Plants out of Place

The newsletter of the
INVASIVE PLANTS ASSOCIATION OF WISCONSIN

Issue 19, August 2007

What on earth was Leopold thinking?

by Roger Packard
Faville Grove Sanctuary, Jefferson County

Working at Faville Grove, with its long history of conservation practices, provides many reminders of just how much ecological thinking has changed over time – and how little.

Madison Audubon Society recently hired a crew of experienced restorationists to help with removal of invasive trees and shrubs in Faville Woods. Following current practice, they removed Tartarian honeysuckle, as well as native trees such as black cherry, elm, maple and eastern red-cedar that tend to take over oak woodlands in the absence of fire. These fire-intolerant species cast a dense shade that inhibits regeneration of oaks and shades out many native understory species.

After clearing out a particularly tangled corner of the woods of its honeysuckle shrub layer and looking across the freshly exposed trunks of the red-cedars that they were about to cut, the crew leader was heard to exclaim, "These cedars are in ROWS! Who in their right mind would PLANT CEDARS!?!"

Funny you should ask.

It turns out that the right-minded tree planters were none other than Bob McCabe and Art Hawkins, under the supervision of their major professor at the time, Aldo Leopold. Dave Tillotson, grandson of Stoughton Faville who still resides at the Faville homestead, cultivated the small trees with his horse-drawn cultivator. In his biography of Leopold, Curt Meine wrote, "At every juncture, it seems, we find Leopold at the cutting edge of conservation activity and environmental thought." And yet, practitioners of ecological restoration look on some of his handiwork just 65 or so years later, and wonder if he had taken leave of his senses.

In the late 1930s and early 1940s at the Faville Grove Wildlife Experimental Area, Leopold and his students sought "to demonstrate that scientific planning and methods can result in a *game crop* as well as a plant crop, and that the two can be combined on the same area to the farmer's benefit." Leopold realized that management practices on private lands have tremendous effects on wildlife, and he felt that "the Faville Grove and Lake Mills community would be an excellent place to make a really serious test of the idea of reconnecting people with land."

In a rocky corner of the Faville farm, Hawkins and McCabe planted butternuts for their beautiful golden lumber, with cedars as a nurse crop to keep weeds down and encourage the butternuts to grow straight and tall. The cedars would

continued on page 2

continued from page 1

provide cover for wildlife until it was time to remove them to make room for the maturing butternuts, which in turn would provide mast for squirrels and other wildlife until the time came to harvest the trees.

The experiment didn't work out quite as planned. Closer investigation of the area revealed a scattering of standing dead butternut trees in the rows between the crowded cedars. The cedars had never been removed, and all of the overcrowded butternuts eventually succumbed to butternut canker, a fungal disease most likely introduced from outside North America. For many years, however, the cedars did provide dense cover for a variety of wildlife at a time when such cover was in short supply.

In Leopold's day, conditions for wildlife in southeastern Wisconsin and throughout much of the Midwest were drastically different from those found today. Some species, perhaps most notably grassland birds, fared better then with less intensive agricultural practices and extensive hay fields. But for other wildlife, particularly game species, the landscape was bleak.

Farmers scraped together a living by exploiting their land in every way they could. Hunting and trapping pressures were intense and only beginning to be regulated. Woodlots, wetlands and any corner that couldn't be plowed were heavily grazed. Deer and Canada geese were rare. Sandhill cranes and turkeys were absent. Fox, raccoons, muskrats and ducks all were hunted or trapped heavily. In this setting, it made considerable sense to create brushy cover and fencerows wherever possible, and to provide supplemental food sources.

Since then, changing agricultural practices in particular have had profound effects on southeastern Wisconsin's landscape and wildlife. With larger, more specialized operations, farmers neglected their marginal lands. As dairy cows became bigger and more productive, they required feed that was higher in protein and calories. The low feed value of forage in woodlots and wetlands was no longer worth the energy the cows expended getting to it, the risk of injury to the less robust animals, or the cost of maintaining fences.

So Wisconsin's open oak woodlands began to close in. Many wetlands likewise were overgrown with shrubs. Rural sprawl has also contributed to the expansion of brushy habitat as small landowners "let" their land "go back to nature."

