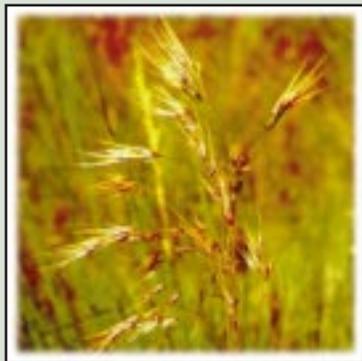


WESTERN RANGELAND NOXIOUS WEEDS

Collecting, Sharing and Using Information



Charles Valentine Riley
Memorial Foundation

COVER PHOTOGRAPHS

Top center: Yellow star thistle (J. Asher, Bureau of Land Management, DOI)

Left center: Leafy spurge (Agricultural Research Service, USDA)

Right center: Spotted knapweed (Weeds of the West)

Bottom left: Downy brome (John Randall, The Nature Conservancy)

Bottom right: Saltcedar (Weeds of the West)

A brief description of each photo follows:

Yellow starthistle – *Centaurea solstitialis*, was introduced from southern Europe and the Mediterranean region in the mid-1800s. It has become a serious weed pest throughout the western U.S. This weed now infests more than 20 million acres of rangeland in the western U.S. where it has greatly reduced forage production for livestock and disrupted natural ecosystems.

Leafy spurge – *Euphorbia esula*, is a Eurasian perennial that was brought to northeastern North America as an ornamental in 1829. Since then, it has spread to some 3 million acres in 29 states. Leafy spurge can reduce land values by interfering with livestock grazing lands, wildlife habitat and associated recreation, rangeland plant diversity and native plant reproduction.

Spotted knapweed – *Centaurea maculosa*, is a native Eurasian perennial that arrived in the U.S. through contamination of alfalfa and soils in ballast water in the late 1800's. To date, it has been identified in over 326 counties in the western U.S. and is present in every county of Washington, Idaho, Montana and Wyoming. Spotted knapweed can increase soil erosion and reduce biodiversity, wildlife and livestock forage.

Downy brome – *Bromus tectorum*, often called cheatgrass, was probably independently introduced on several occasions from southwestern Asia. Its adaptive nature allows for a broad ecological scope, including the sagebrush steppe and Pacific bunchgrass region, where it dominates more than 100 million acres, the semi-desert of the southern Great Basin, the coniferous forest zone of the Rocky Mountains and localized areas of eastern Montana and Wyoming. Through facilitation of wildfires and competitive exclusion of native species reproductions, cheatgrass has substantial adverse effects on rangeland vegetation and the wildlife it supports.

Saltcedar – *Tamarix spp.*, were introduced to the U.S. in the early 1800's from Asia as ornamentals for stabilizing eroding stream banks or to use as wind breaks. Now saltcedar occupies over 1 million acres of arid and semi-arid areas in the southwestern U.S. Its successful invasion of nearly every drainage system in this area has led to a decline in native riparian plant populations by limiting the number of suitable germination sites and increasing salinity.

WESTERN RANGELAND NOXIOUS WEEDS
COLLECTING, SHARING AND USING INFORMATION
Proceedings of a Workshop

Phoenix, AZ
September 6-7, 2000

United States Department of Interior
United States Department of Agriculture
Riley Memorial Foundation

Published by

Charles Valentine Riley Memorial Foundation
2229 Countryside Drive
Silver Spring, MD 20905-4520

September 2001

In collaboration with the

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1849 C Street, NW
Washington, DC 20240

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Paper copies may be purchased from:

U. S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Accession No. PB2001-107838

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Acknowledgements

The unselfish personal contributions by the members of the program advisory committee and the workshop participants are gratefully acknowledged as is the direct financial support and in-kind contributions provided by the sponsors and the substantial in-kind contributions provided by a number of organizations.

Special appreciation is extended to Erin Grossi, Linda Wadley and Valerie Berton for their assistance in collecting, assimilating and editing the proceedings.



DIRK KEMPTHORNE
GOVERNOR

August 17, 2001

As Idaho and the west were discovered, new settlers and explorers developed an enthusiasm for the land they encountered. Today, Idahoans have a kinship with our land. We work to the best of our abilities to manage it for our diverse population's needs. Our eager spirit for the land creates a desire to govern Idaho's treasure for the present, as well as for the future.

The intertwinement of our lives and the land creates a sense of pride and ownership. In recent years much of our western land have come under a new threat from invasive and noxious weeds. Alien weeds are quietly destroying the value and character of the land. As stewards who earn our livelihood from the land, or as outdoor enthusiasts who seek pleasure, we must act decisively to protect it. Idaho and other states must take responsibility to reverse the negative affects of invasive species.

I am pleased that this workshop came together to share concerns and successes with public and private stakeholders. Continued success in combating the scourge of invasive species requires diligence of all who value these unique lands. The onslaught of foreign species is an imperative environmental issue facing Idaho today. I was appointed by Secretary of the Interior Bruce Babbitt, to the National Invasive Species Advisory Committee, which brings non-federal experts and organization leaders together to develop recommendations for federal invasive species management efforts.

Commitment alone is not enough. We cannot manage what we cannot measure. The magnitude and severity of the invasive species issue has not been adequately examined. This workshop has provided an early opportunity to begin integrating the many different tools used to quantify noxious weed encroachment. Our expectation is that we will soon be able to describe with accuracy the extent of the problem and the rate at which invasive species are spreading. We will be able to gauge the progress of our prevention, containment, and control efforts.

Using information to measure and define problems is a starting point. This workshop has provided pertinent information for those groups and agencies that wish to address this issue. Human and fiscal resources must be committed at the federal, state, tribal, corporate, and private levels. We must bring noxious weeds under control before irreversible damage occurs.

The attached workshop proceedings "*Western Rangeland Noxious Weeds: Collecting, Sharing, and Using Information*" will be of great value to you, as you start the important work of locating and mapping invasive species infestations.

