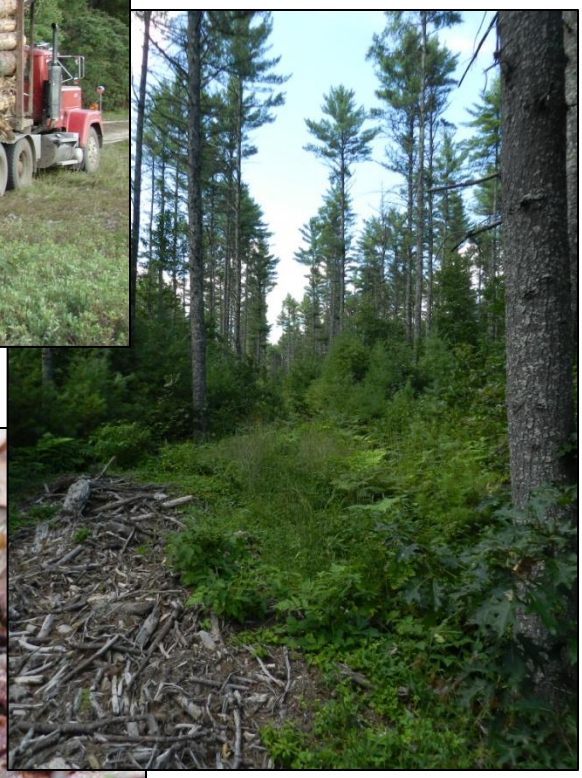
Best Management Practices for the

Eastern Whip-poor-will in New Hampshire



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Overview

The Eastern Whip-poor-will (*Antrostomus vociferous*, hereafter WPW) is a nocturnal bird found in forests and edge habitats throughout the eastern United States and parts of southern Canada. Its populations and range have declined significantly over the last few decades (e.g., Cadman et al. 2007, Sauer et al. 2011, Renfrew 2013), and as a result the species is a conservation priority in most areas where it occurs.

From 2008-2012, the author studied habitat use by WPWs at two sites in New Hampshire, the Mast Yard State Forest (Hopkinton and Concord) and Ossipee Pine Barrens (Madison, Freedom, and Ossipee). These studies used a combination of radio telemetry and territory mapping to identify used vs. unused areas of the two study areas, and were supplemented by anecdotal records of the species both from the study areas and elsewhere in the state. The results of this research project are presented in Hunt (2013).

Summary of Habitat Requirements

Eastern Whip-poor-wills have fairly complex habitat needs, and these are somewhat compounded by the species' large home ranges. In broadest terms, whip-poor-wills need a mix of open habitat for foraging and forested habitat for nesting, and these key features can be either met by multiple habitat types in juxtaposition or a single heterogeneous area of habitat.

Management Recommendations

Effective management for WPW in New Hampshire (and elsewhere in the Northeast) will depend on two things: appropriate techniques and appropriate landscape focus. Even if particular management practices are known to benefit WPW, they are less likely to have an effect if implemented in areas that are less likely to support suitable habitat or that are not in or near areas known to support the species. There is a wealth of anecdotal evidence that WPWs are absent from locations that appear to contain suitable habitat, but these areas tend to be distant from the species' core distribution in the state. As a result, these areas are less likely to be discovered and colonized by dispersing birds on a regular basis. To this end, delineation of focal areas is a useful first step in directing future management.

Whip-poor-will Focal Areas

Based on the core distribution of WPW in New Hampshire, two areas have been identified where management is most likely to benefit the species (Figure 1). These areas are characterized by higher densities of WPW, more frequent reports of the species, and a greater extent of apparently suitable habitat. Three secondary focal areas have been identified based on the same general characteristics, although WPW presence in these locations is significantly lower than in the primary focal areas.

It is important to note that not all locations within focal areas are equally suitable for WPWs, and thus amenable to future management. More detailed maps of the two primary focal areas are presented in Figures 2 and 3, with internal priorities as described below. The general

habitat and landscape features listed here can also be applied to the secondary focal areas. One of the most prevalent features associated with WPW occurrence in focal areas is the presence of relatively well-drained soils. These sandy or loamy soils tend to occur in river valleys and outwash plains in southern and central New Hampshire, and often support pine forests of some sort. Well-drained soils are likely also of benefit to WPWs because the birds' eggs are laid directly on leaf litter on the ground, and thus highly susceptible to even minor flooding. Well-drained soils were also an important component of the pitch pine distribution model used in the New Hampshire Wildlife Action Plan, and this layer may be a better predictor of WPW presence than soils alone (e.g., Hunt 2006).

