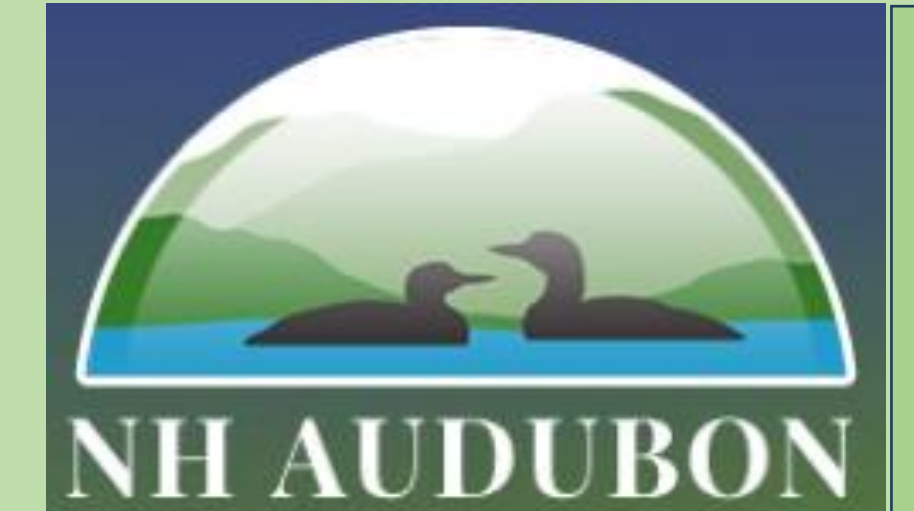


Management Plan Proposal to Increase Pollinator Diversity in NHTI's Sycamore Field



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Background & Purpose

Non-native and invasive plant species outcompete native plants for resources and alter the erosion rates, flooding potential, and soil chemistry of an ecosystem [1]. With limited access to native plant resources, insect pollinators struggle to maintain their nutritional and nesting needs, resulting in a loss of diversity. New Hampshire currently has 36 terrestrial invasive plants and 101 non-native plants with the potential to become invasive [2]. By analyzing the management techniques used by N.H. Audubon in their pollinator meadow, best methods will be suggested to create a pollinator habitat in the NHTI field. This management plan will include proposals to limit the non-native plants in NHTI's field surrounding the Sycamore Community Gardens, control reemergence once establishments are minimized, and recommend native flora to increase pollinator resources.



