DRAFT REPORT
SITE INVASIVE SPECIES MANAGEMENT PLAN

FOR

SIX-MILE CREEK NATURAL AREA
(Ithaca, NY)

(2005)

WRITTEN BY
SIX-MILE CREEK INVASIVE PLANT ADVISORY COMMITTEE (SCIPAC)

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With the help of:
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Adapted from the Site Weed Management Plan, TNC’s Wildland Invasive Species Program
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1. INTRODUCTION

A. History of the management plan and the need for invasive species control

In winter 2005, the Natural Areas Commission (NAC) convened a group to advise them on management practices for the Six-Mile Creek Natural Area. The NAC was following up on recommendations in the Resource Inventory and Restoration Plan for the Six-Mile Creek Natural Area produced by Dr. Tom Whitlow and students in his restoration ecology class at Cornell University. The advisory group, which included members of the Cornell community and others with expertise in conservation, forest ecology, and invasive plants, came to be called the Six-Mile Creek Invasive Plant Advisory Committee (SCIPAC).

Dr. Whitlow’s restoration plan noted that invasive plants present a serious threat to the natural area: “Unless something is done about these [invasive] species, the area will quickly become overrun with exotic invasive plants...it cannot be stressed enough how important it is to implement a long-term invasive weed eradication program and start controlling these plants now” (p. 72). Accordingly, SCIPAC members expanded on the invasives work undertaken by the class, choosing 19 species that presented serious threats, mapping their locations when possible, and developing control plans.

Since 2003, the Friends of Six Mile Creek, a citizens group, has organized volunteer work days, which are largely devoted to invasive plant removal. As had NAC before them, SCIPAC initially thought that continued, but increased, volunteer effort would be adequate to prevent the spread of invasive species in the natural area. It became evident, however, as SCIPAC members gathered information, that the problem was more serious, and that the solution would require more intensive long-term effort than volunteers alone could provide.

The mission statement of SCIPAC became: To preserve for future generations the ecological integrity and beauty of the threatened native community of the Six-Mile Creek basin, we will (1) identify and protect populations of native wildflowers, rare plants, and old growth; (2) control invasive plant species, emphasizing small, nascent populations that can be eradicated before they spread throughout the basin; and (3) monitor and report on our progress.

The consequences of invasion

The invasion of natural communities by (primarily) nonnative plants is an insidious problem because it is obvious only to the informed. When a forest is clear-cut for lumber or bulldozed for development, the changed landscape is obvious to all. Invasive plants can alter an ecosystem just as thoroughly, but because the process involves one species replacing another over a relatively long time period, few people notice.

When invasives overrun a native forest, every organism in the ecosystem is affected. The loss of the Six-Mile Creek Natural Area to invasives would be especially unfortunate because, for the last two hundred years, the site has provided a refuge for native plant populations and the species that depend on them. The landscape of Tompkins County was once 99.7 percent forested, but by 1900, 80 percent of this forest had been cut and the land plowed. Only areas unsuitable for crops or grazing retained vestiges of native ecosystems. The Six-Mile Creek Natural Area is one of these remnants; although parts of the natural area are heavily invaded, some areas are nearly pristine and unusually rich in rare species.
Why combat invasives?
A recent flora of Tompkins County found 2027 plant species growing here; of these, 800—about 40 percent—are nonnatives, and approximately 10% of those are considered invasive. Many nonnative invasive plants left most of their specialized pathogens and herbivores behind, giving them a competitive advantage over the native flora. This competition can lead to local extirpation of native plant species. For the many native plant species found over a broad swathe of the Northeast, local extirpation does not necessarily mean complete extinction. However, if native plant communities are not preserved they will eventually be found only in the center of great preserves. Small, fragmented forests like those surrounding Ithaca may lose native species: the Norway maples may replace sugar maples; garlic mustard may replace trilliums and other spring ephemerals. Indeed, the edges of these small forests, including those around Six-Mile Creek, are already saturated with buckthorn, privet, and honeysuckle rather than native sumac and spicebush.

Few private landowners have the desire, the knowledge, and the labor to address this problem. It is a monumental task, one that must be carried on in perpetuity, which puts it beyond the reach of an individual person’s enthusiasm. In our view, then, efforts to preserve uninvaded native ecosystems must be overseen by permanent institutions.

The longer we fail to address the invasives problem, the worse it will get. If we don’t act, in a century there may be no place in central New York where one can see an example of the healthy, uninvaded forest ecosystems that once covered the Northeast. These are worth preserving, for they are part of our biological heritage, the context in which our communities evolved.

B. Description and purpose of the site (preserve or managed area)
The Six-Mile Creek Natural Area encompasses 1130 contiguous acres of woodlands, meadows, and water bodies in Tompkins County, New York. It was designated as a natural area by the Common Council of the City of Ithaca in 1998 to protect the reservoir, which is the source of the city’s drinking water, and the surrounding watershed. The Six-Mile Creek Natural Area is considered to have “significance for ecological and/or recreational reasons...[and is] best appreciated and maintained in a natural, relatively undisturbed state (rather than as an active use park)” (Code of the City of Ithaca, NY, Chapter 114).

Several natural communities occur in the Six-Mile Creek Natural Area. Two of these are unique to the region: a remnant of old-growth hemlock-hardwood forest, and a north- and east-facing slope where no fewer than three state-listed rare plants are found (pers. comm. F.R. Wesley, D. Werier). In addition, the natural area encompasses acres of floodplain forest (where the county’s largest sycamore tree can be found) and ridge tops covered by Appalachian oak-hickory forest. The abandoned fields and shrub lands that are common to the central New York landscape are also extensive in the natural area.

Though it is the intention of SCIPAC to propose management guidelines for the entire 1130 acre natural area, our current knowledge of invasive species distribution across the whole area precludes a comprehensive plan. Therefore, we have identified three conservation targets, or priority areas. Two of these priority areas, the Second Bowl–Beech Woods, and the Dry Shale Talus Slopes, are found in the part of the natural area most heavily damaged by anthropogenic factors, making them the most susceptible to past, and continuing, plant invasion. The third, the Amphitheater, is an area where the rare sedges, Carex careyana and Carex jamesii, and the critically rare grass, Poa sylvestris, occur. Furthermore, the Amphitheater is the only site in the natural area where the aggressive invasive species, Japanese stilt grass (Microstegium vimineum), is known to occur.
C. How invasive species interfere with management goals

**Second Bowl–Beech Woods**

The Second Bowl begins approximately one-half mile from the entrance at Upper Giles Street, and is situated mostly east of the trail. Most closely resembling the maple-basswood rich mesic forest community type, the overstory is dominated by sugar maple, American basswood, and white ash. The herbaceous understory is highly diverse, containing an abundance of spring ephemerals. Early spring–flowering species such as Trillium, Hepatica, Bloodroot, and Spring-beauty, among others, attract many visitors to the natural area. The preponderance of invasives here, however, threatens the survival of this much-loved and ecologically important site.

The Second Bowl is heavily invaded by garlic mustard, particularly along the trail. Garlic mustard also occurs in dense patches within the forest stand itself. Studies have shown that some forested stands invaded by garlic mustard have lower herbaceous species cover and/or diversity. Invasive shrubs present in the Second Bowl include exotic bush honeysuckles, Japanese barberry, and privet. These shrubs may outcompete and displace native herbs and shrubs. Garlic mustard may also threaten native butterfly populations, including the rare West Virginia White (*Pieris virginiensis*). Adults of several species may lay their eggs on garlic mustard rather than the native host species, *Dentaria diphylla*, and many or all of these larva may die.

Beech Woods is an old-growth stand of hemlock and northern hardwoods, located just up the trail and contiguous to the Second Bowl. The flora of Beech Woods is similar to that of the Second Bowl and includes many spring ephemerals. Beech Woods is less invaded than the Second Bowl; because the site is slightly higher in elevation than the Second Bowl, and farther from the creek, it is less susceptible to invasion by the water-borne propagules of invasive species such as garlic mustard. Surveys conducted by SCIPAC in spring 2005, however, have revealed that the threat to Beech Woods is greater than previously thought. The proximity of Beech Woods to the trail and to the seriously invaded Second Bowl makes it increasingly susceptible to the same species that are already ubiquitous in the Second Bowl. For this reason we are treating the two forested stands as one management unit.

**Dry Shale Talus Slope**

An Appalachian oak-hickory forest community occupies the ridges surrounding the natural area. In at least three locations, dry shale talus slopes exist below these ridges. These generally south-facing slopes are host to several remarkable native species, including Carolina vetch (*Vicia caroliniana*), broadleaf sedge (*Carex platyphylla*), yellow pimpernel (*Taenidia integerrima*), meadow zizia (*Zizia aptera*), Seneca snakeroot (*Polygala senega*), low bindweed (*Convolvulus spithamaea*), and four-leaf milkweed (*Asclepias quadrifolia*) (pers. comm. F.R. Wesley). This community type is most seriously threatened by illegal foot traffic. It is not yet known which invasive species, if any, are present.

