Management Recommendations for Saint Andrews Farm, Barrington, Rhode Island
Submitted to the Barrington Conservation Commission
By The Rhode Island Natural History Survey
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Introduction

The Saint Andrews Farm property, owned by the Town of Barrington, and managed by the Barrington Conservation Commission is a great asset to the surrounding community. For those residents living adjacent to the parcel, the land provides a visual release from the surrounding suburban environment. For all who visit the site, the benefits of recharging in the surrounding open space, exercise, and opportunities to view wildlife are immeasurable. The property also benefits all citizens of Barrington by functioning as a site for groundwater recharge, and storm water retention.

Plant communities present throughout the farm parcel are in transition from the historic land uses as pasture and gravel extraction, to old field, shrubland and woodland habitats. As early successional habitat, Saint Andrews Farm has the potential to provide habitat for a variety of mammals, birds, amphibians, reptiles and insects. In New England transitional habitats must be maintained by some form of disturbance, as over time they will become vegetated by increasingly tall, woodland community species. Fire and wind are traditional disturbance regimes which create openings in the landscape, and provide wildlife with areas in transition from open habitat to that which is forested. As a result of practices which suppress fire, as well as a reduction in human disturbances from logging and agriculture, many plant and animal species that depend on transitional habitats for survival are in decline[1]. Natural disturbance regimes can be simulated by periodic mowing efforts and selective tree removal. By developing a management protocol which incorporates a rotating mowing schedule, a mosaic of early successional plant communities can be maintained at Saint Andrews Farm as a means for promoting early successional wildlife species.

Saint Andrew's Farm contains a variety of the habitat elements which make up early successional habitat mosaics. These include old field, scrub-shrub and woodland components. Ideally, from the standpoint of wildlife management, the old field component should dominate the mosaic, with a combination of low shrubs and saplings comprising from 10 to 30[2] percent of the area. Additionally, the area should be greater than 150' wide and greater than 5 acres[3]. Saint Andrews Farm is set within a relatively square shaped parcel, easily providing a distance greater than 150 feet from edge to edge, and providing interior areas with a buffer from the surrounding residential habitats. The total area encompasses approximately 27 acres[4], which is sufficient to support a variety of shrubland bird species as well as a host of other organisms.

[1] DeGraaf, Richard and M. Yamasaki, 2003. Options for managing early successional forest and shrubland bird habitats in the northeastern United States. Forest Ecology and Management. Volume 185 pp. 179-191.

[2] Natural Resource Conservation Service bulletin, 2007. Early Successional Habitat Management; Old Field Management. Vermont.

[3] Rothbart, Paul, 2006. Maintaining and Restoring Grasslands. Chapter 3. Manageing Grasslands, Shrublands and Young Forests for Wildlife: A Guide for the Northeast. The NE Upland Habitat Technical Committee.

[4] Google Earth imagery estimate.

Findings

The focal point of Saint Andrews Farm is the old field habitat. Rolling topography across the field presents ecotypes ranging from the dry sandy soils of the hill tops, to moist and fertile conditions at the lower elevations. Grasses and wildflowers represent a mix of native and non-native species. The area is bisected with mown paths, and serves as a popular walking spot. Areas where rocks prohibited grazing, or prevent mowing, have grown up as shrub and tree islands within the field.

The northern edge of the property contains a narrow wetland corridor, which supports seasonal and storm generated stream flow through its' interior. The western portion of the wetland is vegetated by a mix of small diameter trees with a mixed understory of native shrub and herbaceous species. Non-native shrub species are present around the perimeter of the wetland. The eastern half of the wetland appears to have been part of the gravel extraction operation that occurred throughout the eastern portion of the property. Soil composition is primarily mineral in content, and leaf litter is minimal. The diameter of the tree saplings is uniform, indicating that once the gravel extraction was complete, the area was left undisturbed and allowed to regenerate. The shrub understory is sparse, and dominated by a young colony of the invasive shrub, glossy buckthorn *(Rhamnus frangula)*[5].

The plant community within the remaining gravel removal area can be characterized as scrub-shrub habitat, dominated by tall perennial forbs, such as golden rod *(Solidago spp.)*, asters *(Aster spp.)*, and mugwort *(Artemisia vulgaris)* with opportunistic shrub species interspersed. Woody vegetation is most dense along the northern edge adjacent to the wetland, providing a band of shrub thicket habitat. However, a number of the shrub and tree species present are non-native and considered as invasive to New England plant communities[6].

At the eastern-most end of the gravel extraction area, mounds of fill material and an excavated hole containing some landscaping debris are present. The area is vegetated by a mix of annual and biennial herbaceous species, indicating a more recent period of disturbance. Many of the species present in this area are considered invasive.

The property is bound on three sides (north, west, and south) by residences, and to the east by a Town parking area and soccer field. A vegetated buffer exists between all of the surrounding land uses and Saint Andrews Farm. The buffer consists of a mix of native and non-native tree and shrub species of varying densities.

Management Recommendations

The current mix of plant communities found at Saint Andrews Farm, present an ideal opportunity for managing the area as early successional habitat, while continuing to provide residents of Barrington with an area for passive recreation. The proximity of Saint Andrews Farm to the coastal flyway makes it a potentially important migratory bird stop-over. Its size is ample enough to support a variety of species, offering the additional potential for educational possibilities for

[5] Taxonomy follows Gleason and Cronquist, 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, 2nd Edition.

[6] Invasive status follows determinations made by the Invasive Plant Atlas of New England, 2009.

residents interested in Rhode Island wildlife. The predominant old field, punctuated by tree islands, along with the area of scrub-shrub flanked by wooded wetland, provides a diverse mosaic of habitat types and moisture regimes. By initiating a rotating mowing regime to manage individual areas, and working to control invasive species throughout the property, Saint Andrews Farm could provide early successional wildlife with valuable feeding, cover and nesting habitat.

The concept of mowing individual areas on a rotating schedule, allows for some areas to be left undisturbed each year, and maintains suitable wildlife habitat throughout the year. Spring nesting sites would be available, as well as food resources for migratory birds. Some communities such as the field would be mowed more frequently than that of, for example, the scrub-shrub. Overall, mowing operations should take place outside of the main nesting season, which falls between April 15th and August 15th[7].

Old Field Management

Field grasses and wildflowers observed within the old field portion of Saint Andrews Farm include a mix of native and non-native species. The total area comprises approximately 15 acres which is considered small by wildlife management standards, but suitable as breeding habitat for certain species such as bobolinks and savannah sparrows. Small isolated grasslands are valuable feeding and resting sites for migratory birds such as warblers, sparrows and larks[8].

While the old field plant species are predominantly herbaceous in nature, woody shrub and tree species can be found growing sporadically among the grasses. In the past, management practices for Saint Andrews Farm have involved regular mowing of the field throughout the growing season to keep grass height low. During the 2009 growing season mowing was reduced to once, to allow species to mature to aid in the inventory of the property. During a site visit conducted on September 22nd, a population of a rare milkweed species *(*Whorled milkweed, *Asclepias verticillata)* was observed growing among native grasses. The milkweed is considered a Species of Concern in the State of Rhode Island. At present there are only three other sites for this species known in the State, and only one of these has the potential to contain a viable population. A ranking of "State Concern" indicates that, though the species is not in imminent danger of being lost to the state, it is one that for which relatively few sites have been documented, and for which populations are considered vulnerable. The whorled milkweed is a species found in the dry, mineral soils of old field habitats, typically growing among native warm season grasses. By modifying the mowing regime within portions of the field, the population will likely expand.