This has been good news for many wildlife species—too good, in fact. The same "edge" species targeted for assistance when Hawkins and McCabe planted their cedars rebounded to the point that some, like the white-tailed deer, have now achieved nuisance status. And yet, other species have not fared as well.

Just as dairy cattle were pulled from wetlands and woodlots, eventually they were pulled from open pastures as well, which were abandoned to cedars and box elders, or plowed to provide grain for immobile, high-yielding cows. Grassy hay fields that were cut twice during a growing season gave way to alfalfa monocultures that are green-chopped twice a month. Any meadowlark or bobolink or dickcissel lucky enough to find a nest site in a fencerow out of reach of the voracious choppers is increasingly likely to see its nest fall victim to a hungry raccoon or a stealthy cowbird.

In some respects, conservationists today face entirely different challenges than those that Leopold, his students, and his cooperating farmers faced. The need for large expanses of unbroken habitat free of brushy edges is more apparent now that we have more experience with their continuing loss. Through research and field experience, the dependence of a wide range of natural communities on fire—wetland and woodland, as well as grassland—has become more apparent. And it's more apparent that, if we are to preserve the full diversity of life around us, the focus of our conservation efforts needs to be on entire, functioning natural communities rather than on providing scattered bits of habitat attractive to a few species.

Before European settlement, the area now known as Faville Grove contained an array of natural communities that undoubtedly included dense, brushy habitat where fires carried less frequently. But there were also prairies large enough to support prairie chickens. There were large, open wetlands that supported nesting harriers, and there were savannas with more pasqueflowers than the deer herd could consume. We seek to restore all of these natural communities at Faville Grove in their appropriate locations on the landscape.

So the time for Leopold's red cedars has come and gone. The area is now cleared for the reintroduction of fire, that essential component of the woodland landscape. Though the methods have changed, the legacy of Leopold and company endures in the continuing effort to reconnect people with land through the process of healing the land. Only through a strong connection to land and continuing research will we know when our conservation efforts are on target, and when it's time for new direction.

New and Reprinted Publications from the Wisconsin DNR and UW Extension

compiled by Kelly Kearns

To obtain multiple copies of these publications, contact your local DNR Service Center, or contact Kelly Kearns (608) 267-5066, Tom Boos (608) 266-9276, or Brock Woods (608) 221-6349.

Common and Glossy Buckthorn: Major Threats to Midwestern Woodlands (FR-216)

Japanese Knotweed: A New Threat to Wisconsin's Waterways, Shorelines and Wetlands (ER-657)

Reed Canarygrass Control Practices: Effects and Management Recommendations, A reference table for landowners and restoration professionals (ER-656) Also available as a pdf at www.ipaw.org

Managing Invasive Plants, a special report of the June 2006 Natural Resources magazine (ER-655), includes articles on reasonable expectations in control and prevention, new early detection species to learn, costs of invasion, status of biological control efforts, impacts of earthworm invasions, prevention actions, alternative plants for landscaping and additional references.

Other new publications produced by the Midwest Invasive Plant Network. Contact Kelly Kearns for a single copy of any of the following:

Why Should I Care About Invasive Plants?: How Invasive Plants Affect Hunting, Fishing, Boating, Gardening, Hiking, Biking, Horseback Riding and Other Recreational Activities in the Midwest

Cooperative Weed Management Area Cookbook: A Recipe for Success - A Step-by-step Guide on How to Develop a CWMA in the Eastern US

Keep a Lookout for New Invasive Plants in the Midwest – Poster

Through awareness
comes
positive change.

Invasive Species Awareness Month Successful Again!

by Rachel Orwan, ISAM Coordinator

Invasive Species Awareness Month (ISAM) 2007 was an overwhelming success, with 91 events taking place all over the state. The goal of ISAM is to not only inform, but to change behavior so that instead of adding to the problem of invasive species, we can all contribute to the solution.