**Amphitheater**

The Amphitheater, a steep slope rising above the first reservoir under hemlock and northern hardwoods, is located just south of the 30-foot dam, on the west side of the creek. This area contains the rare sedges, *Carex careyana* and *Carex jamesii*, and the critically rare grass, *Poa sylvestris*. For the sake of these rare species alone, the Amphitheater deserves high priority. It is also the only site in the natural area where the highly aggressive invasive species, Japanese stilt grass (*Microstegium vimineum*), is currently known to occur. It is critical that this species not be allowed to spread. Other invasive species reported from a brief survey of the Amphitheater include lesser celandine, honeysuckle, and garlic mustard.
Approximate locations of priority areas for invasive species management, Six Mile Creek Natural Area, Ithaca, NY
D. Inventory of invasive plant species that interfere with management goals

A full inventory of invasive plant populations located on and near the natural area is lacking. This section will eventually contain maps of these populations with an estimate the area(s) they cover, and notes on whether populations are increasing, stable, or decreasing. The following table details what is currently known about the location of invasive species in the natural area.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common Name</th>
<th>Known location/abundance anywhere in the natural area</th>
<th>Distribution in Beech Woods</th>
<th>Distribution in the Amphitheater</th>
<th>Distribution in the Dry Talus Slopes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer platanoides</td>
<td>Norway maple</td>
<td>Very abundant coming down from Giles street and on both sides of the South Hill Recreation Way</td>
<td>Two individuals</td>
<td>None likely</td>
<td>None likely</td>
</tr>
<tr>
<td>Ailanthus altissima</td>
<td>tree-of-heaven</td>
<td>5 by footbridge at Giles Street parking lot, 2 on the rocky seasonal island on the right across from where the trail turns sharply left at the mound; others near 30-foot dam</td>
<td>One at the edge of beech woods</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Alliaria petiolata</td>
<td>garlic mustard</td>
<td>Very abundant from Giles Street down and on parts of the south slope</td>
<td>Borders the woods</td>
<td>Low abundance</td>
<td>Unknown</td>
</tr>
<tr>
<td>Artemisia vulgaris</td>
<td>mugwort</td>
<td>Medium abundance in Giles Street entrance meadow</td>
<td>None reported</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Berberis thunbergii</td>
<td>Japanese barberry</td>
<td>Unknown</td>
<td>On edges</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Centaurea spp.</td>
<td>knapweed</td>
<td>Low abundance overall, moderate in the meadow at the Giles Street parking lot; also found on sunny islands</td>
<td>None reported</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Elaeagnus umbellata</td>
<td>autumn olive</td>
<td>Common along parts of the South Hill Recreation Way</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Fallopia japonica</td>
<td>Japanese knotweed</td>
<td>Highly abundant above dams and of medium abundance along stream; saturates part of the floodplain below the Giles dam</td>
<td>None reported</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Hedera helix</td>
<td>English ivy</td>
<td>Sporadic in and above First Bowl</td>
<td>None reported</td>
<td>None reported</td>
<td>Unknown</td>
</tr>
<tr>
<td>Lamiastrum galeobdolon</td>
<td>yellow archangel/ yellow deadnettle</td>
<td>Heavily disturbed banks of tributary streams along the north edge of the First Bowl</td>
<td>None reported</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Ligustrum sp.</td>
<td>privet</td>
<td>Ubiquitous on path from parking lot and in First Bowl; sporadic elsewhere, especially in sunny edges</td>
<td>Unknown</td>
<td>A few individuals</td>
<td>Unknown</td>
</tr>
<tr>
<td>Lonicera sp.</td>
<td>exotic bush honeysuckles</td>
<td>High abundance from Giles Street parking area to Beech Woods and monoculture around the South Hill Recreation Way</td>
<td>a few individuals along edges</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Microstegium vimineum</td>
<td>Japanese stilt-grass</td>
<td>Only known population occurs in Amphitheater area</td>
<td>Not reported</td>
<td>One population</td>
<td>Unknown</td>
</tr>
<tr>
<td>Phragmites australis</td>
<td>common reed</td>
<td>One population below Giles Street bridge</td>
<td>None reported</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Ranunculus ficaria</td>
<td>lesser celandine</td>
<td>Scattered along the north edge of the First Bowl, the south shore above the 30 ft dam; a large population near the inlet</td>
<td>Possibly</td>
<td>Prevalent in low abundance</td>
<td>Unknown</td>
</tr>
<tr>
<td>Rhamnus cathartica and R. frangula</td>
<td>common buckthorn and alder buckthorn</td>
<td>Common near Giles Street and in sunny areas near banks in First and Second Bowls</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Rosa multiflora</td>
<td>multiflora rose</td>
<td>A few shrubs near Giles St. entrance</td>
<td>None reported</td>
<td>None reported</td>
<td>Unknown</td>
</tr>
<tr>
<td>Tussilago farfara</td>
<td>colt's foot</td>
<td>Present at both Giles Street entrances and outside the park, uphill from Giles Street. Large patches in First Bowl</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Vinca minor</td>
<td>periwinkle</td>
<td>Present at Giles Street parking lot</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Vincetoxicum rossicum</td>
<td>pale swallow-wort</td>
<td>In the Giles Street parking lot and maybe uphill from it</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Invasive species in present in the Six-Mile Creek Natural Area, but not yet assessed

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampelopsis brevipedunculata</td>
<td>porcelain berry</td>
</tr>
<tr>
<td>Celastrus orbiculatus</td>
<td>oriental bittersweet</td>
</tr>
<tr>
<td>Chelidonium majus</td>
<td>greater celandine</td>
</tr>
<tr>
<td>Coronilla varia</td>
<td>crown vetch</td>
</tr>
<tr>
<td>Dipsacus fullonum</td>
<td>fuller’s teasel</td>
</tr>
<tr>
<td>Euonymus alatus</td>
<td>burning bush, winged euonymus</td>
</tr>
<tr>
<td>Forsythia sp.</td>
<td>forsythia</td>
</tr>
<tr>
<td>Hemerocallis sp.</td>
<td>daylily</td>
</tr>
<tr>
<td>Hesperis matronalis</td>
<td>dame’s rocket</td>
</tr>
<tr>
<td>Iris pseudacorus</td>
<td>yellow iris</td>
</tr>
<tr>
<td>Verbascum thapsus</td>
<td>common mullein</td>
</tr>
</tbody>
</table>

2. OVERVIEW OF THE INVASIVE SPECIES MANAGEMENT PLAN

A. General management philosophy

Although invasive species control is part of the overall site management program, the focus is on preserving the native species and communities. In addition, management priorities have been established with the objective of minimizing the total, long-term workload. Thus, the plan encompasses two approaches: a species-based approach to prevent the establishment of new infestations, and a site-based approach to protect priority areas.

The species-based approach involves the implementation of programs to keep the site free of invasive species that are present, though not yet well established in the natural area, and that are known to be pests elsewhere in the region. While their current impact is minimal, if left alone these species will severely impact the natural area and native plant communities. These are species that can be eradicated from the natural area.

The site-based approach is used for the control or elimination of invasive species that are already well established on the site. Control priorities will be set, according to the actual and potential detrimental effects the invasive species have on native species and communities, particularly on our conservation targets: the priority areas. This means the most valued sites in terms of biodiversity, aesthetics and recreation will be the first to be protected from further invasion of all invasive plants.

For both approaches, it is recommended that action be taken only when careful consideration indicates that leaving the invasive species unchecked will result in more damage than controlling the species using available methods.

An adaptive management strategy is one that uses the lessons from previous seasons of work to mold future efforts. The various phases of our strategy are:

1. Establish management goals for the site.
2. Identify invasive species interfering with these goals and assign priorities based on their likely impacts.
3. Determine effective control options. Assess the likely effects on the target and non-target species and adjust the weed priorities, if necessary.
4. Develop and implement the management plan.
5. Monitor and assess the impacts of management actions.
6. Evaluate the effectiveness of methods (measured against the site goals) and use this information to refine our control priorities, methods, and goals and learn what is practical, effective, and realistic.

Return to step one...

B. Prioritized list of invasive species:

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>Priority for threat to all of natural area</th>
<th>Potential overall priority</th>
<th>Ease of control for this species</th>
<th>Able to Eradicate (May change if known extent of species changes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Microstegium vimineum</em></td>
<td>Japanese stilt-grass</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Probably</td>
</tr>
<tr>
<td><em>Vincetoxicum rossicum</em></td>
<td>pale swallow-wort</td>
<td>High</td>
<td>High</td>
<td>Hard</td>
<td>Unknown</td>
</tr>
<tr>
<td><em>Phragmites australis</em></td>
<td>common reed</td>
<td>High along stream</td>
<td>High</td>
<td>Hard</td>
<td>Probably</td>
</tr>
<tr>
<td><em>Fallopia japonica</em></td>
<td>Japanese knotweed</td>
<td>High along stream</td>
<td>Med. High</td>
<td>Medium</td>
<td>Maybe</td>
</tr>
<tr>
<td><em>Ailanthus altissima</em></td>
<td>tree-of-heaven</td>
<td>High</td>
<td>High</td>
<td>Hard</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Acer platanoides</em></td>
<td>Norway maple</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Probably</td>
</tr>
<tr>
<td><em>Alliaria petiolata</em></td>
<td>garlic mustard</td>
<td>Medium</td>
<td>Medium</td>
<td>Hard</td>
<td>No</td>
</tr>
<tr>
<td><em>Ranunculus ficaria</em></td>
<td>lesser celandine</td>
<td>Medium</td>
<td>Medium</td>
<td>Hard</td>
<td>No</td>
</tr>
<tr>
<td><em>Rhamnus cathartica</em> &amp; <em>R. frangula</em></td>
<td>common buckthorn and alder buckthorn</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Maybe not</td>
</tr>
<tr>
<td><em>Lonicera spp.</em></td>
<td>exotic bush honeysuckles</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>No</td>
</tr>
<tr>
<td><em>Vinca minor</em></td>
<td>periwinkle</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium Low</td>
<td>Med. Hard</td>
</tr>
<tr>
<td><em>Berberis thunbergii</em></td>
<td>Japanese barberry</td>
<td>Medium-Low</td>
<td>Medium-low</td>
<td>Easy</td>
<td>Maybe</td>
</tr>
<tr>
<td><em>Artemisia vulgaris</em></td>
<td>mugwort</td>
<td>Low</td>
<td>Medium</td>
<td>Easy</td>
<td>Probably</td>
</tr>
<tr>
<td><em>Rosa multiflora</em></td>
<td>multiflora rose</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Unknown</td>
</tr>
<tr>
<td><em>Hedera helix</em></td>
<td>English ivy</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Maybe</td>
</tr>
<tr>
<td><em>Centaurea sp.</em></td>
<td>knapweed</td>
<td>Low</td>
<td>Low</td>
<td>Easy</td>
<td>Probably</td>
</tr>
<tr>
<td><em>Ligustrum sp.</em></td>
<td>privet</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Maybe</td>
</tr>
<tr>
<td><em>Tussilago farfara</em></td>
<td>coltsfoot</td>
<td>Low</td>
<td>Low</td>
<td>Hard</td>
<td>Maybe not</td>
</tr>
<tr>
<td><em>Elaeagnus umbellata</em></td>
<td>autumn olive</td>
<td>unknown</td>
<td>Medium</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td><em>Lamiastrium galeobdolon</em></td>
<td>yellow archangel/yellow deadnettle</td>
<td>unknown</td>
<td>Medium-Low</td>
<td>Med. Hard</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Prioritized list of species for site-led control

