



Ice Age National Scenic Trail

*Trail
Stewardship
Notebook*





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Introduction

The Ice Age National Scenic Trail (NST) is a thousand-mile footpath highlighting Wisconsin's renowned Ice Age heritage and scenic beauty. The Ice Age Trail Alliance (IATA) and its partners have the ability to shape users' experiences. As stewards of the land and the Trail, we can help users develop a connection with the land and create a sense of wonder — even pique their curiosity enough to further explore the Trail.

"Stewardship" as defined by the Merriam-Webster dictionary is "...the care and responsible management of something entrusted to one's care." This definition is applicable to the land surrounding the Ice Age NST. We are responsible for the care and management of these Trail lands; they are entrusted to our care.

"The environment is where we all meet; where we all have a mutual interest; it is the one thing that all of us share. It is not only a mirror of ourselves, but a focusing lens on what we can become..."
- Lady Bird Johnson



Keeping the area clear of woody vegetation allows the hiker to view the distant drumlin field.

The key difference between this notebook and other land stewardship guides is that this notebook focuses on the land from the standpoint of the Ice Age NST — "from the Trail, outward." We consider the aesthetics and the ecological ramifications of vegetative management, primarily from the Trail user's perspective.

There are not enough resources to manage vegetation on all Trail lands. When deciding on whether or not to perform vegetation management activities, or determining how aggressively to attack a project, consider other Trail responsibilities, the amount of resources, and the amount of resources available to do the job effectively and sustainably. Successful vegetation stewardship projects begin with proper planning, buy-in from Ice Age Trail partners, a strong dedication to see the project through, and a commitment to long-term maintenance needs.

The Wisconsin glaciation left behind the building blocks — the canvas — on which the vegetation provides color and interest. By design and intent, the Trail brings humans into direct contact with the land. We have both an obligation to care for the land it traverses and a responsibility to interpret the land for users of the Trail. This book will help land stewards to make decisions regarding land stewardship activities. It provides guidance about basic vegetative stewardship techniques and lays out important safety protocols.

Kevin Thusius — IATA Director of Land Conservation

Note: The "Trail Notebook" series is available online at www.iceagetrail.org. Content is drawn from *Ice Age National Scenic Trail: A Handbook for Trail Design, Construction and Maintenance* (available online at www.nps.gov/iatr/parkmgmt/trail_handbook.htm and other sources nationally), extensive field experience, and input from volunteers, agency staff and hikers. This edition may be revised in the future, and we anticipate posting additional drawings, technical details, pictures, and references online (www.iceagetrail.org). The Ice Age Trail Alliance welcomes your suggestions for improving this notebook and gratefully extends a sincere thank you to everyone who works to maintain and improve the Ice Age NST.

Purpose and Scope

Close your eyes and think of your favorite Ice Age Trail segment. Imagine walking on it right now. What do you see? Where is your attention focused? Why? Are you envisioning a great panoramic view, a small woodland lake, a tranquil stream, or waves of prairie grasses and flowers? Why do these images stick in your head? The land may have been protected or the Trail may have been laid out to highlight these wonderful features, but your experience may also be attributed to vegetative management activities that opened a view or restored a long-lost habitat.

What you need to know:

- Active vegetative management — such as removing invasive species (invasives) and restoring native habitats — provides a very real and important benefit to the natural environment: an increase in the diversity and density of native species. Vegetative management may also enhance the Trail experience of users.
- In this book, we address a scale of land stewardship activities, from minimal to landscape-level restoration.
- This book was written primarily for IATA volunteers, but it also is applicable to contractors and partners.
- This book focuses on vegetation (not wildlife habitat) management along the Ice Age NST.
- The Ice Age Trail is a recreation project and a conservation project that provides the opportunity to create corridors of protected, ecologically significant lands. These corridors provide not only for human travel, but also for travel of other animals and seeds. The movement of some animals and plants can be an important ecological or conservation benefit of the Ice Age Trail. However, it also poses a challenge since the Trail acts as a medium in which invasive species can move and propagate.

To Steward or Not to Steward...

As disheartening as it may seem, there will be situations beyond our capabilities or resources. The decision not to address these areas is not one that anyone wants to make, but someday improving these “lost causes” may be possible with new advances in restoration techniques. Moreover, our responsibility to the land compels us to strive to make a difference. Consider the following when deciding whether or not stewardship activities should commence in a particular area.

Is the project worth the effort? Will the benefits outweigh the costs? For example, if the Trail traverses immature woodlands with some evidence of a remnant prairie, then it may be worth the effort and resources to restore that prairie. Conversely, if there are woodlands full of aggressive pioneer trees and a thick ground cover of invasives, then at best, a plan to contain this infestation on the property is all that may be reasonably accomplished. Without large-scale funding and equipment, decisions often end up somewhere along this continuum.

Greater aspirations — such as habitat restoration — mean a greater workload and increased costs. It is important to balance these costs and benefits with other Trail needs before committing IATA resources.

Furthermore, one should consider what are the most important interpretive features on the land. It is wise to design a stewardship project that best interprets the geologic features on a property. For example, keeping an area devoid of woody vegetation will retain views. Conversely, allowing reforestation or promoting tree growth may not be wise in a location where the interpretations of glacial geology are dependent on wide or long views.

Closely related to the topic of land management are the trail user's safety and experience. User safety should be carefully considered when considering land management activities. Avoid creating situations that may be hazardous for Trail and other property users. For example, leaving dead and dying trees provides crucial habitat for woodpeckers and other desirable critters, as well as aesthetic beauty, but leaving dead trees along high-use sections of the Trail may also pose a hazard. Falling branches are dangerous, and once fallen, they create a barrier for Trail users and become a Trail maintenance issue.