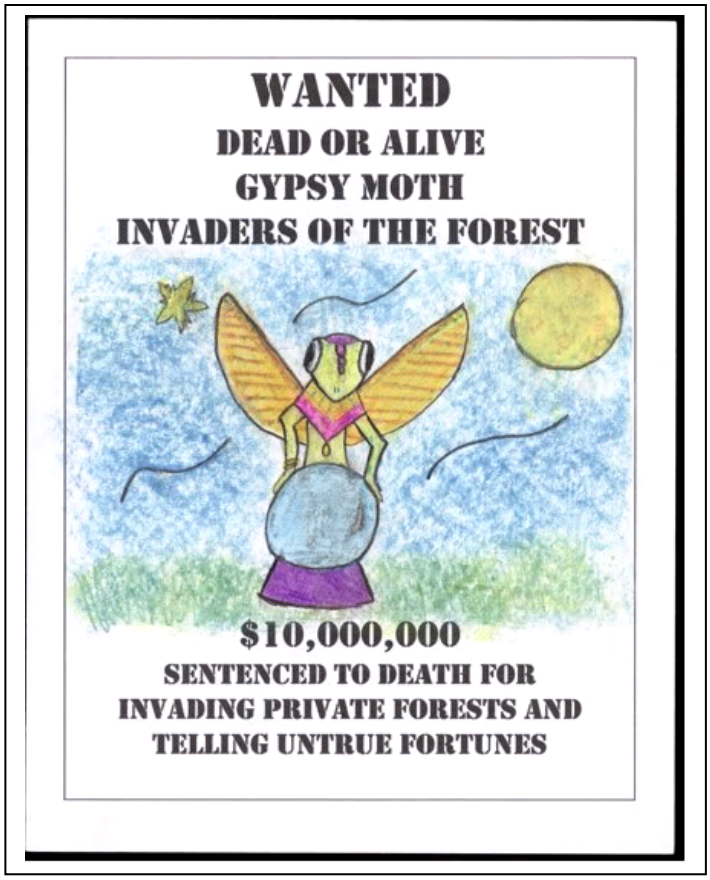
Highlights of this year's ISAM include the first-ever "Wanted: Invaders of the Forest" Poster Contest for 4th and 5th grade students, four Woodland Field Days showing invasives in our forests and what landowners can do about them, the opening of an international art show dealing with issues of invasiveness in our ecosystems and our culture, a series of Wisconsin Public Radio interviews on the Larry Meiller show, an episode of *Discover Wisconsin* and much, much more.

Information about invasive species appeared in many newsletters, including those of the Wisconsin ATV Association, the Master Gardeners, the Wisconsin Association of Lakes, the Wisconsin Woodland Owners Association, and the Wisconsin Family Forests. Plus, dozens of stories and editorials about invasive species ran in newspapers and magazines throughout the state, including an article in the WDNR Natural Resources Magazine. Through this multi-tiered approach, we hope to have reached every citizen in Wisconsin with the message that invasive species are an issue about which we should be concerned, and, what's more, an issue in which people play a direct role.

ISAM could not have been this successful without your cooperation and participation. Thank you for helping to plan, publicize, and promote invasive species educational programming. Remember that you don't need to wait for ISAM 2008 to reach out and spread the word about invasive species. I encourage you to continue to find ways to inform our citizens so we can all be a part of the solution!

It has been a pleasure for me to have the opportunity to work on this project. I very much appreciate all of the help I have received from my talented and high-capacity planning committee, as well as all of the other folks I have been able to work with along the way! I cannot express how much easier my job was made because of the creative, innovative and knowledgeable advice I received from those already working to educate people about invasives. ~ Rachel

"Wanted: Invaders of the Forest" – ISAM Poster Contest



2007 ISAM "Wanted Poster" contest winner by Anne Dupont, 5th grade,

ISAM 2007 included a poster contest for 4th and 5th grade students. Kids were asked to research species that invade forests and then create a poster detailing one or more of those species – "Wanted Poster" style. The response was overwhelming. We received 667 poster entries from 34 different classrooms! The winning entry was featured on the ISAM poster and t-shirt. The judging committee had a difficult time because there were so many excellent entries, but finally chose a poster about the gypsy moth, by Anne Dupont of Greenville. Anne was a 5th grade student who, when she is not learning about invasive species, likes to ride horses, play volleyball, paint, swim, play with her little sister (she actually said that, I'm not making it up), and show her Boarder Terrier Cricket.

Please visit the ISAM website (invasivespecies.wi.gov) to see her poster as well as the posters created by our two runners-up: Kane Poad and Alex Jenson.

This contest encouraged the use of a valuable resource for educators: the *Invaders of the Forest Educator's Guide*. This guide includes lesson plans and examples for over twenty activities for children and adults of all ages. Visit the Environmental Education for Kids (EEK!) website to download pieces of this guide for use in formal and informal educational settings.

