

Appendix E.

Invasive and Overabundant Species Management Plan for the Albany Pine Bush Preserve

Invasive and Overabundant Species Management Plan for the Albany Pine Bush Preserve



Prepared by: Jesse Hoffman, Preserve Steward & Botanist

Albany Pine Bush Preserve Commission
195 New Karner Road
Albany, NY 12205
www.albanypinebush.org

Table of Contents:

Introduction..... 1

Invasive Plant Species..... 1

 Albany Pine Bush Preserve Commission
 approach to invasive plant species management..... 7

 Invasive plant treatment methodologies 8

 Invasive plant species distributions/treatments..... 9

Invasive Non-plant Species..... 16

 Albany Pine Bush Preserve Commission
 approach to invasive non-plant species management 19

 Invasive non-plant species distributions/actions..... 19

Overabundant Native Plant Species..... 20

 Albany Pine Bush Preserve Commission
 approach to overabundant native plant species management 20

 Overabundant native plant treatment methodologies..... 21

 Overabundant native plant species distributions/treatments 21

Acknowledgements..... 23

Literature Cited 23

Additional Resources 24

List of Figures:

Table 1. Invasiveness ranks and corresponding ecological threat levels for invasive plant species in the Albany Pine Bush Preserve.	1
Table 2. CAPMO PRISM invasive species tiers and tier ranking criteria	2
Table 3. NYS listed invasive plants, ecological threat levels, invasiveness ranks, and EDRR designations for species occurring in the Albany Pine Bush Preserve.....	3
Table 4. NYS listed invasive plants, ecological threat levels, and invasiveness ranks for species not yet occurring in the Albany Pine Bush Preserve.	4
Table 5. Invasive plant species treatment priorities in the Albany Pine Bush Preserve.	7
Table 6. NYS invasive non-plant species occurring in the Albany Pine Bush Preserve	16
Table 7. NYS invasive non-plant species not yet occurring in the Albany Pine Bush Preserve.....	16
Table 8. Overabundant native plant species and their designations as ecological generalists or pine barrens specialists for species occurring in the Albany Pine Bush Preserve	20
Table 9. Overabundant native plant species treatment priorities	21

Introduction:

The Albany Pine Bush Preserve and the Albany Pine Bush Preserve Commission (APBPC) were created by the New York State legislature to protect one of the best remaining examples of the globally rare inland pitch pine-scrub oak barrens ecosystem. The Preserve supports one of fewer than 20 such ecosystems worldwide, is home to two rare plant species (Hoffman 2016), and 75 wildlife “species of greatest conservation need” designated by New York State (NYSDEC 2015), including the federally endangered Karner Blue Butterfly (Campbell et. al. 2014). The inland pitch pine-scrub oak barrens ecosystem is an early-successional, fire-dependent ecosystem that requires periodic disturbance in order to persist. Historically this was accomplished through wildfire. Presently, prescribed burning is the ideal way to maintain this necessary disturbance regime.

Invasive species, defined by NYS to be “Those species that are nonnative to the ecosystem under consideration, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health” (6 NYCRR Part 575), have the capacity to significantly alter the structure and function of the inland pitch pine-scrub oak barrens ecosystem. They may displace native species and eliminate the features and functions that make the Albany Pine Bush unique and worthy of protection. In the absence of fire, some native plant species can also become over abundant with ecological effects similar to those of invasive species.

In order to protect and maintain this imperiled ecosystem, invasive plants, invasive animals, and overabundant native plant species must be managed throughout the Preserve.

This plan serves as a guide for the Albany Pine Bush Preserve Commission’s management of invasive species and overabundant native species. It defines the underlying approach to management decision making, provides basic species distribution information, and offers information about effective treatment methodologies. Species identification information is available elsewhere and specific treatment plans should be created and implemented annually.

Invasive Plant Species

In 2014, New York State adopted legislation that defined a state-wide list of invasive species. As a part of that process, 183 non-native plant species occurring in New York were evaluated and categorized based on their invasiveness, which is a cumulative metric using a species’ inherent ecological and biological characteristics, its likely impacts, and the feasibility of control (Jordan, Moore and Weldy, 2008; NYISC 2010; Brooklyn Botanic Garden, 2013). The resulting “invasiveness rank” assigns a numerical value to each species. A higher value indicates a higher ecological risk associated with that particular invasive species. Ranks are grouped into ecological threat levels as shown in Table 1.

Table 1. Invasiveness ranks and corresponding ecological threat levels for invasive plant species in the Albany Pine Bush Preserve.

Invasiveness Rank	Ecological Threat Level	Ecological Threat Level Abbreviation
<40.00	Insignificant	I
40.00-49.99	Low	L
50.00-69.99	Moderate	M
70.00-80.00	High	H
>80.00	Very High	VH

Detailed rankings for each species can be found on the New York invasive species information website (http://nyis.info/?action=israt_nn_plant). Species listed at the moderate, high, or very high levels are of potential concern to the Albany Pine Bush Preserve Commission (Brooklyn Botanic Garden, 2013).

In 2016, the Capital Mohawk Partnership for Regional Invasive Species Management (Capital Mohawk PRISM, 2016) completed a list of invasive species deemed to be of high priority within the PRISM boundaries. This list includes several species not appearing on the Brooklyn Botanic Garden (2013) list because these species have emerged as threats in the time since that list was compiled. Species were categorized into tiers one through four, based on a combination of the ecological threat level criteria established by Jordan, Moore and Weldy (2008), and abundance within the PRISM area. When these same criteria are applied to the Albany Pine Bush Preserve, the four resultant tiers are described below. These tiers provide broad guidance in prioritizing invasive species efforts.

Table 2. CAPMO PRISM invasive species tiers and tier ranking criteria.

		Abundance			
		None in Preserve	Low (Eradication/containment may be feasible)	Medium (Possible eradication feasible with big effort, or localized control)	High (Established/widespread in Preserve; only strategic localized management)
Ecological Threat Level	Very High or High	Tier 1 - High Priority 1b) Species is not in the Preserve, is inside PRISM ==> Look +++ (Most survey effort) 1c) Species is not inside of the Preserve or PRISM, but is close (east NA) ==> Look ++ (high survey effort) Tier 1 - Watch list (Long Distance) 1d) Species is not inside of Preserve or PRISM, and is far (not in east NA) ==> Look - (less survey effort)	Tier 1 - High Priority 1a) Species is in the Preserve. High likelihood of establishment in region if introduced and high likelihood of extreme ecosystem changes if established. Should evaluate Rapid Response actions if detected. Eradication/containment candidate. (Look +++)	Tier 2 - Evaluate Response Manage over time, or possible eradication candidate if big resources available. Evaluate using IPMDAT for plants (Look ++).	Tier 3 - Established Eradication may not be feasible; focus on localized management over time to contain, exclude, or suppress.
	Moderate	X	Tier 2 - Evaluate Response Research impacts further, monitor population. Possible eradication candidate to prevent possible change to high impacts (Look ++)	Tier 3 - Established Localized management over time to contain, exclude, or suppress.	X
	Low or Insignificant	X	X	X	X
	Unknown	X	Tier 4 - Research Research, map, and monitor population, and alert local entities to keep an eye out for it	Tier 4 - Research Research, map, and monitor population, and alert local entities to keep an eye out for it	X