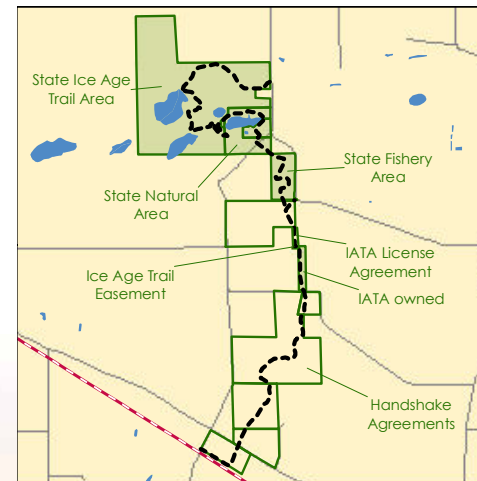
This area was cleared to expose oak trees and as part of a large-scale savanna restoration project.

What you need to know:

- Look at the land with an objective eye. Don't let your personal feelings dominate the discussion.
- Look at the potential stewardship zone with a Trail-wide perspective. Is it worth interpreting a site when several similar sites exist within a few miles?
- Before beginning land stewardship activities, it is important to get the Ice Age Trail partners involved in answering the following questions.
 - On this piece of land or Trail, what is most valuable to Trail users and managers? Does it contain a unique geologic feature?
 - How best can the Trail and the land coexist in the area?
 - Is the vegetation so significantly changed from pre-settlement conditions that it is impractical to try to restore it back to that condition?
- Do your research. Check historic aerial photos, talk to the property manager, experts, neighbors, users, and others who can help to inform the decision.
- Listen. Listening to others' suggestions helps to ensure long-term participation in the project.
- Determine both the current condition of the land and the desired future condition. Check the Wisconsin's Ecological Landscapes maps (available on the Wisconsin Department of Natural Resources [DNR] website) and other resources to determine pre-settlement vegetation, if restoration to pre-settlement vegetation is the goal for the property. (Trying to convert an area into a prairie when its historical landscape was a hardwood forest is not a sustainable solution.)
- Ask whether this is a quality canvas on which to create a masterpiece. A remnant prairie is more likely to have long-term restoration value than a badly degraded wood lot. A mature forest with century-old trees is a better starting point for ecological restoration than an aspen grove, which requires either cutting every few decades or waiting several decades for the aspens to be succeeded by more shade-tolerant trees.
- Stay in harmony with the surrounding landscape. Do not try to make the stewardship zone something it's not. Avoid creating a narrow strip of vegetation along the Trail that differs significantly from the surrounding environment. This is not a sustainable or aesthetically pleasing solution.

Ranges of Stewardship Activities

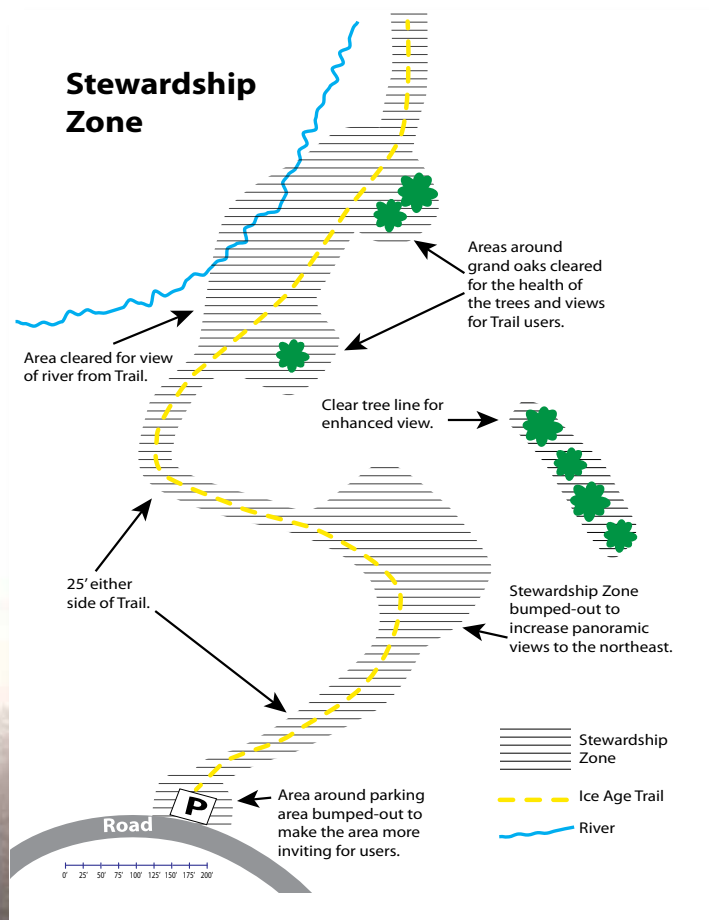
The Ice Age Trail Alliance is responsible for the construction and maintenance of the Trail — an enormous task. As stewards of the Ice Age Trail and the land that surrounds it, we are responsible for preventing the spread of invasive species. It will not always be possible to rid all Trail lands of invasives. Private ownership, lack of resources, and overworked property managers are all factors that can prevent stewardship activities on Trail lands. The availability of resources for both Trail work and land stewardship must be considered when making decisions on the level of resources (time, funding, human energy) to dedicate to land stewardship activities.



Each Ice Age Trail segment can be broken down per Trail land and assigned a “stewardship zone” for managing stewardship activities. For example, an area may be assigned a stewardship zone of 25 feet on either side of the Trail because it is within a relatively mature forest, on state wildlife lands with a significant garlic mustard issue, or in an area where the Trail rights are narrow. Treating the entire Trail land is not

The Ice Age NST traverses a myriad of lands with differing property ownership, each with varying rights for the Trail and its own set of regulations.

often a viable alternative. Treating 25 feet on either side of the Trail — the “stewardship zone” — helps prevent further spread of invasives and makes the goal of keeping the Trail free of invasives more feasible. This relatively wide corridor prevents a tunnel effect around the Trail and lets Trail users see into the mature forest canopy or enjoy clear skies on a beautiful winter day. Another section of Trail may have a much larger stewardship zone — sometimes hundreds of feet from the Trail — because the Trail lands are permanently protected, have few or no invasives, or include a significant interpretive feature along the Trail.