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common Name</th>
<th>Priority as judged by threat to priority sites</th>
<th>Potential priority in current priority sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alliaria petiolata</td>
<td>garlic mustard</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Microstegium vimineum</td>
<td>Japanese stilt-grass</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Acer platanoides</td>
<td>Norway maple</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Vincetoxicum rossicum</td>
<td>pale swallow-wort</td>
<td>Medium</td>
<td>Medium-High</td>
</tr>
<tr>
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<td>privet</td>
<td>Med</td>
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<td>Lonicera spp.</td>
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<td>Med</td>
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</tr>
<tr>
<td>Ailanthus altissima</td>
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<td>Medium</td>
</tr>
<tr>
<td>Rhamnus cathartica and R. frangula</td>
<td>common buckthorn and alder buckthorn</td>
<td>Medium</td>
<td>Unknown</td>
</tr>
<tr>
<td>Phragmites australis</td>
<td>common reed</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Fallopia japonica</td>
<td>Japanese knotweed</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Artemisia vulgaris</td>
<td>mugwort</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Centaurea sp.</td>
<td>knapweed</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Hedera helix</td>
<td>English ivy</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Rosa multiflora</td>
<td>multiflora rose</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Elaeagnus umbellata</td>
<td>autumn olive</td>
<td>Unknown</td>
<td>Low</td>
</tr>
<tr>
<td>Lamiastrum galeobdolon</td>
<td>yellow archangel/yellow deadnettle</td>
<td>Unknown</td>
<td>Low</td>
</tr>
<tr>
<td>Ranunculus ficaria</td>
<td>lesser celandine</td>
<td>unknown</td>
<td>Low</td>
</tr>
</tbody>
</table>

C. Summary of specific actions planned

All of the species listed in the above tables are known to exist in the Six-Mile Creek Natural Area, but the extents of their populations are not known. Our current knowledge about the locations of native and invasive species is derived from a limited number of walks on trails in the Six-Mile Creek Natural Area and consultations with local naturalists. It is ill-advised to make specific management recommendations without a comprehensive inventory of the plants found throughout the natural area. Because of this limitation, specific management actions have not yet been developed. Included herein is an outline of the general steps necessary to manage the invasive species known to be present and a sample management implementation schedule that demonstrates how the overall management strategy (as described in section 2A) can be applied.

The first step toward protecting native plant communities and removing the invasive plants in the natural area is to inventory and map the invasive plant populations and the locally rare or endangered native plants. Because volunteers lack the time and often the knowledge to conduct a detailed survey we recommend a professional be hired. The professional will map the extent and abundance of the invasive plant populations and the locations of any rare or endangered flora. This information will allow the Natural Areas Commission to understand the extent of the invasive plant populations and allow the NAC to modify any goals recommended in this plan.
After the inventory and mapping are completed, we recommend a review of the priority areas, of the prioritized list of invasive species threatening the priority areas, and a reassessment of the eradicability of the invasive species populations found within the natural area. Then, within each priority area a “defensible area” should be delineated. A defensible area is defined as a manageable subunit containing an otherwise healthy native plant community that contains some invasive plants within it. To be manageable, a defensible area should be small enough that every year all of the mature invasive plants found within it can be removed and prevented from reproducing or spreading vegetatively. Defensible areas should have clear boundaries so that control efforts can be monitored unambiguously. As invasive species are successfully controlled, and the number of individual invasive plants found within the defensible area decreases over time, the defensible areas will become larger. If control efforts are not successful, invasive species found within the area will increase and the “defensible area,” the area in which invasive plants were prevented from reproducing or spreading vegetatively, would become smaller over time.

Once the initial inventory and delineation of defensible areas are completed, systematic invasive plant control can begin. This strategy is clear, but the particular species targeted may change based on the inventory and planning work described above.

As described above, defensible areas will be created for all of the priority areas, currently identified as Second Bowl–Beech Woods, the Amphitheater, and the Dry Shale Talus Slopes. Every year inspections should be conducted to identify and plan the removal of invasive plants found within the defensible areas. Our current knowledge of species found in and around the Second Bowl–Beech Woods indicates the need to control garlic mustard, lesser celandine, Norway maple, and the invasive bushes, Japanese barberry, common and smooth buckthorns, exotic bush honeysuckles, and privet. Our current knowledge of species found in and around the Amphitheater points to the need to control Japanese stilt-grass, lesser celandine, exotic bush honeysuckles, and privet. We do not currently know what invasive species are present on the Dry Shale Talus Slopes, so we do not yet have any recommendations for them. Invasive species control in these three priority areas will be largely mechanical, such as hand pulling or cutting of flowers and seeds from mature plants. This work is time consuming and particularly suited for volunteer work parties. In addition, limited herbicide application would be recommended to control some species, e.g. large Norway maples, tree-of-heaven, and possibly garlic mustard. Herbicide work would take only a few hours to complete, but must be done by a licensed herbicide applicator. SCIPAC recommends the hiring of a paid coordinator to manage both the volunteer work parties and the herbicide applications.

To prevent the establishment of new invasive species it is important that the entire natural area be managed for invasive species, not just the priority areas. We strongly suggest the development of programs to monitor the natural area for additional invasive species that have not established themselves in the natural area but are present around Ithaca. These surveys could be done by paid naturalists or trained volunteers on organized surveying trips. Passive monitoring, in which rangers and users of the natural areas report the location of new invasive species populations, could be a first step toward a more comprehensive program. In addition, the initial inventory of invasive species may identify species whose current populations are small enough to be eradicated, but are likely to expand rapidly in the natural area. All populations of these species will be targeted for control, whether or not they occur in a priority area. These efforts will help prevent new invasions from becoming established in the natural area. We have identified the following species for a species-based approach to control: common
reed, Japanese knotweed, Norway maple, Japanese stilt-grass, tree-of-heaven, and pale swallow-wort. This eradication will require periodic surveys of the natural areas by experts. Any populations identified should be monitored, documented, and scheduled for removal. Control work for these species would be performed through mechanical or targeted chemical methods.

We have chosen to focus our resources on populations that can be eliminated or are an immediate threat to a priority sites. The following plants are not eradicable and are not currently a threat to the priority areas; therefore they are not currently targeted for removal: autumn olive, coltsfoot, English ivy, knapweed, mugwort, multiflora rose, periwinkle, and yellow archangel.

The strength of the adaptive management strategy that we recommend is the ability to learn from previous management experiences. To evaluate the effectiveness of applied methods and learn what is practical, effective, and realistic, the impacts of all management actions must be monitored and assessed. Therefore, thorough and accurate records of all management activities must be maintained. For example, for the priority sites, the location of invasive plant populations before control work begins and the location of the boundaries of the defensible areas should be recorded. Every time control work is done, notes will also include the following information: the number of work hours, the location of the work, a brief description of the invasive plants targeted, and an assessment of the area after work is finished—i.e. was the targeted species completely removed? Is garlic mustard about to flower? At a minimum, all priority area should be surveyed each fall and notes taken to indicate if invasive species were prevented from reproducing or spreading vegetatively within the defensible areas. Each winter, all invasive species control work should be summarized, and each subsequent spring, the summary compared with the new surveys of emerging plants to determine the success of the previous years’ efforts. Ideally, a small report would be written each spring detailing gains and losses, and would include a work schedule for the current year.
### D. Sample invasive species management plan implementation schedule

