INFORMATION TO ACTION:
Teaching Ecological IPM for Invasive Plants in Natural Areas

An interactive panel discussion at the
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ABSTRACT

Effective integrated pest management programs are site-specific and dependent on the invasive plant biology, site ecology, land use goals, and appropriate and available control methods. Teaching resource managers to design successful, ecologically-based IPM programs is a great need. During this interactive workshop, we will discuss methods of teaching ecologically-based IPM and adaptive management. The workshop will yield clear suggestions on how to improve teaching methodology and increase resource managers' understanding of ecological IPM for invasive plant management.

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Panel members:

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DISCUSSION SUMMARY

Information to Action: Teaching Ecological IPM for Invasive Plants in Natural Areas

Teaching adult-learners about invasive plants in natural areas was the focus of a lively two-hour, facilitated discussion among the panelists and audience. The teaching experience of the panelists ranged from college undergraduate instruction, to Extension work with farmers and ranchers, to training of federal agency personnel. Members of the audience also had a wide range of experience and knowledge.

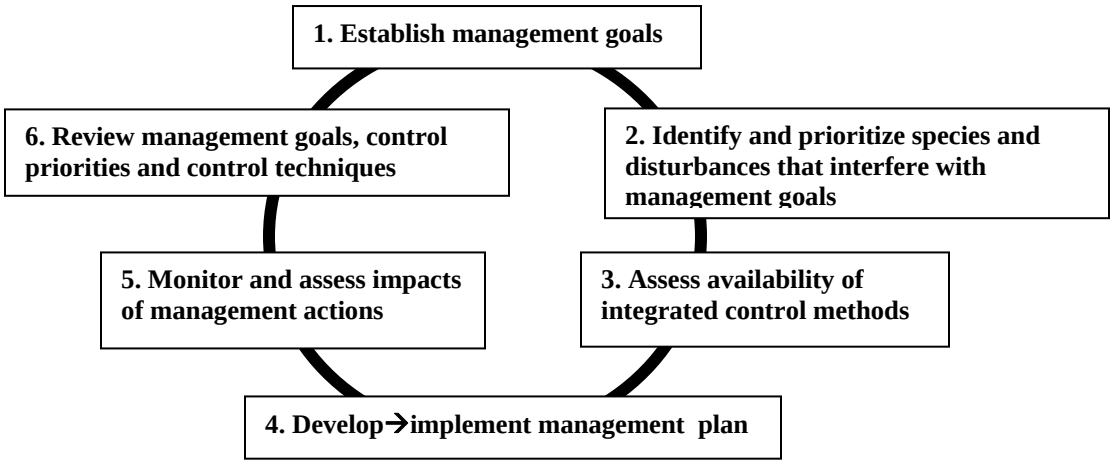
Discussions touched on the following areas:

- Some of the **difficulties in training** people to manage invasive plants include: convincing people that invasive plants are a problem; lack of understanding of ecosystem dynamics and invasive plant impacts; complexity of the multi-disciplinary issues involved; lack of time – for the trainer *and* the trainee; shortage of identification skills and taxonomists for native and nonnative plants.

- Successful techniques for **engaging adult learners** include: explaining how the information is relevant; integrating new information into existing (and accepted) knowledge; providing experience as well as theory; and engaging learners with visual, audio, and kinesthetic (physical) styles whenever possible. Key points should be restated repeatedly. Field tours effectively engage students in hands-on learning about biology and ecology.

  It was also pointed out that adults often enjoy having a group to share and compare their experiences with. Experiential "learning groups" that involve scientists and land managers have been shown to be time-consuming, but very effective. The knowledge and perspective of the land managers/farmers/ranchers is considered as well as that of the scientists. For the cohesion and sustainability of the group, it is important that it have a sense of growth and moving toward a goal.

- Teaching **ecological principles** rather than providing prescriptions for control is essential in training for ecological IPM in natural areas. Control prescriptions are problematic because management must be based around land use goals, current and desired vegetation, site ecology and hydrology, socio-political considerations, technical expertise of the land manager, budget, etc. Natural resource managers should be encouraged to analyze the needs and possibilities of each site and develop long-term management plans.