Sincerely,

A handwritten signature in black ink, appearing to read "Dirk Kempthorne", written over a large, stylized initial "D".

DIRK KEMPTHORNE
Governor

DK:em

EXECUTIVE SUMMARY

Western rangeland weeds such as yellow starthistle, leafy spurge, Canada thistle and Russian knapweed are causing tremendous losses to agricultural industries, including both crop and livestock production, and to environmental resources on private lands. Concurrently, many public lands managed by federal agencies are being steadily invaded. As a result, these lands held in the public trust are experiencing reductions in commodity yields, recreational opportunities, biodiversity and ecosystem function.

Selected Federal Programs. Over 20 federal agencies are involved with invasive species; nine of these agencies with specific interests in western rangeland weeds were represented at the workshop. Three agencies have responsibility for managing invasive plants on especially large amounts of public land. Tens of millions of acres infested with noxious weeds are scattered among the 264 million, 192 million and 83 million acres under the purview of the Bureau of Land Management (BLM), U.S. Forest Service (FS) and National Park Service (NPS), respectively. These agencies all have programs specifically targeted towards invasive plants, with BLM and FS having major responsibilities on rangeland. However, grazing is also permitted on over 100 NPS units and invasive plants are of concern on most units. Each agency has an inventory and mapping program with emphasis being placed on the unit, state and regional levels by NPS, BLM and FS, respectively. However, all three agencies have plans for some information to be integrated into national agency databases, and realize that sharing detailed weed inventory, treatment and monitoring information with local and state governments is essential to have efficient, on-the-ground weed management programs.

State Inventory and Mapping Programs. Sixteen contiguous western states that are members of the Western Governors' Association share common interests in the management of noxious rangeland weeds. To address the significant economic and environmental impacts inflicted by these invasive, nonnative species, western states have designed and are implementing a variety of

state-level programs. Presently, three states (California, Idaho and Montana) have developed and are actively implementing statewide noxious weed inventory and mapping programs. Colorado is just beginning its program and several other western states are actively investigating opportunities. Existing state inventory and mapping efforts share a number of similarities but also exhibit unique characteristics that address the conditions and needs of the individual states. As these programs demonstrate their capacity to address management needs, it is likely that other western states will incorporate mapping efforts into statewide weed management programs. Ultimately, such efforts may help to catalyze a truly regional approach to weed control throughout the West.

Selected Projects. Three local weed mapping projects and three multi-state invasive pest projects provided important insights into the challenges and successes associated with such efforts. A combination of early involvement of landowners in planning data collection efforts and technical assistance from outside the county or district was key to development and use of local mapping efforts. In the three multi-state projects reviewed, valuable leadership from federal agencies was evident. The Cooperative Weed Management Area (CWMA) component of the Greater Yellowstone Ecosystem involves four federal agencies, three state agencies, at least five counties, and some local management areas. Mapping in the CWMA, much of it fully computerized with assistance particularly from the NPS, is becoming an increasing part of setting management priorities, recording treatments and evaluating progress. In the two other multi-state projects, a regional database on exotic plant distributions and an aerial detection survey on insects, disease, and other disturbances to forested ecosystems provided useful perspectives on methodologies that have other applications.

Overarching Data Issues. Discussion of data standards, quality assurance and accuracy and data sharing provided workshop participants with a range of opportunities from which they might select specific "pieces" that could be useful to

individual and/or group efforts. Efficiency of collection, processing and sharing of data can be substantially enhanced through the use of a common language that can be defined through standards. The standards developed under the auspices of the North American Weed Management Association provide such a common language. The use of this common language is being encouraged and accepted by many of those who are collecting data on invasive weeds. However, how that common language will be used will vary since the scope and accuracy of data will depend on intended use. For instance, land owners and weed managers often will need precise information as to location and density, whereas regulators may be more interested in distribution over large areas and changes over time. Use of a common language is particularly important for sharing data in electronic databases. The desirability of sharing data is widely recognized, but the development and acceptance of protocols for sharing of data, particularly through extensive integration of databases, is in its infancy. A range of issues related to privacy and ownership as well as the availability of technology and resources will determine what data can and should be shared.

Non-Federal Stakeholders. Six non-federal stakeholders, representing agricultural interests and state fish and game agencies, interacted with participants throughout the workshop. The message was clear that they agreed broadly about the serious problems being caused by invasive plants and other invasive organisms and that they supported mapping invasive weeds if it is “done right.” However, views expressed indicated that there was a critical need to clarify the circumstances under which the federal government is likely to take action or encourage others to take action. The concerns about actions of governments, particularly the federal government, varied from “some” concern to a strong desire for farmers and ranchers to receive “rock solid protection.” Although adequate representation existed to identify concerns of non-federal stakeholders, representation was not adequate to quantitatively access attitudes.

Issues, Impediments and Opportunities. In-depth discussions in four breakout groups tended to coalesce around three issues:

- Private landowner involvement, including private users of public lands
- Developing mapping capacity
- Privacy

A wide range of impediments and concerns as well as opportunities for dealing with those impediments and concerns were identified for each issue. Examples of opportunities for removing impediments include increased involvement of the private sector at the local level, additional technical assistance with mapping and developing trust by involving landowners in the collecting and use of data. Also, there appears to be a need to establish unambiguous exemptions to the release of data to third parties by federal and state agencies that will prevent, directly by name or indirectly by geographical description, identifying individual owners of property. Also, adopting a scale for reporting data that will avoid identifying individual owners can be particularly useful in dealing with privacy concerns. The guidance provided prior to the workshop that “... we always have to strike a balance between the resources that we are expending on data gathering, data management, data access and data use with the need to get stuff done on the ground.” ... proved to be highly relevant to discussions in the breakout groups as well as throughout the workshop.