2007 Invader Crusader Award Recipients

Each year, as part of Invasive Species Awareness Month, the Wisconsin Council on Invasive Species honors individuals and organizations whose contribution to education, policy development, and on-the-ground work are an inspiration to others working in the field of invasive species. The work and dedication of these people are examples of the difference one person can make. Here are the 2007 award winners.

Baraboo Hills Stewardship Volunteers, Baraboo (group volunteer effort): The Baraboo Hills Stewardship Volunteers remove invasive plants from The Nature Conservancy's preserves and are very active in educating the community about invasives.

Tom Boos, Madison (volunteer effort): Tom volunteers many hours with various groups, including IPAW, The Prairie Enthusiasts, The Natural Resources Foundation of Wisconsin, The Nature Conservancy and Pleasant Valley Conservancy. Tom's greatest asset is his enthusiasm and ability to inspire others.

Kathie and Tom Brock, Shorewood Hills (volunteer effort): The Brock's invasive species work has been instrumental in getting many other private landowners to begin or improve prairie and savanna restoration efforts.

Laura Felda-Marquardt, Rhinelander (professional effort): Laura built the highly successful Clean Boats, Clean Waters program from its initial concepts into the statewide force that it is today. Since 2002, she has trained over 1,000 volunteers to keep invasive species out of Wisconsin's lakes.

Eunice Padley, Madison (professional effort): In response to requests from the Governor, Eunice spearheaded a 2005 study that identified plant species currently posing the greatest threat to Wisconsin forests, the ecological and economic impacts posed by invasive plants, and various ways that the Division of Forestry could address the problem.

Becky Sapper, Ashland (professional effort): As a member of the Wisconsin Council on Invasive Species for three years, Becky was the primary person to initiate Invasive Species Awareness Month (ISAM) in Wisconsin.

Rick Shulte, DeForest (professional effort): As a representative of UAP Timberland, Rick has tirelessly traveled Wisconsin to meet with and educate land managers, answering questions and providing advice on the safe and effective use of herbicides for plant management.

Linda Spelshaus, Sheboygan (volunteer effort): Linda has been the Purple Loosestrife Education and Control Coordinator for Ozaukee Master Gardeners since 2003; she has trained over 100 volunteers to rear the loosestrife-eating beetles.

2007 ISAM Poster Contest and Invader Crusader award winners at the June award ceremony.

WEED WARRIOR SONG

(Sing to the tune of "Garden Song" by David Mallett)

by Kathy Dodd Miner, Madison

Inch by inch, row by row
Garlic mustard's got to go –
Gotta pull it all you know,
Gonna make this healthy land …

Inch by inch, row by row,
Off we march to meet the foe.
Pull it hard and pull it slow –
Gonna give the earth a hand.

New invasives on the scene?
Gotta get them while they're green.
Gonna keep the system clean
From these plants that will not share …

Japanese parsley*, multiflora rose –
Yank it up wherever it grows.
With our hands and with our hoes
We will show how much we care.

(Repeat "Inch by inch" verses)

Herbicide Resistance Management Practices for Reed Canarygrass

by Craig A. Annen, Integrated Restorations, LLC, Email: annen00@aol.com

More than 115 reed canarygrass (RCG) germplasms (breeding lines) are registered in the United States and Canada, and the number of wild populations and cultivar-wild type hybrids has yet to be experimentally determined. A high level of genetic variability greatly increases the likelihood that some populations will evolve herbicide resistance. Resistance is the inherited ability to tolerate treatments or recover from treatment effects. Devine (1997) estimated that resistance to grass-specific herbicides (graminicides) could appear in some grass species after only 6 – 10 consecutive years of selection pressure. If RCG populations develop widespread resistance to graminicides, selective chemical control options will be lost as a management tool for RCG. Practicing resistance management will enable us to extend the functional life of graminicides for RCG suppression. The purposes of this article are to briefly outline the mechanisms of graminicide action and resistance, and to propose management practices that can be employed to delay the onset of resistance to graminicides. A starting point to develop a strategy for managing herbicide resistance is understanding the molecular mechanisms of herbicide toxicity and the genetics of resistance.