This plan combines both the Brooklyn Botanic Garden (2013), and (Capital Mohawk PRISM, 2016) lists in Tables 3 and 4. Both tables indicate scientific names, common names, ecological threat level and invasiveness rank as described in Brooklyn Botanic Garden (2013), and PRISM tier rankings using the criteria in Table 2. Table 3 lists invasive plant species that are currently known to occur in the Preserve. It also designates those species that are not well established preserve-wide as Early Detection Rapid Response (EDRR) species. This designation suggests that a species is in the early stages of invasion and has a high potential for eradication if treated quickly. Table 4 lists invasive plant species that do not yet occur in the Preserve. These species represent the most likely emerging threats to the ecosystem. It is critical for Preserve managers to familiarize themselves with these species so that if encountered, they can be eliminated before populations are able to expand and spread. All species in Table 4 are EDRR species. These lists will be continuously updated as new species are documented and previously documented species are eradicated.

Table 3. NYS listed invasive plants, ecological threat levels, invasiveness ranks, PRISM Tiers, and EDRR designations for species occurring in the Albany Pine Bush Preserve.

Scientific Name	Common Name	*Ecological Threat Level	*Invasiveness Rank	PRISM Tier	EDRR
<i>Acer ginnala</i>	Amur maple	M	66.22	2	Y
<i>Acer platanoides</i>	Norway maple	VH	82.00	1a	Y
<i>Ailanthus altissima</i>	tree-of-heaven	M	68.00	3	N
<i>Alliaria petiolata</i>	garlic mustard	VH	84.00	3	N
<i>Artemisia vulgaris</i>	mugwort	H	79.31	3	N
<i>Berberis thunbergii</i>	barberry	VH	91.00	1a	Y
<i>Bromus tectorum</i>	cheat grass	M	50.00	X	N
<i>Celastrus orbiculatus</i>	Oriental bittersweet	VH	86.67	3	N
<i>Centaurea jacea</i>	black knapweed	M	62.34	2	N
<i>Centaurea stoebe</i>	spotted knapweed	H	78.89	3	N
<i>Cirsium arvense</i>	Canada thistle	H	71.00	2	N
<i>Coronilla varia</i>	crown vetch	M	62.07	X	N
<i>Elaeagnus umbellata</i>	autumn olive	VH	94.00	1a	Y
<i>Euonymus alatus</i>	burning bush	VH	81.25	1a	Y
<i>Euphorbia cyparissias</i>	cypress spurge	H	75.32	3	N
<i>Fallopia japonica</i>	Japanese knotweed	VH	97.94	1a	Y
<i>Hesperis matronalis</i>	dame's rocket	M	56.98	X	N
<i>Iris pseudacorus</i>	yellow iris	H	76.00	1a	Y
<i>Lonicera morrowii</i>	Shrub honeysuckle	VH	85.54	3	N
<i>Lonicera tatarica</i>	shrub honeysuckle	VH	85.54	3	N
<i>Lonicera x bella</i>	Shrub honeysuckle	VH	85.54	3	N
<i>Lotus corniculatus</i>	bird's foot trefoil	M	59.00	X	N
<i>Lysimachia nummularia</i>	moneywort	M	64.29	X	N
<i>Lythrum salicaria</i>	purple loosestrife	VH	91.00	1a	N
<i>Microstegium vimineum</i>	Japanese stilt grass	VH	85.00	1a	Y
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil	VH	100.00	3	N
<i>Morus alba</i>	white mulberry	M	68.67	3	N
<i>Nasturtium officinale</i>	watercress	M	65.75	3	N
<i>Pastinaca sativa</i>	wild parsnip			2	N
<i>Phalaris arundinacea</i>	reed canary grass	H	77.78	1a	Y
<i>Phleum pratense</i>	timothy	M	63.75	3	N
<i>Phragmites australis</i>	common reed	VH	92.00	3	N
<i>Pinus sylvestris</i> ¹	Scotch pine	n/a	n/a	1a	Y
<i>Poa compressa</i>	Canada bluegrass	M	68.75	X	N
<i>Poa pratensis</i>	Kentucky bluegrass	M	67.78	X	N
<i>Potamogeton crispus</i>	curly pondweed	H	79.79	3	N
<i>Rhamnus cathartica</i>	glossy buckthorn	VH	81.00	1a	Y
<i>Robinia pseudoacacia</i>	black locust	VH	81.11	3	N
<i>Rosa multiflora</i>	multiflora rose	VH	89.00	3	N
<i>Rumex acetosella</i>	sheep sorrel	M	66.25	X	N
<i>Saponaria officinalis</i>	bouncing bet	M	52.50	X	N
<i>Solanum dulcamara</i>	trailing nightshade	M	50.52	X	N
<i>Tanacetum vulgare</i>	tansy	M	52.38	3	N
<i>Trapa natans</i>	water chestnut	VH	82.00	1a	Y
<i>Tussilago farfara</i>	coltsfoot	M	57.50	X	N

Table 3 continued

Scientific Name	Common Name	*Ecological Threat Level	*Invasiveness Rank	PRISM Tier	EDRR
<i>Ulmus pumila</i>	Siberian elm	M	52.50	3	N
<i>Veronica officinalis</i>	speedwell	M	51.95	X	N
<i>Vicia cracca</i>	cow vetch	M	54.44	X	N

* Threat levels and invasiveness ranks listed are not specific to inland pitch pine-scrub oak barrens ecosystems. The level to which any of these species threaten conservation targets in the Preserve is highly variable. For site specific information, see Invasive Plant Distribution/Treatment section below. ¹ Scotch Pine, *Pinus sylvestris* does not appear on the Brooklyn Botanic Garden (2013) list, but is relevant to the Preserve. This non-native species produces large quantities of wind-borne seed, and is highly invasive in recently disturbed sites when mature individuals are nearby.

Table 4. NYS listed invasive plants, ecological threat levels, and invasiveness ranks for species not yet occurring in the Albany Pine Bush Preserve.