<table>
<thead>
<tr>
<th></th>
<th>Current Level— 4 volunteers and 2–3 work days/year</th>
<th>Increased Volunteer Effort— 20 hour volunteer expert time and 6 work days/ year</th>
<th>With Paid Staff— $25,000 a year: 20 hrs/week staff, consultant for inventories, coordinating 10 work days/ year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventorying</strong></td>
<td>* Small group of knowledgeable volunteers walks through the Second Bowl–Beech Woods and determines which plants need to be controlled for the year. In the first year they also determine the boundaries of the defensible area.</td>
<td>* Small group of knowledgeable volunteers walks through the Second Bowl–Beech Woods and determines which plants need to be controlled for the year. In the first year they also determine the boundaries of the defensible area.</td>
<td>*Experts are hired to do a series of walks through Beech Woods, determine which plants need to be controlled for the year, and note the presence of unique flora. For the first year they also determine the boundaries of the defensible area.</td>
</tr>
<tr>
<td></td>
<td>* Small group of knowledgeable volunteers walks through the Amphitheater area and determines which plants need to be controlled for the year. For the first year they also determine the boundaries of the defensible area.</td>
<td>* Small group of knowledgeable volunteers walks through the Amphitheater area and determines which plants need to be controlled for the year. For the first year they also determine the boundaries of the defensible area.</td>
<td>*Experts are hired to do a series of walks through the Amphitheater area, determine which plants need to be controlled for the year and note the presence of unique flora. For the first year they also determine the boundaries of the defensible area.</td>
</tr>
<tr>
<td></td>
<td>* Small group of knowledgeable volunteers walks through the Dry Talus Slope area and determines which plants need to be controlled for the year. For the first year they also determine the boundaries of the defensible area.</td>
<td>* Small group of knowledgeable volunteers walks through the Dry Talus Slope area and determines which plants need to be controlled for the year. For the first year they also determine the boundaries of the defensible area.</td>
<td>*Experts are hired to do a series of walks through the Dry Talus Slope area, determine which plants need to be controlled for the year, and note the presence of unique flora. For the first year they also determine the boundaries of the defensible area.</td>
</tr>
<tr>
<td></td>
<td>*The remainder of Six-Mile Creek is not inventoried for either invasives or populations of rare plants.</td>
<td>*The remainder of Six-Mile Creek is not inventoried for either invasives or populations of rare plants.</td>
<td>*The remainder of the natural area is comprehensively inventoried to more accurately determine the locations of both invasives and rarities, to use as the basis for realistic planning. This effort might take place over a number of years.</td>
</tr>
<tr>
<td></td>
<td>*Information from walks is turned into a work plan for the year.</td>
<td>*Information from walks is turned into a work plan for the year.</td>
<td>*Passive inventorying is implemented so hikers and park rangers can report small, eradicable populations of invasives anywhere in the natural area.</td>
</tr>
<tr>
<td></td>
<td>*Maps are created from this information.</td>
<td>*Maps are created from this information.</td>
<td>*Maps are created from this information.</td>
</tr>
<tr>
<td>Current Level— 4 volunteers and 2–3 work days/year</td>
<td>Increased Volunteer Effort— 20 hour volunteer expert time and 6 work days/year</td>
<td>With Paid Staff— $25,000 a year: 20 hrs/week staff, consultant for inventories, coordinating 10 work days/year</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>*Spring walk with knowledgeable volunteers pulls small populations of invasive plants in priority areas.</td>
<td>*Spring walk with knowledgeable volunteers pulling small populations of invasive plants in Beech Woods.</td>
<td>*Small populations of high-priority invasive species such as common reed are controlled in areas outside of the priority areas</td>
<td></td>
</tr>
<tr>
<td>*Norway maple and tree-of-heaven control is performed</td>
<td>*Norway maple and tree-of-heaven control is performed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Volunteers with herbicide permits do limited herbicide work, such as stem injection of Japanese knotweed and stump treatment of trees.</td>
<td>*Staff and volunteers with herbicide permits do some herbicide work in the fall.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Other invasive plants are controlled as determined by the spring inventory and expected number of volunteers.</td>
<td>*Other invasive plants are controlled as determined by the spring inventory and expected number of volunteers.</td>
<td>*Other invasive plants are controlled as determined by the spring inventory and expected number of volunteers. Long-term plans are developed to eradicate high-priority invasives from important areas and protect populations of rare plants. Large numbers of volunteers solicited by the natural areas steward stop the spread of invasives in targeted areas, allowing the resurgence of native species.</td>
<td></td>
</tr>
<tr>
<td>* The great majority of invasive species remain uncontrolled; most sections of the natural area receive no attention.</td>
<td>* The great majority of invasive species remain uncontrolled; most sections of the natural area receive no attention.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Current Level—  
4 volunteers and 2–3 workdays/year | Increased Volunteer Effort—  
20 hour volunteer expert time and 6 work days/year | With Paid Staff—  
$25,000 a year: 20 hrs/week staff, consultant for inventories, coordinating 10 work days/year |
<p>| Monitoring | *After control work is completed, one volunteer will see if the Second Bowl-Beech Woods defensible area is completely free of invasive plants. If the area is not free of invasive plants, notes about the abundance of the invasives will be created (including whether the individuals reproduced this year). | *In the fall, all of the priority areas will be checked to ensure they are completely free of invasive plants. If the area is not free of invasive plants, notes about the abundance of the invasives will be created (including whether the individuals reproduced this year). |
| Monitoring | *For other areas where control work was done, after work is completed, one volunteer will see if the area is completely free of invasive plants. If the area is not free of invasive plants, notes about the abundance of the invasives will be created (including whether the individuals reproduced this year). | *For other areas where control work was done, after work is completed, the area will be checked to ensure it is completely free of invasive plants. If the area is not free of invasive plants, notes about the abundance of the invasives will be created (including whether the individuals reproduced this year). |
| Monitoring | *Volunteer hours and work summaries are not done. | *Volunteer hours and a summary of work done during each control work day will be kept. |
| Monitoring | *Maps will be updated. | *Maps will be updated. |
| Monitoring | *The presence of invasives throughout the rest of the natural area is not assessed. | *The majority of Six-Mile Creek will not be monitored for invasive plants. |
| Monitoring | A systematic, multiyear strategy for monitoring the natural area is developed, beginning with high-priority areas and expanding yearly into additional areas where invasives have been controlled. | A systematic, multiyear strategy for monitoring the natural area is developed, beginning with high-priority areas and expanding yearly into additional areas where invasives have been controlled. |</p>
<table>
<thead>
<tr>
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<th>Increased Volunteer Effort—20 hour volunteer expert time &amp; 6 work days/year</th>
<th>With Paid Staff—$25,000 a year: 20 hrs/week staff, consultant for inventories, coordinating 10 work days/year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Administration</strong></td>
<td><em>A group such as the NAC would coordinate the inventory walks.</em></td>
<td><em>A group such as a more active Friends of Six Mile Creek would coordinate the inventory walks.</em></td>
</tr>
<tr>
<td></td>
<td><em>A group such as the NAC would coordinate at least 2 volunteer work events.</em></td>
<td><em>A group such as a more active Friends of Six Mile Creek would coordinate at least 6 volunteer work events, some with community volunteers, others with knowledgeable volunteers or volunteers with herbicide permits.</em></td>
</tr>
<tr>
<td></td>
<td><em>A group such as the NAC would recruit someone to conduct the follow-up monitoring.</em></td>
<td><em>A group such as a more active Friends of Six Mile Creek would recruit a small group to conduct the follow-up monitoring.</em></td>
</tr>
<tr>
<td></td>
<td><em>A small amount of record-keeping would be required to track activities from year to year.</em></td>
<td><em>A medium amount of record-keeping would be required to track activities from year to year.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>A large amount of record-keeping would be required to track activities from year to year and provide the data for reports to funding sources.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Some time would be spent to develop programs such as the passive monitoring.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Maps would be updated at least yearly.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>If money is being administered by another organization, a limited amount of bookkeeping would be required.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>The steward would apply for funding and follow up reports to funders. This would be especially time consuming at the start.</em></td>
</tr>
<tr>
<td>Current Level—</td>
<td>Increased Volunteer Effort—</td>
<td>With Paid Staff—</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>4 volunteers and 2–3 work days/year</td>
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</tr>
</tbody>
</table>

**Results**

*Invasive species spread is slowed or even stopped in the Second Bowl-Beech Woods.*

*Over several years, invasive species spread is stopped in Second-Bowl-Beech Woods, the Amphitheater, and the Dry Talus Slope.*

*Over several years, invasive species spread is stopped in Second-Bowl-Beech Woods, the Amphitheater, and the Dry Talus Slope.*

*The invasive-free, defensible areas, are increased in number and area.*

*The herbeaceous ground cover in Beech Woods is preserved—trout lily, hepatica, trilliums, bloodroot, blue cohosh.*

*Some of the herbeaceous ground cover in all of the defensible areas is preserved.*

*The herbeaceous ground cover in all of the defensible areas is preserved.*

*Japanese stilt-grass is prevented from becoming established in Tomkins County.*

*Japanese stilt-grass is prevented from becoming established in Tomkins County.*

*Japanese stilt-grass is prevented from becoming established in Tomkins County.*

*The remainder of the Six-Mile Creek Natural Area is more severely invaded every year.*

*The spread of Norway maples and tree-of-heaven is slowed.*

*Norway maples and tree-of-heavens are prevented from spreading*

*Small populations of invasive plants are removed and these species are prevented from establishing in the natural area.*

*The area from which invasives have been cleared increases each year, allowing the return of native species.*

*Over a period of years, as unmanaged forests throughout central New York are lost to invasive species, Six-Mile Creek is increasingly recognized as a rare and valuable refuge for native ecosystems.*
<table>
<thead>
<tr>
<th></th>
<th>Current Level—4 volunteers and 2–3 workdays/year</th>
<th>Increased Volunteer Effort—20 hour volunteer expert time &amp; 6 Workday/year and</th>
<th>With Paid Staff—$25,000 a year: 20 hrs/week staff, consultant for inventories, coordinating 10 workdays/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks</td>
<td>* Areas damaged by invasive plants—the Giles Street parking lot and the Recreation Way—will remain that way</td>
<td>* Areas damaged by invasive plants—the Giles Street parking lot and the Recreation Way—will remain that way</td>
<td>* Areas without healthy native plant communities—the Giles Street parking lot and parts of the Recreation Way for example—continue to have invasive plants present</td>
</tr>
<tr>
<td></td>
<td>* Because of limited resources, over 10 years, the Second Bowl- Beech Woods defensible area increases very little.</td>
<td>* Because of limited resources, over 10 years, the three defensible areas increases very little.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* The abundance of invasive species continues to increase everywhere except in the Second Bowl- Beech Woods.</td>
<td>* The abundance of invasive species continues to increase everywhere except in the three priority areas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Ultimately, currently uninvaded areas come to be dominated by invasives; local natives become rarer or are extirpated altogether.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Locally rare grasses and other native flora are lost since the Amphitheater and Dry Talus Slope are not being protected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Tree canopy is increasingly composed of invasive trees, such as Norway maple and tree-of-heaven.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E. Resources necessary to implement invasive species management plan

As this plan shows, SCIPAC made many recommendations for control of specific invasive plants. Our most important conclusion is that the current level of management by devoted volunteers is not adequate to the task we face. Our recommendation is to establish the infrastructure and funding to maintain, in perpetuity, a Natural Areas Steward to monitor the health of our natural areas and coordinate efforts to restore them and address problems as they arise.