Cool season grasses, such as the European orchard grass *(Dactylis glomerata)* and timothy *(Phleum pretense),* make up portions of the old field habitat. They were brought to this country as forage for livestock, and are adapted to growing under cool, damp weather conditions. They typically form the green cover of grass during the early spring and late fall months. Growth of cool season grasses tends to be dense and sod forming. In addition, cool season grasses lose their upright stature in winter, becoming matted and reducing the value as cover for small mammals. However, certain bird species, such as bobolinks, do utilize hayfields for nesting, and so leaving

[7] Rothbart, Paul, 2006. Maintaining and Restoring Grasslands. Chapter 3. Manageing Grasslands, Shrublands and Young Forests for Wildlife: A Guide for the Northeast. The NE Upland Habitat Technical Committee.

[8] Rothbart, Paul, 2006. Maintaining and Restoring Grasslands. Chapter 3. Manageing Grasslands, Shrublands and Young Forests for Wildlife: A Guide for the Northeast. The NE Upland Habitat Technical Committee.

a portion of the old field as a hayfield is recommended. Areas containing only cool season grasses could be mowed annually in the fall, with the mower height set at 6 inches above the ground[9].

A small population of the invasive forb, Cypress spurge *(Euphorbia cyparissias),* is present in the northwest corner of the field. This species is a common invader of hayfields, and is toxic to cows and horses. The species grows by spreading underground rhizomes and so is very difficult to remove by hand pulling. Rhode Island has obtained permits for the use of biological control; however the population density is such that this approach may not be effective. Herbicide applications are therefore recommended. Please refer to the attached information on Cypress spurge.

The predominant warm season grass found in the Saint Andrews Farm field is little bluestem *(Schizachyrium scoparium).* Warm season grasses grow as a bunch grass, meaning that each plant forms an isolated clump. Little bluestem has a deep root system and is adapted to growing on poor, dry soils. The bare ground between individual plants provides dusting areas for birds, burrowing habitat for insects, and locales for forb germination; thus increasing the potential for plant diversity. Warm season grasses, as the name implies, typically grow during the warmer months of the growing season, and so provide seed forage for wildlife late into the fall, and even though the early months of winter. The stems of warm season grasses do not get matted down by snow and therefore provide cover throughout the winter months, and nesting sites in early spring. Areas dominated by warm season grasses should be mowed every 2 -3 years in early spring. Standard wildlife conservation mowing practices should be followed by setting the mower blade height to10 inches to allow regeneration of grasses[10].

A mosaic pattern of 1 to 2 acre squares should be laid out throughout the old field habitat, to allow for some areas to be mown in a given year, while leaving other areas undisturbed. Existing trails throughout the field can be left for residents to utilize the open space for passive recreation. Trail maintenance should follow whatever regime is acceptable to local residents.

While regular mowing will prevent woody species from maturing in the old field habitat, individuals will persist and re-sprout. Throughout all areas of the field, shrub and tree saplings, both native and non-native should be removed either through mechanical means, or through the use of herbicide. Please refer to the attached information on habitat management for details.

Tree Island Management

Historic and current mowing practices in the field, have avoided areas of rock out croppings. Over time, woody vegetation dominated these areas, which now present themselves as tree islands within the field. The islands provide cover and perching sites for birds and mammals which utilize the field to forage for food. They also provide wildlife with wind breaks, as well as denning and nesting sites. Our recommendation for these sites is to continue to manage them as tree islands, while managing for native species through the removal of non-native and invasive plant species. Non-native trees, such as Norway and sycamore maple *(Acer platanoides* and *A. pseuodoplatanus)* can be individually girdled and left in place to provide nesting sites for cavity

[9] Natural Resource Conservation Service bulletin, 2007. Early Successional Habitat Management; Old Field Management. Vermont.

[10] Natural Resource Conservation Service bulletin, 2007. Early Successional Habitat Management; Old Field Management. Vermont.

nesting birds. Invasive shrubs, such as glossy buckthorn *(Rhamnus frangula)*, multiflora rose *(Rosa multiflora)*, and Morrow's honeysuckle *(Lonicera morrowii)*, can be removed by cutting the main stem close to the ground, and then applying a small amount of herbicide to the freshly cut stem. Seedlings can be hand-pulled when soil is moist. The growth of native, berry producing shrubs, such as bayberry *(Myrica pensylvanica)*, northern arrowwood *(Viburnum dentatum)*, or highbush blueberry *(Vaccinium corymbosum)*, should be encouraged.

Specimen, or noteworthy trees, occur in several areas in and around the old field. These include a white oak and several black walnuts in the north end, adjacent to the scrub-shrub habitat and woodland swamp. In the course of tree-island management, invasive buckthorn could be removed and these specimens could become areas of visual interest for recreational users of the space.

Woodland Edge Management

The vegetation around the periphery of Saint Andrews Farm consists primarily of mature trees, which provide a woodland buffer between the surrounding human activity and the interior of the property. As with the shrub islands, this buffer should be maintained. Management could include allowing additional native shrub species to grow up along the edge to create a less dramatic height transition between the field and the mature trees. Non-native tree and shrub species should be gradually replaced with natives. Removal should be done over time to prevent a reduction in buffering capacity and loss of habitat. If left in place, non-native species will continue to provide a seed source to field and tree islands.

Wetland Management

The woodland wetland community along the northern edge of the property is a relatively young red maple *(Acer rubrum)* swamp, and area subject to storm flowage. Within the upper, or western portion, native shrub and herbaceous species are present with non-native species present at the periphery. The shrub layer at the eastern end is dominated by the invasive shrub, glossy buckthorn. Within this area, herbaceous species are largely absent. Dumping of yard waste along the northern edge of the wetland appears to be a common practice. The detrimental effect being most pronounced in instances where non-native species, such as garlic mustard *(Allaria petiolata)* have been introduced to the wetland community.

Removal of invasive species from wetland habitats is an activity for which Rhode Island Department of Environmental Management approval can be obtained. DEM regulations allow the Department to waive normal wetland permit rules for invasive removal projects being undertaken in a controlled manner.[11] Proposed work would be reviewed as a wetland restoration.

Management within the western portion of the wetland would involve selective removal of invasive shrubs, following the practices outlined for the tree islands, as well as the removal of garlic mustard. Garlic mustard is a biennial species, and can be hand-pulled over the course of a number of years to eliminate it from the wetland community. Garlic mustard is best managed by pulling the basal rosettes in late fall or early spring. Neighbors should also be encouraged to remove garden waste from the wetland, and to alter their practices of dumping. Additionally, a small, patch of Japanese knotweed *(Polygonum cuspidatum)* has recently become established

[11] Conditions for this exemption of permit may be found in DEM Wetlands Rule 6.02(K)

along the south side of the wetland. This population is small enough, that at present it could be removed from the site by hand digging the tubers. As Japanese knotweed can re-sprout from fragments of the stem which contain leaf nodes, it is recommended that removed plant material be air dried (avoiding contact with soil) for at least 3 months before composting. Tubers dug from the ground should be cut into small pieces before being air dried. Alternatively the population could be treated with herbicide through the stem-injection method, as outlined in the attached material on the species.

As evidenced by the mineral nature of the soil, the lack of an organic layer or leaf litter, and mounds of fill material present, it appears the present plant community within the lower portion of the wetland formed after gravel was removed from the site. The plant community consists of red maple saplings, with an emerging understory of glossy buckthorn. Management of the lower portion of the wetland would include remove of the buckthorn and augmenting the soil and community with organic material.