What you need to know:

- A “stewardship zone” is an area where efforts are made to manage vegetation, such as the control of invasive, nonnative, and aggressive native plant species. A stewardship zone may be parallel to the Trail or less uniformly shaped when bound by expanded legal right for the Trail (i.e. easement, public land), a particular habitat type, or other identifiable features.
- Always consider how the stewardship zone affects the desired future condition of the Trail and the desired experiences of Trail users.
- Targeting a narrow stewardship zone along the Trail is an effective strategy for helping prevent further spread of invasive species. It also helps to focus IATA resources on the Trail.



Land Stewardship and Trail Maintenance

The stewardship zone is often in a limited area parallel to the Ice Age Trail. This is helpful because it limits the resources needed to control invasives in an area; however, it may also inhibit the ability to conduct landscape-level restoration, which will affect the management techniques employed.

The main goal of land stewardship efforts along the Trail is to limit the spread of invasives. Other goals include restoring or maintaining healthy, sustainable ecosystems and managing vegetation for an improved user experience by revealing scenic views or geological features. Prevention first, then enhancement.



Here, the stewardship zone (in blue) has been cleared approximately 75 feet from the Ice Age NST (yellow).

What you need to know:

- Land stewardship activities can be done from the Trail tread, but usually stewards must leave the tread, making it difficult to know when and where to stop when working from the Trail outward. Naturally, the target species will not know the boundaries of the stewardship zone and may exist just outside the zone. These invasives will no doubt be next year's crop within the stewardship zone, but keep focus on the defined stewardship zone.
- Keep your eyes on the primary goal: preventing the Trail and its users from being vectors for invasives and other undesirable species.
- When attempting to control Trail-encroaching plants such as prickly ash, honeysuckle, brambles, and sumac, it is important to work at least ten feet away from the Trail in each direction and choose the most effective control method or methods. This approach will significantly improve user experience and lengthen the time intervals between treatments.

Stewardship through Education

Educating Ice Age Trail users is an achievable and effective way to help control the spread of invasive plants. A helpful method, especially when coupled with other stewardship efforts, is to build Trail users' awareness of the presence and negative effects of invasive species.



This educational sign explains the deleterious effects of invasive species while Trail users remove potentially invasive seeds from their footwear using the boot brush below it.

What you need to know:

- Place educational signs explaining the negative effects of invasives, and how Trail users can minimize or prevent spread of invasives, at strategic locations such as trailheads, kiosks, and interpretive or informational displays.
- Talk to state, county and local land managers regarding stewardship needs along the Trail. This will help both the Ice Age NST and the managers' properties.
- Trailheads are a good place to install boot brushes combined with informational signs. The signs educate users as they clean contaminated soil and vegetation off their footwear.
- Publish pertinent information in media sources, chapter and partner newsletters, and online (Facebook, IATA website pages, etc.) to further cultivate awareness of stewardship needs.

Small-scale Stewardship Activities

Small-scale stewardship activities, such as removing a relatively low-density population of invasive species from a small stewardship zone, can be accomplished with a modest commitment that is sustained over time.



Examples where woody brush was removed around large oak trees, creating expanded views along the IAT.

What you need to know:

- Small-scale projects can usually be accomplished with a few individuals working one to six times each year.
- With a narrow stewardship zone, it is possible for a few dedicated individuals to cover a long distance along the Trail. Note, however, that invasive species will continue to plague our native plant populations from outside the stewardship zone.
- If a small-scale project shows positive results, someday larger-scale efforts may become feasible.
- Often a small area (such as around one tree or one rock, opening one window) can be cleared to make a dramatic improvement in the user's experience.

Being Part of the Solution

It's not just Trail users who can spread invasives. Land stewards, trail builders and maintainers, and their tools may also be vectors for invasive species. Let's do our part to minimize the problem.

What you need to know:

- Properly clean clothes and tools after each day of working in areas of invasives and prior to entering a site for the first time, especially in areas devoid of invasives. This helps to prevent the spread of invasives.
- Learn to recognize invasive species.
- Wear clothing and footwear that do not attract seeds.
- Stay on designated trails whenever practical.
- Avoid areas infested with invasive species to the extent possible.
- When in doubt, stay out!
- Clean yourself, your equipment, and your dog before and after recreating.
- Properly dispose of soils, seeds, or plant parts from cleaning (i.e., in the trash).
- Educate others about invasive species.
- Volunteer to help control invasive species.

Enhancing Views

It is desirable to perform vegetation stewardship activities to open or maintain a viewshed and provide a superlative user experience along the Trail. For instance, you may expand the stewardship zone to remove buckthorn or native aspen or maple saplings along the Trail for better viewing of a picturesque creek or other Trail feature. This is another example of looking “from the Trail, outward.”



Small trees and shrubs were removed from the foreground to allow for this vista of the prairie below.

Large-scale Stewardship Projects

When desired future conditions, approvals of land managers and Trail partners and access to resources come together, a large-scale stewardship project may be feasible. This often consists of ecosystem restorations.

What you need to know:

- A well-constructed and vetted restoration plan must be agreed to by Ice Age Trail partners prior to beginning the project.
- The plan must be reviewed and updated frequently.
- The plan must include long-term funding, resource development, monitoring costs, and commitments.



Monitoring IATA property for invasive species.

Monitoring

Regardless of the size or shape, the stewardship zone must be monitored on a regular basis. It is the most basic stewardship activity.

What you need to know:

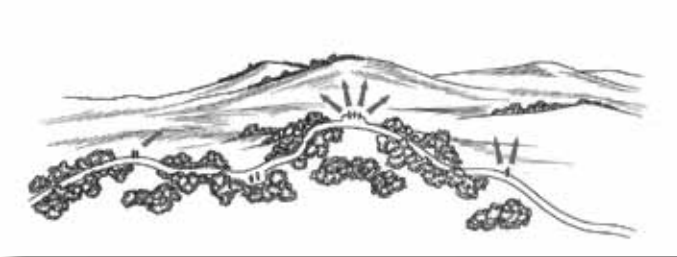
- Learn how to identify invasive plant species (see <http://dnr.wi.gov/invasives/>).
- Check for new and/or expanding populations of invasives within the stewardship zone.
- The earlier a population of invasives is discovered, or the less established it is, the more likely it can be controlled successfully, and the less effort will be needed to control it.
- Monitoring is especially important on IATA-owned properties. The IATA has the additional responsibility of limiting the negative effects (i.e. spread) of invasive species on neighboring lands. IATA lands provide strategic opportunities for restoration because the IATA retains exclusive control over them¹.