Principles and Leadership. The need to move forward in addressing how to apply technology, to involve all stakeholders and to understand their needs and concerns was emphasized in the concluding observations. Operating principles and leadership for moving forward were highlighted. Three operating principles include:

- Use processes that already have been identified
- Involve the public
- Remember one size does not fit all

Key elements that must be provided by leadership are:

- Vision
- Alignment (moving in the same direction, but not necessarily in lock step)
- Motivation

Outcomes, Needs and Suggestions. A major outcome from the workshop was the extensive exchange of information among workers with

similar interests. Some were synergised to improve what they were doing; some refined their plans to initiate electronic-based programs; and some began to learn about the many possibilities for the first time.

Many opportunities and needs for improving programs were identified. The two greatest overall needs were increased capacity at all levels and increased inputs from non-federal stakeholders. Carefully designed mapping efforts can contribute to more effective utilization of resources for preventing and controlling noxious weeds. However, it also was clear that, with hundreds of millions of acres of land threatened and tens of millions of acres already infested, the current total capacity is not adequate to deal with the problem. Total capacity needs to be increased to take full advantage of mapping and related database efforts. Some approaches to building capacity include:

- Increase emphasis on the development of CWMA's to increase the interaction among local, state, tribal and federal agencies
- Expand capability to conduct field surveys and produce associated computerized maps
- Increase technical assistance to local programs and to on-the-ground federal personnel
- Provide additional cost-sharing for local mapping programs from state and/or federal sources

- Streamline systems so that there are more compatible databases so that sharing and integration of data are more feasible
- Utilize at the operational level a minimum number of basic elements from uniform standards
- Develop or refine state and federal agency strategic and implementation plans to provide more specific guidance for on-the-ground actions
- Increase resources available at all levels

In addition to encouraging increased inputs from non-federal stakeholders at the local level, there is a need for an overall quantitative understanding of how users of both private and public lands view noxious weeds and how they should be managed. Specifically, the needs in question could be addressed by the following actions:

- Conduct a quantitative professional survey of users of public and private lands in the western states to assess attitudes and of state agencies and state-level interest groups to assess their activities and interests
- Analyze results of the surveys to develop guidance for federal, state, tribal and local organizations and develop policy options, including possible incentives, for improving the management of noxious weeds on private and public lands

INTRODUCTION

Western rangeland weeds such as yellow starthistle, leafy spurge, Canada thistle and Russian knapweed are causing tremendous losses to agricultural industries including both crop and livestock production. Concurrently, many public lands managed by federal agencies are being steadily invaded. As a result, these lands held in the public trust are experiencing reductions in commodity yields, recreational opportunities, biodiversity and ecosystem function. Consequently, every state in the West has noxious weed management programs that endeavor to enhance the financial and technical resources available for weed management and to assist in coordination across the diverse public

and private land ownership mosaic common to the region. The opportunities for increasing cooperation and collaboration on information systems associated with western rangeland weeds are perhaps unique because of these circumstances. Thus, western rangeland weeds were selected by the Riley Memorial Foundation for special emphasis in exploring ways to enhance collecting, sharing and using information on invasive species.

The Western Rangeland Noxious Weeds Workshop was organized to bring together state weed coordinators, federal weed management specialists, weed mapping systems administrators, represen-

tative local weed management supervisors, selected non-federal stakeholders and others concerned with the management of invasive plants in western rangelands on both private and public lands. The purpose of the workshop was to provide opportunities for participants to:

- Enhance the understanding of weed management programs at all levels and of the status of mapping and databases
- Explore existing mapping systems that enhance weed management efforts
- Develop a more extensive understanding of how local, state and federal mapping systems are or will be implemented in the future
- Discuss some of the complexities of mapping efforts including privacy concerns, data quality and limitations on data gathering at the local level
- Confer among colleagues about the possibilities of sharing mapping data across jurisdictional boundaries to develop powerful management tools
- Review the principles associated with organizational function and collaboration

As the 19-member program advisory committee began to design the workshop program, the need for some refinements in terminology became apparent. Although the term “invasive plant” is accurate, the term “noxious weeds” was preferred as being more meaningful, particularly at the local level. Also, although distributional databases are very close to computerized mapping, from an operational perspective the program committee chose to design the program around mapping and inventories to be inclusive of what is happening broadly. The committee also chose to explore how distributional databases and computerized mapping is being used and can be used to support operational programs. Also, immediately before the workshop, participants were provided with some quotes from the Invasive Species Stakeholders Roundtable held on April 26, 2000, in Washington, DC, (<http://www.invasivespecies.gov/other/stkhldr.pdf>) as examples of private stakeholder inputs specifically related to collecting, sharing and using information:

“We need to make sure that the level of data that we are gathering and putting into databases ... is

always commensurate with the use that we are going to be putting them to.” *Paul Gertler, Western Governors’ Association*

“...we always have to strike a balance between the resources that we are expending on data gathering, data management, data access, data use with the need to get stuff done on the ground.” *Tom Hebert, Capitolink, LLC*

“Simplistic or user-friendly databases on the internet are not necessarily a virtue. They can lead to misinformation, disinformation or misinterpretations.” *N. Marshall Meyers, Pet Industry Joint Advisory Counsel*

Persons representing nine federal agencies, 18 state agencies and tribes, eight local jurisdictions and eight different private sector organizations and interests participated in the workshop (Appendix A). Over 30 formal presentations were made; four breakout groups provided the opportunity to have in-depth interactions on key issues; and 13 posters, displays and demonstrations (Appendix B) served as the focal point for an evening reception that provided a venue for extensive informal discussion. Twenty-three database and mapping resource persons were identified who are in a position to provide information on databases and mapping and identify additional resource persons (Appendix C). Representatives of organizations from production agriculture participated in the opening and mid-day sessions. A panel of three representatives from the private sector concluded the workshop, following reports from the breakout groups. A total of 73 persons participated in the workshop (Appendix D).