If these two layers are superimposed on the focal areas, the result is a clearly defined zone that represents where WPW are most likely to occur within focal towns. For the Ossipee focal area (Figure 2), this zone is centered on an area between Silver Lake and the outlet of Ossipee Lake, with extensions up the Bearcamp and Pine Rivers to the northwest and south, respectively. Almost all recent WPW records from this area have been from the modeled pine barrens habitat. An additional area of predicted pine barrens is evident in the town of Conway just to the north, but Conway was not included in the focal area due to a lack of WPW records. However, there is certainly potential for birds to occur in this area given its proximity to the Ossipee Pine Barrens proper.

The Upper Merrimack Valley focal area (Figure 3) is roughly twice the size of Ossipee, and includes portions of the Merrimack River valley and several tributaries (particularly the lower Contoocook, Soucook, Suncook, and Piscataquog). Again, areas modeled as pine barrens tend to have the most records of WPW, although in this case there are also significant numbers in the Piscataquog drainage in Weare. The latter may be partially a result of higher disturbance levels associated with the Hopkinton-Everett Flood Control Area. WPW also occur regularly in the vicinity of the Blackwater River in Webster. Predicted pine barrens in southwestern Belknap County (Tilton and Belmont) and along the Suncook River in Epsom may also be suitable sites for WPW, but the lack of recent records precluded them from being included in the focal area. At the southern end, Manchester has been excluded because most of the suitable habitat there has already been developed.

Focal Habitats

The majority of WPW records in New Hampshire are from habitats dominated by pines, and recent sightings from pure hardwoods are exceedingly rare. Because of this, management specifically targeted toward WPW should be discouraged at hardwood sites, which instead may be better managed for early successional songbird species. Areas where management is most likely to be successful – even within appropriate habitat in focal areas – are those where there has been some history of WPW use, or which are close to already occupied areas. As noted above, pine or pine/hardwood forests on well-drained soils are more likely to contain suitable habitat, or habitat that can be made more suitable through management. In the absence of a soils map or other soils data, gravel or sand pits are good indications of appropriate soils in an area. Forests on slopes are generally avoided unless underlain by very rocky substrate.

At a stand scale, open forests with a variable understory appear more suitable (e.g., Fig. 4a). There are few records from pine plantations, stands with complete canopy closure, or forests with a consistently dense shrub layer. However, there is a point at which a forest becomes too open, presumably because there is reduced cover for nesting (e.g., Fig. 5a). The presence of a nearby opening or disturbance (ROW, field, past timber harvest, gravel pit, etc.; Fig. 4b,c) can make a pre-treatment site more suitable to begin with, and subsequent management could build upon such existing landscape features where possible and feasible.

Data on the value of wetlands to WPW are equivocal. Birds appear to select them at Mast Yard, but not at Ossipee, but this difference could be due to a higher incidence of wetlands at the former, or their proximity to other preferred habitat types. And while wetlands fell within WPW home ranges, very few actual spot-mapped or telemetry locations were actually within the wetlands proper. In this context, wetlands probably function as an alternate type of edge, and used primarily for singing locations or open areas over which to forage. It is thus unlikely that wetlands are a significant feature of WPW habitat in their own right.

Management Practices

Probably the most effective way to enhance habitat for WPW is through harvest. Not all harvest techniques are equally effective, and only those that open up relatively large areas of canopy – with resultant regeneration – are considered. The silvicultural practices listed below come from *Good Forestry in the Granite State* (Bennett 2010).