¹ IATA-owned lands are often encumbered by state and federal funding contracts, which may prescribe limitations. What may be done on these lands may also be limited by local laws/ordinances. IATA staff must be contacted prior to stewardship projects on IATA land.

What you need to know:

- Providing Trail users with windows into sites or a view of an expansive vista or an interesting plant community is one of the main reasons to perform stewardship activities.

- Providing Trail users with interest, such as changes of scenery, can be done effectively by performing stewardship activities.



- Consider bumping out a stewardship zone (with appropriate permissions) to include removal of brush to expose a panoramic view, a geologic feature, or a grand old tree.
- When doing this type of stewardship activity, it is common that species that were once considered desirable become less desirable when the focus of the stewardship activity changes. For instance, removing maple saplings to expose a distant view may be an option not otherwise previously considered.

Planning Stewardship Activities & Projects

Defining the stewardship zone is the first step in planning an effective, sustainable stewardship project or activity. See the chapter on Ranges of Stewardship Activities.

What you need to know:

- ☛ 1 mile of Trail x 50 feet wide (25 feet on each side of the Trail) = 6+ acres per mile.
- ☛ Determine the ownership of the property. Obtain landowner information from IATA staff.
 - Who is the property manager? Is it private, public, or IATA-owned?
 - Is there a management agreement or plan that limits allowable stewardship activities?
 - If you are working with public land, what is the primary purpose of the property? Although they may host or incorporate the Ice Age NST, state wildlife areas (SWAs), state natural areas (SNAs), state parks, state and county forests, and state Ice Age Trail areas (SIATAs) all have different primary management objectives. Generally, among state-owned properties, SIATAs will provide the most latitude in vegetative management for the Trail.



General Ecological Types

Before starting stewardship activities, identify general ecosystem types such as prairie, woodland, and wetland. In each type of environment there are nonnative, native aggressive, and nonnative invasive species.

What you need to know:

- ☛ In woodlands there is a natural progression from pioneer to climax species. A healthy, mature forest community is generally self-perpetuating until disturbed by some force of nature, humans, or the introduction of invasive species.
- ☛ In wetlands, there are natural and artificial reasons for groundwater fluctuations as well as invasive species that affect the size, type, and quality of the wetland.
- ☛ In prairies and savannas, there is a successional tendency toward reforestation in the absence of fire.
- ☛ Humans have the ability to impact these ecosystems, both negatively and positively. Stewardship activities strive to keep the human impact on ecosystems positive, but poor planning and poor execution can have devastating effects.
- ☛ There is a general tendency toward more invasive plant species and greater densities of invasives in the southern part of Wisconsin, although the ranges of many invasive species are moving northward.

Desired Future Condition

Working with Ice Age Trail partners, including ecological professionals and IATA staff and volunteers, determine the desired future conditions (DFC) of the stewardship zone. Is the DFC for scenic enhancement, a full ecological restoration, or reconstruction (such as converting a row-crop field to a prairie planting)? If the DFC is Trail access without any desire of stewardship enhancement, then significant vegetative management may not be needed. Conversely, if the DFC is a native prairie and the area is covered with eastern red cedar, choosing to restore the historic ecological condition will require a long-term, labor-intensive effort. On the other hand, leaving an area of less-than-desirable trees and shrubs along an adjacent roadway may be a wise option to lessen the visual and auditory impacts of the roadway on Trail users.

Some properties are protected for future Trail use, but the Trail is not built yet. Ideally, prior to Trail layout and design (TLD), these properties will receive attention to address vegetative stewardship needs. Often, this

will aid in the TLD process. After the Trail has been laid out and a final route determined, stewardship activities can be done around the Trail route. Working in advance of Trail construction will aid in construction, invasive species control, and possibly ecological enhancement. Ideally, such areas will receive several years of vegetative stewardship to rid the soil of viable seeds.

What you need to know:

- To determine the desired future condition, gather environmental information such as soil types, topography, existing vegetation and wildlife, and species of concern. Are there glacial or other geophysical features on the land that would benefit from vegetative management? Has a Natural Heritage Inventory (NHI) review been conducted by the Wisconsin DNR Bureau of Endangered Resources? Will the project comply with Section 106 of the National Historic Preservation Act? Are there any safety concerns? An excellent source for finding and tracking this information is the IATA's Project Review Form.
- Ask this important question when determining the stewardship zone and the amount of effort to put into its enhancement: What is the interface between the stewardship zone, the DFC, and the user's experience on the Ice Age Trail?
- Determine the projected costs of stewardship activities. Are volunteers able to do the work? What capital expenditures are needed and who will fund them? Will contractors be needed?
- Although controlling invasives prior to Trail construction is not always possible, take measures to lessen the spread of invasives during the Trail construction process. Proper cleaning of boots, clothing, and tools before entering the site and after each workday will help to prevent the spread of invasives even in areas where no invasives are observed.



Building a group of constituents is essential for the long-term goals of stewardship activities.

Long-term Planning

It is vital to build a strong constituency for the outdoors that will maintain the hard work put into a stewardship zone. Trail stewards can do this by working closely with local communities and other Trail partners.

Furthermore, with larger-scale efforts, it is important to develop a management plan very early in the process. The management plan requires the involvement and approval of the property manager. The management plan should include a comprehensive background and options for future stewardship projects. A good management plan will address roles and responsibilities of partners, including the nuts and bolts of restoration planning. It should be updated periodically to adapt to changing conditions and stewardship techniques. Without an enduring, well-thought-out plan and strong community support, land stewardship projects are not sustainable. All the hard work and toil put forth at the beginning of a project will all too easily vanish.

