- 5) Brochures or other educational materials can be updated with new information to benefit ringed boghaunters conservation.

(C) Conservation Performance Objective

Increase awareness of the ringed boghaunter and its peatland and upland habitats. Reduce direct and incidental damage to peatlands by chemical application and runoff from landowners and abutters.

(D) Performance Monitoring

Regularly monitor ringed boghaunter sites and communicate with local conservation commissions and residents to discuss problems.

(E) Ecological Response Objective

Outreach and education should increase the probability that local ringed boghaunter populations will persist into the future.

(F) Response Monitoring

Develop baseline water quality indicators for peatlands and regularly sample to detect changes in water chemistry at specific peatland sites. Monitoring is especially needed at unprotected sites that are surrounded by residential development and would benefit from education and outreach efforts (e.g., Three-Way Basin, Ponemah Fen).

(G) Implementation

Work with NHFG Public Affairs Division or other organizations such as TNC to develop a brochure fea-

turing the ringed boghaunter. Distribute brochures to ringed boghaunter site owners, abutters and town officials and departments whose activities may affect sites such as public works. Follow up on activities that are detrimental to ringed boghaunter sites with contact to specific individuals or relevant agencies.

(H) Feasibility

Brochures are a cost-effective way to inform people about ringed boghaunters.

4.2 Conservation Action Research

N/A

ELEMENT 5: REFERENCES

5.1 Literature

- Biber, E. 2002. Habitat analysis of a rare dragonfly (*Williamsonia lintneri*) in Rhode Island. *North-eastern Naturalist* 9:341-352.
- Briggs, N. 1994. An ecological and behavioral study of *Williamsonia lintneri* (Hagen), the ringed boghaunter. Unpublished report to The Nature Conservancy, Rhode Island Field Office.
- Cairns, S. J. 1998. Ringed boghaunter (*Williamsonia lintneri*) in New Hampshire: 1998 inventory and monitoring. New Hampshire Natural Heritage Bureau, Concord, New Hampshire, USA.
- Cairns, S. J. 2000. Ringed boghaunter (*Williamsonia lintneri*) in New Hampshire: 1999 inventory and monitoring. New Hampshire Natural Heritage Bureau, Concord, New Hampshire, USA.
- Lundgren, J. A. 1999. Characterization and classification of plant communities inhabited by the ringed boghaunter dragonfly (*Williamsonia lintneri*). The Nature Conservancy. Boston, Massachusetts, USA.
- McCarthy, P. 1995. Banded bog skimmer (*Williamsonia lintneri*) in New Hampshire: 1994 inventory and monitoring. The Nature Conservancy. Concord, New Hampshire, USA.
- McCarthy, P. 1996. Banded bog skimmer (*Williamsonia lintneri*) in New Hampshire: 1995 inventory and monitoring. The Nature Conservancy. Concord, New Hampshire, USA.

5.2 Data Sources

- Maine Inland Fisheries and Wildlife. 2005. Ringed boghaunter in invertebrates listed in Maine. <<http://www.state.me.us/ifw/wildlife/etweb/group/rbog.htm>>. Accessed 2005 February 26.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. <<http://www.natureserve.org/explorer>>. Accessed 2004 December 29.
- New Hampshire Natural Heritage Bureau. 2005. Database of Rare Species and Exemplary Natural Community Occurrences in New Hampshire. Department of Resources and Economic Development. Concord, New Hampshire, USA.

Distribution of Ringed Boghaunter in New Hampshire

Distribution
■ Known
■ Potential



0 10 20 40 Miles

Known = confirmed breeding observations as reported in the
NH Natural Heritage Bureau's Element Occurrence Database.
Potential = possible breeding and other observations from the
same data source.

