

Monitoring Management Results at Montague Plain WMA - 2009

Management Overview

Habitat management at the Montague Plains Wildlife Management Area (MPWMA) is derived from applied research. Tools DFW has used to increase understanding of the WMA include vegetation history, land use history, fire history, current vegetation patterns, historical vegetation and fauna and research to improve public safety in this highly fire prone area.

The research that has occurred at the WMA represents a partnership between DFW and the University of Massachusetts - Amherst, the US Forest Service, Harvard University, Northeast Utilities and the Department of Conservation and Recreation's Bureau of Fire Control.

All lines of evidence indicate that historical agricultural practices transformed an extensive, open-canopied oak/pine barrens with frequent pitch pine, heathland and grassland into a closed-canopied pitch pine dominated system capable of accumulating high fuel loads and supporting dangerous crown fires that threaten residential areas nearby, and that does not support the vast majority of target species found in Table 1.

Six important scientific papers have been published based on this research:

Compton et al. 1998. Soil carbon and nitrogen in a pine-oak sand plain in central Massachusetts: role of vegetation and land use history. *Oecologia* 116:536-542.

Donohue et al. 2000. Effects of past and present on species distributions: land use history and demography of wintergreen. *Journal of Ecology* 88:303-316.

Fuller et al. 1998. Impact of human activity on regional forest composition and dynamics in central New England. *Ecosystems* 1 :76-95.

Motzkin et al. 1996. Controlling site to evaluate history: vegetation patterns of a New England sand plain. *Ecological Monographs* 66:345-365.

Motzkin et al. 1999. A historical perspective on pitch pine-scrub oak communities in the Connecticut Valley of Massachusetts. *Ecosystems* 2:255-273.

Motzkin et al. 2002. Frost pockets on a level sand plain: do vegetation-microclimate feedbacks maintain persistent vegetation patterns? *Journal of the Torrey Botanical Society*. 129:154-163.

In addition several Masters of Science Theses have focused on MPWMA including:

Duveneck. M. 2005. Characterizing canopy fuels as they affect fire behavior in Pitch Pine (*Pinus rigida*) P.Mill.

Grima, P. 2009. Determining springtime foliar moisture in Pitch Pine (*Pinus rigida*)

Goals

Conservation Goals – Improve and restore habitats for conservation targets (Table 1).

Public Safety Goals – Improve public safety by restoring current pitch pine dominated ecosystem to a system dominated by oak, pitch pine, heath and grasses.

Monitoring Summary

General vegetation monitoring is anchored on the 121 permanent plots established by Harvard Forest. These were resampled in 2000 and after mechanical treatments and prescribed fires. Sixty of these plots were selected as the foundation for locating bird monitoring points and are resampled every 3 years or after management activity or other event such as ice storms.

The 28 conservation target species include 5 birds, 2 reptiles, 14 insects and 7 plant species. Table 1 summarizes the results of monitoring some of which began in the 1970's. All target species extant on the WMA are showing increases or remaining stable. Three moth and butterfly species were eliminated from the site prior to DFW acquisition in 1998. DFW will attempt to restore populations of those three species in the coming years.

Bird monitoring has been conducted systematically since 2003. The methodology involves repeat visits to 60 points. At each point the number of birds detected by species is recorded for 4 minutes.

A study of the box turtle population occurring on the MPWMA is in its 4th year. Most of their activity is confined to mesic forests on Wills Hill though they do occasionally use some of the managed areas. A pilot study of hog nosed snake began in 2008. Six individuals have been fitted with radio transmitters. Hog nosed snake concentrate in managed areas and appear to avoid closed canopy unmanaged areas.

In addition, a study of native pollinators began in 2008. Preliminary results indicate that far more species of native bees occur in managed areas than in unmanaged closed canopy pitch pine (Fig.1).