Buckthorn is a colonial shrub species, meaning that it spreads primarily by vegetative means through the extension of underground rhizomes. As a result, cutting alone will induce the stems to sprout additional aerial stems along the rhizome. The best management option is to cut stems close to the ground and apply herbicide to the freshly cut stems. To augment the soil and encourage the growth of native species, a 6 inch layer of chipped wood material and leaf litter can be spread throughout the wetland to build up a topsoil layer and provide a barrier to further establishment of non-native species. Storm flow corridors should be maintained as is. Once it is determined that the buckthorn has been successfully removed, native species can be planted in the understory to increase the plant diversity and improve the value of the habitat for wildlife. Native colonial species, such as sweet pepperbush *(Clethra alnifolia),* silky dogwood *(Cornus amomum),* and bayberry will provide soft fruits for small mammals and migratory birds.

Scrub-Shrub Management

The gravel extraction area includes two vegetative components. The southern half is primarily composed of a mix of tall perennials with the northern half being dominated by shrubs and sapling trees. Both components provide good cover and foraging habitat for small mammals and birds, and should be managed to ameliorate the conditions provided at present. Non-native invasive species should be selectively removed, following the protocol for management of the tree islands and old field habitats. Of particular concern is a large patch of Japanese knotweed growing on top of what appears to be a mound of fill material adjacent to the parking lot. Regular cutting and application of herbicide should bring the population under control, but without removal of the tubers complete elimination may not be possible (please refer to attached information on the management of Japanese knotweed).

To maintain the current mix of woody species within the northern portion of the area, and to encourage the development of a diverse shrub habitat, alternating areas should be mowed every 10 years[12]. Selectively promoting the growth of native colonial shrubs, through removal of non-native species, will augment the health of the community through the density of the root systems, and present a shrub community that is more resistant to non-native species. Though mowing may

[12] Tefft, Brian, 2006. Manageing Shrublands and Old Fields. Chapter 4. Manageing Grasslands, Shrublands and Young Forests for Wildlife: A Guide for the Northeast. The NE Upland Habitat Technical Committee.

present an opportunity for non-native species to become established, the practice of careful stewardship can counteract their arrival by removing plants before they become established. In addition to the species recommended for the wetland habitat, the addition of more sun tolerant species such as winterberry *(Ilex verticillata)* and alders *(Alnus spp.)* would provide colonial root systems and soft fruits for birds and mammals.

The southern half of the area should be mowed more frequently, with alternating areas mowed on a rotating schedule of every five years[13], to maintain a mix of predominantly herbaceous species. Woody species that are present in the area should be selectively removed, as should any that seed into the area in the future. At present, multiflora rose *(Rosa multiflora)* is extensive in portions of this habitat. Its' rapid and sprawling growth competes directly with the herbaceous species for light and space, and makes the habitat impenetrable for all but the smallest mammals and birds. Please refer to management recommendations for this species provided with the text.

The fill piles and gravel pit holes at the eastern-most end of the gravel extraction area require the most complex protocol for management. The area is vegetated by weedy species both native and non-native. Many of the non-native species, such as phragmites *(Phragmites australis)*, garlic mustard and bedstraw *(Galium species)* are considered invasive and have the ability to persist as the community matures. A successful strategy common among annual and biennial species is heavy seed production to ensure survival of the species from year to year. From a management perspective, this means that a large number of seeds will be present in the seed bank, making removal of the species difficult in the short term. As with many agricultural weeds, the seeds of the plants present germinate best when exposed to sunlight. Combined measures involving the movement of soil from the mounds, into the pit, and then covering the area with black plastic tarps to heat the soil is recommended to reduce the viability of seeds. Warm season grasses, such as switch grass *(Panicum virgatum)* and little bluestem could be planted to create a community of native herbaceous species. Following the restoration work and seeding, the area will need to be monitored for the germination of non-native and/or woody species. The warm season grasses can be planted either through seed or seedling plugs. Typically, most of the growth that occurs in warm season grasses during the first two years is within the root system, so planting plugs of the grasses will give the area a head start on re-vegetation.

Conclusion

Though extensive in scope, these practices can be implemented over time, as funds and community participation allow. The primary components for improving the habitat in the short term are maintaining the present variety of plant community structure through cyclical mowing on a variety of appropriate time scales, and removing or controlling the spread of the invasive species. The observation of the rare, whorled milkweed population growing in the old field, speaks clearly to benefits of reducing the frequency of mowing to promote the growth of native species. Community participation in the maintenance and stewardship of the property will enrich appreciation for the potential habitat and wildlife benefit, and in the long term ensure that the area remains as open space.

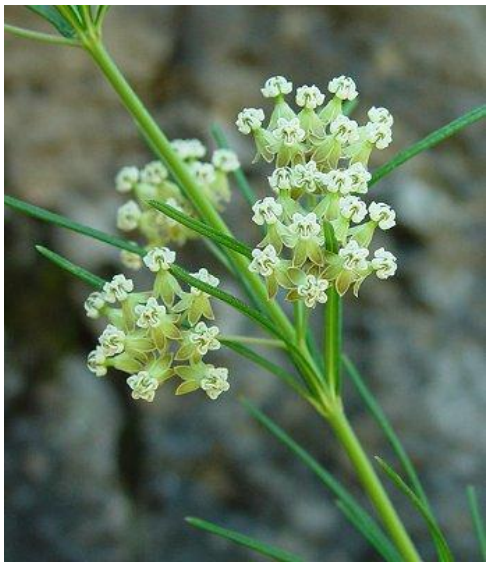
[13] Natural Resource Conservation Service bulletin, 2007. Early Successional Habitat Management; Old Field Management. Vermont.

Saint Andrews Farm Photos
September 22, 2009

Old Field Habitat; Warm and Cool Season Grasses Species

Tree Island; White oak with Non-native

Asclepias verticillata, Whorled milkweed



Inflorescence (Photo courtesy Missouri Botanical Society)

Wooded Swamp; Red maple with Buckthorn understory

Wooded Swamp; Native Vegetation

Scrub-shrub Habitat; Native Forbs, Mix of Non-native and Native Shrubs and Trees

Non-Native Annual Species; Gravel Excavation Area

Saint Andrews Farm Plant List
Rhode Island Natural History Survey Site Visit
September 22, 2009

Endangered Plants at Saint Andrews Farm		**Status**
Asclepias verticillata	common milkweed	Rare SC

Non-native, Invasive Species		**Life Form**
Acer platanoides	Norway maple	Tree
Acer pseudoplatanus	sycamore maple	Tree
Catalpa species	catalpa	Tree
Robinia pseudoacacia	black locust	Tree
Berberis thunbergii	Japanese barberry	Shrub
Euonymus alatus	winged euonymus or burning bush	Shrub
Ligustrum species	evergreen privet	Shrub
Lonicera morrowii	Morrow's honeysuckle	Shrub
Lonicira japonica	Japanese honeysuckle	Shrub
Rhamnus cathartica	common buckthorn	Shrub
Rhamnus frangula	glossy buckthorn	Shrub
Rosa multiflora	multiflora rose	Shrub
Alliaria petiolata	garlic mustard	Forb
Centaurea nigra	black knapweed	Forb
Euphorbia cyparisias	Cypress-spurge	Forb
Polygonum cuspidatum	Japanese knotweed	Forb
Phragmites australis	Phragmites, tall reed	Grass
Celastrus orbiculatus	Oriental bittersweet	Vine