Executing Stewardship Projects

Once a project is planned and ready for implementation, now what? As with other Trail projects, proper leadership is vital for executing a safe, fun, and effective project. It is the responsibility of the leader or leaders to ensure that all requirements are met and that all volunteers and contractors are placed into situations where they are able to perform safely. Effective leadership begins with proper preparation. Refer to IATA's Leadership Notebook for detailed instructions on running a quality work outing.



Youth work crew clearing under large oaks provides for expansive views under the canopy.

“Work safely, have fun...and get the work done.”

Once the stewardship zone and desired future conditions are determined and an approved plan is in place, it's time to don the gloves and begin vegetative stewardship activities. Techniques to transform habitats or control invasive species are constantly changing. This book discusses only the basic ecological management techniques. Talk to consultants, contractors, volunteer experts, and IATA staff and consult the latest DNR recommendations prior to beginning any land stewardship activity.

Basic Vegetative Stewardship Techniques

Vegetation management techniques include manual/mechanical and chemical methods, prescribed fire, and in-fill (i.e., over-seeding). These techniques can help control invasives, restore desired vegetation on trail lands, or both. When deciding which methods to use, it is important to weigh the costs, benefits, and safety factors of each, and determine the resources available (e.g., funding, volunteer labor, expertise). Depending on the species, the growing stage of the plant, the age of the plant, location, time of year, or other factors, several treatment options may be appropriate.

Manual/Mechanical Control Methods

Manual/mechanical treatments include smothering, hand pulling, hand digging (destumping or shoveling), girdling, or cutting with a power brush cutter, brush mower, or forestry mower.

Working with volunteers:

Always maintain a positive volunteer experience. Manual/mechanical treatment methods such as hand pulling provide an excellent volunteer opportunity for large groups and/or when you only have volunteers for a short period of time. The participants do not need to be very experienced, and they will see an immediate result from their efforts — whether

it is filled garbage bags or a hidden orchid revealed by removal of an ocean of garlic mustard. Watch for volunteer boredom; pulling weeds for more than an hour or two may get tedious. Remember, “Work safely, have fun, and get the work done.” Break up long days of pulling weeds with a walk-and-talk along the Trail, and rotate tasks to avoid repetition.



Youth group pulls and bags thousands of pounds of garlic mustard along the Ice Age Trail in the Kettle Moraine State Forest.

- When to use:** Hand pulling can be an effective method for controlling some invasives before the seed sets. It is best done where there are smaller populations of invasives and pulling will make a real difference. Hand pulling is also a good method when there are desirable species to be saved and mowing or broadcast spraying would cause considerable collateral damage to desirable species. This method also works well in steep terrain or hard-to-get-to locations where mowing would be difficult. Mowing can be done with a large-scale brush mower but should not be done in areas where collateral damage to desirable species would be high. Consult IATA's Equipment Use Policy for necessary Personal Protective Equipment (PPE) when using brush mowers and other power equipment.

- Species to target:** In general, mechanical treatments work best on annual and biennial species. Hand pulling is typically successful and productive on small (less than 3 feet tall) nonwoody species. Hand pulling is very effective for second-year garlic mustard, spotted knapweed, wild parsnip (with gloves, long sleeves, and long pants to prevent oil from coming in contact with skin), adult Japanese hedge parsley, sweet clover, and dame's rocket. Wild parsnip, burdock, and most thistles can be removed using a sharp shovel (or specialized tool) and cutting a few inches below the ground. Mowing can be productive for young woody species such as buckthorn where it's a veritable monoculture. However, without consistent follow-up treatments, mowing can make the situation worse due to excessive resprouting. Small clonal stands of quaking aspen where individuals are over one inch in diameter can be controlled by girdling.



Girdled aspen

Chemical Control Methods

Chemical treatments are often the best option for perennial plant species and some biennials if they are dense and dominant. There are three types of chemical treatment options: 1) cut-stump treatment, 2) basal bark treatment, and 3) foliar treatment. See "Pesticide Use Policy in a Nutshell" on page 37 to help determine when to use pesticides. *Sites must be posted with warning signs at the time of application.*

Note: Applicators are not required to be certified for most pesticide applications along the Trail; however, certification by Wisconsin's Department of Agriculture, Trade and Consumer Protection is required if they apply or direct the application of:

- restricted-use pesticides
- pesticides on a for-hire basis
- pesticides in public schools or on school grounds
- pesticides in aquatic environments

Certification is also required for people who conduct pesticide-safety classes for agricultural workers or pesticide handlers as required under the Worker Protection Standard (WPS).

Applicators should be trained, educated, and comfortable with the treatment method before beginning the activity.

1) Cut-stump Treatment

Cut-stump treatment means cutting a woody shrub and then chemically treating the cambium layer. To cut the shrub, use a chainsaw, powered brush-cutter, handsaw, or forestry mower. Cut close to the ground. This reduces tripping hazards and provides the shortest distance from the treatment area to the roots. After cutting, paint (with a paintbrush) or



Area before cut-stump treatment.



Area after cut-stump treatment.

carefully spray the outer edge of the cambium layer on the top of the cut stump with the appropriate herbicide. Add a colored dye to the herbicide mix to help identify which stumps have been treated.

- **Working with volunteers:** Cutting woody invasives with handsaws or loppers is a great way to keep large groups of volunteers safe, effective, and engaged. Large areas can be covered in a short amount of time. Volunteers can be organized into three groups. The first group cuts the brush and marks cut stumps with pin flags. The second group hauls the brush. The third group (or possibly just one person) applies herbicide to the cut stumps. Depending on weather variables and chemical type, it may be necessary to treat stumps with herbicide within half an hour of cutting, as waiting longer may lessen effectiveness.

Read herbicide labels carefully for details.

- **When to use:** The cut-stump treatment is a good technique to consider when clearing an area for viewsheds. It is important to cut, remove brush, and then treat the stumps to prevent resprouting. This method is a great option for trail maintenance outings and clearing in stewardship zones along the Trail. It is also an effective procedure when ridding an area of a monoculture of woody invasives. Often overseeding or supplemental planting will be required afterward.



Note blue dye on treated cut stumps.