Table 1 : Rare Species Monitoring at Montague Plain Wildlife Management Area					
Taxon	Latin name	Statewide Status*	Monitoring Schedule	Local Population Trend	Habitats
Rare Plants					
Nantucket shadbush	<i>Amelanchier nantucketensis</i>	SC	3 yrs	Increasing	
New Jersey tea	<i>Ceanothus americanus</i>	WL	3 yrs	Increasing	Dry, open woods and thickets
spreading tick trefoil	<i>Desmodium humifusum</i>	WL	5 yrs	Stable	Dry woods
fringed gentian	<i>Gentianopsis crinita</i>	WL	5 yrs	Stable	Open to semi-open wetlands; stream margins
wild lupine	<i>Lupinus perennis</i>	WL	Annual	Increasing	Sunny areas in sandy soils
white rattlesnake root	<i>Prenanthes alba</i>	WL	5 yrs	Stable	Moist to wet woodlands
spring rock spikemoss	<i>Selaginella rupestris</i>	WL	5 yrs	Stable	Rock outcrops or sunny gravelly soil
Rare Lepidoptera					
blueberry sallow	<i>Apharetra dentata</i>	DL	8-10 yrs	Stable	
New Jersey tea inchworm	<i>Apodrepanulatrix liberaria</i>	T	8-10	Stable	Barrens
frosted elfin	<i>Callophrys irus</i>	SC	Extirpated prior to acquisition		Grasslands
pine woods underwing	<i>Catocala</i> sp1	SC	8-10 yrs	Stable	Pine barrens
northern hairstreak	<i>Fixsenia ontario</i>	SC	5 yrs	Stable	Oak woodlands
a geometer moth	<i>Glena cognataria</i>	RD			Heath
William's tiger moth	<i>Grammia williamsii</i>	T	Extirpated prior to acquisition	Undetermined: Resoration began 2006	Grassland
slender clearwing sphinx moth	<i>Hemaris gracilis</i>	SC	8-10 yrs	Increasing	
barrens buckmoth	<i>Hemileuca maia</i>	T	Annual	Increasing	Pitch pine barrens
pine barrens itame	<i>Itame</i> sp1	SC	8-10 yrs	Stable	Pine barrens
barrens metarranthis moth	<i>Metarranthis apicaria</i>	E	Extirpated prior to acquisition		Pine barrens
pink sallow	<i>Psectraglaea carnosa</i>	SC	8-10 yrs	Stable	Heathland
pine barrens zale	<i>Zale</i> sp1	SC	8-10 yrs	Stable	Pitch pine - scrub oak barrens
pine barrens zanclognatha	<i>Zanclognatha martha</i>	T	8-10 yrs	Stable	Maturing pitch pine stands
Rare Reptiles					
eastern box turtle	<i>Terrapene carolina carolina</i>	SC	5 yrs	Stable	Forests, esp. moist open deciduous
E Hog Nosed Snake	<i>Heterodon platirhinos</i>	RD	Ongoing	Increasing	Does not use untreated pitch pine areas.
Birds					
Field sparrow	<i>Spizella pusilla</i>	RD	Ongoing	Increasing	Managed areas
Eastern towhee	<i>Pipilo erythrophthalmus</i>	RD	Ongoing	Increasing	Scrub and managed areas
Prairie warbler	<i>Dendroica discolor</i>	RD	Ongoing	Increasing	Scrub and managed areas
Whip poor will	<i>Caprimulgus vociferus</i>	RD	Ongoing	Stable	Scrub and managed areas
Woodcock	<i>Scolopax minor</i>	RD	Ongoing	Stable	Scrub, managed areas

*E=Endangered, T=Threatened, SC=Special Concert, WL=Watch List, RD=Regionally Declining, DL=Delisted.

Figure 1.

Effects of Fuels Reduction and Habitat Restoration on Native Bee Communities in Massachusetts Pitch Pine-Scrub Oak Barrens



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INTRODUCTION: Pitch pine-scrub oak barrens are a globally threatened, fire-dependent habitat that harbors numerous declining, rare, or imperiled plant and animal species. Pitch pine-scrub oak barrens have been reduced by 90% in western Massachusetts. Pitch pine-scrub oak barrens at the Montague Plains WMA require active management to reduce fire risk to adjacent property and to preserve their unique ecological characteristics, and these activities could reasonably be expected to impact native bees.



Given the importance of native bees from the perspective of both the conservation of biodiversity and the economic benefits of pollinator services, we are surveying bee communities on the Montague Plains to: 1. establish baseline information on bee communities, 2. determine how bees are affected by fuels reduction activities and habitat restoration, and 3. make recommendations for managing pitch pine-scrub oak barrens to benefit bee communities.

METHODS: We sampled bees from mid-April through September, 2008 at 30 sampling points ≥ 200 m apart distributed evenly among untreated pitch pine, treated pitch pine, and scrub oak barrens.





Pitch pine Treated pitch pine Scrub oak

We sampled bees with bee bowls (Russell et al. 2005) at 2-3 week intervals throughout the season. Six of the points were sampled each visit, the remainder were sampled once. For each sample, we placed 15 bowls, alternating white, florescent yellow and florescent blue, 10 m apart on linear transects. We collected bowls after 24 hrs. Bowls were supplemented with netting on an *ad-hoc* basis.

During each visit, we recorded the presence and species of any plants in flower on each transect, and within the study area as a whole. Also, we measured percent cover of all plant species on each transect using a point intercept method, as well as understory structure with a Robel pole and canopy closure using a sighting tube (James and Shugart 1970).

PRELIMINARY RESULTS: We captured $\approx 1,500$ bees during the study. We are currently sorting and identifying specimens, however preliminary results indicate that bee captures were highest in treated pitch pine, lowest in untreated pitch pine, and intermediate in scrub oak.






Halictus ligatus Augochlora pura Nomada spp. Megachile latimanus

FUTURE PLANS: Once the specimens have been identified, we will compare bee species richness, species composition, and the abundance of individual species among treatments, with particular attention to rare species and new state or regional records. We will also analyze species richness and abundance in relation to plant species composition and structure, as well as seasonality. Plans for next year include additional sweep sampling, as well as efforts to identify the ecological mechanisms responsible for community differences among treatments. These might include detailed field observations of foraging or nesting, as well as assessment of microclimatic conditions.

REFERENCES: James, F.C. and H.H. Shugart. 1970. A quantitative method of habitat description. *American Birds* 24:727-736. Russell, K.N., H. Ikerd, and S. Droege. 2005. The potential conservation value of unpowered powerline strips for native bees. *Biological Conservation* 124:133-148.

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