Plant List for Saint Andrews Farm Site Visit September 22, 2009

Aceraceae	
Acer platanoides	Norway maple
Acer negundo	box elder
Acer rubrum	red maple
Acer pseudoplatanus	sycamore maple
Anacardiaceae	
Toxicodendron radicans	poison ivy
Rhus copallinum	winged sumac
Apiaceae	
Daucus carota	Queen Anne's lace
Aquifoliaceae	
Ilex verticillata	winterberry
Araceae	
Arisaema triphyllum var. pusillum	Jack in the pulpit
Symplocarpus foetidus	skunk cabage
Asclepiadaceae	
Asclepias syriaca	common milkweed
Asclepias verticillata	common milkweed
Asteraceae	
Achillea millefolium	yarrow
Artemisia vulgaris	mugwort
Aster novibelgii	New York aster
Aster racemosus	small headed aster
Centaurea nigra	black knapweed
Conyza canadensis	horseweed
Eupatorium perfoliatum	boneset
Taraxacum officinale	common dandelion
Tanacetum vulgare	common tansy
Solidago caesia	axillary goldenrod
Solidago gigantea	smooth goldenrod
Solidago juncea	early goldenrod
Solidago rugosa	rough goldenrod
Balsaminaceae	
Impatiens capensis	spotted touch-me-not
Berberidaceae	
Berberis thunbergii	Japanese barberry
Betulaceae	
Betula populifolia	gray birch

Plant List for Saint Andrews Farm Site Visit September 22, 2009

Bignoniaceae	
Catalpa species	catalpa
Brassicaceae	
Alliaria petiolata	garlic mustard
Caprifoliaceae	
Lonicera morrowii	Morrow's honeysuckle
Lonicira japonica	Japanese honeysuckle
Viburnum dentatum	northern arrowwood
Sambucus canadensis	elderberry
Celastraceae	
Euonymus alatus	winged euonymus or burning bush
Celastrus orbiculatus	Oriental bittersweet
Convolvulaceae	
Calystegia sepium	hedge-bindweed
Cornaceae	
Cornus amomum	silky dogwood
Nyssa sylvatica	tupelo, black gum
Cupressaceae	
Juniperus virginiana	eastern red cedar
Cyperaceae	
Carex lurida	tufted sedge
Carex stricta	tussock sedge
Cyperus esculentus	yellow nutsedge
Ericaceae	
Kalmia latifolia	mountain laurel
Vaccinium corymbosum	high-bush blueberry
Euphorbiaceae	
Euphorbia cypparisias	Cypress-spurge
Fabaceae	
Robinia pseudoacacia	black locust
Vicia tetrasperma	four-seed vetch
Trifolium pratense	red clover
Lespedeza capitata	bush clover
Fagaceae	
Quercus alba	white oak
Quercus velutina	black oak

Plant List for Saint Andrews Farm Site Visit September 22, 2009

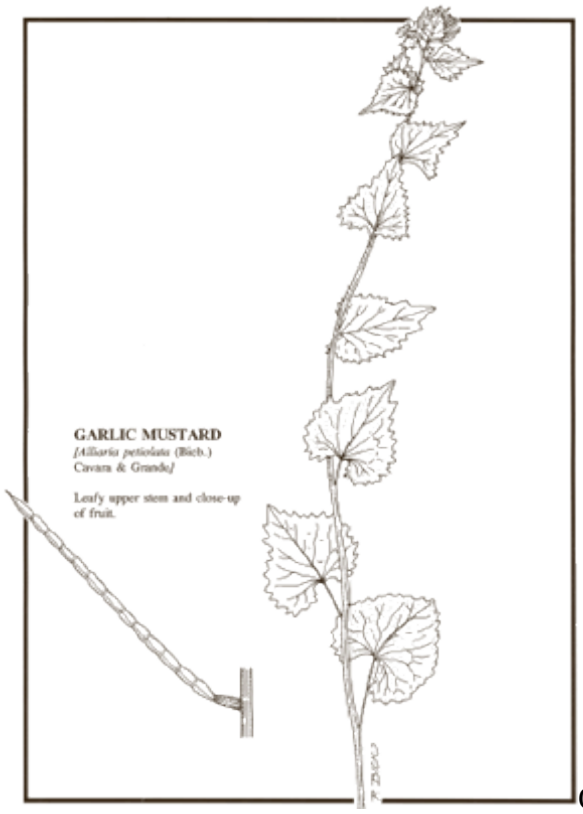
Juglandaceae	
Juglans nigra	black walnut
Lamiaceae	
Glechoma hederaceae	Gill-over-the-ground
Lauraceae	
Sassafras albidum	sassafras
Lindera benzoin	spicebush
Moraceae	
Morus rubra	red mulberry
Myricaceae	
Myrica pensylvanica	bayberry
Oleaceae	
Fraxinus americana	white ash
Ligustrum species	evergreen privet
Onocleaceae	
Onoclea sensibilis	sensitive fern
Osmundaceae	
Osmunda cinnamomea	cinnamon fern
Osmunda regalis	royal fern
Phytolaccaceae	
Phytolacca americana	pokeweed
Pinaceae	
Pinus strobus	white pine
Plantaginaceae	
Plantago lanceolata	English plantain
Poaceae	
Dactylis glomerata	orchard grass
Phragmites australis	Phragmites, tall reed
Holcus lanatus	velvet grass
Panicum clandestinum	deer tongue
Panicum virgatum	switch grass
Phleum pratense	Timothy
Schizachyrium scoparium	little blue-stem
Polygonaceae	
Polygonum cuspidatum	Japanese knotweed
Rumex acetosella	sheep sorrel
Polygonum persicaria	Lady' s thumb

Plant List for Saint Andrews Farm Site Visit September 22, 2009

Rhamnaceae	
Rhamnus cathartica	common buckthorn
Rhamnus frangula	glossy buckthorn
Rosaceae	
Prunus serotina	black cherry
Spiraea alba	meadowsweet
Rosa multiflora	multiflora rose
Rubus allegheniensis	blackberry
Rubus flagellaris	prickly dewberry
Rubiaceae	
Galium mollugo	wild madder
Galium species	bedstraw
Smilacaceae	
Smilax rotundifolia	bull-brier
Solanaceae	
Solanium nigrum	black night shade
Vitaceae	
Parthenocissus quinquefolia	Virginia creeper
Vitis labrusca	fox grape

Garlic Mustard [Alliaria petiolata (Bieb.) Cavara Grande]

DESCRIPTION



Garlic mustard produces a characteristic fragrance of garlic from all parts of the plant. Adult flowering or fruiting plants grow 24-48 inches (61-125 cm) high. Basal rosettes have dark green, kidney-shaped leaves that differ somewhat in shape from the sharply-toothed, triangular, alternate, petioled leaves on the stems. Garlic mustard usually blooms in May. Numerous small white flowers, 0.25 inches (6-7 mm) across, are borne in a terminal raceme at the apex of the stem, and also at some leaf axils. Plants usually produce 1 flowering stem, but may have as many as 10 stems from a single root. Each flower is composed of 4 white petals that narrow abruptly at the base. Black seeds are produced in 1-4.7 inch (3-12 cm) long, narrow, linear capsules called siliques.

SIMILAR SPECIES

Garlic mustard is easily distinguished from all other woodland mustard plants by its characteristic odor of garlic and the 2-4 foot (0.6-1.2 m) tall flower stalks covered with numerous small, four-petalled, white flowers in May. The alternate, coarsely toothed, broadly triangular stem leaves with a distinct petiole are also characteristic. The garlic odor gradually dissipates by autumn, and garlic mustard rosettes may then be mistaken for violets *(Viola* spp.) or immature white avens *(Geum canadens*e). Garlic mustard can be distinguished from these species by

examining the roots. Garlic mustard has a white slender taproot, with a characteristic crook or "s" shape at the top of the root, just below the base of the stem. Garlic mustard should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Garlic mustard is native to Europe, and also occurs in northern Africa, Sri Lanka, and India. In North America, garlic mustard is now distributed from Quebec and Ontario, south to North Carolina and Kentucky, and west to Kansas and North Dakota. It is scattered in mesic woodlands in Missouri, and will probably become more widespread in the near future. It occurs in at least 41 counties in Illinois, mostly in the northern half of the state.