- **Species to target:** Woody vines, shrubs, saplings, trees, and other sensitive species, ideally less than 2 inches in base diameter. Common species for which this method is effective include but are not limited to

buckthorn, honeysuckle, autumn olive, box elder, alder, and sumac. Using patience and cutting and treating each cane, this is also an effective method for treating brambles such as raspberries.

2) Basal Bark Treatment

Basal bark treatment means applying herbicide to the bottom portion of a plant's stem. The herbicide must be mixed with an oil-based chemical such as bark oil (i.e., crop oil) or diesel fuel. Bark oil tends to be more environmentally friendly than diesel fuel, but it is more expensive. The oil penetrates the plant's bark and carries the herbicide into the cambium for translocation into the root. Spread a 3- to 4-inch-wide band around the entire circumference of the stem in order to be effective.

- **Working with volunteers:** Because of the oil-based products required, this treatment is best left to qualified applicators and is not a good option when managing a large number of volunteers during a work outing. Often the smell of the oil lingers in the air for days after the treatment.
- **When to use:** Use when targeting specific plants that are growing among desirable plants. Since no cutting is needed, it is easy for a small number of applicators to cover a large area. Also, applications can be done year-round. A potential negative aspect of this treatment method is that the brush will remain standing after it dies, so expansive views will not be achieved immediately after treatment.

- **Species to target:** Woody vines, shrubs, saplings, trees and other sensitive species less than 2 inches in base diameter. Common species for which this method is effective include but are not limited to buckthorn, honeysuckle, autumn olive, box elder, and sumac. This is also an effective option for controlling black locust.



Using a sprayer or brush, apply herbicide and oil mix around outer bark.

3) Foliar Treatment

Foliar treatment means spraying leafy vegetation. This method has the greatest risk of collateral damage because spray can hit or drift onto nontarget species. (However, the chemical concentration in foliar solutions is much less than that used for cut-stump or basal bark treatments.)

- **Working with volunteers:** This technique should be used with no more than one or two volunteers present. It should be used only by experienced applicators.
- **When to use:** Consider using foliar treatments only when there is little or no risk of collateral damage to desirable plants in the area or when the area is so degraded that collateral damage is acceptable. This can be accomplished in areas where there is a solid mat of target species or by performing treatment when desirable species are dormant. Spraying garlic mustard in the early spring or spraying first-year garlic mustard in the late fall are effective since most desirable plants will not be growing and therefore will not be affected.
- **Species to target:** In general, foliar treatment should be used on herbaceous and woody species that are low to the ground and found in large concentrations. First-year garlic mustard, Japanese barberry, wild parsnip, and brambles such as raspberries (genus *Rubus*) are the most common species treated with this method.



Prescribed Fire

Prescribed fire is used to manage a variety of habitat types including prairies, savannas, woodlands, and some wetlands. Typically performed in spring and fall, prescribed fires control some undesirable species while stimulating the germination of desirable species.



Preparing for prescribed burn on a goat prairie.

A prescribed fire helps to release native seeds and prepares the soil for overseeding, if planned. Prior to scheduling a prescribed fire, a burn plan must be in place and approval must be obtained from the property manager and the local fire authority.

Types of prescribed fires: Broadcast burning is done on the understory and covers a large area. Brush pile burning should be done only with snowcover and minimal winds. See IATA's flyer *Tips for Safe and Effective Brush Piles*. Fire extinguishers and water cans must be on site when any type of burn is done.

Note: At the time of this publication, the Ice Age Trail Alliance and its volunteers do not have the authority to perform prescribed burns². When prescribed fire is the best option, IATA volunteers should seek assistance from partner organizations. Partnering with nonprofit organizations, county, state, and/or federal agencies is a good way for the IATA to have prescribed burn along the Ice Age NST.

² There are several exceptions in which the IATA has made special arrangements with partner organizations.

- **Working with volunteers:** Perform broadcast burning only with a trained, experienced burn boss and an appropriate number of crew members to safely cover the site. The burn boss will take into account wind, humidity, terrain, fuels, etc., and ensure that the burn meets objectives for the parcel. When burning brush piles, cutting and stacking brush is a rewarding and useful task for volunteers, as is burning the piles (as permitted; see above). Hot food and drink during and after the burn make a wonderful cold-weather treat.
- **When to use:** Prescribed fire can be very beneficial for oak woodland, oak savanna, prairie systems, and certain wetlands because burning cycles nutrients, manages succession by top-killing woody brush, and for some species is necessary to open seed coats to allow germination. Burning brush piles should be done with snow on the ground and without heavy winds, and care must be taken to avoid collateral damage, as burning brush piles will leave sterilized soil for years after the burn.



After much effort only a small portion of this pile burned. The low-density pile with misplaced logs failed to ignite and burn properly.



This tight pile of parallel branches cut into small lengths burned quickly and kept flames from reaching too high into nearby canopy.



Area along the Ice Age NST on partner property where a prescribed burn was recently conducted.

- **Species to target:** Prescribed fire may be used to manage a specific type of ecosystem such as an oak woodland, oak savanna, or prairie. In general, fire is not used to manage invasive species. Using fire would mean using a broadcast tool for a specific problem (like invasives), and if the natural system is not fire tolerant, burning to control invasives may create bigger problems for the system. Prescribed burning may set back some invasive species, but other than first-year seedlings of herbaceous plants, it usually does not kill the invasive. Therefore, using one of the mechanical or chemical methods is best to control invasive species³. Brush piling works well with buckthorn, eastern red cedar, and other woody undesirable species.

³ Fire can be an integral part of invasive species control in conjunction with other techniques. For example, a properly timed burn can reduce Kentucky bluegrass in a prairie and help release native species.

Infilling

Infilling is a method of establishing desirable species and forcing out undesirable plants by inter-seeding, over-seeding and planting plugs. The use of nonnative, benign cover species (e.g., annual rye) can also provide fuel for future prescribed burns and competition for invasives. Often, collecting seed is part of the infill process.



Native plant seeds are collected and stored in a mesh feed sack to maintain air flow and allow for drying.