1) Clearcutting. Clear cuts in and of themselves are not necessarily attractive to WPWs for a few years (e.g., 3-5) following harvest. This may be because they lack any significant vegetative features such as patchy shrubs (Fig. 5c). However, if a clear cut is adjacent to otherwise suitable forest (e.g. an open canopy achieved through natural or silvicultural means), it may be used by WPWs for foraging from its edge. Once a clear cut starts exhibiting a more varied regenerative structure (5-8 years post-harvest) it is more likely to be attractive. Some evidence from Mast Yard suggests that a post-harvest burn may result in more heterogeneous regeneration and make such cuts even more suitable to WPWs. There are no data that allow for rigorous evaluation of the effects of cut size on WPW, but anecdotal information suggest that smaller cuts are less likely to be occupied. At Mast Yard, two small (< 1 ha) log landings were rarely used by WPW, but this could also be because of limited regeneration. However, such cuts can provide an attractive edge if surrounding forest is suitable for the species' needs. A similar practice - Group Selection – is included here because the ultimate result is the same: trees are completely removed from an area of forest. However, group cuts tend to be relatively small (< 1 ha) and in this context may not be large enough to be used by WPW on a regular basis. At the opposite extreme, other studies have shown that WPW are usually within 100 m of an edge (Wilson and Watts 2008), suggesting that clear cuts larger than 5-6 ha could have unused interiors and thus not be fully used.

2) Overstory Removal. This practice removes larger trees while leaving the understory of saplings and shrubs relatively unaltered. The result can be a dense area of young

growth interspersed with openings resulting from both skid roads and the overstory removal itself. A 3 ha patch treated this way at Mast Yard was regularly used by WPWs for both foraging and roosting. A benefit over clearcutting is that the relatively unimpacted shrub layer is probably more attractive to WPW in the short term. The young pine regeneration that often results in these cuts can provide good daytime roosting cover.

3) Crop Tree Release. In a crop tree release (CTR), some percentage of trees is removed to enhance growing conditions for pre-identified dominant or co-dominant trees. The result is a variable degree of opening in both the canopy and understory that may be attractive to WPWs. However, limited data from Mast Yard suggest that such a forest is less attractive to WPWs than one with more extensive cutting, and in this regard a CTR may be more similar to a shelterwood cut (below). Areas of open understory resulting from CTR may be used as part of a WPW home range if other suitable habitat features (e.g., clear cuts) are adjacent or nearby.

4) Shelterwood and strip cuts. These two common forestry techniques can also result in a mosaic of forest types, but may not result in habitat configurations attractive to WPWs. This may be because the openings that are generated are relatively narrow, in which case a more extensive shelterwood cut may be more effective. But in either case, available data suggest that more extensive harvesting as discussed above is more likely to generate the appropriate early successional structure.

Comparison of CTR and other partial cuts at Mast Yard with a harvest on private land to the north suggests that heavier thinning is more likely to provide suitable habitat for WPW in the short term. In the private harvest, relatively heavy cutting combined with an extensive network of roads and skid trails resulted in perhaps 50% or more of the site being open (Fig. 4d). As such a harvested site ages, however, it may become unsuitable more quickly as herbaceous growth and regeneration fill in the relatively narrow gaps. This successional process may be one reason that the fairly narrow strip cuts at Mast Yard are not extensively used by WPW. Another option might be to combine thinning with complete harvests (either clear cuts or overstory removal) on smaller parcels. The latter areas will persist as suitable WPW habitat for a longer period (especially if periodically maintained), and perhaps serve as foci for WPW activity (as they appear to have done at Mast Yard).

Powerline rights-of-way are something of a unique situation. Ideally, these can be maintained as shrublands adjacent to forest indefinitely through selective harvest of taller trees (e.g., those that a growing into the zone where they are more likely to interfere with transmission lines). Selective harvesting of this sort allows the shrubby or open understory to persist, whereas more broad-based approaches such as mowing (and some herbicide treatments) would eliminate all ROW vegetation to the likely detriment of WPW use (as per clear cuts). Forest landowners who abut ROWs and who are interested in enhancing habitat for WPW might consider implementing forestry on areas adjacent to the ROW. This may be of particular benefit if the adjacent forest is dense or overly shrubby, in which case a small group cut could improve nesting habitat while the ROW continues to provide foraging habitat.