HABITAT

This species occurs most frequently in upland and floodplain forests, savannas, and along roadsides. It invades shaded areas, especially disturbed sites, and open woodland. It is capable of growing in dense shade and occasionally occurs in areas receiving full sun.

LIFE HISTORY

Garlic mustard is a biennial herb. Seeds germinate in early spring, young plants overwinter as basal rosettes, and adults bloom from May-June the following year. Each plant dies after producing seed. Seeds disperse when the siliques burst at maturity in August. Seeds have a 20-month dormancy period and do not germinate until the second spring after ripening. The species reproduces readily from the numerous seeds produced.

EFFECTS UPON NATURAL AREAS

Garlic mustard aggressively has invaded numerous forested natural areas and is capable of dominating the ground layer in many areas. It is a severe threat to many natural areas where it occurs because of its ability to grow to the exclusion of other herbaceous species.

Control Recommendations

Initial effort in areas of heavy infestation

Fall or early spring burning is an effective control treatment in oak woods. Repeated burns over several years may be necessary to achieve adequate control and to eliminate plants produced from the seed bank. Removal of leaf litter by burning will increase the survival of seedlings the following spring, therefore, burning in consecutive years may be necessary to deplete the seedbank. Prescribed fires should be of sufficient intensity to burn the affected site thoroughly. A clean fire that burns down to the root crown when the spring rosettes are up is recommended.

Low intensity fires that leave unburned areas will not control garlic mustard effectively. Any isolated plants that are not burned should be removed by hand prior to flower production.

Research by Victoria Nuzzo indicates that cutting flowering stems at ground level results in 99% mortality, while cutting at 4 inches (10 cm) above ground level produces 71% mortality and reduces total seed production by 98%. Plants cut near ground level when in full flower usually do not resprout. Viable seed may be produced after stems are cut: pending further research, cut stems should be removed from the site when possible.

The control method used over the last three years at The Nature Conservancy's Trice-Dedman Woods nature preserve in northwest Missouri has been a combination of hand pulling and prescribed fire. The Nature Conservancy has successfully controlled or eliminated this plant from several such sites by a combination of spring burning, hand-pulling, and cutting flowering stems with a scythe. When garlic mustard occurs in nearly pure populations with few other plants, scything is advantageous in that large areas can be covered quickly and the soil is not disturbed.

Spot application of 1% Roundup (a formulation of glyphosate) to the foliage of individual plants is effective during spring and fall when most native vegetation is dormant but garlic mustard remains green. Herbicide should be applied when air temperatures are above 32 deg. F (0 deg. C). Managers should exercise caution when applying herbicide to garlic mustard to avoid contacting nontarget plants. Roundup is a nonselective herbicide (kills all vegetation) and should not be used during the growing season in high-quality areas because of the possibility of harming nontarget plants. **Do not spray so heavily that herbicide drips off the target species.** The herbicide should be applied while backing away from the treated areas to avoid contacting the wet herbicide. Basagran (generic name Bentazon) has also been used effectively as a foliar spray and may have less impact on semi-evergreen forbs which may be active in late fall or early spring. By law, herbicides only may be applied as per label instructions.

Initial effort in areas of light infestation

Removal of plants by hand-pulling is effective if the root is removed. If the stem snaps off from the root crown of a non-flowering plant, the plant may resprout. When hand-pulling, disturb the soil as little as possible, and tamp the soil firmly after removing the plant. Soil disturbance can bring garlic mustard seed to the surface and create a favorable environment for garlic mustard germination and growth.

Maintenance control

Vigilant monitoring and hand removal of first- and second-year plants prior to flower production can be effective. A regular burning regime in oak woods can control garlic mustard.

Recommended practices on lands other than high-quality natural areas

Fall or early spring burning in oak woods can control this species. Repeated burns may be necessary over several years. Spot application of 2% Roundup to individual plants as described

above can be used in severely disturbed woods. Cutting or scything flowering stems, as described above, is effective. Maintenance control is the same as given above.

In addition, hand spraying individual plants with an amine formulation of 2,4-D is an effective control when applied according to label instructions. To reduce vapor drift, use an amine formulation of 2,4-D rather than an ester formulation. A 1% solution of Mec Amine-D (2,4-D plus Dicamba) applied to the foliage of young plants is also effective. Either herbicide should be applied only during spring or fall when most native vegetation is dormant but garlic mustard remains green. The herbicide 2,4-D amine is selective for broadleaf plants. As with Roundup, managers should exercise caution when applying these herbicides to garlic mustard to avoid contacting nontarget plants. Do not spray so heavily that herbicide drips off the target species.

Failed or Ineffective Practices

Low intensity fires that do not burn through the leaf litter have no effect on garlic mustard.

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Common Buckthorn (Rhamnus cathartica L.)

Other names: European buckthorn, Hart's thorn, waythorn, rhineberry

DESCRIPTION

Common buckthorn ia a shrub or small tree reaches heights of 25 feet (7.6 meters); trunk diameter is up to 10 inches (25 cm); crown is spreading and irregular. The bark is gray to brown, showing a rough texture when mature. Twigs are often tipped with a spine. Leaves and bud scars are nearly opposite to opposite. Small black fruits up to one-quarter inch (0.6 cm) diameter and containing 3-4 seeds are typical. Leaves are broadly elliptic, rounded to pointed at the tip, and toothed. Both upper and lower leaf surfaces are smooth. Leaves stay green late into fall.

SIMILAR SPECIES

Two native species of buckthorn are found in Missouri. These are Carolina buckthorn *(Rhamnus caroliniana*) and lance-leaved buckthorn *(Rhamnus lanceolata*). Carolina buckthorn is essentially restricted to the Ozark region in Missouri, whereas lance-leaved buckthorn is found throughout the state with the exception of the Mississippi Lowlands of southeast Missouri. Both species grow in soils derived from limestone or dolomite. Common buckthorn can be distinguished from both native species by its opposite or near opposite leaf arrangement and by the presence of

spiny tips on its twigs. Its leaves are abruptly pointed to rounded at the tip, whereas the two native species both have leaves that are more gradually tapered to a point at the tip.

Common buckthorn should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

This exotic buckthorn is an endemic of Eurasia that was introduced to North America as an ornamental shrub. It has become naturalized from Nova Scotia to Saskatchewan, south to Missouri and east to Virginia. Distribution records from Missouri are scattered, but the species probably has the potential for establishment throughout the state.

HABITAT

Common buckthorn inhabits woodlands and savanna. It is quite sun tolerant, as it is also found in prairies and abandoned fields. It is cultivated for hedges and wildlife habitat and is used in shelterbelt plantings. It has become naturalized in pastures, fencerows, roadsides, and slopes of ravines.

LIFE HISTORY

Common buckthorn produces fruit that is readily eaten by birds. The severe laxative effect of the fruits readily distributes seeds. The shrub readily resprouts from cut or damaged stems.

EFFECTS UPON NATURAL AREAS

Common buckthorn readily invades natural communities. Once established, it crowds or shades out native shrubs and herbs. It can invade woodlands, savannas, and prairies.

CURRENT STATUS

Exotic buckthorns are sold as ornamentals by several nurseries, and are used as hedges in many urban areas. There are no current legal restrictions on the sale or propagation of these plants.

Control Recommendations

Recommended Practices in Natural Communities of High Quality

As with all management, control efforts must balance improvement of the biotic community with damage caused by the management. It is always best to take the least damaging approach that will affect the desired control of an exotic. The following are effective control measures for common buckthorn.