Scientific Name	Common Name	Ecological Threat Level	Invasiveness Rank	PRISM Tier
<i>Acer palmatum</i>	Japanese maple	M	50.00	X
<i>Acer pseudoplatanus</i>	sycamore maple	H	71.11	1b
<i>Achyranthes japonica</i>	Japanese chaff flower	H	71.08	
<i>Actinidia arguta</i>	hardy kiwi vine			1c
<i>Actinidia polygama</i>	silver vine			1c
<i>Aegopodium podagraria</i>	goutweed	M	63.75	X
<i>Agrostis gigantea</i>	redtop, black bentgrass	M	67.50	X
<i>Agrostis stolonifera</i>	creeping bentgrass	M	67.50	X
<i>Akebia quinata</i>	chocolate vine	M	52.38	X
<i>Aloandra vesiculosa</i>	waterwheel			1c
<i>Alnus glutinosa</i>	European(black) alder	M	64.44	X
<i>Ampelopsis brevipedunculata</i>	porcelain berry	H	71.26	1c
<i>Anthriscus sylvestris</i>	wild chervil	H	78.75	1b
<i>Aralia elata</i>	Japanese angelica tree	VH	80.46	1c
<i>Arthraxon hispidus</i>	small carpgrass	H	75.68	1b
<i>Berberis vulgaris</i>	common barberry	M	68.75	X
<i>Brachypodium sylvaticum</i>	slender false brome	VH	86.60	
<i>Butomus umbellatus</i>	flowering rush	M	63.75	X
<i>Cabomba caroliniana</i>	Carolina water-shield	H	72.34	1c
<i>Cardamine impatiens</i>	narrowleaf bittercress	H	76.32	1b
<i>Carex kobomugi</i>	Asiatic sand sedge	M	68.60	X
<i>Carlina vulgaris</i>	carline thistle			4
<i>Cirsium palustre</i>	marsh thistle	M	67.90	X
<i>Clematis terniflora</i>	Japanese virgin's bower	H	72.60	1b
<i>Corydalis incisa</i>	incised fumewort			1c
<i>Cynanchum louiseae</i>	black swallow-wort	VH	89.69	1b
<i>Cynanchum rossicum</i>	pale swallow-wort	VH	87.63	1b
<i>Cyperus difformis</i>	variable flatsedge	M	51.95	X
<i>Cytisus scoparius</i>	Scotch broom			1c
<i>Datura stramonium</i>	jimsonweed, thorn-apple	M	50.00	X
<i>Digitalis purpurea</i>	purple foxglove	M	53.33	X
<i>Dioscorea polystachya</i>	Chinese yam; cinnamon vine	H	77.50	1c
<i>Dipsacus laciniatus</i>	cut-leaf teasel	H	75.56	1b

Table 4 continued

Scientific Name	Common Name	Ecological Threat Level	Invasiveness Rank	CAPMO PRISM Tier
<i>Egeria densa</i>	Brazilian waterweed	H	74.71	1b
<i>Eichornia crassipes</i>	water hyacinth			4
<i>Elaeagnus angustifolia</i>	Russian olive	M	68.00	X
<i>Eleutherococcus pentaphyllus</i>	five-leaf aralia			1b
<i>Epilobium hirsutum</i>	hairy willow herb	M	62.50	X
<i>Eragrostis curvula</i>	weeping lovegrass	M	57.14	X
<i>Euonymus europaeus</i>	European spindle tree	M	60.00	X
<i>Euonymus fortunei</i>	winter creeper	H	77.78	
<i>Euphorbia esula</i>	leafy spurge	H	75.90	1b
<i>Euphorbia lathyris</i>	caper spurge	M	56.98	X
<i>Fallopia baldschuanica</i>	China fleece vine	M	50.60	4
<i>Fallopia sachalinensis</i>	giant knotweed	VH	97.94	1b
<i>Fallopia x bohemica</i>	bohemian knotweed	VH	97.94	1b
<i>Festuca filiformis</i>	hair fescue	M	60.27	X
<i>Ficaria verna</i>	lesser celandine	VH	85.56	1b
<i>Frangula alnus</i>	smooth buckthorn	H	72.73	1b
<i>Froelichia gracilis</i>	slender cottonweed	M	53.25	X
<i>Galega officinalis</i>	professor weed	M	59.72	X
<i>Glaucium flavum</i>	yellow hornpoppy	M	65.75	X
<i>Glyceria maxima</i>	tall glyceria	H	79.52	
<i>Hedera helix</i>	English ivy	M	66.00	X
<i>Heracleum mantegazzianum</i>	giant hogweed	H	72.00	1b
<i>Humulus japonicus</i>	Japanese hops	H	74.03	1b
<i>Hydrilla verticillata</i>	water thyme	VH	91.40	1c
<i>Hydrocharis morsus-ranae</i>	frogbit	VH	85.57	1b
<i>Impatiens glandulifera</i>	ornamental jewelweed	M	66.67	X
<i>Imperata cylindrica</i>	cogon grass	H	79.00	
<i>Kochia scoparia</i>	Mexican summer-cypress	M	68.75	X
<i>Lepidium latifolium</i>	broad-leaf pepper-grass	H	79.38	
<i>Lespedeza bicolor</i>	shrubby bush clover	M	63.33	X
<i>Lespedeza cuneata</i>	Chinese lespedeza	H	74.44	
<i>Ligustrum obtusifolium</i>	border privet	H	76.67	1b
<i>Ligustrum vulgare</i>	European privet	M	67.82	X
<i>Lonicera japonica</i>	Japanese honeysuckle	VH	83.51	1b
<i>Lonicera maackii</i>	Amur honeysuckle	VH	84.44	1c
<i>Ludwigia grandiflora</i>	Uruguayan primrose willow	VH	88.30	
<i>Ludwigia peploides</i>	floating primrose willow	VH	89.36	
<i>Lysimachia punctata</i>	spotted loosestrife	M	57.14	X
<i>Lysimachia vulgaris</i>	garden loosestrife	H	72.73	1b
<i>Marsilea quadrifolia</i>	European water fern			4
<i>Miscanthus sinensis</i>	Chinese silver grass; eulalia	H	77.78	1b
<i>Murdannia keisak</i>	marsh dewflower	H	78.16	
<i>Myriophyllum aquaticum</i>	parrot-feather	H	76.67	1c
<i>Myriophyllum heterophyllum</i>	broadleaf water-milfoil	VH	93.62	1b
<i>Najas minor</i>	brittle water nymph	M	64.84	X