Fig.3: The invasive plant oriental bittersweet wrapping around milkweed

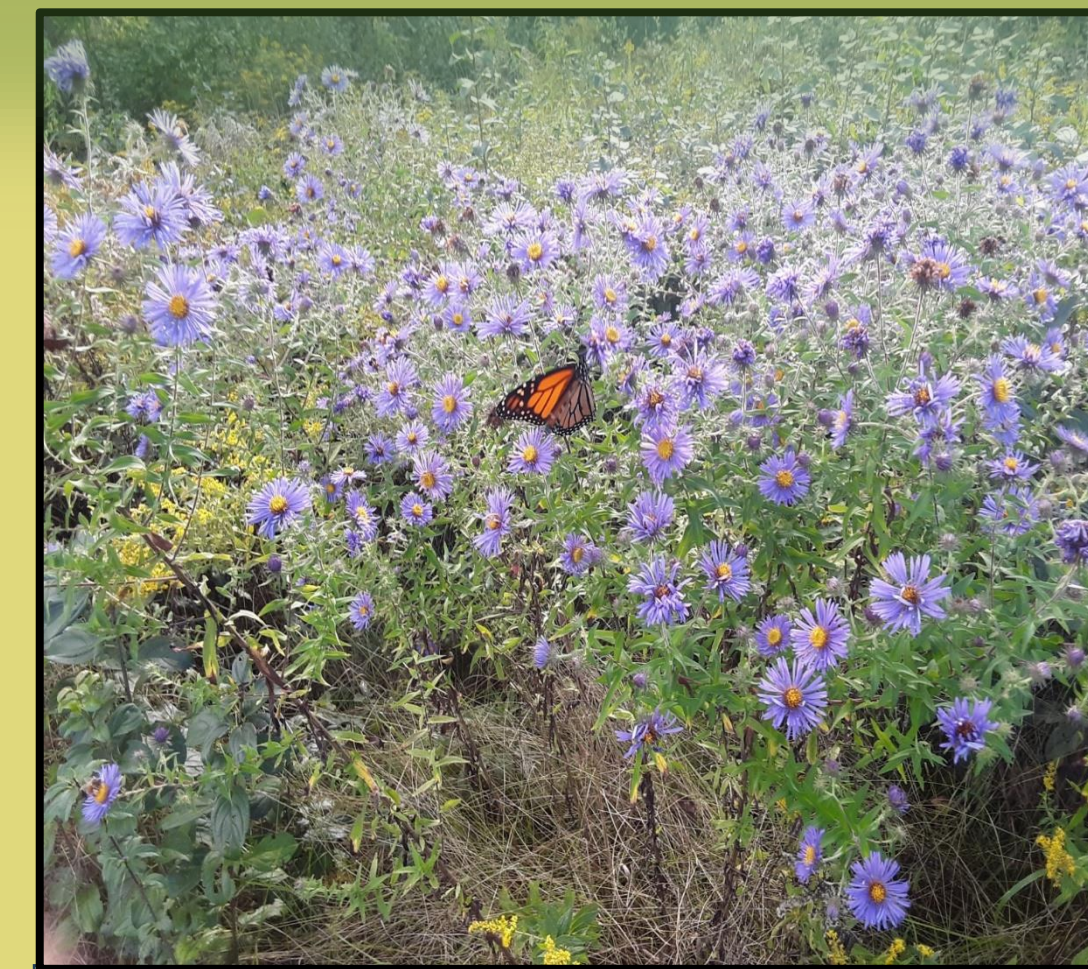


Fig.4: A monarch butterfly enjoying the nectar of New England Asters



Fig.5: Common milkweed, a necessary native plant for specialist pollinators

NHTI Field Results

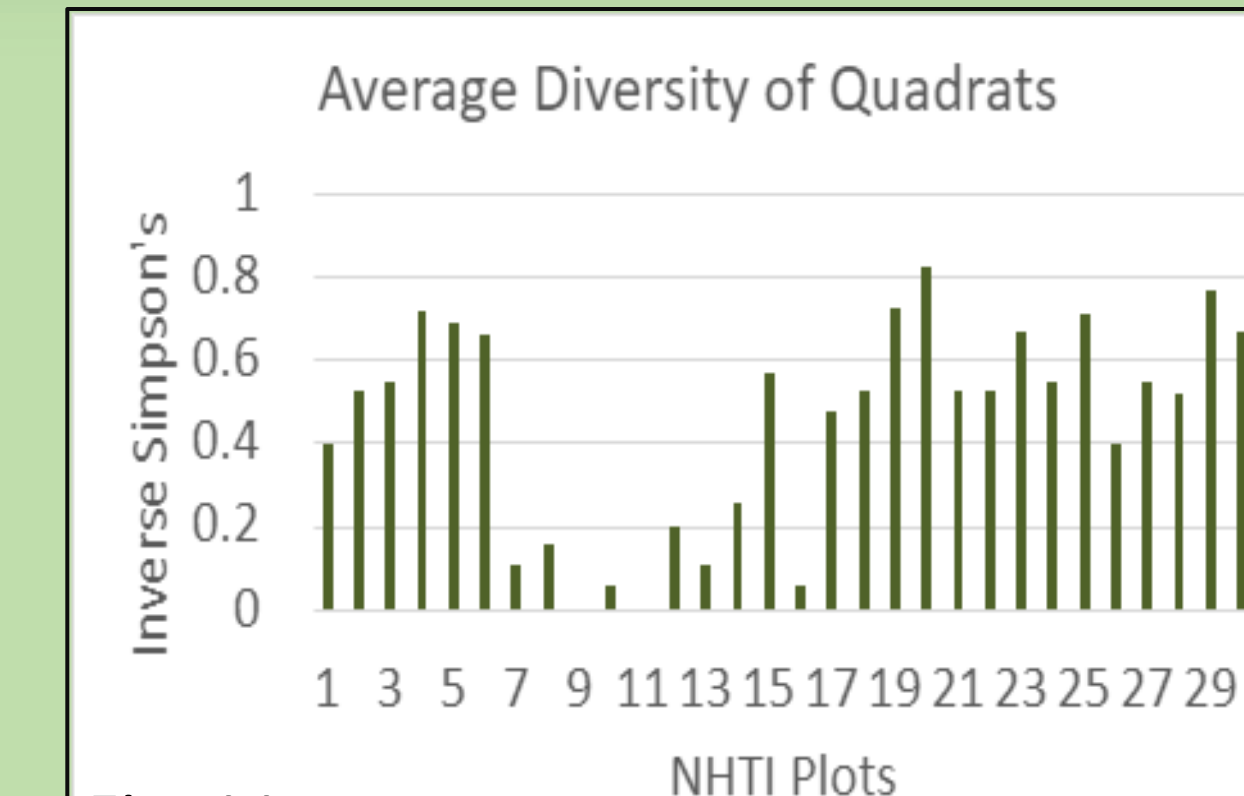


Fig. 11