Fire is sometime effective in controlling buckthorn. Regular prescribed fire will kill seedlings and stems of this species in fire-adapted upland sites, although resprouting may occur. Some control usually will be evident after the first burn. However, for complete control in established stands of buckthorn, burning yearly or every other year may be required for 5-6 years or more. Early spring burns, late April to early May, capitalize on the fact that buckthorn leafs out earlier than most native shrubs. Burning shortly after leaf out may reduce resprouting, since root reserves will be low at that time. Fire should not be used to control this species if the community will be affected adversely. Burns should be conducted by 37 persons trained or experienced in conducting prescribed burns, and proper safety precautions should be followed.

When burning is not feasible, larger trees can be cut or girdled and resprouts clipped as they occur. When using chainsaws and other power equipment, proper safety equipment and precautions need to be used. For safety recommendations refer to your chainsaw owner's manual. For girdling to be effective, use an ax or saw to make 2 parallel cuts 4-5 inches apart, cutting through the bark slightly deeper than the cambium. The bark is then either knocked off, using a blunt object like an ax head, or peeled away, using a blunt ax blade. Phloem should be removed without damaging the xylem. Girdles should be checked after a few weeks to make sure that bark does not develop over the cut area. Girdled trees take time to die and the results may not be seen until a year later. Basically, the tree is slowly starving to death. All suckers should be cut. Since girdling will probably produce abundant sprouting below the girdle, the cut-stump treatment described below will provide a more efficient means of control by eliminating sprouting.

In upland areas where burning is not feasible, cut stumps can be treated with Trimec (a formulation of 2,4-D, MCCP and Dicamba) or Roundup (formulation of glyphosate) to prevent resprouting. Trimec, an herbicide specific for broadleaf plants, should be diluted with an equal portion of water and applied according to label instructions. Roundup is non-specific and kills all photosynthetically active vegetation. Although the Roundup label recommends a rate of 50-100% for cut-stump treatment, a 50% solution has proven effective. Autumn is the preferred time to cut and stump-treat buckthorn, because 1) buckthorns retain green leaves late into the fall, making it easy to find all plants and 2) most native vegetation is dormant, minimizing the potential harm to non-target plants.

To be effective, the herbicides mentioned above must be applied immediately after cutting. Consult appropriate herbicide label(s) for specific application directions. These chemicals can be applied either by spraying individual cut stumps with a low pressure hand sprayer or else by wiping the herbicide on each cut stump with a sponge applicator (sponge-type paint applicators can be used). Care should be taken to avoid herbicide contact with nontarget plants. Native nontarget plants will be important in recolonizing the site after buckthorn is eliminated. By law, herbicides may only be applied according to label directions.

Recommended Practices on Lands Other Than High-Quality Natural Areas

Same as given above for high-quality areas, with the following additions:

In addition to the cut-stump treatments recommended above, Garlon 3A (a formulation of triclopyr) is a selective, translocated herbicide that can also be applied on cut stumps. A 50%

Garlon solution diluted with water can be sprayed, using a hand sprayer, to the cut stump. Application should be within minutes of cutting. Cut-surface application can be made during 38 any season of the year, but application during the dormant season reduces the potential for drift injury.

Dormant season basal-bark treatment using Garlon 4 herbicide is effective on trees and resprouts less than 6 inches in diameter, however, this treatment is not labeled for use in wetlands. Two to two and one-half oz. of Garlon 4 is added to one gallon of diesel fuel. Spray this mixture, using a hand sprayer, to the basal portion of the trunk. Spray to a height of 12-15 inches (30.5-38.1 cm.). A thorough spraying is necessary. **This treatment should not be used in high quality natural areas because the diesel fuel may kill vegetation around the tree.**

Another formulation using Garlon 4 has been used successfully in the spring and fall at Cuivre River State Park in Lincoln County, Missouri. Managers there used a mixture of Garlon 4 (25%), Cide-kick (10%), and diesel fuel (65%) as a thinline treatment for common buckthorn. Cide-kick is a spreading agent that improves the ability of a spray to encircle a stem when sprayed from one side. If the treatment is done during the dormant season, the percentage of Garlon 4 may be increased to 30%. Stems under two inches in diameter were sprayed on only one side. Larger stems were sprayed all the way around. All but the larger trees were killed completely using this method. Fall treatment was preferred because of the ease of spotting buckthorn after most other vegetation had lost its leaves.

Use of Garlon 4 is best done in the dormant season to lessen damage to nontarget species. Great care should be exercised to avoid getting any of the mixtures on the ground near the target plant since some nontarget species may be harmed. Avoid using Garlon 4 if rain is forecast for the following 1-4 days; otherwise runoff will harm nontarget species. In areas of heavy infestation, a large seedbank of common buckthorn in the soil will probably necessitate repeated control measures for a period of years, as new seedlings emerge. Seedlings or small plants may be hand pulled or removed with a grubbing hoe or larger plants may be pulled out with heavy equipment. Excavation often disturbs roots of adjacent plants, or creates open soil that may be readily colonized by new seedlings. This technique may be most useful to control invasion at low densities, or along trails, roads, and woodland edges.

Failed or Ineffective Practices

No effective biological controls that are feasible in natural areas are known.

Girdling or cutting without chemically treating the stumps will cause sprouting that will require retreatment by cutting or using foliar sprays.

Multiflora Rose (Rosa multiflora Thunb. ex Murray)

DESCRIPTION

Multiflora rose is a medium height, thorny, bushy shrub with a more spreading than erect growth form. Leaves are born alternately on the stems and divided into 5-11 leaflets (usually 7-9). Each leaflet is broadly oval and toothed along its margin. Clusters of numerous, white flowers, three-quarter to one and one-half inches (1.9-3.8 cm) across, bloom in late spring. The fruits are small, firm, red hips that may remain on the plant well into winter. Older rose shrubs may obtain a height of 15 feet (4.6 meters) or more with a root crown diameter of 8 inches (20 cm).

SIMILAR SPECIES

Multiflora rose can be distinguished from Missouri's native roses by the presence of a feathery or comb-like margin on the narrow stipules (a green, leaf like structure found at the base of each leaf stalk). Missouri's native rose species all have stipules at the base of the leaf stalk, but their stipules do not have feathery margins. Multiflora rose can also be distinguished from most native roses by the fact that its styles are fused together into a column. The native roses, except prairie rose *(Rosa setiger*a) have separate styles. Multiflora rose should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Multiflora rose was originally introduced to the East Coast from Japan in 1886 as rootstock for cultivated roses. In the 1930's the U.S. Soil Conservation Service advocated use of multiflora rose in soil erosion control. Experimental plantings were conducted in Missouri and Illinois, and as recently as the late 1960's, many state conservation departments were distributing rooted cuttings to landowners. It was planted in the Midwest for living fences and soil conservation. Managers recognized that plantings of this thorny, bushy shrub provided excellent escape cover and a source of winter food for wildlife. The species soon spread and became a serious invader of agricultural lands, pastures, and natural communities from the Midwest to the East Coast.

HABITAT

Multiflora rose occurs in successional fields, pastures, and roadsides. It also may occur in dense forests, particularly near natural disturbances such as treefall gaps and along streambanks. It has a wide tolerance for soil, moisture, and light conditions; but it does not grow well in standing water.

LIFE HISTORY

Multiflora rose is named for the clusters of many white flowers born on this perennial bramble during May or June. The flowers develop into small, hard fruits called hips that remain on the plant throughout winter. The great majority of plants develop from seeds remaining in the soil relatively close to plants from which they were produced. Birds and mammals also consume the hips and can disperse them greater distances. Rose seeds may remain viable in the soil for 10-20 years. Multiflora rose also spreads by layering, i.e., where tips of canes touch the ground and form roots, and by plants that arise from shallow roots.