The range of topics covered by presentations, panels, posters and in breakout groups included (1) the Invasive Species Advisory Committee, (2) federal programs, (3) state programs, (4) selected special projects, (5) standardizing, collecting, processing and sharing data, (6) views from non-federal stakeholders, (7) a review of issues and opportunities and (8) concluding observations. The information exchanged at the workshop is summarized in these proceedings and includes a final section on outcomes, needs and suggestions.

A VIEW FROM THE INVASIVE SPECIES ADVISORY COMMITTEE

Nelroy Jackson

Invasive Species Advisory Committee

The Invasive Species Advisory Committee (ISAC) consists of 32 members (<http://www.invasivespecies.gov/council/advisory.shtml>) appointed by the U.S. Secretary of Interior. ISAC includes broad representation from industry, scientific disciplines, academics, extension personnel, managers, as well as technical personnel. Why are invasive species important to such a broad range of interests? Invasive species are a threat to biodiversity. They are particularly important in the western United States in terms of fire prevention, water recovery, benefits to wildlife and grazing for livestock. Additionally, invasive species cost a lot of money. The economic problems associated with invasive species are increasing due to their spread by travel, trade, tourism and transport. The world is very different from what it was 10 or 20 years ago in terms of the volume of people who are moving by car or airplane and the amount of trade among states and countries.

What is important to ISAC? The concerns of ISAC can be summarized in the form of a slogan, "Do the doable." Let's take the resources that we have and focus them on getting things done, and let's focus as well on increasing resources and cooperation. No single entity can do this job alone. It takes the melding of federal, state, county, non-government organizations and private efforts. Communications on invasive species need to be substantially increased within the federal government starting at the highest levels – the Executive Office of the President and the Secretaries of the most concerned Departments – and throughout the more than 20 federal agencies (<http://www.invasivespecies.gov/other/org.shtml>) concerned with invasive species. In addition, we need communication between land managers and those academics that are composing the databases. Thus, the important thing is communication in order to "Do the doable."

OVERVIEWS OF SELECTED FEDERAL PROGRAMS

The nine federal agencies represented at the workshop were Bureau of Land Management (BLM), U.S. Forest Service (FS), National Park Service (NPS), U.S. Geological Survey (USGS), Agricultural Research Service (ARS), Fish and Wildlife Service, Animal and Plant Health Inspection Service, Natural Resources Conservation Service, and U.S. Air Force. All of these agencies have specific interests and responsibilities related to invasive plants. However, three of them perhaps have the greatest responsibility for managing invasive plants on public lands. Tens of millions of acres infested with noxious weeds are involved among the 264 million, 192 million and 83 million acres under the purview of BLM, FS and NPS, respectively. Therefore, representatives from these agencies were asked to provide overviews of their agencies' programs with special reference to mapping, inventories, and databases.

Bureau of Land Management

Tim Reuwsaat, Gina Ramos, and Kathie Jewell,
Bureau of Land Management

Damages to property and the cost to treat invasive species rise every year. Weed inventory and mapping data are important so that we can immediately identify and attack invasive weed problems in order to lower costs. As part of BLM's Partners Against Weed Strategy Plan (<http://www.blm.gov/education/weed/paws/>) BLM's overall objective is to control and manage the presence of weed infestations on public lands and prevent any future infestations. In FY-2000, BLM spent \$7.2 million to inventory, monitor and treat noxious and invasive weeds on BLM-managed lands. By the end of FY-2000, BLM had inventoried nearly 7 million acres of public lands for weed occurrences. By 2001, BLM expects to complete an inventory for weed

occurrences on another 7 million acres. Lands inventoried to date for weeds represent only 12 percent of the 264 million acres of public land that BLM manages. We should be inventorying three times as much as we are annually.

Approach. Tools such as mapping and inventory are only part of the integrated approach to manage invasive and noxious weeds. A successful strategy to accomplish our overall objective must include an effective inventory and mapping system populated with reliable data. A dependable inventory is essential to set priorities for weed treatments and to make the most efficient use of resources. Therefore, we must continually discuss data issues, common data standards and data collections as we carry out the comprehensive inventory and mapping for invasive species. As a cooperator with county, state and other federal agencies, BLM is committed to detect, report, control and manage invasive species in a boundary-less environment. From a national perspective, one step is to work with FS and other agencies in the Department of Interior to use the same inventory standards and protocols. BLM is already employing the standards developed by the North American Weed Management Association (NAWMA). BLM is seeking agreement on using the same definitions and standards for reporting the variety of weed treatments that occur by each agency. BLM's long term goal is to share and exchange information between the federal agencies. We also are looking for ways to house that information so that it is available to private, local, state and federal entities. By doing this, we are assured that there is a common format for evaluation, assessment and interpretation for all of the weed inventory and monitoring information that is being reported among federal, state and local agencies.

Inventory, Treatment and Monitoring Information. Currently, inventory activities are underway by BLM in each state. Primary computerized database and mapping efforts in cooperation with state and local efforts are ongoing in the states of Idaho, Montana and Oregon. By the end of 2002, BLM will deploy a bureau-wide database system that will link BLM field, state and

Washington offices. The database system also will include web-based entries for BLM cooperators and be accessible for their needs. BLM's goal is to be able to exchange weed inventory, treatment and monitoring information with the public, county, state and federal agencies. Additional information on the BLM program is available at <http://www.blm.gov/weeds/>.