Prior to collecting any seed, seek local native seeds and consult professionals to determine appropriate seed species and forb-to-grass seed ratio. Obtain permission from the managing authority of the property. When collecting native seed, it is best to collect no more than 50 percent (less is better) of the seed from any given source in a year to allow the site to maintain itself. Native seed should be air dried until the materials (stalks, seed pods, leaves) crumble. Feed sacks work well to store the seed. Hanging them from the rafters or beams of a storage facility with a consistent day-to-day temperature is recommended. Hanging the bags will help to prevent mice or red squirrels from eating the seed.

- **Planting:** Clean seed by hand or mechanically with a hammer and fan mill. Inoculate legumes with a mycorrhizal fungus prior to planting. Establish a good seedbed by using a prescribed fire, raking, or another form of thatch removal. Seed may be hand scattered in the spring or fall, but there are limitations with both times of year — the site characteristics will dictate which is best. If planting plugs, it is best

to do so in either the spring or fall; if they are planted in the fall, give them enough time to establish roots to prevent winterkill. If it doesn't rain, plant plugs should be watered every couple of days for the first month. In rare cases, transplanting native trees or shrubs may be an option. However, unless it is possible to water the plants consistently, the likelihood of their survival is relatively low.

- **Working with volunteers:** Hand-collecting, hand-broadcasting, and cleaning seed are wonderful volunteer activities. Very little experience is required. Young and old alike can do it, and with some patience, they can enjoy the fruits of their efforts.
- **When to use:** Typically infilling is done during large restoration projects. However, there may be opportunities to try infilling techniques along narrow stewardship zones when infilling is consistent with surrounding habitat types.
- **Species:** The historic ecological profile and desired future condition will dictate which species to plant. For general reference to natural heritage inventory natural community descriptions, see <http://dnr.wi.gov/org/land/er/communities/>. Also contact your local extension office and other local conservation organizations that engage in collecting native plant seed.



Hand-broadcasting seed is an excellent volunteer opportunity.

Follow-up/Maintenance

Ecological management and vegetative stewardship activities should be well documented, including what treatments have been tried, when they were tried, and their effectiveness. This adaptive resource management approach is invaluable when determining what techniques have or have not worked, and it will be the basis for updating management goals and practices. Follow-up tasks include systematic monitoring and proper record keeping, including photographic documentation and dates. Documentation helps focus successful efforts.

Efforts to keep a narrow corridor free of invasives may parlay into a more expansive restoration effort in the future. All stewardship activities should be documented to the degree necessary based on the scope of the undertaking. Minimally, the type and timing of stewardship techniques used and the type and amount of herbicide used should be documented.

What you need to know:

- In accordance with the IATA's Pesticide Use Policy, IATA volunteers, contractors, and staff must annually submit a Pesticide Use Notification Form to the IATA's main office. Pesticide use on state, county, or other publicly owned lands will likely require reports to the managing authority of those properties. Permission must be granted from the managing authority (usually the landowner) prior to any applications. On public lands, often a management agreement must be in place prior to starting stewardship activities. On state lands, the applicator must complete the Chemical Use Approval, Form 4200-009, and Chemical Use Report Form 4200-008, according to WDNR guidelines. An IATA Pesticide Use Report Form must also be submitted by December 1 of each year to the IATA's main office.
- Meaningful and dedicated follow-up is essential for the success of a stewardship project. Spraying garlic mustard one year, then leaving it for the next two, is not an effective use of time and resources.

- An important aspect of a successful management program is to have long-term stewards of the land and plan for leadership succession. This can be done in a number of ways, but it is vital that these stewards (whether a group or an individual) understand and agree to the necessary commitment. If resources are not available, and there is little or no community buy-in, the project may not be worth even beginning. Successful land stewardship projects begin with proper planning, buy-in from a variety of partners, a strong dedication to seeing the project through, and a commitment to long-term stewardship and trail maintenance needs.
- IATA staff members oversee projects on a trailwide basis. The on-the-ground work, however, relies on time and efforts from partners; local, long-term, and episodic volunteers; conservation and recreation organizations; schools and experiential education programs; community service organizations; and friends groups. With such help, the project stewards can concentrate their efforts on project management and multiply their efforts through proper leadership.

Tools of the Trade

Before going out into the woods or fields to deal with those nasty invasives, be armed with the proper tools. As is true with a trail building or maintenance crew, hand tools make up the majority of vegetative stewardship "weaponry." These tools include folding/bow saws, loppers, chainsaws, mowers, and brush cutters for cutting woody brush, and weed wrenches to pull smaller (less than 1.5-inch diameter) trees and shrubs found in relatively small numbers. For spraying,



Long pants, impermeable top layer, impermeable gloves, eye protection and shoes are required PPEs when spraying herbicides. Face shield and helmet are recommended.

there are large options such as backpack sprayers (usually 4 to 5 gallons), smaller options such as handle sprayers (1 to 2 gallons), and hand sprayers (1 to 2 quarts). No matter which one you use, ensure that it is clean and dry before each use. Check all the joints, caps, and gaskets for leaks and repair them properly before using. If a sprayer is difficult to fix correctly, it's time to replace it. Check well in advance of the workday. Don't wait until you're in the field with a dozen eager volunteers before you notice equipment issues.

What you need to know:

- The most important tools are those used for safety. Wear personal protective equipment (PPEs) while mixing and applying herbicide. See the product label for specific PPE information. At a minimum, wear long pants, long-sleeved shirt, shoes and socks and chemical-resistant nitrile gloves (at least 14mil [0.35mm]) in thickness. Other recommended PPEs (even if not mentioned on the product label) include chemical-resistant goggles or other eye protection, appropriate airway protection, sturdy boots, rubber boots, gaiters, chaps, hat, and an impermeable top layer when using a backpack sprayer.
- Place pesticide warning signs on each access point into the treatment area prior to application. They may be obtained (often at no cost) from the pesticide vendor. To educate Ice Age NST users, applicators may choose to use signs conveying more information.
- Use the right tool for the job — that includes the optimal pesticides.
- Plan ahead. Make sure herbicides are mixed properly and all tools are in good working order well before volunteers show up to help.