EFFECTS UPON NATURAL AREAS

Multiflora rose readily invades prairies, savannas, open woodland, and forest edges. It is a thorny, bushy shrub that can form impenetrable thickets or "living fences" and smother out other vegetation. It is a serious pest species throughout the eastern United States.

CURRENT STATUS

There are probably no counties in Missouri where multiflora rose cannot be found today. The species was designated a noxious weed by Missouri state law in 1983. As such, Missouri counties may adopt a law that requires mandatory control of multiflora rose.

Control Recommendations

Recommended Practices in Natural Communities of High Quality

Pulling, grubbing, or removing individual plants from the soil can only be effective when all roots are removed or when plants that develop subsequently from severed roots are destroyed. These approaches are most practical for light, scattered infestations.

In fire-adapted communities, a routine prescribed burn program will hinder invasion and establishment of multiflora rose.

Research indicates that 3-6 cuttings or mowings per growing season for more than one year can achieve high plant mortality. Such treatment may need to be repeated for 2-4 years. Increased mowing rates (+6 per season) did not increase plant mortality. In high quality communities, repeated cutting is preferred over mowing, because repeated mowing will damage native vegetation as well as multiflora rose.

Cutting stems and either painting herbicide on the stump with a sponge applicator (sponge-type paint applicators can be used) or spraying herbicide on the stump with a low pressure hand-held sprayer kills root systems and prevents resprouting. Roundup herbicide (a formulation of glyphosate) has been effective in controlling multiflora rose when used as a 10-20% solution and applied directly to the cut stump. Although the Roundup label recommends a higher concentration for cut-stump treatment (50-100%), this lower concentration has proven effective. With this technique, herbicide is applied specifically to the target plant, reducing the possibilities of damaging nearby, desirable vegetation. Cut-stump treatment is effective late in the growing season (July-September), and also during the dormant season. Dormant season application is preferred because it will minimize potential harm to nontarget species. Glyphosate is a nonselective herbicide, so care should be taken to avoid contacting nontarget species. Both glyphosate and piclorum (Tordon RTU) are recommended for controlling established plants.

In addition, Triclopyr (tradename Garlon 3A) can be applied to cut stems or canes for selective control of multiflora rose. Garlon 3A diluted in water at a rate of 50% can be sprayed, using a hand sprayer, to the cut surface. Application should be within minutes of cutting. Use of Garlon 3A is best done in the dormant season to lessen damage to nontarget species. Great care should be exercised to avoid getting any of the herbicide on the ground near the target plant since some nontarget species may be harmed. Avoid using Triclopyr if rain is forecast for the following 1-4 days; otherwise runoff will harm nontarget species. By law, herbicides may only be applied according to label directions.

Recommended Practices on Lands Other Than High-Quality Natural Areas

Repeated cutting, as discussed above, is effective. For large populations on severely disturbed areas, mowing can be substituted for cutting individual plants. However, mowing multiflora rose can result quickly in flat tires. On mowers, filling tires with foam is recommended.

Fosamine (tradename Krenite) can be applied as a foliar spray in a 2% solution plus 0.25% surfactant (two and one-half ounces of Krenite plus one-half ounce surfactant per gallon of water). The Krenite S formulation contains the appropriate amount of surfactant. Coverage of foliage should be complete. Krenite should be applied only in July-September. No effects will be observed during the autumn season following application. Slight regrowth may occur the

following season but canes will die during the summer. Fosamine kills only woody species and is non-volatile, therefore it is the preferred foliar spray treatment.

Dicamba (tradename Banvel) is an effective foliar spray that is less preferred than Krenite. Banvel is selective against broadleaf plants, so care must be taken to avoid contacting desirable, broadleaf vegetation. It can be applied as a foliar spray in a 1% solution (1 ounce of Banvel per gallon of water). Though this solution can be applied any time during the growing season, best results are obtained during May and June when plants are actively growing and flowering, following full leaf-out. One-half ounce of a surfactant should be added when treating dense foliage and, to enhance control in late season applications, complete coverage of all green leaves should be achieved. **Do not spray Krenite or Dicamba so heavily that herbicide drips off the target species. Foliar spray of herbicides should only be used in less sensitive areas because of problems with contacting nontarget species.**

Glyphosate (tradename Roundup) is an effective foliar spray when applied as a 1% solution to multiflora rose plants that are flowering or in bud. Roundup is not a preferred chemical treatment, however, because it is nonselective and the selective herbicides mentioned above are effective. Nevertheless, Roundup can be used as a foliar spray during the growing season on severely disturbed sites if care is taken to avoid contacting nontarget plants. Roundup should not be used as a foliar spray during the growing season in high-quality natural areas because it can be result in damage to nontarget species. Roundup is useful as a foliar spray for alien plants that remain green and retain their leaves after native vegetation is dormant or senescent. Multiflora rose does not fit this description adequately and is controlled most effectively when treating during the growing season.

PROPOSED BIOLOGICAL CONTROLS

No effective biological controls that are currently considered feasible in natural communities are known. Rose rosette disease (RRD) is a fatal disease of multiflora rose and some cultivated roses, first described in the 1940s. The disease is caused by a virus-like particle transmitted by an eriophyid mite *(Phyllocoptes fructiphilus* K.). During past drought years, mite populations built up and RRD spread through much of the Midwest. The disease kills infected roses within two to three years and has already reduced weed populations in some areas. Pruning of multiflora rose will encourage succulent growth, which is more susceptible to mite infestation. Pruning may be practical in areas where RRD is present to encourage the spread of the disease. However, RRD may also infect native roses and plums, as well as commercially important plants in the rose family such as apples, some types of berries, and ornamental roses

The rose seed chalid *(Megastigmus aculeastus* var. *nigroflavu*s), a small wasp-like insect also imported from Japan, attacks developing seed of several rose species. By destroying large amounts of seed, the chalid limits new infestations. Research on the impact on cultivated roses along with studies on environmental limitations are currently being conducted. Both RRD and the rose seed chalid have been documented in Missouri, but not in all counties. Once more is known about the biology of these two control agents, RRD and the rose seed chalid could provide effective control of multiflora rose in areas where other methods are not feasible or are undesirable.

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Shrubland Birds in Massachusetts - David I. King

Shrubland birds are species that are restricted to habitats with little or no tree canopy and a well developed shrub cover. Their association with shrubs makes them relatively distinct from grassland specialists. There are about 41 species of shrub birds in the northeast. Warblers and sparrows are the best represented taxa. Many of these species are extreme habitat specialists restricted to specific habitat characteristics present only 10-15 years post disturbance (Schlossberg and King 2009).

Shrubland birds are of high conservation interest. Seven of 10 federally endangered songbirds in the contiguous US are scrub-shrub birds. Closer to home, the National Breeding Bird Survey indicates that 75% of the species have declined significantly since the BBS was initiated in 1966. Particularly grave examples include the Brown Thrasher and Eastern Towhee, both of which have declined >90%, and two other shrubland bird species, the Golden-winged Warbler and Yellow-breasted Chat, have disappeared from Massachusetts altogether.

These declines are strongly associated with declines in habitat availability. For example, the percentage of forested habitat in Massachusetts that is suitable for shrubland birds has declined >90% since 1950 to only 3-6% of forested land in the state (train et al. 2001). Although the amount of habitat for shrubland bird habitat has increased in Maine over this period, many of the shrubland bird species of regional concern, such as Golden-winged Warblers, Yellow-breasted Chats, Brown Thrashers, Prairie Warblers, Eastern Towhees etc., are not present in industrial forest lands in Maine.