The Forest Service Perspective

James Olivarez and Rita Beard,
Forest Service

FS has been involved in the fight associated with noxious weeds for over 20 years. However, an overall updated agency approach to dealing with noxious and nonnative invasive plants was developed and published in 1998 in "Stemming the Invasive Tide" (http://www.fs.fed.us/r6/weeds/fs_strat_doc.pdf). In this particular discussion, we will deal primarily with noxious weeds efforts in the National Forest System (NFS). Six of the eight NFS regions oversee lands in the western states and each region has a noxious weed coordinator – with two or three of these regions most active in noxious weed management. Our best estimate is that there are about 4 million acres of rangeland infested with noxious weeds in the NFS. About \$5 million are allocated annually by NFS for its noxious weed program. With limited resources, allocation of resources between inventories and mapping and weed control is a real challenge. However, inventory and mapping are essential, since the resulting information is one of a three-component budget allocation formula that the agency operates under. Thus, inventory and mapping not only play an important role in how funds are allocated within the agency, but also provide information that we want to share with Congress and our partners.

Approach and Status. A key emphasis in the NFS strategy in dealing with noxious weeks is partnerships. That emphasis was launched in the early 1990's with the NFS as a charter member in the greater Yellowstone effort. The memoranda of understanding that we initiated and instigated have become models for other efforts and have led to subsequent guidelines for use with our

other partners like the BLM as well as state agencies. The Yellowstone effort also has provided the basis for some of the mapping that is being done now in other areas and in other versions of mapping and standards that are being pursued.

Computerized inventories and mapping with extensive integration of databases and the inclusion of treatment information is our goal. Further, FS needs a corporate database as well as operational databases at the local level that can readily be shared with partners. The FS corporate database is intended to provide a total natural resource information system known as TERRA, which is just getting past the development stage. This database has a vegetation and soils module within which we would like to incorporate our weed inventory and mapping data. Efforts are underway to draw heavily on the NAWMA standards and to integrate them into the vegetation and soil module of TERRA and to implement the use of these same standards in collecting data that might be managed at the forest or regional level or by partners. As FS mapping and inventory efforts on noxious weeds are improved and expanded, we fully intend for the standards and databases to be useful to the states and the private sector as well as the federal agencies, but the information and data must also be compatible with internal FS reporting needs.

Currently, a variety of weed inventory systems exist in FS, including a lot of variable spreadsheets. However, perhaps 40 percent of the forest managers have Geographical Information System (GIS) available and national inventory and monitoring protocols have been developed and are being implemented.

Future Considerations. As we look to the future, we will place increased emphasis on implementing uniform standards, automation in collecting and processing data, efficient sharing of data at the local and state levels and contributions to the FS corporate database. Also, the pesticide database maintained by FS will be upgraded and consideration will be given to adding release and distribution of biocontrol agents to one of the FS databases. Additional information on the FS program may be found by searching <http://www.fs.fed.us/>.

National Park Service

Ron Hiebert,
National Park Service

NPS is very concerned about invasive species. Weeds are considered one of the top threats to the natural resources that NPS is charged to protect. This includes weeds in rangelands. Although grazing is not permitted in most parks, grazing is authorized by enabling legislation in about 100 units. Service-wide efforts to map, inventory and manage invasive plants in parks thus include western rangelands.

General Approach. Noxious weed management in western rangelands is a priority for NPS. Although NPS does not have a service-wide programmatic weed inventory and mapping program, individual parks are developing programs for weed inventory, mapping and management. There are many examples of excellent park-based programs including those in the Greater Yellowstone Ecosystem and Theodore Roosevelt National Park.

All park managers are interested in new tools and procedures to help them manage weeds. They recognize the importance of cooperating with their neighbors. They recognize the value of quality inventory and mapping data and do support sharing information and working with other agencies, states, counties, and private landholders. What they want and expect from regional and national offices is for them to listen to their needs and to be advocates for obtaining the needed technology and funds. NPS relies on the Biological Resources Division (BRD) of the USGS and universities, through the newly created Cooperative Ecosystem Studies Units, for needed research, and protocol and tool development to help us do the job of weed management more effectively and efficiently.

Activities and Plans. NPS has developed a strategic plan for invasive species management. That plan, among other things, calls for the inventory and monitoring of nonnative plants. Specific goals and activities include:

- *Working with the service-wide inventory and monitoring program to initiate inventories to gather information needed to make invasive*

plant management decisions. This is in progress as a major part of the Natural Resource Challenge in NPS. A \$7.3 million increase to the NPS budget was approved by Congress in FY-2000 to conduct biological inventories in parks. A program is underway to compile inventories of all vertebrates and vascular plants in all NPS sites with significant natural resources by 2004. A national database (NPSpecies) has been developed. Data fields will indicate if a species is native or nonnative, when it was observed and exact location, if known. So, as part of this effort, we should, at a minimum, have an inventory of the presence of nonnative plants that can be mapped within all parks. The data will be available to the public on a web site. In addition, if a park manager asks for distribution and abundance surveys of specific weed species, and funds are available to support the work, this more detailed information will be gathered.

- *Developing standards for nonnative plant inventories that would be used by all federal land management agencies.* NPS has funded projects and worked with BRD to develop inventory and mapping protocols. ARS is a key cooperator in the leafy spurge control efforts in the Dakotas. Also, NPS is an active participant in the development of mapping and data standards by NAWMA.
- *Supporting development of remote sensing and GIS technologies.* An excellent example of the application of new technologies is the cooperation of ARS, National Aeronautics and Space Administration and NPS in the mapping of leafy spurge in North Dakota.
- *Creating partnerships with adjacent landholders and with county weed districts to share resources in the preparation of landscape inventory maps.*

This is being done in many areas. Parks are active in weed management areas in regional weed councils.

- *Establishment of a national invasive species coordinator.* The coordinator has been employed.
- *Establishment of four invasive species control teams with plans for more teams.* One of these teams will be operating out of Carlsbad Caverns National Park and will serve multiple parks in the Southwest.
- *Development of a decision support system to help managers decide which weeds should be given priority for management.* The system is called the Alien Plant Ranking System (APRS) and includes databases on invasive species characteristics, control and fact sheets. The system is automated and web based (<http://www.npwrc.usgs.gov/resource/2000/aprs/aprs.htm>). The system is now being combined with the Southwest Exotic Mapping Program (SWEMP) to form the Southwest Exotic Plant Information Clearinghouse. The web site will be based at Northern Arizona University.