Prescribed Burns are a special case of WPW habitat management. Burns are the preferred method of maintaining or restoring pine barrens habitat (e.g., Garlapow 2007), in part because pitch pine germination is facilitated by fire. In most NH barrens, fire is combined with some other management technique (usually mowing and/or tree harvest) that first opens up the understory. This combination serves the dual purpose of removing potentially competing species and reducing fuel loads and the risk of wildfire. The extent of pre-burn treatment may be important in determining the future suitability of a site for WPW. Based on observations at Ossipee, extensive areas of shrub mowing combined with tree removal result in sites characterized by widely scattered trees. After a burn, and the elimination of remaining woody debris and herbaceous vegetation, such sites resemble savannah (Fig. 5a), and are rarely occupied by WPW. This finding is corroporated by Garlapow (2007), who found WPW more likely to use areas with lower amounts of dense ground cover. After a few years however, as regenerating shrubs become larger, the birds are more likely to use the site, although they still appear to occur at lower densities or be concentrated at the edges of the treated area. Burning in the absence of mowing, or in connection with more selective tree/shrub removal, seems to result in habitat patches more attractive to WPW. As in traditional harvest-only management, proximity to otherwise suitable habitat will increase the chances of WPW using sites that would otherwise be too open.

As noted above, a prescribed burn post-cut may result in suitable habitat for WPW even if pine barrens vegetation is not the management objective. Of the three clear cuts dating to the 1990s at Mast Yard, WPW activity was far more consistent at the two that were subsequently burned (Fig. 4b). These sites also differed by being more open, with highly variable regeneration, while the unburned site was dominated by denser and taller aspen (Fig. 5b). Presumably, burning had some uneven effect on aspen regeneration that resulted in more heterogenous site conditions in subsequent years.

Because WPWs nest directly on the ground, management operations should not occur during the peak breeding season (mid-May through late July) if birds are present on a site. If needed, the presence of birds can be determined by conducting 2-3 evening surveys during peak lunar conditions during this period (half hour after sunset on clear nights during the week preceding a full moon, Hunt and Gallo 2007). Limited evidence from Mast Yard State Forest suggests that harvests in unoccupied areas *adjacent* to occupied ones may facilitate more rapid colonization during subsequent breeding seasons.

One other factor to consider when contemplating WPW habitat management is the effects of various practices on Lepidoptera communities. Moths comprise a significant portion of WPW diets (Cink 2002), and there has been speculation that population declines could in part be the result of historic declines in large moth species (e.g., Sphingidae, Saturniidae). These declines may in turn be due to historic chemical and biological control of gypsy moths (*Lymantria dispar*) (Schweitzer 2004). Given potentially reduced abundance of large moths, any additional impacts on WPW prey availability could have cumulative impacts on foraging success and productivity. While data on the effects of forestry on moths are limited, there is some evidence that diversity is more strongly reduced in stands subject to clearcutting when compared to more selective harvest techniques (Summerville and Crist 2002, Summerville 2011). How this might apply to WPW habitat is unknown, but is presented here for potential consideration.

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Figure 1. Proposed focal areas for Eastern Whip-poor-will management in New Hampshire.