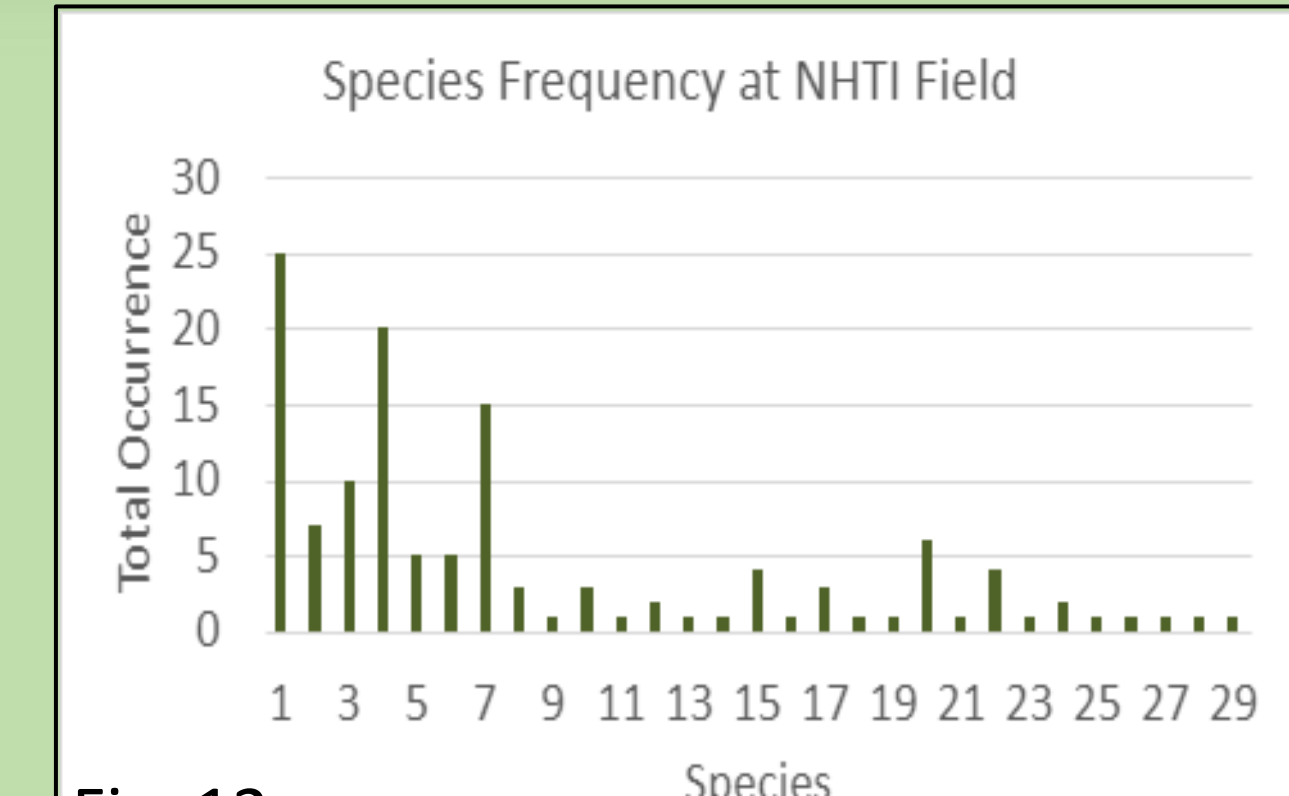


Fig. 12

Diversity results (Fig. 11) show a higher variety of species per sample in the back plots (Fig.2), however, the average diversity for the field was low at 0.45. Species frequency (Fig. 12) shows how many times each plant appeared in the samples on average. See species list below.