Pesticide Use Policy in a Nutshell

Follow the most advanced practices that maximize effectiveness of the pesticide, maximize personal and public safety, and minimize potential negative environmental impact. Read and follow all information found on the product label. Have adequate training, experience, and knowledge to perform the tasks, and avoid working alone whenever possible. Stay informed of current best practices and consult with pesticide experts. Never apply pesticides without the landowner's explicit permission.

Consider the following questions when deciding whether or not to use pesticides: Are there other alternatives? What are the risks of pesticides (to the public and to desirable plants)? How successful will the treatment be on target species?

Minimize risks by applying pesticides during times when exposure risks to humans and desirable plants are reduced. Use the most appropriate chemical and lowest effective concentration. Take into account weather conditions at the time of application. Conduct surveys for rare and desirable species prior to applications.

Install pesticide application warning signs at trailheads, parking areas, spur trails, road crossings, and other locations where Trail users will see them prior to entering the affected areas. Remove warning signs after the restricted entry interval as indicated on the product label or after sunset of the following day, whichever is later. Do not leave the signs on site long after these requirements.

Comply with all pesticide-label guidelines regarding wearing personal protective equipment (PPE). At a minimum, wear long pants, a long-sleeved shirt, shoes and socks, and chemical-resistant nitrile gloves at least 14mil (0.35mm) thick.

Provide enough clean water on the site to properly wash hands and other parts of the body. Triple-rinse tools and equipment with clean water in an area near the application site or on an impermeable surface at least 100 feet from open water. Use rinsate (the rinse water) as mixing water for future applications.

Keep good records of pesticide use and report applications to the IATA main office annually. Use state forms when on state lands.

For a poison emergency, call (800) 222-1222. For spill emergencies, call the WDNR spill hotline, (800) 943-0003.

To minimize the need for disposal of waste, plan carefully so that only the amounts necessary for immediate needs are purchased, stored, and prepared. Label all pesticide containers clearly with pesticide name, concentration, and date.

All IATA staff, volunteers, contractors, pesticide users, and their supervisors must comply with federal and state laws and guidelines that apply to pesticide use. These laws require that pesticides be stored, handled, and disposed of in accordance with label directions. The label is the law.

Definitions

Climax species (late successional species): Species that remain essentially unchanged as long as the site remains undisturbed.

Interseeding: Broadcasting seed over existing vegetation.

Invasive species (invasives): Species that have been introduced by human action to an area where they did not previously occur naturally (i.e., where they are not native), become capable of establishing a breeding population in the new location without further intervention by humans, and spread widely throughout the new location. Generally speaking, invasive species are those that do not fit into the desired future condition of trail lands.

Land management: The general maintenance of properties, such as maintaining parking areas, monitoring boundaries, dealing with neighbor issues, and handling agricultural leases.

Land stewardship: The specific management of vegetation on or around the Ice Age Trail, such as removal of invasives, spreading seeds, and creating viewsheds.

Overseeding: Broadcasting seed over mostly bare soil.

Pioneer species: The first species to colonize a landscape where there is little or no competition, which often occurs after a traumatic disturbance such as a fire or flood.

Restricted use pesticides are labeled as such by the Environmental Protection Agency and require the applicator to be certified by the Wisconsin Department of Agriculture Trade and Consumer Protection (WDATCP).

Stewardship zone: An area where efforts are made to manage vegetation, such as the control of invasive and aggressive plant species. This zone may be parallel to the Trail or may be described by the legal boundaries of a property, habitat type, or other identifiable features.

Trail lands: Properties that host the Ice Age Trail. Trail lands can include private, county, state, federal, and eased lands. They range in size from a few feet on private lands to thousands of acres on publicly owned tracts.

Vector: A mechanism of travel for a plant species.

Viewshed: The area or landscape visible from a particular point; in this notebook, the view from a point on the Ice Age NST.

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Web Sites:

WDNR's invasive species pages:

General information: <http://dnr.wi.gov/invasives/>;

Control methods: <http://dnr.wi.gov/invasives/control.htm>;

Herbicide information: <http://dnr.wi.gov/forestry/fh/weeds/herbicides.htm>;

Natural resource code NR 40: <http://dnr.wi.gov/invasives/classification/>

Best Management Practices for invasive species on hiking trails: <http://dnr.wi.gov/invasives/bmp.htm>

Invasive Plants Association of Wisconsin (IPAW): <http://www.ipaw.org/>

Invasive Plants of Wisconsin — Herbarium; Cofrin Center for Biodiversity (great for identifying plants); covers 42 species: http://www.uwgb.edu/biodiversity/herbarium/invasive_species/invasive_plants01.htm

National Park Service's Job Hazard Analysis regarding herbicide safety: <http://www.nps.gov/iatr/supportyourpark/upload/JHA10%20Herbicide%20Safety.pdf>

Wisconsin Clean Sweep Program: (608) 224-4545 or visit: http://datcp.wi.gov/Environment/Clean_Sweep/index.aspx <http://datcp.state.wi.us/core/environment/environment.jsp>

Ecological landscapes of Wisconsin: <http://dnr.wi.gov/landscapes/>

Plant species composition of Wisconsin prairies: <http://digital.library.wisc.edu/1711.dl/EcoNatRes.DNRBull188>

Plant Ecology Lab, University of Wisconsin-Madison: <http://www.botany.wisc.edu/pel.htm>

Atlas of the Wisconsin Prairie and Savanna Flora: <http://digital.library.wisc.edu/1711.dl/EcoNatRes.DNRBull191>

Society for Ecological Restoration; has a lot of good reference materials: <http://www.ser.org/>; http://www.ser.org/content/ecological_restoration_primer.asp; http://www.ser.org/content/guidelines_ecological_restoration.asp

Wisconsin wetland restoration handbook for landowners: <http://dnr.wi.gov/wetlands/handbook.html>

IATA Pesticide Use Notification Form

DNR Chemical Use Approval, Form 4200-009

DNR Chemical Use Report, Form 4200-008

IATA Pesticide Use Report Form

Tips for Safe and Effective Brush Piles

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