INTRODUCTION

Effective integrated pest management (IPM) programs are site-specific and dependent on the invasive plant biology, site ecology, land use goals, and appropriate and available control methods. Teaching resource managers to design successful, ecologically-based IPM programs is a great need.

During this interactive workshop, panelists and audience members discussed methods of teaching ecologically-based IPM for invasive plant species in natural (non-crop) areas. Topics included: 1) training needs; 2) techniques to engage adult learners; and 3) determining *what* to teach of this complex subject.

Facilitator Bruce Erickson posed questions to the panelists as well as the audience. In some cases, the audience split into small groups and recorded their responses on flipcharts, then reported back. The information below reflects ideas of the audience and facilitator as well as the panel.

TRAINING TECHNIQUES, SHORTFALLS, NEEDS, AND SUCCESSES

The group determined that training obstacles can be organized by the experience and educational level of the student/learner:

Introductory level

- Not convinced that invasive species are an issue
- Lack of interest in invasive species management
- Continual (annual) training needed for temporary, seasonal workers

Intermediate level

- Lack of understanding of current systems, site ecology of the past versus site ecology of the present
- Lack of relating present and future impacts to prioritizing species for management
- Missing the whole (ecosystem) picture

Advanced level

- Overall complexity – difficult to teach because IPM is multi-disciplinary and, in some cases, the variables (e.g., effects of climate, soils, other trophic levels, historic land uses) are simply unknown

Overall

- Lack of time for training (by the trainer *and* student/learner)
- Trainers may resist new ideas
- Ineffective techniques used to engage students/learners
- "Training" versus "learning"

A teaching method to help overcome the hurdle of a diverse and differently educated audience is to offer additional training sessions for introductory- and intermediate-level learners in conjunction with advanced learning programs. Optional labs can help students who need extra help or have additional interests.

Another technique to bring diverse students to a common understanding and encourage interaction is "controlled venting." Controlled venting can be sparked by asking a simple, provocative question, such as, "Who hates gophers?" Responses establish common ground among learners, encourage sharing, and often increase group interaction.

ENGAGING STUDENTS

The facilitator and panelists were all experienced teachers, primarily of adults. They have taught different kinds of learners, ranging from university students to farmers to agency professionals. The panelists shared responses to the question: ***What are the best teaching techniques for adult learners?***

Dr Steinmaus: Help students to understand how invasive plants are affecting their lives through impeding recreation, loss of water, loss of wildlife/game species, economic impacts, etc. Additionally, show them these effects through field tours, video, and other creative activities. When students understand impacts on them, they will have an incentive to take action.

Dr. Jordan: Facilitate learning "systemically." Keep in mind that viewpoints deserve respect because they are dependent on an individual's view of the world (this is "contextual relativism"). "Right" and "wrong" in some cases depends on your view of the world. However, there is a definitive "right" and "wrong" dependent on facts and historic models of cause/effect. Help the student understand the facts in their world.

Dr. Lee: Students must be trained in a style conducive to their learning ability. Offer a smorgasbord approach to learning. Include techniques that are hands-on and fun. Include case studies, field trips, and speakers with intriguing personalities to help energize the group. Outdoor tours aid students in "catching the passion" of ecology and biology of invasive plants. Offer handouts, visuals, and active participation. Interaction is a must. Students must be involved in the learning process.

Dr. Steinmaus: Field trips for plant identification familiarize learners with the plant community, both native and non-native. These field trips will also provide an opportunity to elucidate forms of disturbance that can encourage invasion or discourage native success . Utilize teaching techniques that are hands-on. Require learners to feel, smell, and scrutinize each species. "Learn by doing" helps classes to be more about the student rather than the teacher.
Another idea: Bring someone to the group who is "off the beaten track." Have him/her briefly present relevant information. Follow-up with discussion of "What was the implication of what you just learned?" "How will this knowledge change your opinion, actions, program, objectives?"

Dr. Erickson: Several important principles should be considered when addressing adult learners. Learners need to know why the information being presented is important to them and their invasive plant management programs. Adults learn best when they can integrate new information in to what they already know, and the information is directly relevant to help them

develop their IPM program. Experience over theory is a preferred learning method. Engage learners using visual, audio, and kinesthetic (physical activity) styles whenever possible.