Future Considerations. Biological Inventory within the National Resources Challenge will provide data on the presence and absence of weeds in all national parks. Multiple parks have active cooperative weed management programs and these are expected to increase in number. Also, with the establishment of a service-wide invasive species coordinator and the expected additional invasive species control teams, weed inventory, mapping and management efforts are expected to increase significantly. Additional information on the NPS program is available at <http://www.nps.gov/redw/exo-link.htm>.

AN OVERVIEW OF STATE INVENTORY AND MAPPING PROGRAMS

Eric Lane, Colorado Department of Agriculture
Glen Secrist, Idaho Department of Agriculture

Sixteen contiguous western states that are members of the Western Governors' Association share common interests in the management of noxious rangeland weeds. To address the significant eco-

nomie and environmental impacts inflicted by these invasive, nonnative species, western states have designed and are implementing a variety of state-level programs. Necessarily, these programs

may differ considerably to suit the specific circumstances and needs of each state. Factors such as the percentage of federal public lands, available financial resources, local industries and stakeholders help to shape each state's program and the services it provides to citizens and local government as well as public land management agencies. Regardless of specific differences in structure and function, each western state has a noxious weed management program charged with administering a state noxious weed law that may restrict the sale and distribution of specified species and typically provides for mandatory treatment of identified noxious weed species. In addition, they are developing multi-stakeholder working groups to address noxious weed issues and are drafting strategic plans that provide a framework for future action. These programs, usually located in the state departments of agriculture, endeavor to enhance the financial and technical resources available for local, regional and statewide weed management efforts and provide coordination across the diverse public/private ownership mosaic that characterizes the states of this region.

Role of Inventories and Mapping

Increasingly, states are developing and implementing programs to inventory and map noxious weeds as part of their efforts to enhance the technical resources available to local communities. More importantly, such programs may also provide a critical decision-support system that facilitates the development and management of cooperative noxious weed management efforts across the landscape of public and private lands. As a source of objective information regarding the location and severity of targeted noxious weed species, such mapping programs can provide local governments and other partners (state and federal land management agencies, local non-governmental organizations, private citizens) with a means to understand the distribution of targeted species across a local landscape. Developing a shared understanding of this distribution is often a pivotal factor that allows a community to collectively design and implement an effective management plan for its lands, one that incorporates appropriate levels of management (eradication, containment, suppression) for every landowner depending upon the

current distribution of targeted species and the community's objectives relative to those species.

As a means of providing technical support to local communities and coordinating management efforts efficiently and effectively across jurisdictional and property boundaries, the value of such inventory and mapping programs has not been lost on western states. Consequently, there is wide interest among the states in the practical application of inventory, survey and mapping approaches that benefit noxious weed management efforts. However, as a few pioneering western states have learned, there are a number of considerations that may affect not only the effective development and implementation of such programs but also the effective management of weeds on both public and private lands.

Data Standards

In order to share information across jurisdictional and property boundaries, individuals and organizations that wish to map noxious weeds must agree upon common data standards so that like information can be collected and exchanged efficiently. The array of data that can be acquired when mapping noxious weeds is staggering as well as the methods by which individuals collect and record such information. Of particular concern in recent years has been the methods by which the large federal land management agencies, especially the U.S. Forest Service and Bureau of Land Management, intend to collect inventory and mapping data. Historically, federal agencies have tended to pursue very individualized courses of action and develop databases that fit agency-specific needs but not the needs of the broader community of federal natural resource managers or the states in which data are collected. Similarly, county weed supervisors have also tended to collect such information in a vast array of different ways, resulting in data that are very different and hence difficult at best to share and collectively understand. States have quickly realized the need for data standards that will allow diverse partners to share compatible inventory and mapping data. The development of the North American Weed Management Association's core data standards may provide a solution to this thorny problem.

Scale

As most individuals with mapping and weed management experience understand, mapping is a tool to be used in service of achieving one's management objectives. If one's mapping efforts are not thus aligned, either too little data will be gathered to provide the information sought or too much data will be gathered. Both result in a loss of time spent gathering data of little use. However, the data needed to help make management decisions typically varies according to scale. Consequently, the data needed by the state to facilitate management at a regional or state level differs from that required by a landowner or manager to implement management actions at a property-specific level. States have struggled with the need to balance local needs with state or regional needs. Careful consideration of the use to which data will be put is required in each state if states are to provide useful guidance to local weed managers but also assist in the coordination of watershed or statewide efforts.

Non-Federal Stakeholder Concerns

Ongoing and developing weed inventory/mapping efforts have revealed a variety of concerns related to the collection, management and presentation of data that involve private lands. To varying degrees, private landowners in these states have voiced concerns about sharing data about their

property's condition. Given the acrimony that other natural resource issues, such as threatened and endangered species, have caused among private landowners and the government, mapping provides an opportunity to either aggravate such concerns or to help resolve them through a more productive relationship.

Status of State Inventory and Mapping Programs

Presently, three states (California, Idaho and Montana) have developed and are actively implementing statewide noxious weed inventory/mapping systems. In addition, Colorado is just beginning its program and several other western states are actively investigating opportunities to develop programs similar to those already in existence. Like the state weed management program of which they are a part, existing state inventory/mapping efforts share a number of similarities but also exhibit unique characteristics that address the conditions and needs of the individual states. As these programs demonstrate their capacity to address the management needs of local communities and to develop more coordinated, statewide control efforts, it is likely that other western states will incorporate their own mapping programs as an integral component of a statewide weed management program. Ultimately, such efforts may help to catalyze a truly regional approach to weed control throughout the West.