Molecular Mechanisms of Graminicide Action

Grass-specific herbicides of the aryloxy-phenoxypropionic acid (APP, common names end in "fop") and cyclohexane-1,3-dione (CHD, common names end in "dim") chemical families inhibit the metabolic enzyme acetyl coenzyme-A carboxylase (ACCase). ACCase catalyzes the formation of malonate, a building block of a variety of fatty acids, such as those that comprise the cell membrane. ACCase is composed of two different enzyme subunits joined into a single enzyme package. The production of malonate is a two-step reaction, and each enzyme subunit catalyzes one of the steps.

A normally functioning ACCase enzyme can assemble malonate because the three-dimensional shape of its active site (the part of the enzyme where the chemical reaction takes place) is similar to the three-dimensional shape of both components from which malonate is formed. APP and CHD herbicides bind to a portion of the enzyme other than the active site and change its shape so that it is unable to catalyze the reactions (Maier et al. 1994).

Graminicides are grass-specific because the AC-Case found in sedges, other monocots, and broadleaf species is *structurally different* than the AC-Case found in the grass family (Poaceae). Non-grasses are tolerant of APP and CHD herbicides because their ACCase lacks a binding site for the herbicide.

When graminicides interfere with grass ACCase activity, the cell runs out of the malonate building blocks with which it constructs lipids. Plant growth ceases almost immediately when the preexisting pool of malonate building blocks is depleted (this is why graminicides are observed to stunt RCG growth) and the actively growing portions of the plant and its rhizome system eventually succumb to tissue necrosis. Suppression of the inactive (dormant) portions of the plant requires additional herbicide applications.

The Genetic Basis of Herbicide Resistance

Repeated exposure to graminicides has produced resistant genotypes in at least 14 different grass species, including *Phalaris minor* (annual littleseed canarygrass). In 11 of these species (including *P. minor*), a direct link has been established between resistance and changes in ACCase and the DNA base pair sequences of the gene that encodes AC-Case. In each of these 11 species, different resistant genotypes displayed different patterns of resistance to different APP and CHD herbicides (Devine 1997, Gengenbach et al. 1999). In other words, if a genotype developed resistance to sethoxydim (CHD), it was not automatically cross-resistant to clethodim (CHD) or fluazifop (APP).

The three-dimensional shape of an enzyme influences how it interacts with other molecules, or if it will interact at all. The mutations that confer different resistance patterns occur in the region of the gene that codes for the three-dimensional structure of the sites to which the graminicides bind. Mutations in this coding region can result in a variety of amino acid substitutions, each altering the structure of the herbicide's binding site in a unique manner, and each leading to a specific resistance-susceptibility pattern. For example, the herbicide binding site in a susceptible plant can accommodate all APP and CHD herbicides and is susceptible to

all graminicides, but the mutant (tolerant) herbicide binding site may only be able to accommodate CHD molecules; APP molecules no longer fit. If the APP molecule no longer fits, it will no longer be able to change the three-dimensional shape of the ACCase enzyme and will not affect its ability to catalyze the reaction that yields malonate. The resistance pattern in this mutant would be CHD-susceptible, APP-resistant (Devine 1997).

At the local population level, repeated herbicide treatments will reduce or eliminate susceptible individuals, increasing over time the proportion of the population carrying resistance mutations in their DNA. Eventually, the population will consist entirely of resistant genotypes. Preventing or delaying this progression of events is a primary goal of herbicide resistance management.

Resistance-Susceptibility Patterns: Resistance Management Tool or Temporary Transition State?

It may seem as though the experimentally observed resistance-susceptibility patterns offer the opportunity to alternate APP and CHD herbicide formulations as a resistance management strategy. However, *these resistance-susceptibility patterns may only represent a temporary transition state between complete susceptibility and complete tolerance to all graminicides,* and may be an artifact of the short-term scope of inference of herbicide resistance investigations. Complete resistance to all graminicides may evolve rapidly from this state.

Predicting the rate of increase of resistance mutations in RCG populations is difficult because clonal growth may act to decrease the rate at which resistance evolves, while cultivated varieties of RCG may have higher rates of evolution because of enhanced seed production characteristics caused by selective breeding (Ostrem 1988, Sahramma et al. 2004). It remains unclear whether naturalized satellite populations of these cultivated genotypes will attain and pass on resistance alleles at a faster rate than "wild" field populations. We cannot be assured that randomly alternating APP and CHD herbicides will be an adequate resistance management practice in the long-term.