1-Grasses, 2-F. Loosestrife, 3-S.T. Vetch, 4-S. Fern, 5-R.L. Wintergreen, 6-S.Y. Wood Sorrel, 7-Goldenrod, 8-Deertongue, 9-C.E. Primrose, 10-R. Grape, 11-N.B. Honeysuckle, 12-W. Poison Ivy, 13-E. Whitetop, 14-S. Everlasting, 15-Asters, 16-Creeping Cinquefoil, 17-W. Smartweed, 18-Silvery Cinquefoil, 19-R.F. Pennyroyal, 20-Oriental Bittersweet, 21-P.L. Violet, 22-Alder Buckthorn, 23-Common St. John's Wort, 24-C. Milkweed, 25-Virginia Plantain, 26-M. Fern, 27- Multiflora Rose, 28-European Ash, 29-A. Burnweed

Popular Management Practices

Management	Pros	Cons
Chemical Control	<ul style="list-style-type: none"> Affordable Does not bioaccumulate (Glyphosate) Half life of 7 to 60 days[3] 	<ul style="list-style-type: none"> Hazard to non-target species Soil and Water degradation
Mowing	<ul style="list-style-type: none"> Competition for light 	<ul style="list-style-type: none"> Loss of resources
Tilling	<ul style="list-style-type: none"> Increased Germination 	<ul style="list-style-type: none"> Cutting rhizomes increases spread
Prescribed Burns	<ul style="list-style-type: none"> Supports biodiversity Limits the establishment of woody plants 	<ul style="list-style-type: none"> Increases germination in some non-natives
Synthetic Mulching	<ul style="list-style-type: none"> Regulates soil temperatures Conserves soil moisture 	<ul style="list-style-type: none"> Nonbiodegradable Repeated replacement

Invasive Plants in Audubon's Meadow



Fig.6: Oriental Bittersweet



Fig.7: Multiflora Rose



Fig.8: Alder Buckthorn

Oriental bittersweet (Fig. 6), multiflora rose (Fig. 7), and Alder buckthorn (Fig. 8) were the problematic invasives in Audubon's field. Low smartweed and great mullein are non-native plants also sampled in the field.

Audubon's Management Methods:

One third of the field was tilled and half of the plot was covered with 10 mil plastic and the other half with landscaping fabric. Another third of the field was mowed and covered with half plastic, half fabric. One third was left unaltered as the control plot. The experimental plots were seeded with a mix provided by the Xerces Society one year after covering.

Target Invasive Plants in NHTI's Field



Fig.9: Oriental Bittersweet



Fig.10: Alder Buckthorn

Oriental bittersweet (Fig.9) and alder buckthorn (Fig.10) were the most problematic invasives sampled in NHTI's field. Silvery and creeping cinquefoil, Virginia plantain, common St. John's wort, multiflora rose, and European ash were the other non-native plants that were sampled in the field. **Removal is also recommended for quaking aspen, a native tree that monopolizes resources for beneficial plants.**

Recommended Management Practices

Without Chemical Control	With Chemical Control
Mechanical Weeding: Cut alder buckthorn and quaking aspen with a rotary mower and cover dense patches with synthetic mulch. Hand pull oriental bittersweet when soil is moist or pull with a border fork.	Cut both invasives and quaking aspen down to a stem using a rotary mower and spot-spray stems using triclopyr or glyphosate in late fall to winter (after flowering).

After the established invasives are removed, prescribed burning is recommended in the winter to control reemergence.

Suggested Flora

Plant	Bloom Period	Pollinators	Flood Tolerance	Ave. Price /0.25Lb
Lanceleaf Coreopsis	April- July	Bees, Birds, Butterflies	No Flooding	\$7-11
Common Milkweed	June-July	Bees, Butterflies, Beetles	Flood Tolerant	\$23-100
Black-eyed Susan	June-August	Butterflies, Bees, Wasps, Moths	No Flooding	\$18-35
Anise Hyssop	July-October	Bees, Butterflies, Moths, Birds	No Flooding	\$51-79
New England Aster	August-October	Bees	Flood Tolerant	\$128-200
Calico Aster	September-October	Bees, Butterflies, Moths, Wasp	Flood Tolerant	\$100-150
Grey Goldenrod	August-November	Butterflies, Bees	No Flooding	\$75-90

NHTI Field Conditions

The field is approximately 11 acres and partially enclosed by Fort Eddy Pond, which has flooded onto the field for 3 consecutive years (Fig.1). Soils are slightly acidic (5.2-5.6) well-drained sandy-loam [4] and most plants are exposed to full sun conditions. Field samples were collected mid-October 2023. Plots were divided into Front Right (FR), Front Left (FL), Back Right (BR), and Back Left (BL)(Fig. 2). Colors of samples denote separate sample quadrats.



Fig. 1



Fig. 2

Useful Native Plants Sampled	Bloom Period	Pollinators
Fringed Loosestrife	May- September	Specialist Loosestrife Bees
Smoothtare Vetch	April- June	Honeybees
Goldenrods (Tall)	August- October	Bees, Butterflies, Beetles, Wasps
Asters (New England & Calico)	August-October	Bees, Butterflies
Common Milkweed	June- August	Bees, Butterflies

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