SELECTED STATE INVENTORY AND MAPPING PROGRAMS

Almost any jurisdiction involved with noxious weeds uses maps of one kind or another, and most local jurisdictions that have weed management programs are preparing maps manually, with a limited number of local jurisdictions beginning computerized mapping efforts. The need for inventories and mapping systems to support weed management efforts is becoming increasingly evident with the every-increasing magnitude of the weed problem on rangeland. At least three western states are active in developing statewide mapping programs and others are initiating such efforts. A review of three of the more advanced efforts that are underway in Montana, Idaho and California

may provide useful models for others and should provide some insight of how information from these programs may be shared with other jurisdictions.

State of Montana

Barbra Mullin,

Weed Coordinator, Montana Department of Agriculture

The Montana mapping program began in the mid-1980's, when land managers, weed districts and landowners recognized the need for mapping standards that would allow easy comparison of data

compiled from different entities. Standards were developed that included the type and scale of base maps, how to designate infested areas on maps, symbols for percent cover and codes for weed species. These standards were not widely adopted and used until they were incorporated into the "Guidelines to Development of Weed Management Areas in the Greater Yellowstone."

Purpose. The purpose of the Montana Noxious Weed Survey and Mapping System is to help Montana resource managers map and manage weeds by successfully implementing a standardized statewide mapping system. The objectives are to develop and maintain a statewide spatial database for weed management, to calculate the total number of acres infested, to determine how fast noxious weeds are spreading, to evaluate the usefulness of new technology, both Global Positioning System (GPS) and Geographical Information System (GIS) for weed mapping and to provide training and technical support.

Standards and Accurate Mapping. Montana mapping standards were formalized and adopted in the mid-1990's through a Cooperative Extension publication and weed mapping workshops and training. At that time there was wide variation found in maps and acreage figures submitted to the Montana Department of Agriculture. Accurate mapping and a reliable estimate of infested acres in the state are critical when justifying expenditure of state and county tax dollars on weed management programs. Early funding for the Montana Noxious Weed Trust Fund grant program was supported by the use of maps showing spotted knapweed moving into eastern Montana along roadways and leafy spurge spreading across the state along waterways.

A standardized mapping system also can be used to show change over time. It is useful to see weed distribution and trends over time and across the state and to determine if weed management programs impact those trends. This information helps to understand the biology of the invasion process and determine how weeds actually spread. It also aids in the prediction of areas that may be subject to weed invasion, to assess the economic impact of weed invasions and to increase public awareness of weed impacts.

Scope and Approach. Montana has 56 counties and 92 million acres of land. A little less than one-third of Montana is federal land, with about 9 percent in state land, and the rest is private lands. The Montana mapping system was designed to allow this variety of land managers to use mapping methods that fit their situation, but could also be adapted for use within the statewide database. These methods include hand mapping, GPS mapping and computer mapping. Many counties are still using hand maps because, while they have GPS units, they don't necessarily have the time or the staff to collect GIS data. Most counties with mapping programs use 1:24,000 U.S. Geological Survey (USGS) base maps with mylar overlays. This makes it fairly easy to track the weeds over time at the county or weed management area level. These county maps are generally fairly accurate. Adding this information to the statewide system requires the time and effort to digitize, scan or on-screen draw the information.

Technical Support and Inputs. The Montana program has allowed for the provision of technical support to the counties, including equipment software purchases at a reduced rate through the university system, training in standardized mapping procedures, training on equipment use and software operation and import of county-generated data into the state system. To date, 22 of 56 weed districts, Montana Department of Agriculture, Montana Department of Fish, Wildlife, and Parks (MDFWP), the Bureau of Land Management (BLM), U.S. Forest Service (FS), Bureau of Indian Affairs and several other groups have staff who have participated in training workshops. At this time we have received limited data into the statewide system from 15 Montana weed districts, MDFWP and BLM. One limitation in developing this system is time constraints most land managers and county weed personnel have in developing and providing the information to the state level. The information required and system development for the Montana mapping standards is good, but at this time information provided to the state is very limited and doesn't cover the whole state. It is expected that over time additional information will be included in the system and will provide accurate maps of weed infestations in Montana.

Section-Based Maps. There is an immediate need for statewide maps that give an overview of weeds in Montana but specific input into the state system is slow, so a section-based weed mapping program has been designed to serve the immediate need. In 1998, county weed districts were asked to provide infestation information on five Category 1 noxious weeds to the section level within their counties. Infestation information was requested on leafy spurge, spotted knapweed, Russian knapweed, sulfur cinquefoil and Dalmatian toadflax. Every county weed district was sent a map of their county and requested to indicate if each weed was present, absent or unknown in each section. All of the maps were then sent back to the state. While these maps do not give accurate acreage estimates, they do provide good trend information on where weeds are located, where they are moving in the state and what may be happening on the landscape level. The section-based map information was combined with estimated acreage figures provided by counties to provide some limited information on infestation sizes. Section-based maps are currently being developed for all newly invading species in the state (Category 2 and Category 3 weeds).

Status and Future Considerations. At this time, the Montana Department of Agriculture is maintaining the section-based maps and BLM is maintaining the statewide standardized mapping program. Currently all data input to the statewide system from counties, state agencies and local landowners is supported by a grant from the Montana Noxious Weed Trust Fund grants program. Limited resources at the local level will always limit the development of a mapping program. At best, maps will be developed for Cooperative Weed Management Areas (CWMAs) and areas of critical concern. It is important to balance information required from the local level with what is needed at the state level. In Montana, if, over time, the section-based mapping program can be combined with the more specific statewide information, reliable information will be available for use at the state level. Additional information on the Montana program is available at <http://www.montana.edu/places/mtweeds/>.

State of Idaho

Danielle Bruno,
Idaho State Department of Agriculture

Under the State of Idaho noxious weed law, the Director of Agriculture is responsible for coordinating efforts, collecting and disseminating information and establishing requirements for the county weeds superintendents. The counties are responsible for maintaining a coordinated program, notifying land owners of uncontrolled noxious weeds on their property and controlling noxious weeds as necessary. Therefore, counties are a major source of on-the-ground weed information.