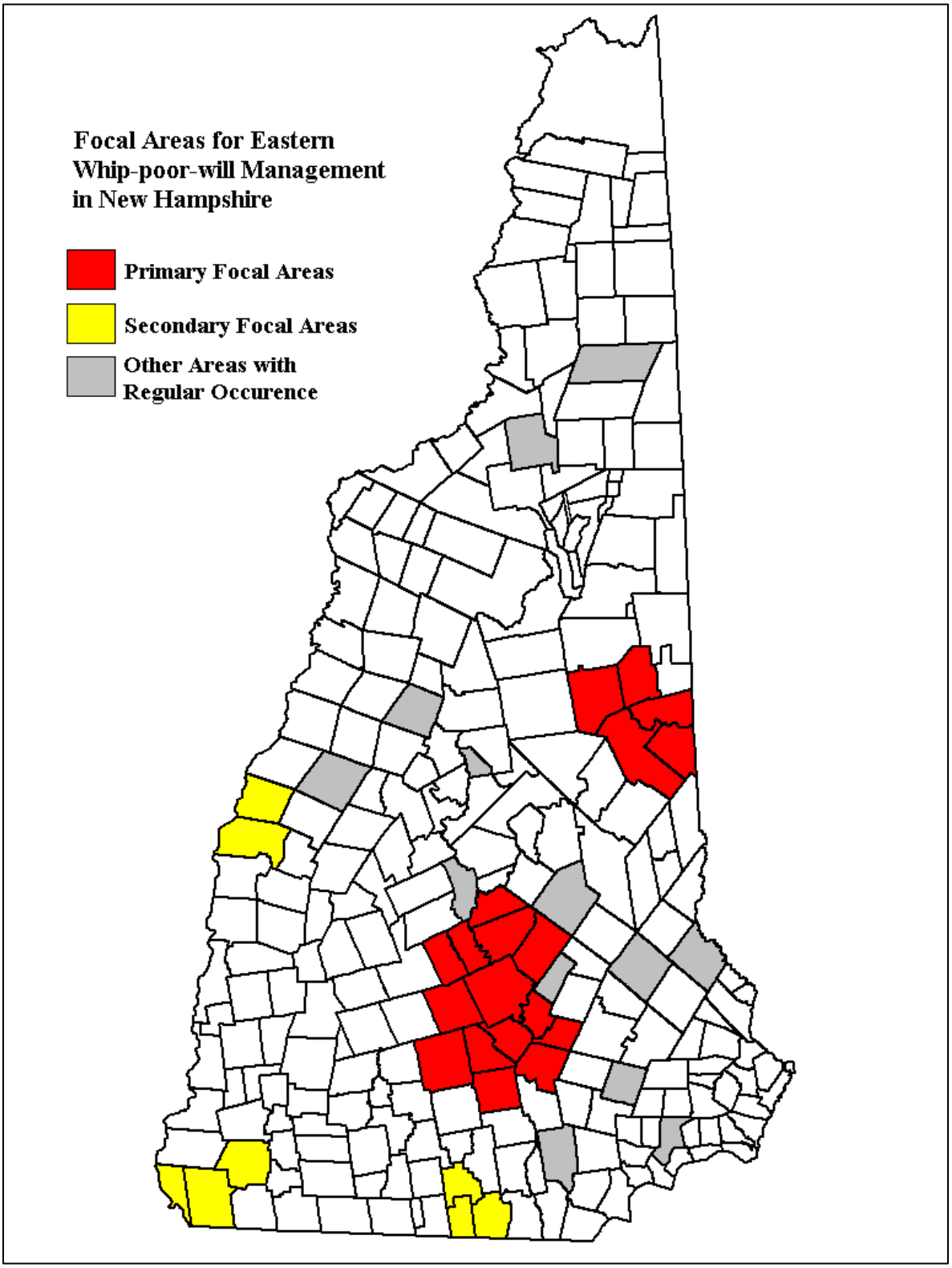

Figure 2. Detail of the Ossipee WPW Focal Area, showing locations of well-drained soils (orange) and predicted pine barrens habitat (pale blue). Focal towns shaded gray and water bodies in dark blue. See text for details.