Table 4 continued

Scientific Name	Common Name	Ecological Threat Level	Invasiveness Rank	CAPMO PRISM Tier
<i>Nelumbo nucifera</i>	sacred lotus	M	64.38	X
<i>Nitellopsis obtuse</i>	Starry stonewort			1c
<i>Nymphoides peltata</i>	yellow floating heart	H	74.47	1b
<i>Oplismenus hirtellus</i>	wavyleaf basketgrass	H	70.27	1c
<i>Paulownia tomentosa</i>	princess tree	M	51.11	X
<i>Persicaria longiseta</i>	creeping smartweed	M	60.27	X
<i>Persicaria perfoliata</i>	mile a minute weed	VH	91.11	1b
<i>Phellodendron amurense</i>	Amur cork tree	H	74.00	1c
<i>Pinus thunbergii</i>	Japanese black pine	M	58.62	X
<i>Pistia stratiotes</i>	water lettuce			4
<i>Populus alba</i>	white poplar	M	67.78	X
<i>Prunus avium</i>	sweet cherry	M	55.00	X
<i>Prunus cerasus</i>	sour red cherry	M	55.00	X
<i>Prunus padus</i>	European bird cherry	M	51.11	X
<i>Pueraria montana var. lobata</i>	kudzu	VH	84.44	1c
<i>Pyrus calleryana</i>	Bradford Pear	M	65.06	X
<i>Ranunculus repens</i>	creeping buttercup	M	63.22	X
<i>Rhodotypos scandens</i>	Makino jetbead	M	69.33	X
<i>Rosa rugosa</i>	Japanese (rugosa) rose	M	63.44	X
<i>Rubus bifrons</i>	Himalyan blackberry	M	56.67	X
<i>Rubus laciniatus</i>	evergreen blackberry	M	63.22	X
<i>Rubus phoenicolasius</i>	wineberry	VH	85.56	1b
<i>Salix atrocinerea</i>	rusty willow	VH	84.44	1b
<i>Salix cinerea</i>	gray florist's willow			1c
<i>Salvia glutinosa</i>	sticky sage			1c
<i>Schedonorus arundinaceus</i>	tall fescue, Kentucky fescue	M	65.00	X
<i>Schoenoplectus mucronatus</i>	bog bulrush			1c
<i>Senecio jacobaea</i>	tansy ragwort	M	60.00	X
<i>Silphium perfoliatum</i>	cup-plant	H	77.78	1b
<i>Sorgham halapense</i>	johnsongrass			4
<i>Spiraea japonica</i>	Japanese spirea	M	62.34	X
<i>Syringia reticulata</i>	Japanese lilac tree			1b
<i>Valeriana officinalis</i>	common valerian	M	62.16	X
<i>Veronica beccabunga</i>	European speedwell	M	61.84	X
<i>Viburnum dilatatum</i>	linden arrowwood	M	57.14	X
<i>Viburnum lantana</i>	wayfaring-tree	M	53.75	X
<i>Viburnum opulus (var. opulus only)</i>	European cranberry bush	M	67.09	X
<i>Viburnum sieboldii</i>	siebold viburnum	M	62.50	X
<i>Vinca minor</i>	periwinkle	M	57.14	X
<i>Wisteria sinensis</i>	Chinese wisteria	M	56.70	X

Albany Pine Bush Preserve Commission approach to invasive plant species management:

The Albany Pine Bush Preserve has substantial acreage with at least some invasive plant species present. To help ensure that time and resources for invasive plant management are used efficiently, invasive plants are addressed throughout the Preserve in a systematic way. Likelihood of treatment success, cost minimization, and conservation value of target areas are the overarching criteria considered in setting priorities. Treatment priorities are listed in descending order below:

1. Early Detection Rapid Response - Treat any occurrence of a newly documented invasive species in the Preserve, and any occurrence of any invasive species that aren't well established Preserve-wide. Eradicate every occurrence (as discovered during casual surveys or using institutional knowledge) of the following:
 - i. All species in Table 4.
 - ii. Species marked as EDRR species from Table 3.

2. Invasive Species Prevention Zones (ISPZ) - ISPZs are high quality areas of the Preserve that are essentially free of invasive species. These areas are maintained in pristine condition by eliminating any occurrence of invasive species discovered in the ISPZ.
 - i. Pine barrens vernal ponds ISPZs– check biannually
 - ii. ISPZs comprised of any other communities within the inland pitch pine-scrub oak barrens ecosystem – check at least once every five years.

3. Rare Species Locations - Treat any occurrence of an invasive species threatening the viability of vulnerable populations of rare, threatened, or endangered species.

Aside from EDRR, ISPZs, and rare species locations, invasive species treatments are prioritized based on the size of the infestation, and the quality of the invaded habitat. Lower numbers have a higher priority as conveyed in Table 5 below. A small infestation is an infestation that is estimated to take a crew of four people two days or less to eliminate. A large infestation is an infestation that is estimated to take longer than two days for a crew of four people to eliminate. The plant communities within inland pitch pine-scrub oak barrens ecosystems are those described in Edinger et. al. (2014) and Gebauer et. al. (1996). These plant communities include successional northern sandplain grasslands, pitch pine-scrub oak barrens, pitch pine scrub-oak thickets, pitch pine-oak forests and pine barrens vernal ponds. Other community types include all other plant communities present on Albany Pine Bush Preserve lands. High quality plant communities are dominated by the native species and proper spatial arrangement representative of those communities. Low quality plant communities contain some native plant species representative of those communities, but are not dominated by such species. The inland pitch pine-scrub oak barrens ecosystem is the principle conservation target in the Albany Pine Bush Preserve.

Table 5. Invasive plant species treatment priorities in the Albany Pine Bush Preserve.

	Small invasive species infestation	Large invasive species infestation
High quality plant communities of inland pitch pine-scrub oak barrens ecosystems	1	2
Low quality plant communities of inland pitch pine-scrub oak barrens ecosystems	3	4
Other community types	5	6

Invasive plant treatment methodologies:

Plants have differing ecological vulnerabilities which can be exploited to facilitate effective control. Treatment methods vary depending on the particular species in question, the size of the individual, the size of the infestation to be eliminated and plant phenology. When treating invasive plant species at the landscape level, a combination of methods is often the most effective approach. A description of potential treatments methods is provided below.