Since city finances are tight and government funding may be inconsistent, we thought the wisest course would be to seek startup funding from private sources. In several months of sporadic searching, we located three possible sources of grant funds: the Park Foundation, the National Fish and Wildlife Foundation’s Pulling Together initiative, and (in the near future) state programs that will increasingly fund invasives work. To apply for such grants, we must be able to demonstrate:

1. That we represent the interests of the citizens and government of Ithaca, as shown through government willingness to help administer the program and provide a level of in-kind matching support necessary to receive many grants;
2. That we have specific, realistic goals based on shared values and sound scientific evidence; and
3. That a reliable, permanent organization will accept responsibility for managing any funds we receive.

In the long run, it may be wise to establish a Natural Areas Foundation (or some legally analogous group) that could accept donations; perhaps the members of the NAC could serve as the board of directors.

We should emphasize that some of our recommendations must be regarded as provisional. Although the members of SCIPAC have devoted many hundreds of hours to assessing the natural area and producing this report, it is far beyond the capacities of even the most devoted volunteers to thoroughly survey an area of more than 1000 acres and develop definitive plans and priorities for managing the area. To begin formulating a well-documented set of management plans, a far more extensive survey by experts in invasive and endangered native plant populations is necessary. The estimated cost for this survey would be about $4500.

The Natural Areas Steward Position:
The responsibilities of the Natural Areas Steward will vary with the funding available. They will also vary with time and whether the responsibilities extend to all the city's natural areas or just to Six-Mile. A possible breakdown of responsibilities:

• 50% grant-writing and other fund-raising. This may seem high, but every other task depends on funds. A program that peters out in a few years has failed. Although the nature of the management the natural areas requires may change over time, the need for management is no more likely to disappear than the need for street repairs, garbage collection, or reliable electricity. In addition to seeking grants, donations may be solicited directly, in cash and in kind, from local businesses and individuals.

• 30% soliciting and coordinating volunteers and working to control invasives in the field. There exists in Ithaca a huge array of potential volunteers, such as scout troops, high school groups, fraternity and sorority groups,
senior citizen organizations, Cornell and Ithaca College conservation groups, church groups, and summer youth employment programs.

• 10% networking. Attending meetings and collaborating with groups addressing similar problems, such as the Native Plant Society, Bernd Blossey’s Ecology and Management of Invasive Plants group, the Finger Lakes Land Trust, the Cayuga Watershed Network, the Nature Conservancy, Cornell and Ithaca College conservation groups, state and national invasives groups, and town and city government groups.

• 5% education and outreach. Leading tours, setting up collaborations with school groups, giving presentations, perhaps creating a monthly newsletter. The possibility of an exhibit on the history of Six-Mile Creek at the History Center has already been broached with the center’s director, Matt Braun.

• 5% supplies. A GPS unit, tools, possibly an on-site storage shed, printing costs, computer access, refreshments for volunteers.

It is important to recall that Six-Mile Creek is only one of four Ithaca natural areas. The others are Fall Creek, the Fuertes Bird Sanctuary at Stewart Park, and the Southwest natural area. The latter two currently receive no maintenance whatsoever. We recommend that we explicitly define our goals for these areas and then seek the resources to meet them, rather than permitting passive neglect to determine how these areas evolve. An ecosystem worth defining as a protected natural area is worth managing, and these areas too should fall under the responsibility of the natural areas steward.

F. Notes on past invasive species removal

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common Name</th>
<th>Notes on control performed on this species in the past</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer platanoides</td>
<td>Norway maple</td>
<td>It has been mapped by Daniel Otis.</td>
</tr>
<tr>
<td>Alliaria petiolata</td>
<td>garlic mustard</td>
<td>Has been hand pulled at Giles Street entrances, in first flood plain forest, and toward the Second Bowl. In 2005 we hand pulled the plants at the Second Bowl.</td>
</tr>
<tr>
<td>Berberis thunbergii</td>
<td>Japanese barberry</td>
<td>A few have been pulled from the Second Bowl.</td>
</tr>
<tr>
<td>Fallopia japonica</td>
<td>Japanese knotweed</td>
<td>In 2004 stem injection of herbicide was performed by Jacob Barney in the first floodplain forest. However, many plants were uprooted and washed downstream during the high water of the spring of 2005, and some of these have rerooted.</td>
</tr>
<tr>
<td>Lonicera spp.</td>
<td>exotic bush honeysuckles</td>
<td>In 2005 individuals were pulled from the Second Bowl-Beech Woods. In 2004 many individuals were removed from the Second Bowl; in 2005 we noticed the improved open space, but also some small plants that are there.</td>
</tr>
<tr>
<td>Microstegium vimineum</td>
<td>Japanese stilt-grass</td>
<td>David Werier organized a group from the Native Plant Society to hand pull this grass during the fall of 2004 and 2005.</td>
</tr>
</tbody>
</table>
3. SPECIFIC INVASIVE SPECIES ACCOUNTS

Scientific name: *Acer platanoides*  
Common name: Norway maple

A. PRIORITY: Short-term—moderate, but long-term—high. This is a “rapid response” species: when it is found anywhere in the natural area it should be removed as soon as possible.

B. DESCRIPTION

Norway maples are particularly easy to spot in the first two weeks of November, when most native trees have lost their leaves but many Norway maples are still bright yellow. With practice, Norway maples are easy to spot during summer, too, when their dense canopies make a dark impression against a background of natives.

Norway maple is native to continental Europe, except for the extreme north, the extreme west, and Great Britain. In more southerly areas it is found mainly in mountains. A tall tree, it reaches a maximum height of <30 m and has a maximum lifespan approaching 400 years. Because they are very tolerant of urban conditions, Norway maples have been widely planted in cities throughout the northeastern US. In recent decades they have been observed to form feral colonies around many communities.

C. CURRENT DISTRIBUTION ON THE SITE

Locations of Norway maples can be described in general terms in several areas along Six-Mile Creek. The sites examined are conveniently divided into two general regions. (1) On the flood plains and adjacent slopes on the north side of Six-Mile Creek, both above and below the Giles Street dam, and between the Giles Dam and the 30-foot dam approximately 1 km upstream. (2) Along the South Hill recreation way.

1. Six-Mile Creek. After turning right from Rt. 79 onto Giles Street, Giles curves to the right at the entrance to the access road and heads downhill. Dozens of Norway maples grow along the length of the access road—generally young trees just reaching the canopy and not yet seeding prodigiously. These trees, when more mature, will be a constant source of seeding into the slopes and flood plains of Six-Mile Creek.

   On Giles Street itself, as one heads downhill from the trail entrance, there are several aged trees growing on the left and seeding into the adjacent forest. These trees may be the source of most of the Norway maples in the First Bowl.

   Along the driveway to the Giles parking lot are mature, seeding Norway maples to the left and right. There are also trees growing on the slope to the northeast of the parking lot, and at the top of this slope.

   As one walks up the main trail from the parking lot and approaches the mound before the sharp left turn, there are several massive Norway maples growing to the left of the trail, and one to the right just as one approaches the left turn.

   The First Bowl itself is home to perhaps 20 mature Norway maples, mostly concentrated in the northeast corner not far from the point where the small tributary stream enters the bowl.

   In the Second Bowl are at least two Norway maples. At the upper end of the trail approximately 1 km from the parking lot, the path ascends a steep slope that leads to a point above the first dam. Approximately 200 m downstream from this slope, growing on a gravel bar in the stream itself, is a multi-trunked Norway. About 200 m farther downstream from this tree is another, more substantial seasonal island, and a Norway maple grows on the north, downstream side of this island.
On the flood plains downstream from the Giles Street dam are a number of enormous Norway maples, which in some locations appear to be outcompeting sycamores.

2. Adjacent to the South Hill Recreation Way, on both the uphill (south) and downhill (north) sides, are dozens of mature, seeding Norway maples, including some enormous old trees. Whether one enters from the Crescent or the Juniper entrances, Norway maples are very common.