Resistance Management Practices for Reed Canarygrass

1. **Incorporate variability into your management plans**. Resistance will evolve more slowly with variable treatment approaches than with regular patterns and consistent treatment practices.

2. **Use an integrated, multiple-treatment approach to RCG control**. Do not rely exclusively on herbicide applications to restore a degraded plant community, but use other control methods in conjunction with herbicide applications. Apply herbicides at a lethal rate and according to label specifications. Hand pull scattered individuals. On sites with water control structures, couple prolonged flooding with other suppression treatments. Reintroduce stabilizing disturbances (such as controlled burns) to enhance growing conditions and provide germination requirements for replacement species. To accelerate control, couple tillage or prescribed flooding to herbicide applications. When control is accelerated, fewer herbicide applications are required and there is less time for selection of tolerant genotypes.

3. **Abate landscape disturbances prior to initiating herbicide applications**. RCG invasions are often a symptom of interacting chronic background disturbances (e.g., nutrient or stormwater inputs, sedimentation, hydrological modifications). Without correcting the underlying causes of invasion, probabilities of long-term, sustainable success are small and repeated herbicide applications will be required to sustain suppression.

4. **Reserve grass-specific herbicides** for high quality mixed-species stands with intact propagule banks of native species.

5. **Change chemical families of herbicides (in a random pattern).** If RCG occurs in a patchy or clumped distribution within a stand of native species, randomly substitute graminicide applications with directed applications of broad-spectrum herbicides (glyphosate or imazapyr). Where possible, use sequential applications of broad-spectrum herbicides (in early spring before native species emerge) and graminicides after native species emerge (late spring through late summer) when follow up treatments are necessary. If RCG is commingled with desirable native species and the risk of collateral damage is high, randomly alternate among the APP and CHD graminicides. Also, read and understand the herbicide label before applying graminicides; certain graminicide formulations should not be applied to some types of sites except during prolonged hydrological drawdown.

Continued on page 11

Garlic mustard as a noxious weed in Wisconsin

by Tom Brock

On the IPAW list of invasive plants, garlic mustard (*Alliaria petiolata*) was ranked second, after reed canary grass, in negative impact on native plant communities. Possibly because it is more readily eradicated, garlic mustard probably ranks first in the extent of efforts, public and private, to control it. There has been a large amount of recent publicity on garlic mustard, including numerous articles in newspapers. Despite this, in many areas of Wisconsin control is nonexistent.

In Wisconsin there are only three weeds on the state noxious weed list: Canada thistle, leafy spurge, and field bindweed. Why isn't garlic mustard on the list? Good question.

The likely answer is that declaring a weed "noxious" means that all landowners are legally required to destroy it on their property at their expense:

"Every person shall destroy…[it]…on all lands which he shall own, occupy or control. The person having immediate charge of any public lands shall destroy…[it]…on such lands. The highway patrolman on all federal, state or county trunk highways shall destroy…[it]…on that portion of the highway which he patrols. The town board shall cause…[it]…to be destroyed…on the town highways." [Wisconsin 66.96(3)]

There are also significant penalties for noncompliance. Both private and public lands come under the jurisdiction of this law. It applies to agricultural land, forests, rights-of-way, residential lots, city streets, everywhere.

For some years now, efforts have been underway to establish a new weed and invasive species law that would broaden the scope and permit regulation of nonagricultural weeds such as garlic mustard. Currently, this falls under the responsibility of the Wisconsin Council on Invasive Species, of which IPAW's Jim Reinartz is a member. However, there is no proposed category of invasive species in the rules that would require any landowner to remove an invasive species from their land; only cultivation or purposeful planting of some categories of invasives is likely to be illegal.

Under current law, any municipality or county board has the power by ordinance or resolution to declare a species as "noxious" within their boundaries. Thus, a municipality has great power to require the removal of garlic mustard.

This is what the Village of Shorewood Hills did in 1998 due to the efforts of my wife Kathie. On the recommendation of the Village Parks Committee, the Village Board willingly added garlic mustard to its noxious weed list. Working with the Village Forester, the Weed Commissioner maintains a list of areas where garlic mustard is present. Residents with this invasive on their property are notified in writing that they are required to eradicate it. Several local companies are available for hire to residents who are unable to do this job themselves. Finally, the village is scrupulous in eradicating garlic mustard from its own public properties. Volunteers play an important role here, but the village has a weed control budget, which makes it possible to hire a contractor to deal with large infestations.