- a. Hand pulling – Some species can be effectively eliminated by physically removing the plant from its substrate. This method can be used for many woody species when they are at the seedling or young sapling stage, before they have had a chance to establish a robust root system. Once extensive rooting has taken place, hand pulling becomes impractical except when targeting shallowly rooted species (e.g. shrub honeysuckle). With larger individuals, it is important to remove as much of the root system as possible to avoid the re-sprouting of root fragments left in the soil. Some species of herbaceous plants can be hand pulled successfully if their root systems can be removed largely intact. Proper disposal of removed individuals is critical to preventing their spread.
- b. Cutting – Species that do not readily re-sprout from the roots can be eliminated by simply cutting the plant off at the ground level (e.g. Scotch pine). This method is used exclusively on woody plants. For plants with a diameter at breast height (dbh) of up to two inches, the cutting can be done by hand with loppers, or mechanically with a brush cutter. For larger individuals, cutting is done with a chainsaw.
- c. Girdling – This method is used on woody species with a minimum dbh of two inches. It involves physically removing a continuous strip of bark from around the entire diameter of the tree. A tool called a bark spud is used to peel the bark away in this manner.
- d. Whole tree removal – This method is used on mature tree species which have formed monocultures with little or no desirable vegetation in the understory (e.g. black locust). Trees are mechanically harvested using traditional forestry techniques. Once trees have been cut and removed from the site, stumps and roots are dug out and buried on site deeply enough to prevent re-sprouting (~20 feet deep). The site is root raked to remove any large root fragments present, and is smoothed in anticipation of restoration planting.
- e. Cut stump herbicide – This method is used on woody plants that readily re-sprout from the roots. (e.g. Oriental bittersweet) The technique is accomplished by cutting the trunk(s) a few inches above ground level and spraying a concentrated herbicide solution on the exposed cambium layer of the resulting stump. For plants with a dbh of up to two inches, the cutting can be done by hand with loppers, or mechanically with a brush cutter. For larger individuals, cutting is done with a chainsaw. Within minutes after cutting, the herbicide is applied to the cambium with a straight stream, or tight cone angle spray under low pressure. This is a highly targeted herbicide technique resulting in virtually no non-target effects.
- f. Drill and fill herbicide – This method, used exclusively on woody plants, works best with larger diameter trees, though it is effective on individuals with a minimum dbh of two inches. One inch diameter holes are drilled at a slightly downward facing angle into the tree every eight inches around the circumference of the tree. Holes are only drilled to a depth of one to two inches. These holes are then immediately filled with a concentrated herbicide solution. This is a highly targeted herbicide technique resulting in virtually no non-target effects.

- g. Foliar herbicide – This method consists of spraying the leaves of plants with a diluted herbicide solution. It can be done with handheld or mechanized equipment depending on scope. This method is less targeted and often results in the death of some non-target vegetation.
- h. Wicking herbicide – This method involves spraying herbicide onto an absorbent cotton glove or other absorbent material and then wiping the herbicide saturated material onto the leaves and stem of the plant. This technique is primarily used in wetlands or other extremely sensitive areas. It is a highly targeted herbicide technique resulting in virtually no non-target effects.
- i. Biocontrol – This is a method of controlling invasive species using other living organisms. An invasive species’ (hosts’) natural predator, parasitoid, herbivore, or pathogen (biocontrol agent) from the home range of the invasive species, is imported in order to damage the invasive species. Biocontrol is undertaken by government authorities, with biocontrol agents available for release only after a lengthy review process. With appropriate permitting and documentation, approved biocontrol agents may be released intentionally on sites with host species present. Biocontrol agents may also migrate to such sites without assistance. Biocontrol agents may be capable of reducing host populations, but are not able to fully eradicate host species.
- j. Prescribed Fire – This method is applied by intentionally burning vegetation at a particular time, in a specific location, and in a controlled manner in order to accomplish pre-determined results. This requires a high degree of staff training and logistical support as well as a sophisticated understanding of ecological processes. Low intensity prescribed fire top kills plants with an ecological effect on the burned plant similar to that of cutting the plant. High intensity fire can heat the roots of shallowly rooted species enough to kill the entire plant including the roots.

Invasive plant species distributions/treatments:

Acer ginnala – Amur Maple

Known from two populations in Blueberry Hill, both mapped in GIS and treated in October 2016

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15

Acer platanoides - Norway maple

Sparsely distributed throughout the Preserve

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire

Ailanthus altissima - tree-of-heaven

Common throughout the preserve

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire

Alliaria petiolata - garlic mustard

Common throughout the preserve

Not treated at this time – current science indicates that *A. petiolata* is self-regulating via negative soil feedback given time (B. Blossey pers. comm.).

Artemisia vulgaris - mugwort

Common throughout the preserve

Foliar herbicide	5% glyphosate solution with non-ionic surfactant, applied after August 15 – primary control technique
------------------	---

Berberis thunbergii – barberry

Sparsely distributed throughout the Preserve

Hand pulling	Effective for isolated individuals
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique

Bromus tectorum - cheat grass

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Celastrus orbiculatus - Oriental bittersweet

Common throughout the preserve

Hand pulling	Possible with small isolated individuals
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Foliar herbicide	3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Centaurea jacea - black knapweed

Known from a few plants in the landscaping around the Discovery Center

Hand pulling	Effective for isolated individuals – primary control technique
--------------	--

Centaurea stoebe - spotted knapweed

Common throughout the preserve

Hand pulling	Conducted in highly visible areas of the Preserve
Biocontrol	Several biocontrol agents are present in the Preserve, see Dillon and Gifford (2015) for details – primary control technique

Cirsium arvense - Canada thistle

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Coronilla varia - crown vetch

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Elaeagnus umbellata - autumn olive

Sparsely distributed throughout the Preserve

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15

Euonymus alatus - burning bush

Sparsely distributed throughout the Preserve

Hand pulling	Effective for isolated individuals
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique

Euphorbia cyparissias - cypress spurge

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Fallopia japonica - Japanese knotweed

Known from 12 GIS mapped locations throughout the Preserve

Foliar herbicide	Mow in early summer (June 1), treat 6 weeks after mowing using a 5% glyphosate solution with non-ionic surfactant – primary control technique
------------------	---

Hesperis matronalis - dame's rocket

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Iris pseudacorus – yellow iris

Known from populations around Rensselaer Lake

Hand pulling	Effective, but time consuming
Wicking herbicide	5% glyphosate herbicide solution, applied after August 15 – primary control technique

Lonicera tatarica, etc. - shrub honeysuckle

Common throughout the preserve

Hand pulling	Effective, but time consuming
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Foliar herbicide	3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Lotus corniculatus - bird's foot trefoil

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Lythrum salicaria - purple loosestrife

Common throughout the preserve

Hand pulling	Effective for isolated individuals
Biocontrol	Biocontrol agents released in NYS by others are present in the Preserve – primary technique

Lysimachia nummularia - moneywort

Sparsely distributed throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Microstegium vimineum – Japanese stilt grass

Known from one GIS mapped location in management unit Amphibian

Foliar herbicide	0.3% Sethoxydim herbicide solution with 1% crop oil adjuvant, applied before 12” in height – primary control technique
Cutting	This species is an annual and can be mowed after maturity is reached, but before mature seed is present to prevent reproduction (mow in late July - early August)

Myriophyllum spicatum – Eurasian water millfoil

Common throughout Rensselaer Lake

Not treated at this time – Because Rensselaer Lake is heavily invaded, and is not a part of the inland pitch pine-scrub oak barrens ecosystem, no treatment has been considered at this time.