Dr. Jordan: Establish "learning groups." In Minnesota, for example, a growers' network was developed by Extension for participants to share information that could help increase farm profits. Lectures were of no interest to this group. They were interested in interacting, resulting in coordinated innovation. The learning-group approach is extremely worthwhile and effective, however it is time-consuming with preparation and follow-up. A key to successful learning groups is a motivated facilitator who can foster a sense of growth and movement toward a goal. There is a difference between facilitating learning and transferring technology.

Other ideas included good teaching practices such as:

- Provide a good-quality, succinct presentation.
- Use hands-on learning, such as site visits/field tours or demonstration projects where learners can touch/feel/smell/get a rash.
- Teach about biological systems (rather than separate biological elements) so learners can understand IPM issues holistically.
- Establish a respectful atmosphere in which people are comfortable sharing their experiences and ideas.
- Aim for collaborative / interactive learning.
- State key points repeatedly (at least 7 times, according to research).
- Tell stories: success stories, case studies, etc.
- Create a shared sense of enthusiasm leading to empowerment, to encourage learners that their efforts are not hopeless.
- Create an atmosphere that sparks a "need to know" reaction.
- Provide a mechanism for learning from mistakes.
- Make it fun.
- Provide food.

DETERMINING WHAT TO TEACH

Prescription versus Concept Learning

Dr. Vollmer: When seeking advice, invasive plant managers often prefer a control recommendation in the form of a straightforward prescription. However, generalized control prescriptions are impossible to give for natural areas because management depends on land use goals, current and desired vegetation type, site ecology and hydrology, socio-political issues, technical expertise of the land manager, budget, etc. Generally, intermediate-level learners understand the basics of plant management, including biological, cultural, chemical, and mechanical control methods, as well as the concepts of prevention, early detection and rapid response, and the importance of educating the public and making them aware of the invasive plant. Often the issue for intermediate-level land managers is how to build *site-specific management programs* based on their knowledge. Teaching ecological concepts is necessary to

encourage invasive plant managers to think through their unique site and develop a long-term management plan.

What are the most important topics to teach?

Workshop attendees suggested that introductory curriculum must include convincing evidence for why it is important to manage invasive plants. Are invasive plants just filling a niche? To present a convincing argument, identify the differences between the functioning plant communities when invaders are present compared to a pristine plant community. Relate the community examples to the learner (Master Gardener, farmer, rancher, urban folks). If an impact can't be shown, it is difficult to convince the learner that management is needed. Often the problem is not recognized in the early stages when management is most cost-effective. Once the impact is evident, damage to the ecosystem may be too great or too costly to reverse.

Other ideas about important teaching topics were:

Introductory-level learners

- Invasive species versus native species and their interaction.

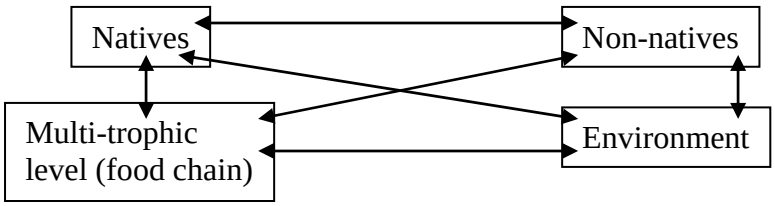


Figure 1. Break-out group with Dr. Jordan

- The definition of "invasive plant" as related to how these species can affect the balance of nature and interact over time and space.
- Impacts of invasive plants

Intermediate-level learners

- Ecology
- Biology
- Monitoring
- Control methods
- Collaboration with / communication to stakeholders

Advanced-level learners

- Whole picture, micro-objectives versus the big picture
- Adaptive management with emphasis on post-control activities
- Documenting impacts of invasive species