D. DAMAGE AND THREATS
Norway maples are now on the New York State list of the top 20 invasive plants. One of the few nonnative species adapted to survive in the shade beneath a full-canopy forest, they use light, water, and nutrients very efficiently, and may offer direct competition to such shade-adapted native trees as sugar maple, beech, and hemlock. Unlike most native species, they produce seed every year. They cast a dense shade, and their roots tend to saturate soil to the extent that few plants will grow beneath them. These factors, in combination with their having left most of their specialized herbivores and diseases behind, may permit them to become permanent, dominant elements of northeastern forest ecosystems, occupying space that would otherwise be filled by native species, and perhaps discouraging the growth of spring ephemerals and other natives.

Scientific name: *Ailanthus altissima*  
Common name: tree-of-heaven

A. PRIORITY  High throughout the entire natural area. This is a “rapid response” species: when it is found anywhere in the natural area it should be removed as soon as possible.

B. DESCRIPTION  
A native of China, tree-of-heaven is a fast-growing tree with alternate compound leaves. It reaches heights of 60' or more and produces numerous suckers (fast-growing new shoots) from its roots. Of loose, open habit, it is generally dioecious, with male and female flowers on separate trees, but some trees have flowers of both sexes. Some find the fragrance of the female flowers unpleasant. Dirr calls it “the most adaptable and pollution tolerant tree available; withstands the soot, grime and pollution of cities better than other species.” This is the tree about which *A Tree Grows in Brooklyn* was written. Dirr notes that in the United States it has no serious natural pests or diseases. It is well established in many locations around Ithaca.

C. CURRENT DISTRIBUTION ON THE SITE  
Many tree-of-heavens are established near the Giles St. parking lot, particularly on the right slope as one descends the driveway to the parking lot. Some of these trees are seeding heavily over the water, increasing the likelihood that they will become a problem downstream. Several years ago a tree established on the island to the right at the first sharp left turn on the path from the parking lot. This tree grew about 8 feet in height per year for the last 3–4 years. The main trunk was destroyed in the floods of the spring of 2005, but at least three trunks have grown from the roots. There are other trees within seeding reach of the flood plain, including several along the South Hill recreation way and one on the north bank below the 30-foot dam. Since seed may be transported by water, trees may establish in areas subject to spring flooding.
D. DAMAGE AND THREATS
Tree-of-heaven is a very fast-growing, suckering tree. Female trees can produce enormous quantities of seed that disperse to great distances. It has naturalized over much of the United States.

Once established, roots can travel at least 100 feet from the parent tree, sending up stout, fast-growing suckers along the way. Although it doesn’t readily establish in deep shade, “mother” stems growing in sun may send roots into shaded areas, and should a gap occur in the vicinity, suckers from these roots are well suited to become dominant canopy trees by their rapid growth and, presumably, by “support” from the mother tree. They are known to be allelopathic, so they have long-term damaging effects on the germination and establishment of other species, including native trees, shrubs, and herbaceous plants. Once established, they are difficult to eradicate without herbicides.

Scientific name: *Alliaria petiolata*  Common name: garlic mustard
A. PRIORITY: Medium. This species will be controlled if it is in a priority area.

B. DESCRIPTION
Garlic mustard is a biennial herb with stalked, triangular to heart-shaped, coarsely toothed leaves. First-year plants appear as a rosette of green leaves close to the ground. Rosettes develop into mature flowering plants the following spring. Flowering plants of garlic mustard reach from 2 to 3 1/2 feet in height and produce buttonlike clusters of small white flowers, each with four petals in the shape of a cross. Seeds remain viable for 5 years or more. Seeds are transported to new areas by animals and by flooding.

C. CURRENT DISTRIBUTION ON THE SITE
Garlic mustard is densely distributed around the Giles Street parking and continues upstream through much of the Second Bowl. It is also very dense at the upper Giles Street entrance. Garlic mustard is also abundant upstream of the dam. The species is less abundant in some parts of the Second Bowl-Beach Woods and on the southern hillside of the natural area. This species is also abundant in properties surrounding the natural area.

D. DAMAGE AND THREATS
Once introduced to an area, garlic mustard out competes native plants by aggressively monopolizing light, moisture, nutrients, soil, and space. Many native wildflowers that complete their life cycles in the spring (e.g., spring beauty, wild ginger, bloodroot, Dutchman's breeches, hepatica, toothworts, and trilliums) occur in the same habitat as garlic mustard. Wildlife species that depend on these early plants for their foliage, pollen, nectar, fruits, seeds, and roots are deprived of these essential food sources when garlic mustard replaces them. Humans are also deprived of the vibrant display of beautiful spring wildflowers.
Scientific name: *Artemisia vulgaris*  
Common name: mugwort

A. PRIORITY: Medium, but no populations have been found in priority sites so not yet target for removal.

B. DESCRIPTION
Mugwort is a rhizomatous perennial herb native to Eurasia and introduced to North America via ship ballast and for cultivation. Once introduced to a site, local spread is primarily via vegetative propagules, but vast amounts of viable seed are produced. Upon establishment, native species are displaced within the canopy.

C. CURRENT DISTRIBUTION ON THE SITE
Currently, mugwort occupies a small area (3m x 1m) just past the kiosk at the Giles Street entrance, with a small satellite population along the rip-rap near the bench in the ‘meadow.’ Several small populations are established uphill on Giles Street, possibly contributing seed to the Six-Mile Creek Natural Area.

D. DAMAGE AND THREATS
Currently, the area occupied by mugwort has caused little damage to the natural area, but the potential exists for complete displacement of native species within mugwort stands. Mugwort is not very shade tolerant and would be unlikely to colonize the forest understory, but could threaten native species on the fringe of the focus areas.

Scientific name: *Berberis thunbergii*  
Common name: Japanese barberry

A. PRIORITY: Medium. This species will be controlled if it is in a priority area.

B. DESCRIPTION
Japanese barberry is a dense spiny shrub that grows 2–8 ft in height. The small oval leaves are green, blue-green, or purplish. Pale yellow flowers are present from April to May. The showy, oblong red berries persist through the winter months. This species should not be confused with the only native species of barberry, *Berberis canadensis*.

C. CURRENT DISTRIBUTION ON THE SITE
Populations are frequent but not dense. It occurs in forested areas throughout the natural area, including the priority site of Beech woods. European barberry is also present, though it is usually restricted to low- pH rocky cliffs (Pers. comm. F.R. Wesley).

D. DAMAGE AND THREATS
Japanese barberry can form dense stands in numerous habitats from full shade to full sun. This species has been shown to alter the pH of soils and disturb the microbial ecology of soils, making it less habitable for native species. Once Japanese barberry becomes established, native plants are displaced and shaded out. The spiny growth habit of the plant also disturbs and reduces habitat for animals. Animals also avoid the thorny bush, preferring to feed on native plants, giving Japanese barberry an even greater competitive edge.
Scientific name: *Centaurea* sp.  
Common name: knapweed  

A. **PRIORITY:** Medium, but no populations have been found in priority sites so not yet target for removal.

B. **DESCRIPTION**  
Knapweed species are some of the worst invaders in the Midwest and prairie states, completely displacing native species. Knapweeds are biennials or short-lived herbaceous perennials producing seeds that are viable up to eight years in the soil. It forms mounds of tattered-looking leaves and produces purple flowers.

C. **CURRENT DISTRIBUTION ON THE SITE**  
Knapweed is well-established on the island to the right at the first left turn on the trail from the parking lot, and probably along the shore and on islands upstream as well. Knapweed does not easily tolerate shade, but knapweed could become well-established on the shoreline and on islands in Six-Mile Creek.

D. **DAMAGE AND THREATS**  
If uncontrolled it could become a persistent aggressive weed on rocky shorelines and islands and in the meadow area near the parking lot.

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Scientific Name: *Eleaegnus umbellata*  
Common Name: autumn olive

A. **PRIORITY:** Medium, but no populations have been found in priority sites so not yet target for removal.

B. **DESCRIPTION**  
This is a substantial shrub or small tree with simple, alternate leaves, bright green on top, silvery below, and the shrub as a whole has a silvery appearance. Stems may bear spines. The small white flowers, borne in late spring, are fragrant. The fruit is small, round, silvery red.

C. **CURRENT DISTRIBUTION ON THE SITE**  
Autumn olive is found in the open fields north of second reservoir and downslope of those fields, and also along the trail near parking lot (Pers. comm. F.R. Wesley). There is at least one substantial colony, including fruiting plants, alongside the Recreation Way on South Hill.

D. **DAMAGE AND THREATS**  
Autumn olive is not well-established in the high-priority sections of the natural area, but since the species is growing in large groves in several nearby areas and is known to be a serious problem in many locations, it should be carefully monitored. In the long term, the goal should be to remove all plants from the natural area.
Scientific name: *Fallopia japonica*  
Common name: Japanese knotweed

A. PRIORITY: High throughout the natural area. This is a “rapid response” species: if it is found anywhere in the natural area it should be removed as soon as possible.

B. DESCRIPTION

Japanese knotweed (*Fallopia japonica*) was introduced from Asia for ornamental purposes and is now invading stream habitat in North America and Europe. Its hollow, bamboo-like stems grow rapidly, up to 4 m tall, and form dense thickets along streams, shading native vegetation and blocking access to streams. Japanese knotweed’s enormous roots can extend 3m deep and are nearly impossible to remove. Its invasion along streams is aided by downstream transport of plant material during floods, depositing roots and seeds in ideal places for knotweed growth: sunny and moist stream banks.

B. CURRENT DISTRIBUTION ON THE SITE

An incipient population has established on the island to the right at the first sharp left turn on the main path from the Giles parking lot; this is probably derived from roots washed downstream during the floods of spring 2005. A large colony of several hundred square meters in area exists on the floodplain below the Giles Street dam.