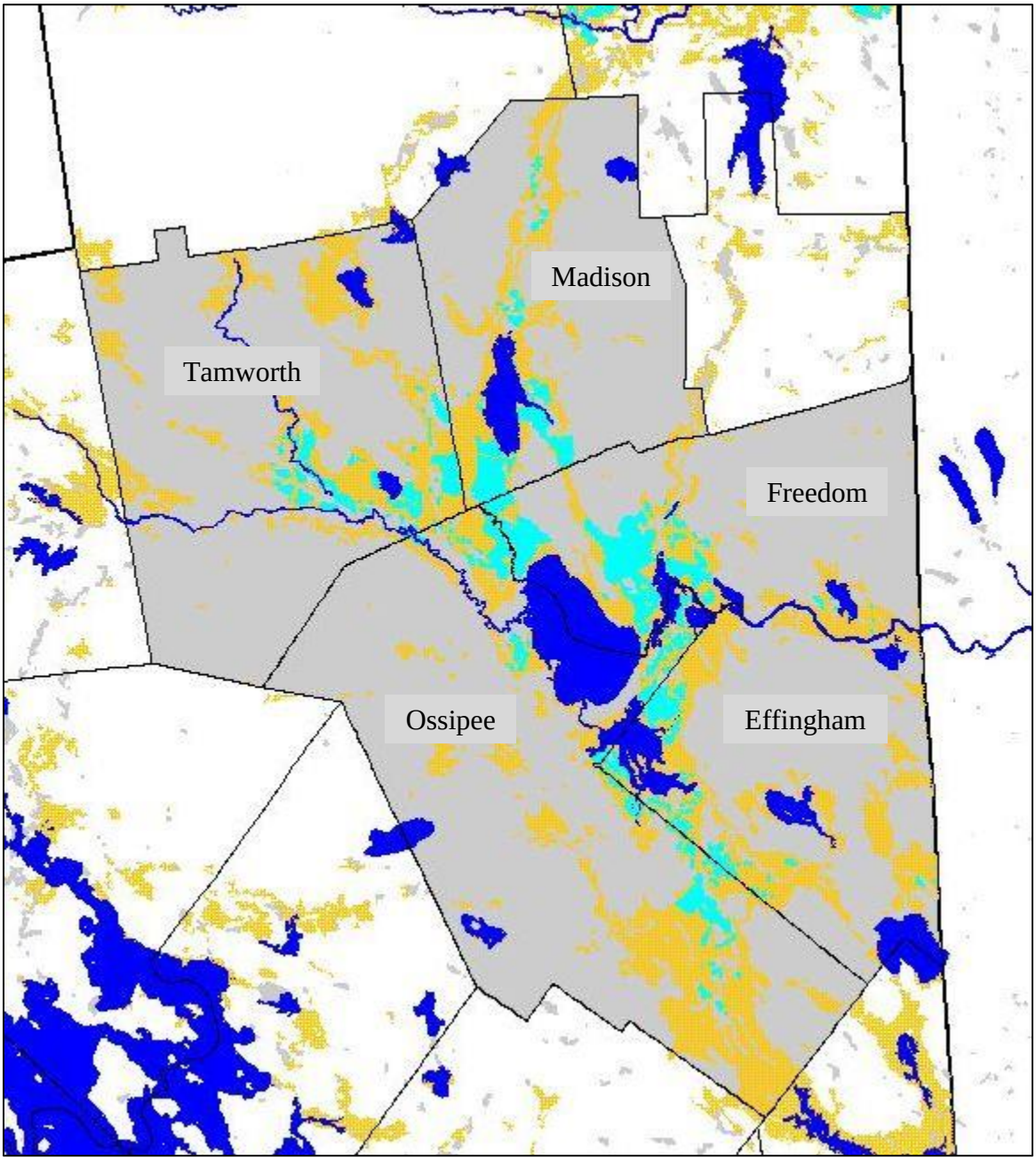

Figure 3. Detail of the Upper Merrimack Valley WPW Focal Area, showing locations of well-drained soils (orange) and predicted pine barrens habitat (pale blue). Focal towns shaded gray and water bodies in dark blue. Note that pine barrens on this map are shifted slightly east because of the quality of digital soils data when the model was originally created. See text for details.