As the result of their regional population declines, most state and federal land management agencies are engaged in activities to create and maintain early-successional habitat as part of their statutory obligations. These practices typically involve either maintaining old field and/or even-aged silviculture such as shelterwood treatments or clearcutting. These agencies are also required to consider the impact of these practices on other forest values.

Detailed guidelines exist for protecting environmental values, however opposition to the creation or management is still often pronounced. There are a number of standard arguments opponents use to support their opposition to active management for shrubland species, which include variants of the following: 1. Shrubland birds were not historically present in the northeast and are an artifact of recent human activity; 2. Shrubland birds are “weedy species” and thus suitable habitat conditions are created by routine human activities. In the following pages, I would like to provide an alternative perspective on these issues.

Our native bird fauna has been evolving for tens of thousands of years, and over this period, the northeast has been subject to extensive disturbance in the form of glaciations and browsing by Pleistocene mega-fauna (Askins 2000). Isolation of ancestral populations by glaciers is thought to have been a major influence in the evolution of the northeastern bird fauna, thus, the assertion that disturbance was absent from the northeast based on accounts of pre-Columbian forests by early

explorers does not reflect the same time-scale as the biological processes that created the bird fauna of the northeast. Further evidence for the pre-historical presence of extensive disturbance in the northeast includes the presence of grassland and shrubland bird remains in middens left by early Native Americans centuries before colonization (Askins 2000).

These early disturbance processes gave way in historic times to a variety of natural and anthropogenic disturbances. Coastal areas were subject to frequent hurricanes and fire resulting from natural ignition sources as well as the wildlife management activities by Native Americans (DeGraaf and Miller 1996, Askins 2000). These large-scale and frequent disturbances were largely confined to coastal areas, leading some to question the validity of shrubland management in interior areas, however John Litvaitis points out that coastal areas in New England are too urbanized to support sufficient shrubland habitat (Litvaitis 2003). In addition, some shrubland birds are less abundant and suffer higher nest parasitism rates by brown-headed cowbirds in urbanized landscapes (Burhans and Thompson 2006, King and Schlossberg, *In Prep*).

The influence of other agents of habitat disturbance has also declined from historic levels. The younger forests that characterize the region are less susceptible to windthrow, and although beaver provide habitat for shrubland birds (Chandler et al. 2009a), and populations are increasing in many areas, sites historically flooded by beaver have been developed by humans, and thus large areas that would have been subject to flooding in historical times are no longer available.

Currently between 3-6% of Massachusetts consists of shrubland habitat, and 70% of this consists of habitat created by logging. Thus, the cessation of logging would result in the rapid loss of more than 2/3 of habitat for shrubland birds. Other types of shrubland habitat include scrub-shrub wetlands, pitch pine-scrub oak barrens, powerline corridors and wildlife openings. Openings created by forestry are occupied by a slightly different suite of bird species than wildlife openings (King et al. 2009a), which in turn differ from wetlands and pitch pine-scrub oak barrens. Powerline corridors provide habitat for shrubland birds, however, the only account for about 0.61% of shrubland habitat in Massachusetts (B. Compton, Personal communication). Also, only corridors in which shrubland habitat is allowed to develop, and which are >50 m in width provide good quality habitat for shrubland birds (King et al. 2009b).

Forest management is an efficient way to create shrubland habitat, because the cost is offset by the value of the timber, however openings need to be at least as large as the territory size of the target species, which in the case of northeastern shrubland birds, is about 3 acres (Chandler et al. 2009b). Also, canopy conditions need to be fairly open. Although we are still working on identifying the exact habitat thresholds for shrubland birds, King and DeGraaf (2000) found that 56% canopy closure was enough to exclude some species of shrubland birds from shelterwood sites in New Hampshire.

Shrubland birds require disturbance to persist, and humans routinely create disturbance as the result of industrial, agricultural and commercial activities. Thus, one could conclude that this chronic and increasing level of disturbance could be sufficient to maintain scrub-shrub birds. Data on songbirds in Missouri suggests that this is not necessarily the case. Researchers there found some shrubland birds, including species of the high conservation concern such as the Blue-winged Warbler and Yellow-breasted Chat, were present in field forest ecotones, which might have led the researchers to conclude these species were flexible in their habitat use, however further examination showed these species were unable to reproduce successfully in edges (Woodward et al. 2001). Thus, the sporadic occurrence of shrubland birds on roadsides or edges probably does not represent a viable population that can sustain itself. Additional evidence for this comes from the Breeding Bird Survey, which is conducted on roadsides, and which shows that shrubland birds in these roadside habitats are declining precipitously.

The more we learn about shrubland birds, the more it becomes apparent that they are habitat specialists. In fact, it turns out that many of the basic principles of conservation biology that were originally described for mature forest birds apply to shrubland birds. For example, most shrubland birds avoid edges (Schlossberg and King 2008), are absent or scarce in smaller habitat patches (Schlossberg and King 2007), and experience lower nesting success near edges (King et al. 2001, King and Byers 2003, King et al. 2009b).

Reports of area sensitivity and edge effects for shrubland birds means that managers need to make sure that habitat patches are large enough to accommodate shrubland birds and minimize edge effects. Currently, we do not know what the exact size thresholds are, but clearly patches need to be at least as large as the territory size of the target organisms, which as we mentioned above, is about 3 acres in the case of northeastern shrubland birds (Chandler et al. 2009b), although work by Rodewald and Vitz (2005) shows that the density of shrubland birds continues to increase beyond 20 acres. Since nest success is generally greater away from edges, we would predict that nest success would be greater in larger clearcuts, because a larger proportion of the habitat is farther away from edges (Thompson 1993, King et al. 1998). Nest success in clearcuts in New Hampshire was slightly higher that smaller openings, however we found no relationship between nest success and area in wildlife openings (Chandler et al., *In Prep*). Larger openings create less edge per area, and thus less edge effects, than the equivalent area of small openings (King et al. 1998).

Because creation of shrubland habitat results in a nearly complete turnover of the bird fauna, a balance of age classes must be maintained. It is possible to maintain both mature forest and shrubland birds in the same landscape, however. Welsh and Healy (1993) showed that forested landscapes in New Hampshire with 18% of their area in regenerating clearcuts had more species than landscapes without clearcuts, and all of the species present in the unmanaged landscapes were present in the managed landscape. Also, regenerating clearcuts are used extensively by mature forest birds for during the vulnerable postfledging period (Vega et al. 1998, Marshall et al. 2003), probably because regenerating clearcuts have greater fruit

and insect resources, or offer better protection from predators. Postfledging habitat can be as important for population viability as nesting habitat (King et al. 2006).

Finally, the creation and maintenance of shrubland habitat benefits threatened species other than birds, including the New England Cottontail (*Sylvilagus transitionalis*), as well as native bees (Milam et al. *In Prep*).

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Cypress spurge - *Euphorbia cyparissias*

In addition to the requirements for the management of all List A species, the following conditions also apply for cypress spurge:

A. The prescribed integrated management techniques are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, or other mechanical techniques approved by the Commissioner.
B. Prescribed integrated management techniques do not include the use of biocontrol agents, herbicides other than those prescribed in (a) **Can be controlled by Roundup Pro Dry at 5% solution; 1# 2,4-D + 8 oz Drive is a turf option. Rangeland/pasture 1#2,4-D + Tordon 22K@1qt/acre or near trees try 1# 2,4-D + 8 oz Paramount/acre.** , cultural techniques, or mechanical techniques other than those prescribed in (a) unless otherwise approved by the Commissioner.
C. Seed longevity is estimated to be eight years.

Cypress spurge - *Euphorbia cyparissias*: is a rare and potentially ecological pollutant for Douglas County, Colorado. It is currently on the State Noxious Weed List as a List A species! ERADICATE IT!

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Jonathan Rife - Weed Inspector