The Town of Middleton (Dane County) has taken an even broader approach. Through the efforts of Richard Oberle, a member of the Town Board and an active member of The Prairie Enthusiasts, not only garlic mustard, but many other invasive plants have been declared "noxious". Richard informs me that the Town is taking a proactive approach toward critical invasive plants on its roadsides and other properties. At present, most of the focus for residential properties is on garlic mustard, and residents who have garlic mustard on their properties receive letters requesting that they remove it. According to Richard, as many as 200 letters have been sent out in a single year.

I suspect that officials of many communities would willingly list garlic mustard as a noxious weed if they were asked to. Citizen involvement here is critical.

"Citizen involvement here is critical."

Annen continued from page 9

6. **Practice active reintroductions of replacement species**. Treatment effects on RCG can be augmented by the presence of competing vegetation. Actively reintroduce replacement species. Refer to the reed canarygrass working group website (http://phalaris.pbwiki.com) for a list of species that may have potential to replace RCG.

7. **Apply herbicides under appropriate field conditions and with carefully selected additives** to ensure maximal effectiveness of the herbicide. Refer to *Plants out of Place 17:4-6 (2007)*.

8. **Regularly monitor results of herbicide applications and maintain detailed herbicide application records.** Look for trends, such as gradual declines in the degree of suppression achieved by herbicides. Determine if inclement weather, defective equipment, or improper application techniques could be responsible for poor herbicide performance. Consider an alternative herbicide formulation if extraneous factors influencing herbicide performance cannot be identified, and the desired level of suppression is no longer being achieved.

Acknowledgment
I am indebted to Jim Reinartz, Dale Secher, Art Kitchen, and Willis Brown for their input.

REFERENCES FOR REED CANARYGRASS CONTROL

Annen, C.A. 2007. Guidelines for selecting herbicide additives for Reed Canarygrass control. Plants out of Place 17:4-6.

Devine, M.D. 1997. Mechanisms of resistance to Acetyl-Coenzyme A Carboxylase inhibitors: A review. Pesticide Science 51:259-264.

Gengenbach, B.G., K.L. VanDee, M.A. Egli, K.M. Hildebrandt, S.J. Yun, S.M. Lutz, L.C. Marshall, D.L. Wyse, and D.A. Somers. 1999. Genetic relationships of alleles for tolerance to Sethoxydim herbicide in Maize. Crop Science 39:812-818.

Maier, A., A. Golz, H.K. Lechtenthaler, N. Meyer, and G. Retzlaff. 1994. Studies on the effects of different Cyclohexane-1,3-diones on *de novo* fatty acid biosynthesis in Poaceae. Pesticide Science 42:153-161.

Ostrem, L. 1988. Studies on genetic variation in Reed Canarygrass, *Phalaris arundinacea* L. Hereditas 108:159-168.

Sahramaa, M., L. Hommo, and L. Jauhiaineu. 2004. Variation in seed production traits of Reed Canarygrass germplasm. Crop Science 44:988-996.

Table of Contents

Plants out of Place
is a periodic newsletter distributed to the members of **IPAW**.

Send comments, suggestions, and articles that you think may be of interest to IPAW to the newsletter **Editor:**

Jim Reinartz
UW-Milwaukee Field Station
3095 Blue Goose Road
Saukville, WI 53080

Phone: (262) 675-6844
Fax: (262) 675-0337
email: jimr@uwm.edu

Join IPAW Today!

Invasive Plants Association of Wisconsin
P.O. Box 5274
Madison, WI 53705-0274

Membership Categories:

- $20.00 individual
- $100.00 organization/agency

For information about joining and a membership form, email: Membership@IPAW.org

Check out what IPAW is working on!
go to www.ipaw.org

we energies® we®

Production and distribution of this newsletter is made possible through a grant from *we energies*.

Invasive Plants Association of Wisconsin
P. O. Box 5274
Madison, WI 53705-0274
Return Service Requested

PRESORTED STANDARD
U. S. POSTAGE
PAID
EAU CLAIRE,
WISCONSIN
PERMIT NO. 1557

If there is no membership expiration date on your address label, you are not yet a member - please join!