Morus alba - white mulberry

Sparsely distributed throughout the Preserve

Hand pulling	Effective for isolated individuals
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique

Nasturtium officinale – watercress

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Phragmites australis - common reed

Common throughout the preserve

Foliar herbicide	5% glyphosate herbicide solution, applied after August 15, used in dense monoculture stands
Wicking herbicide	5% glyphosate herbicide solution, applied after August 15 – primary control technique

Phalarus arundinacea - reed canary grass

Known from one GIS mapped location in management unit Iota

Foliar herbicide	5% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15 – primary control technique
------------------	---

Phleum pratense – timothy

Sparsely distributed throughout the Preserve – While present in the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Pinus sylvestris - Scotch pine

Known from one location in management unit I-Unit1

Cutting	Individuals are hand or mechanically cut off at ground level (below the first whorl of branches) and do not re-sprout – primary control technique
---------	---

Poa compressa - Canada bluegrass

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Poa pratensis - Kentucky bluegrass

Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Potamogeton crispus – curly pondweed

Common throughout Rensselaer Lake

Not treated at this time – Because Rensselaer lake is heavily invaded, and is not a part of the inland pitch pine-scrub oak barrens ecosystem, no treatment has been considered at this time.

Rhamnus cathartica - glossy buckthorn

Sparsely distributed throughout the Preserve

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15

Robinia pseudoacacia - black locust

Common throughout the preserve

Whole tree removal	Used with mature monoculture stands – primary technique
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Rosa multiflora - multiflora rose
Common throughout the preserve

Hand pulling	Can be used on small isolated individuals, thorns make this difficult
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary technique
Foliar herbicide	3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Rumex acetosella - sheep sorrel
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Saponaria officinalis - bouncing bet
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Solanum dulcamara - trailing nightshade
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Tanacetum vulgare – tansy
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Trapa natans - water chestnut
Known from one population in Rensselaer Lake

Hand pulling	Highly effective for this annual aquatic weed, as long as roots are removed and plants are pulled before seed ripening and release in August
--------------	--

Tussilago farfara – coltsfoot
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Ulmus pumila - Siberian elm
Common throughout the preserve

Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire

Veronica officinalis – speedwell
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Vicia cracca - cow vetch
Common throughout the preserve

Not treated at this time – While present throughout the Preserve, this species does not currently have ecological impacts significant enough to warrant treatment. Careful observation over time is necessary to ensure that this remains true.

Invasive Non-plant Species

Invasive non-plant species are taken from 6 NYCRR Part 575, with the exclusion of any marine species, and from (CAPMO PRISM CITATION). These two sources are combined into the lists appearing in Tables 6 and 7 along with the PRISM tiers for each species determined using the criteria found in Table 2. Table 6 lists invasive non-plant species that are currently known to occur in the Preserve, Table 7 lists invasive non-plant species that do not yet occur in the Preserve. The species that do not yet occur in the Preserve represent the most likely emerging threats to the ecosystem. It is critical for preserve managers to familiarize themselves with these species so that if encountered, they can be eliminated before populations are able to expand and spread. These lists will be continuously updated as new species are documented and previously documented species are eradicated.

Table 6. NYS invasive non-plant species occurring in the Albany Pine Bush Preserve.

Scientific Name	Common Name	PRISM Tier
<i>Adelges tsugae</i>	hemlock woolly adelgid	2
<i>Carassius auratus</i>	goldfish	4
<i>Cyprinus carpio</i>	common carp/ koi	4
<i>Lymantria dispar dispar</i>	European gypsy moth	3
<i>Orconectes rusticus</i>	rusty crayfish	2
<i>Trachemys scripta elegans</i>	red-eared slider	2

Table 7. NYS invasive non-plant species not yet occurring in the Albany Pine Bush Preserve.

Scientific Name	Common Name	CAPMO PRISM Tier
ALGAE AND CYANOBACTERIA		
<i>Didymosphenia geminata</i>	didymo	4
<i>Cylindrospermopsis raciborskii</i>	cylindro	

Table 7 continued

Scientific Name	Common Name	CAPMO PRISM Tier
FISH		
<i>Alosa pseudoharengus</i>	alewife	4
<i>Channa argus</i>	northern snakehead	1c
<i>Channa marulius</i>	bullseye snakehead	
<i>Channa micropeltes</i>	giant snakehead	
<i>Clarias batrachus</i>	walking catfish	
<i>Gambusia affinis</i>	western mosquitofish	
<i>Gambusia holbrooki</i>	eastern mosquitofish	
<i>Hypophthalmichthys harmandi</i>	largescale silver carp	1c
<i>Hypophthalmichthys molitrix</i>	silver carp	1c
<i>Hypophthalmichthys nobilis</i>	bighead carp	1c
<i>Misgurnus anguillicaudatus</i>	Oriental weatherfish	1c
<i>Mylopharyngodon piceus</i>	black carp	
<i>Neogobius melanostomus</i>	round goby	1c
<i>Proterorhinus semilunaris</i> (<i>P. marmoratus</i>)	tubenose goby	
<i>Tinca tinca</i>	tench	1c
<i>Cyprinella lutrensis</i>	red shiner	
<i>Gymnocephalus cernuus</i>	ruffe	
<i>Monopterus albus</i>	Asian swamp eel	
<i>Oreochromis aureus</i>	blue tilapia	
<i>Oreochromis niloticus</i>	Nile tilapia	
<i>Sander lucioperca</i> (<i>Stizostedion lucioperca</i>)	zander	
<i>Scardinius erythrophthalmus</i>	rudd	1b
AQUATIC INVERTEBRATES		
<i>Bellamyia chinensis</i> (<i>Cipangopaludina chinensis</i>)	Chinese mystery snail	1b
<i>Bellamyia japonica</i>	Japanese mystery snail	
<i>Bithynia tentaculata</i>	faucet snail	1b
<i>Bythotrephese longimanus</i> (<i>B. cederstroemi</i>)	spiny water flea	1b
<i>Cercopagis pengoi</i>	fishhook water flea	
<i>Corbicula fluminea</i>	Asian clam	1b
<i>Daphnia lumholtzi</i>	water flea	
<i>Dreissena polymorpha</i>	zebra mussel	1b
<i>Dreissena rostriformis bugensis</i>	quagga mussel	1b
<i>Eriocheir sinensis</i>	Chinese mitten crab	1b
<i>Hemimysis anomala</i>	bloody red shrimp	1c
<i>Potamopyrgus antipodarum</i>	New Zealand mud snail	
TERRESTRIAL INVERTEBRATES		
<i>Achatina achatina</i>	giant Ghana snail	
<i>Achatina fulica</i> (<i>Lissachatina fulica</i>)	giant African land snail	
<i>Adelges piceae</i>	balsam wooly adelgid	4