D. DAMAGE AND THREATS

Japanese knotweed can outcompete native vegetation along stream banks, diminishing the ecosystem service and function of riparian vegetation. It is capable of completely monopolizing streamside habitat, especially in full sun.
**Scientific name:** *Hedera helix*  
**Common name:** English ivy

A. **PRIORITY:** Low: This species will be controlled if it is in a priority area or climbing up desired trees.

**B. DESCRIPTION**

English ivy is a trailing or climbing vine native to Europe. Leaves are typically dark green, alternate, and simple. English ivy grows easily in many types of soil, and in light from full sun to complete shade. Roots form when stem nodes contact moist soil, leading to the formation of a dense mat of vegetation. Ivy roots are vigorous resprouters. The plant sprawls across the ground and when it hits any upright object it climbs, reaching the tops of mature conifers of 300 feet. The fruiting stage typically occurs on climbing plants, but may also occur on prostrate patches of sufficient age, especially in full sunlight. Flowers are produced in the fall and fruits mature in the spring. If it produces fruit, English Ivy can be spread great distances by birds.

**C. CURRENT DISTRIBUTION ON THE SITE**

A few small patches are known to exist in the natural area, but not in any of the high-priority areas.

**D. DAMAGE AND THREATS**

English ivy forms a dense mat of vegetation and prevents native plants from growing under it. It can also kill trees when it gets into their canopy. It is very invasive in more temperate climates, but even in Ithaca it can bury native groundcover and topple and kill mature trees.

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**Scientific name:** *Lamiastrum galeobdolon*  
**Common name:** yellow archangel/yellow deadnettle

A. **PRIORITY:** Medium, but no populations have been found in priority sites so not yet target for removal.

**B. DESCRIPTION:**

Yellow archangel is perennial, and spreads by runners, seeds, and broken-off stems. Runnering can produce large stands and makes populations difficult to eradicate. Its variegated leaves are difficult to spot in dappled light. Yellow flowers are easier to spot in mid-May.

**C. CURRENT DISTRIBUTION ON THE SITE:**

One well-established population of yellow archangel is located on heavily disturbed banks of tributary streams along the north edge of the First Bowl.

**D. DAMAGE AND THREATS:**

Currently minimal because the species is not found in areas of highest density and diversity of native wildflowers. Potential for spread, however, is high if this small population is not controlled. Yellow archangel spreads easily by runners and can establish populations in full shade. Known populations should be controlled.

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**Scientific name:** *Ligustrum sp.*  
**Common name:** privet
A. PRIORITY: Medium. This species will be controlled if it is in a priority area.

B. DESCRIPTION
Privets have escaped the garden and are invading forest edges and the interior shading out native species. Privet is a shrub reaching 30 ft in height, with multiple stems at the base, with abundant white flowers producing dark purple to black fruits. Once established privet is difficult to eradicate.

C. CURRENT DISTRIBUTION ON THE SITE
Privet is found almost everywhere in Six-Mile Creek Natural Area, particularly in areas in full or part sun, but it is also able to flourish and produce fruit in shady habitats. It is established in at least one of the priority areas, and perhaps all three of the priority areas.

D. DAMAGE AND THREATS
Privet is competing for space and light with natives, thereby reducing native diversity where it exists. If privet is allowed to expand further into the priority areas, we can expect significant reductions in the native forb and shrub layer.

Scientific name: Lonicera tatarica, L. X bella and others
Common name: bush honeysuckle
A. PRIORITY: Medium. This species will be controlled if it is in a priority area.

B. DESCRIPTION
Honeysuckles are upright deciduous shrubs, 6–15 feet in height. The leaves have short stalks and are opposite and egg-shaped, and 1–2.5 inches in length. Older stems are often hollow. Creamy white to pink flowers are borne in pairs at leaf axils. Honeysuckles flower in early to late spring. Flowering is variable for each species and cultivar. The fruits are many-seeded berries, red to orange. Seeds are widely dispersed by birds; vegetative sprouting also occurs.

There are many nonnative species in North America, some of which are invasive in the Six-Mile Creek area. The Plant Conservation Alliance lists six species and cultivars that are invasive in North America.

C. CURRENT DISTRIBUTION ON THE SITE
Honeysuckle populations are extensive in the Six-Mile Creek flood plain. Populations are encroaching and numerous in wooded sites, including Beech Woods.

D. DAMAGE AND THREATS
Honeysuckles form a dense layer that crowds and shades out native plants species and deplete soil moisture and nutrients. Invasive species compete with native honeysuckles for pollinators. Invasive honeysuckles’ fruits are a lower priority for migrating birds than those of native honeysuckles.
Scientific name: *Microstegium vimineum*  Common name: Japanese stilt-grass

A. **PRIORITY** High. This is a “rapid response” species: if it is found anywhere in the natural area it should be removed as soon as possible.

B. **DESCRIPTION**

Japanese stilt-grass is an annual grass with a sprawling growth habit. Leaves are pale green, lance-shaped, 1–3 inches long, asymmetrical, with a distinctive shiny mid-rib. Flowers appear in late summer (August-September) with fruit maturing soon after. The plant’s ability to root at stem nodes that touch the ground allow it to colonize areas rapidly. Seeds are also easily spread by water. The species is native to Japan, Korea, China, Malaysia, and India.

C. **CURRENT DISTRIBUTION ON THE SITE**

Japanese stilt-grass occurs in the amphitheatre area of Six-Mile Creek. This is the only known population of this species in Tompkins County.

D. **DAMAGE AND THREATS**

Japanese stilt-grass is a very aggressive annual with easily spread seeds. Once established, Japanese stilt-grass can spread rapidly through an area and overtake native habitat within 3 to 5 years. Each plant can produce 100 to 1000 seeds per year. The seeds remain viable for 3–5 years and are easily spread by water and foot traffic.

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Scientific name: *Phragmites australis*  Common name: common reed

A. **PRIORITY**: High. This is a “rapid response” species: if it is found anywhere in the natural area it should be removed as soon as possible.

B. **DESCRIPTION**

Common reed is a rhizomatous perennial grass that forms very dense monospecific stands. Primarily a threat to riparian and tidal marshes, common reed quickly displaces the native vegetation creating dense lawns of old shoots. Common reed stands accrete sediment due to their dense rhizome and shoot system, altering the hydrology of the water body. The genus *Phragmites* is native to North America, but the native species has been displaced by a European species. They can be phenotypically distinguished from each other. This weed is very difficult to control and should be dealt with when populations are small.

C. **CURRENT DISTRIBUTION ON THE SITE**

A single identified *Phragmites* stand exists just outside the bounds of the natural area near the settling pools on Giles Street. We have yet to determine if this is the invasive or native genotype.

D. **DAMAGE AND THREATS**

Upon introduction by either seed or rhizome fragment, common reed will rapidly spread and displace any existing vegetation.
Scientific name: *Ranunculus ficaria*  Common name: lesser celandine

A. **PRIORITY:** Medium. This species will be controlled if it is in a priority area.

B. **DESCRIPTION:**
Lesser celandine is a perennial, shade-tolerant, summer-dormant plant with glossy, cordate leaves and shiny yellow flowers. It does not produce great numbers of seeds but spreads exponentially through tubers (easily water-borne) that form in the leaf axils.

C. **CURRENT DISTRIBUTION ON THE SITE:**
   Limited to high-disturbance areas:
   1) Scattered locations along banks of smaller streams along the north edge of the First Bowl. These streams join shortly after entering the bowl and flow into Six-Mile Creek at the parking area.
   2) Along the south shore above the thirty-foot dam, with a large population near the inlet. Lesser celandine populations could exist elsewhere; the north shore has not been surveyed.

D. **DAMAGE AND THREATS:**
As a very vigorous spring ephemeral, lesser celandine outcompetes native spring-flowering wildflowers through crowding, shading, and monopolizing resources. Damage is currently minimal because the species has not appeared in areas with highest density and diversity of native wildflowers, although it may be damaging marsh marigolds on the south shore above the thirty-foot dam. Threat: quite high due to its mobility (carried by flood waters) and rapid spread.

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Scientific Names: *Rhamnus cathartica* and *R. frangula*

Common Names: common buckthorn and alder buckthorn

A. **PRIORITY:** Medium. This species will be controlled if it is in a priority area.

B. **DESCRIPTION**
Common buckthorn, named for the thorns on the end of its twigs, is a deciduous shrub than can reach the size of a small tree. 2–6 meters tall. Its leaves are mostly alternate and are from 3–6 cm long. Its clustered greenish flowers appear in May and June, followed by drupes (berrylike fruits), which ripen in August and September. Fruits tend to remain on the shrub throughout the winter and are readily dispersed by birds. Dried fruits of this species can float for up to six days, which is especially significant in understanding common buckthorn’s spread in the Six-Mile Creek Natural Area. Common buckthorn is deciduous and drops its leaves late in the autumn. The species name *cathartica* refers to its medicinal value as a purgative. Common buckthorn grows well in well-drained sandy or clay sites, and can often be found on woodland edges. This species is introduced from Europe and Asia, and is classified as a noxious weed in several northeastern states. Planting common buckthorn is prohibited in Connecticut and New Hampshire.