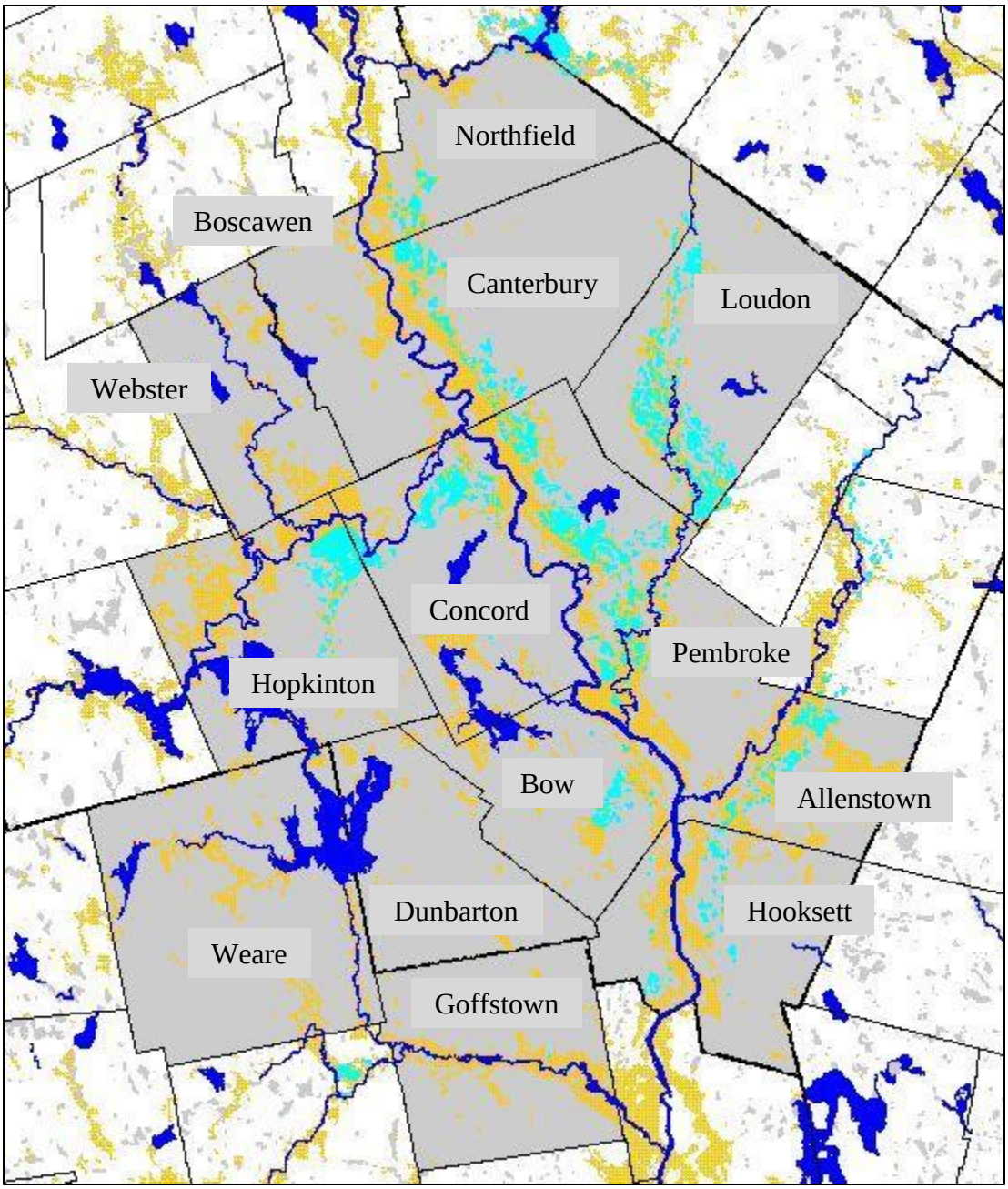

Figure 4. Examples of preferred habitats for Eastern Whip-poor-will in New Hampshire

a) Pitch Pine/Scrub Oak woodland before (L) and after (R) a burn. Note the open canopy, heterogeneous understory, and patchy ground cover in both photos (Ossipee Pine Barrens).

b) 15-20 year old regenerating clear cuts in pine-oak forest. The stand on the left was cut in 1996, brush-sawn in 2000, and burned in 2001 (photo from 2010). The stand on the right was cut in 1993 and burned in 1994 (photo from 2013). Both sites are characterized by a mix of low woody plants, herbaceous ground cover, and scattered pine/hardwood regeneration (Mast Yard).

Figure 4. continued

c) Edge habitats including an old road through pine-oak forest (L: Ossipee) and a power line right-of-way (R: Mast Yard). Both are characterized by a relatively abrupt edge, with open pine-oak forest abutting a heterogeneous open strip of shrubby and/or barren habitat.

d) Heavily harvested forest abutting Mast Yard

Figure 5. Examples of less suitable habitats for Eastern Whip-poor-will in New Hampshire.

a) Unsuitable pine barrens habitat variations include (L) extensive scrub-oak thicket with limited to no ground exposure and (R) pitch pine subject to harvest followed by a burn, resulting in a savannah-like habitat with little canopy cover and dense herbaceous ground cover (Ossipee Pine Barrens)

b) Dense aspen saplings resulting from harvest in 1993 (photo taken in 2013, Mast Yard). This stand was not burned following harvest, in contrast to that shown in Fig 4b.

c) Recent clear cut (cut and photo in 2011, Mast Yard). Whip-poor-wills used the edge of this cut but were never recorded in the interior.