Table 7 continued

Scientific Name	Common Name	CAPMO PRISM Tier
<i>Agrilus planipennis</i>	emerald ash borer	1b
<i>Amyntas spp.</i>	Asian earthworms	1b
<i>Anoplophora glabripennis</i>	Asian longhorn beetle	1c
<i>Apis mellifera scutellata</i> x <i>A. mellifera ligustica</i> / <i>A. mellifera iberiensis</i>	Africanized honey bee	
<i>Archachatina marginata</i>	giant West African snail	
<i>Cryptococcus fagisuga</i>	beech scale	
<i>Dendroctonus frontalis</i>	southern pine beetle	1c
<i>Drosophila suzukii</i>	spotted winged drosophila	1b
<i>Fiorinia externa</i>	elongated hemlock scale	1b
<i>Halyomorpha halys</i>	brown marmorated stink bug	1b
<i>Lycorma delicatula</i>	spotted lanternfly	1c
<i>Lymantria dispar asiatica</i>	Asian gypsy moth	1d
<i>Monochamus alternatus</i>	Japanese pine sawyer	
<i>Myrmica rubra</i>	European fire ant	1c
<i>Odontothrips loti</i> ¹	bird's-foot trefoil thrips	
<i>Pityophthorus juglandis</i>	walnut twig beetle	
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	1b
<i>Sirex noctilio</i>	sirex woodwasp	1b
TERRESTRIAL AND AQUATIC VERTEBRATES		
<i>Cygnus olor</i>	Mute Swan	1b
<i>Lepus europaeus</i>	European hare	
<i>Myocastor coypus</i>	nutria	1c
<i>Nyctereutes procyonoides</i>	Asian raccoon dog	
<i>Sus scrofa</i>	Eurasian boar	1c
<i>Alopochen aegyptiacus</i>	Egyptian goose	
<i>Cairina moschata</i>	Muscovy duck	
<i>Myiopsitta monachus</i>	Monk Parakeet	
<i>Oryctolagus cuniculus</i>	European rabbit	
<i>Xenopus laevis</i>	African clawed frog	
FUNGI		
<i>Amylostereum areolatum</i>	sirex wasp fungus	
<i>Ceratocystisfagacearum</i>	oak wilt	1c
<i>Geomyces destructans</i>	white-nose syndrome	
<i>Geosmithia morbida</i>	thousand canker disease	
<i>Phytophthora ramorum</i>	sudden oak death	

¹ Bird's-foot trefoil thrips, *Odontothrips loti*, does not appear on the 6 NYCRR Part 575 species list, but this insect is of concern because it is destructive to the flower stalk and subsequent seed set of Wild Blue Lupine, *Lupinus perennis* (G. Kennedy, pers. comm.).

Albany Pine Bush Preserve Commission approach to invasive non-plant species management:

The Albany Pine Bush is fortunate in its paucity of invasive non-plant species. The few species that are present in the Preserve are not species that directly affect the inland pitch pine-scrub oak barrens ecosystem that the Commission is tasked with protecting. In the case of such species, documentation of presence or absence in the Preserve is paramount, as is broad-scale monitoring of population levels. For species that more directly affect the inland pitch pine-scrub oak barrens ecosystem, more aggressive treatments would be necessary. All invasive non-plant species monitoring and control is done in cooperation with NYSDEC.

Invasive non-plant species distributions/actions:

Adelges tsugae - hemlock woolly adelgid

Hemlock woolly adelgid was discovered in the Preserve in 2015 and is known from small swaths of hemlock forest located in the ravine systems in the Hunger Kill region of the Preserve. All known occurrences have been mapped with GIS (APBPC, unpublished data). Because hemlock is not a significant component of the inland pitch pine-scrub oak barrens ecosystem, no treatment has been considered at this time. Further surveys are needed in this and other areas of the Preserve to determine the full extent of the infestation, with repeat surveys to record population change over time.

Carassius auratus – goldfish

Present in East Branch Hunger Kill, and Lisha Kill waters as of 1980 (Barnes 2003). Presence has not been surveyed for, nor confirmed since 1980. Surveys should be completed in order to update presence/absence information.

Cyprinus carpio - common carp/ koi

Present in Lisha Kill and Rensselaer Lake waters as of 1980 (Barnes 2003). Presence has not been surveyed for, nor confirmed since 1980. Surveys should be completed in order to update presence/absence information.

Lymantria dispar dispar –European gypsy moth

Present in low numbers throughout the preserve. Populations of this species have not reached levels where damage to vegetation is noticeable. No treatment has been considered at this time since multiple biocontrol agents have been released throughout the state and northeast.

Orconectes rusticus – rusty crayfish

Documented by NYSDEC staff in 2014, throughout the created landfill mitigation wetland known colloquially as Lake Nealon. This site is currently being managed by the City of Albany as a part of their Albany Rapp Road Landfill Ecosystem Mitigation, Restoration & Enhancement project. No treatment has been considered by the APBPC or NYSDEC at this time.

Trachemys scripta elegans – red-eared slider

Known from one individual found in 2014 in the created pine barrens vernal pond wetland near the Albany Rapp Road Landfill. The animal was found dead in 2015. This site is currently being managed by the City of Albany as a part of their Albany Rapp Road Landfill Ecosystem Mitigation, Restoration & Enhancement project.

Overabundant Native Plant Species

There are a wide variety of native plant species that, in the absence of fire, have become overabundant in certain areas of the Preserve. These plants, found in Table 8, can be broadly split into two categories. The first are ecological generalists which include species like aspen and red maple. These species would have existed within the landscape at the periphery of the inland pitch pine-scrub oak barrens ecosystem, but would have been relegated to wetter areas with less severe and less frequent fires. With appropriate fire regimes in place, these species would be virtually non-existent within the upland portions of the inland pitch pine-scrub oak barrens ecosystem. The second category of overabundant native plant species, are the woody pine barrens specialists. Among others, this group includes the pitch pines and scrub oaks from which the inland pitch pine-scrub oak barrens ecosystem derives its name. Pine barrens specialist species would always have been a critical component of the inland pitch pine-scrub oak barrens ecosystem, but at lower densities than those which currently exist in certain areas of the Preserve.

Table 8. Overabundant native plant species and their designations as ecological generalists or pine barrens specialists for species occurring in the Albany Pine Bush Preserve.

Scientific Name	Common Name	Ecological Generalist/ Pine Barrens Specialist
<i>Acer rubrum</i>	red maple	ecological generalist
<i>Pinus rigida</i>	pitch pine	pine barrens specialist
<i>Pinus strobus</i>	white pine	ecological generalist
<i>Populus deltoides</i>	cottonwood	ecological generalist
<i>Populus grandidentata</i>	big toothed aspen	ecological generalist
<i>Populus tremuloides</i>	trembling aspen	ecological generalist
<i>Prunus serotina</i>	black cherry	ecological generalist
<i>Quercus illicifolia</i>	bear oak	pine barrens specialist
<i>Quercus prinoides</i>	dwarf chestnut oak	pine barrens specialist

Albany Pine Bush Preserve Commission approach to overabundant native plant species management:

The approaches for managing ecological generalist species and pine barrens specialist species are vastly different. In order to restore natural fire regimes and encourage pine barrens specialist species, an attempt is made to eradicate ecological generalists from the upland plant communities within the inland pitch pine-scrub oak barrens ecosystem (successional northern sandplains grasslands, pitch pine-scrub oak barrens, pitch pine-scrub oak thickets, and pitch pine-oak forests). For overabundant pine barrens specialist species, a reduction in density as specified in the Albany Pine Bush Pine Barrens Viability Assessment (Bried and Gifford 2008) is the desired outcome. Treatment priorities are listed in descending order below:

1. Reduce densities of pine barrens specialist species in selected high quality pitch pine-scrub oak thickets and pitch pine-oak forests in order to more closely mirror the outcomes desired in Bried and Gifford 2008.
2. Eliminate ecological generalist species from the upland plant communities within the inland pitch pine-scrub oak barrens ecosystem (successional northern sandplains grasslands, pitch pine-scrub oak barrens, pitch pine-scrub oak thickets, and pitch pine-oak forests) based on the size of the ecological generalist species infestation, and the quality of the invaded habitat as detailed in Table 9. Lower numbers have higher priority. Definitions for terms used in the Table are the same as those used in Table 5.

Table 9. Overabundant native plant species treatment priorities.

	Small ecological generalist species infestation	Large ecological generalist species infestation
High quality upland plant communities within the inland pitch pine-scrub oak barrens ecosystem	1	2
Low quality upland plant communities within the inland pitch pine-scrub oak barrens ecosystem	3	4

Overabundant native plant treatment methodologies:

The methods utilized in reducing populations of overabundant native plant species are the same as those used when eliminating invasive plant species described previously.

Overabundant native plant species distributions/treatments:

Acer rubrum – Red maple

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15
Prescribed fire	Small populations of seedlings less than ½ inch in diameter can be reduced or eliminated with moderate to high intensity prescribed fires.

Pinus rigida – Pitch pine

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Cutting*	Individuals are hand or mechanically cut off at ground level
Cut stump herbicide*	54% glyphosate herbicide solution, applied after August 15

*Some pitch pine trees will re-sprout prodigiously when cut and others not at all. We are unsure at present what parameters affect these varying results. Informally, it seems that larger trees (>12” dbh) are less likely to re-sprout, but in addition to dbh, time of year at cutting, particular site conditions, recent weather, and individual tree health all likely play a role. We continue to investigate the best methods to use in controlling pitch pine.

Pinus strobus – white pine

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Cutting	Individuals are hand or mechanically cut off at ground level but do not require the use of herbicide since they do not re-sprout – primary control technique
Prescribed fire	Young thin barked white pine can be successfully managed with a moderate to high intensity prescribed fire.

Populus deltoides – Cottonwood

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Populus grandidentata – Big toothed aspen

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Girdling	Used with mature trees with a dbh of two inches or more, labor intensive
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Populus tremuloides – Quaking aspen

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Girdling	Used with mature trees with a dbh of two inches or more, labor intensive
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Prunus serotina – Black cherry

Common throughout the preserve

Whole tree removal	Used with mature stands when planting with restoration seed is desired
Cut stump herbicide	54% glyphosate herbicide solution, applied after August 15 – primary control technique
Drill and fill herbicide	54% glyphosate herbicide solution, applied after August 15
Drill and fill herbicide	5.4% picloram and 20.9% 2,4-d herbicide solution, used before August 15 for isolated individuals in preparation for same growing season prescribed fire
Foliar herbicide	Used on dense stands of young re-sprouts, 3% Glyphosate herbicide solution with non-ionic surfactant, applied after August 15

Quercus illifolia – Bear oak

Common throughout the preserve

Foliar herbicide	5% fosamine and 0.25% imazapyr herbicide solution with nonionic surfactants, applied after August 15 – primary control technique
------------------	--

Quercus prinoides – Dwarf chestnut oak

Common throughout the preserve

Foliar herbicide	5% fosamine and 0.25% imazapyr herbicide solution with nonionic surfactants, applied after August 15 – primary control technique
------------------	--

Acknowledgements:

Special thanks to Joel Hecht, Stewardship Director; Neil A. Gifford, Conservation Director; Steve Campbell, Ph.D., Conservation Biologist; and Amanda Dillon, Field Ecologist for their contributions and detailed reviews.

Literature Cited:

Barnes, J. K. 2003. Natural History of the Albany Pine Bush: Albany and Schenectady counties, New York. New York State Museum Bulletin no. 502. Albany, New York.

Blossey, B. Assistant Professor, Cornell University – Department of Natural Resources. Personal Communication.

Bried, J. T. and N.A. Gifford. 2008. Albany Pine Bush Pine Barrens Viability Assessment. Albany Pine Bush Preserve Commission. Albany, NY.

Brooklyn Botanic Garden. 2013. Invasiveness assessment scores and ranks for 183 nonnative plant species in NYS.

http://www.nyis.info/pdf/NYS%20INVASIVE%20PLANT%20RANKS_March%202013.pdf (January 14, 2016).

Campbell S.P., A.M. Dillon, and N.A. Gifford. 2014. Population trends of the Karner Blue Butterfly (*Lycaeides Melissa samuelis*) in the Albany Pine Bush Recovery Unit, 2007 – 2014. Albany Pine Bush Preserve Commission, Albany, New York.

Capital Mohawk PRISM. 2016. Invasive Species Priority Rankings List. Compiled November 15, 2016

Dillon, A. and N. A. Gifford. 2015. Evaluation of the Albany Pine Bush Preserve, Albany (NY) for a spotted knapweed (*Centaurea stoebe*) biological control program. Albany Pine Bush Preserve Commission. Albany, NY.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero. 2014. Ecological Communities of New York State, second edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, Albany, New York.

Gebauer, S., W.A. Patterson, M.F. Droege, and M. M. Santos. 1996. Vegetation and soil studies within the Albany Pine Bush Preserve: a landscape level approach. Report prepared by the Albany Pine Bush Preserve Commission, Albany, NY and the Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, MA.

Hoffman, J. H. 2016. Flora of Albany Pine Bush. Albany Pine Bush Preserve Commission. Albany, NY. Unpublished report.

Jordan, M.J., G. Moore and T.W. Weldy. 2008 (2012 update). New York State Ranking System for Evaluating Non-Native Plant Species for Invasiveness. Unpublished report. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

Kennedy, G. Professor, North Carolina State University – Department of Entomology. Personal Communication.

[NYISC] New York Invasive Species Council. 2010. Final report: A regulatory system for non-native species. http://www.dec.ny.gov/docs/lands_forests_pdf/invasive062910.pdf (January 14, 2016).

[NYSDEC] New York State Department of Environmental Conservation. 2015. New York State wildlife action plan. http://www.dec.ny.gov/docs/wildlife_pdf/swapfinaldraft2015.pdf (January 14, 2016).

Additional Resources:

www.newyork.plantatlas.usf.edu

www.nyimapinvasives.org

www.nyis.info