Overall

- Reaching target audience

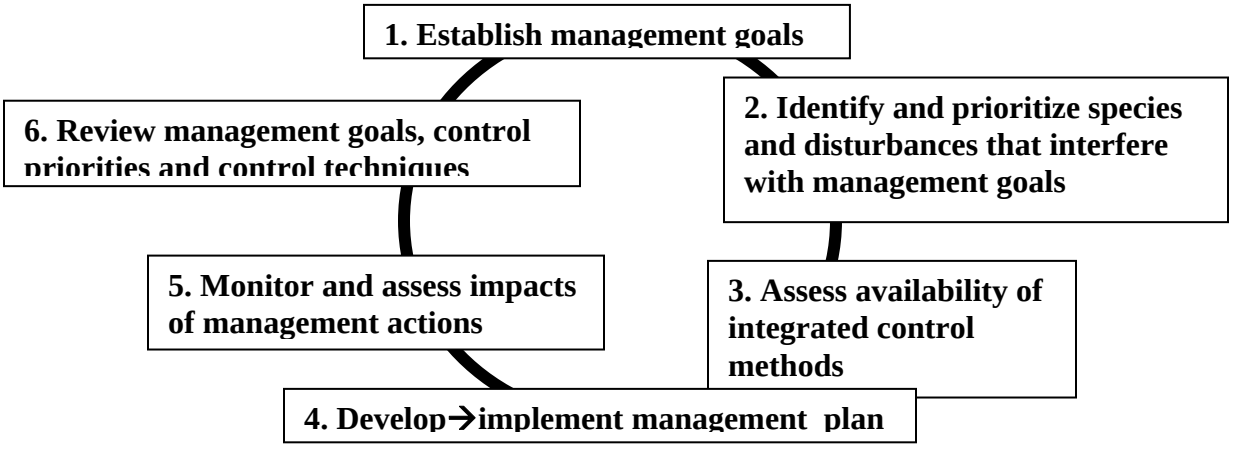
Dr. Jordan: When teaching IPM, ecological and biological functions of the system must be taken into account. A holistic approach is needed. Knowing the invasive and native plants that *may* establish is as important as knowing what is already established. Plant identification is extremely

important. It is important to teach what species *look* out of place. Sampling technique and precautions against destruction of endangered species should be incorporated into the curriculum.

Dr. Lee: It is important to make sure the student has the day-to-day correct principles for a knowledge base. The knowledge base is then integrated into the student's current management problem. Students should be encouraged to think through their specific management scenario. More often than not, the invasive plant manager wants immediate results. They need to be taught the broader picture, such as the system as a whole, to understand potential management outcomes and consequences.

Dr. Steinmaus: The Invasive Plant Management Process model will help students use a conceptual approach to ecological plant management (Figure 2). The student needs to think through several scenarios including: "What will replace the controlled species?" "How will that replacement occur: reliance on a native seedbank, hydroseeding, transplanting?" There cannot be a time gap between control and replacement" "Management goals should not necessarily be rehabilitate back to some native condition. The native condition may not be possible because the native condition may not be known or perhaps the native condition will not be a sustainable situation under current circumstances"

Figure 2. Invasive Plant Management Process



In relation to step #2, discussion identified several unique inputs that would influence management decisions. Inputs included funding issues of amount and longevity, agency priorities and policies, and species priorities. Students should notice that the "control" part of this Management Process does not begin until step #4. In relation to step #5, the term "monitoring" was clarified to encompass a wide variety of techniques. Monitoring is among the most important, cost effective methods in any IPM program natural or cultivated. What to monitor would be dependent on the land manager's objectives. Type of monitoring should take into consideration why you are monitoring. Be sure that monitoring meets the needs of the objective, in this case, "Were management actions successful or in need of adjustment?"

It was noted that each of the steps in Figure 2 is complex – administratively *and* socially. Also, the process is circular in that it will be a rare situation when a single cycle of this process will

result in successfully completing management goals. Students must realize that this business of invasive plant management is more often an ongoing process that will require less effort as each cycle passes.

Learning Objectives

Learning objectives are much more concrete at the Introductory and Intermediate levels. At the Introductory level, we strive for the student to understand the impacts of invasive species and the need for management. At the Intermediate level, basic principles of management are introduced with the importance of incorporating social and practical influences on the management program. At the Advanced level, teaching objectives may be more ambiguous, tailored and manipulated to meet the specific learning objective of the student. At this point, a "road map" may be more appropriate for the teacher versus a concrete objective.

Some educators/facilitators do not establish learning objectives. Rather, they help the learning group identify what it needs to know or do, they provide resources, then they help the group reach its self-determined goal.

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