Alder buckthorn can reach up to 7 meters in height. Twigs are grayish or brown and sometimes covered with fine hairs. Its leaves are alternate, elliptic, and 3.5–6.5 cm in length. Alder buckthorn’s greenish flowers appear in
May and June, followed by purplish black drupes in July and August. The fruits drop to the ground soon after ripening, to be eaten by birds and mice. Fresh fruits can float for 14 days before sinking. This species grows in wetter and more acidic soils than common buckthorn, but can be found in all soil types. Alder buckthorn is native to Europe and Asia, and is considered naturalized in New York and New Jersey.

Both these *Rhamnus* species were probably introduced to North America before 1800. They did not become widespread, however, until they became commonly used for hedgerows and roadsides. They can now be found in pastures, roadsides, fence rows, and ravines throughout North America. In general, buckthorns easily form dense thickets with canopies that spread until they touch the canopies of other shrubs.

**C. CURRENT DISTRIBUTION ON SITE:**
Many plants can be found along the path leading upstream from the Giles Street parking lot, and sporadically all the way to the 30-foot dam. They are also very common along the South Hill recreation way. They often occur in dense tangles with honeysuckle and privet, as one sees on both sides of the path leading from the parking lot.

**D. DAMAGE AND THREATS**
This species’ ability to form dense thickets with thick canopies means it can shade out native vegetation. Common buckthorn is shade tolerant and poses a danger to our native shade-loving spring annuals. Both common and alder buckthorn seeds can survive flooding and can be transported to new sites by water, and may establish themselves on the edges of Six-Mile Creek and other wet areas.

**Scientific name:** *Rosa multiflora*  
**Common name:** multiflora Rose

**A. PRIORITY:** Low. No populations have been found in priority sites so not yet target for removal.

**B. DESCRIPTION**
Multiflora rose is a 7’–10’ shrub with spines, compound leaves with 7–9 toothed leaflets, and pyramidal clusters of small, fragrant, white flowers appearing in May and June. Its drooping branches, which can root at their tips, allow the multiflora rose to easily form thickets. In late summer and fall, it bears red-orange fruits. Birds eat the fruits, then regurgitate or deposit the seeds in droppings. Seeds “planted” in this way germinate at a higher rate than seeds not eaten by birds. A single, medium-sized multiflora rose can produce 500,000 seeds per year. Multiflora rose also reproduces from root sprouts and horizontal underground stems, or rhizomes. Multiflora rose tolerates a wide variety of soils. This shrub is native to Japan, Korea, and China. It is a noxious weed in at least ten U.S. states, persisting in more than 45 million acres in the eastern U.S. Planting multiflora rose is illegal in some areas. Luckily, it does have some natural enemies, ranging from insects to mildews to fungus.

**C. CURRENT DISTRIBUTION ON SITE**
There are several multiflora rose near the Giles Street parking lot, including a massive tangle surrounding the first sycamore to the left as one follows the upstream path from the parking lot.
D. DAMAGE AND THREATS
Thick populations of multiflora rose lower land values for forestry and recreation. This shrub forms thorny, impenetrable thickets through vegetative propagation. Its dense thickets crowd out native vegetation. Entire pastures have been covered with this noxious weed. Because this plant seems to favor disturbed ground, especially previously plowed sites, multiflora rose can take over other disturbed areas such as pastures, hedges, power line corridors, and roadsides. Multiflora rose is capable of establishing huge seeds banks that can continue to sprout new plants for at least twenty years after the removal of the mother plant.

“Plain old Charlie Dream,” an Indiana state forester and botanist, strongly opposed landscaping of cemeteries with multiflora rose in 1948. He wrote, “When Gabriel sounds his horn, I am afraid some will be stranded and not be able to get thru the roses.”

Scientific name: *Tussilago farfara*  
Common name: coltsfoot

A. PRIORITY: Medium, but no populations have been found in priority sites so not yet target for removal.

B. DESCRIPTION
Introduced from Europe, coltsfoot is a perennial, reproducing by rhizomes and by seed. Plants apparently of two types: (1) more or less leafless stems bearing flower heads in early spring (March to June), and (2) very short stems bearing large leaves in summer. In its flowering stage, coltsfoot can be distinguished from dandelion by its purplish bracts on the flowering stem. After flowering, the vegetative plant can be distinguished from young plants of burdock by its perennial rhizome system and its broadly heart-shaped, palmately veined leaves.

Coltsfoot is successful in colonizing disturbed environments because seedlings and juveniles can tolerate a wide range of conditions. The species has high adaptability to many habitat types, and fast growth, development, and spread of individuals.

C. CURRENT DISTRIBUTION ON THE SITE
A survey for coltsfoot has not been completed, but it has been observed along the emergency access road off Giles, in dense colonies in the First Bowl, and sporadically at the margins of woods adjoining the shores of the stream.

D. DAMAGE AND THREATS
Coltsfoot is highly invasive due to its rapid growth and tolerance to disturbed and intact habitats (forests, fields, disturbed and waste places and along roads, rivers, lakes, ravines and drainage ditches in urban and rural areas) and can crowd native species. While it is not currently present in the Second Bowl or amphitheatre, there is high potential for its spread to both these areas of high priority. Rhizomes or seeds originating from populations along the access road could be transported by water or by animals.
**Scientific Name: Vinca minor**  
**Common Name: periwinkle**

A. PRIORITY: Medium, but no populations have been found in priority sites so not yet target for removal.

B. DESCRIPTION
Periwinkle is a short evergreen perennial vine with blue-purple flowers. The plant grows in partial sun to full shade and is native to Europe and Western Asia. Populations spread downstream easily.

C. CURRENT DISTRIBUTION ON THE SITE
Periwinkle can be found in the parking area near Mulholland Wildflower Preserve and on the rich floodplains on both sides of stream. (Pers. comm. F.R. Wesley)

D. DAMAGE AND THREATS
Once established in an area, *Vinca* forms a dense carpet, spreading vegetatively to the exclusion of all other herbaceous plants. As it grows well in dense shade, it is a particular threat to native spring ephemerals. Its colonies expand in size each year. Colonies near the Giles parking lot currently cover hundreds of square meters.

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**Scientific name: Vincetoxicum rossicum**

**Common name: pale swallow-wort**

A. PRIORITY: High due to rapid spread and colonization of undisturbed areas. This is a “rapid response” species: if it is found anywhere in the natural area it should be removed as soon as possible.

B. DESCRIPTION
Pale swallow-wort is an herbaceous perennial vine in the milkweed family. Plants can easily reach more than 2 m, especially in shaded areas. The small, five-pointed flowers are light pink to maroon. Fruits are borne in pods that split open to release tufted seeds that are easily wind-dispersed over long distances.

C. CURRENT DISTRIBUTION ON THE SITE
In 2004, a dense population of pale swallow-wort was found in a small area adjacent to the parking lot, near the creek. This is the only known population of pale swallow-wort in the Six-Mile Creek Natural Area. This population currently does not threaten the high-priority, sensitive areas.

D. DAMAGE and THREATS
Swallow-worts form dense monospecific stands in fields and forest understories. They shade out small herbaceous plants and climb over trees and larger brush. In highly sensitive areas owned by the Nature Conservancy in Jefferson Co., NY, these plants have damaged habitats of 57 rare species of flora and fauna. These species are highly aggressive, spread rapidly, and have been shown to alter soil ecology to favor their long-term establishment.
4. REFERENCES


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Some native wildflowers of Six-Mile Creek (clockwise from right): **Leatherwood**, an uncommon understory shrub; **hepatica**; **American ginger** and a close-up of the flower; **spring beauty**.
Luxuriant growth of native spotted geranium, ferns, and sycamore, with invasive garlic mustard in the foreground.
Patches of open, relatively uninvaded forest still exist in the Second Bowl; the band of green in the distance is a stand of invasive honeysuckle that established in streamside light.
Three of the most common invasive shrubs in Six-Mile Creek: *barberry* (left), *privet* (below left), and *honeysuckle* (below right). These species are spread far and wide by birds that eat their seeds. Especially in sunny areas, these species often form impenetrable thickets, crowding out native species. Many invasives hold their leaves longer than native species, which may give them a competitive advantage.
On the path from the parking lot, privet and honeysuckle have formed impenetrable tangles.
A massive stand of **Japanese knotweed** on the floodplain below the Giles dam. This is one of the most difficult invasives to eradicate; it often takes sustained effort over several seasons. A number of small populations have been found between Giles and the next dam upstream; some have been eradicated, but constant vigilance will be necessary to keep others from getting established.

**Winged euonymus**, like privet, honeysuckle, barberry, and buckthorn, produces brightly colored fruit and is spread by birds. A number of massive fruiting specimens are growing in the first bowl.
**Norway maples** are common in the natural area. This one has fallen across the stream but will continue to produce seeds as long as it remains upright and its roots are in contact with the soil.

Patches of pure **garlic mustard** are common throughout much of the natural area.

**Tree-of-heaven** is presently common only near the Giles Street parking lot, but these trees are fruiting heavily; seeds disperse widely and germinate readily. Once established, tree-of-heaven is almost impossible to eradicate without chemical treatment.
**Oriental bittersweet** has climbed fifty feet into the trees (right) on the floodplain below the Giles Street dam and is fruiting heavily, so we'll be seeing a lot more of it. This vine has many trunks (below), some of which twine around each other in masses 6 inches wide. Others, perhaps spread by birds, are growing in the area upstream from the the Giles dam.
Periwinkle doesn’t set seed and doesn’t rapidly proliferate through a woodland, but once a colony is established it expands slowly over long periods. This massive patch is one of several near the Giles parking lot; there are others on the slopes on the north side of the creek.

Crown vetch doesn’t appear to be much of a threat to woodlands under full canopy, but several sunny islands are heavily infested with it.