Goal and Approach. The goal of the Idaho State Department of Agriculture (ISDA) mapping program is to promote the use of mapping technologies at the local level. This is done by providing funding for cost-share programs for development and use of GPS and GIS technologies at the county level. This simple statement encompasses a big program. What you have to do is kind of nudge them along a little bit at a time. There is a lot of interest in this technology. Several local agencies have bought the \$200 GPS units and are using them. Many people are using computers personally as well as professionally. Therefore, the fear of technology that was there five years ago is not quite as strong, but you're still dealing with that superintendent that has been there for 20 years. I often say "Hey, come on; push a button. You can do it." There is resistance to change.

In addition to initial training, there has been a heavy need for providing support. Support can be nothing more than a phone call. It really has helped a great deal. Returning all phone calls and e-mails in as timely a manner as possible is important. Timely communication has been one of the most important steps to moving the programs forward technologically. Technical support has really gone a long way in keeping programs on track and keeping momentum.

Standards. Another very important part of the Idaho program has been the establishment of state-wide standards for mapping and monitoring that are to be used by all cooperating agencies and partners. And yes we "steal" with pride. The

Montana standards and the North American Weed Management Association (NAWMA) standards have been very useful. Every program will do a little modification for its own use, but basic standards have been very integral. The Idaho baseline set of standards are pretty simple. Five things are asked: (1) What is it? (2) Where is it? (3) How big is it? (4) Approximately how dense is it? and (5) When did you look at it? Standardized recording has actually been the more difficult part. The same standards are used regardless of what level of technology a group is using, all the way from a paper map and a field notebook to using a GIS. Continuity really helps with data transfer and no one feels left out. But, standardization does take a lot of effort. Sometimes, people will stray a little bit and you have to stay on top of it. Ensuring that developed standards are compatible with national standards and used by all cooperators is very important. Because Idaho is heavily federally owned, there must be federal buy in. If the federal agencies have a national standard, they must adhere to it. So, it is important that Idaho standards fit federal standards to the extent feasible. There is flexibility even in the most rigid of things, but you have to work hard to get there.

Scope and Status. In the state of Idaho, land uses are approximately 41 percent rangeland, 38 percent forest and 14 percent agriculture, so natural resource commodities are very important. There are 44 counties and approximately 1.2 million people in the state according to the 1997 census. Idaho has 35 plants listed as noxious by the state. Idaho doesn't have different categories of noxious weeds; all state-listed weeds are to be controlled.

As of August 2000, there were 24 recognized CWMA's in Idaho with at least four more being formed. Nearly 70 percent of the state is covered with CWMA's. The CWMA's are required to have annual operating plans, and they are all creating base maps. The best advantage Idaho has had with the CWMA's is that they combine the best of the technological management of the federal agencies with the best of the on-the-ground expertise of the local guys. The local guys may not own a computer, but their federal agency partners do. So, partnerships can be used to get local efforts on GIS. Partnerships with tax assessors who use GIS has also been beneficial.

Eight counties used mapping and resource grade GPS units last year. Those are \$3,000 to \$5,000 GPS units. So many local agencies are trying to be more sophisticated than the cheap outdoors units. Several more counties have requested funds for the more versatile GPS units next year. Five counties are actively using GIS for mapping on a county level. That is in addition to what is being done by their federal agency partners.

In 1999, Shelly High School incorporated weed mapping into its solutions curriculum and is involved in several county mapping programs. In fact, the school is the primary data source for Bingham County. There are five more schools involved in that program now. Also, the Students Investigating Today's Environment (SITE) program developed a range plants native and noxious unit for teachers to incorporate in the classroom. SITE has been really great at getting the word out to Idaho's teachers about mapping.

Challenges. There are still some difficulties to overcome with the mapping program. Balancing local requirements with state and national needs is an important issue. Proving the importance of mapping, that it is not taking time away from killing weeds, is another important issue. The cost of using GPS and GIS can be prohibitive. Being able to hire that extra technical person makes all the difference. Keeping all partners adhering to the standards is a challenge. As mentioned before, standardization involves taking time just going around and making sure everybody is still doing the same thing. Even after a great first year, momentum can be killed by a small problem in the second year. Issues of data storage and use of information from private lands has become formidable, especially when you talk about web publishing. How do we protect the rights of peoples' information we are keeping? Field reviews and audits of the grants is another challenge. We have suddenly become financial officers as well as weed scientists. Appeasing those requiring immediate gratification can be difficult. Building local capacity takes time, and that has been a hard sell. Lastly, we must continue to cast aside and break barriers that limit or impede full statewide cooperation and coordination of weed management activities. Just saying, "Well, I'll do my part, you do your part and we'll call it cooperation" is not cooperation.

Building an integrated program and ignoring the jurisdictional boundaries, like the weeds do, is difficult but it can be done.

Future Considerations. ISDA will continue to support the use of mapping technologies on the local level. It will continue to emphasize and support the need for storing all weed inventory and monitoring information in GIS. ISDA will continue to develop inventory and mapping standards and promote the use of these standards by all parties involved in weed management. ISDA will also continue to promote cooperation and coordination between all parties involved in noxious weed management. Additional information on the Idaho program is available at <http://www.agri.state.id.us/animal/weedintro.htm>.

State of California

Steve Shoening and Pat Akers,
California State Department of Agriculture

The California Department of Agriculture (CDFA) has a fully operational GIS and GPS system for noxious weeds supported by an infrastructure of 13 field-based biologists and three technical state-wide support staff. Computerized databases convertible to maps exists for 2,000 populations of the 40 most important noxious weeds ("A"-rated) in the state. For 1,200 populations, information is available to sharply focus eradication efforts and to prioritize other management actions. Location data are GPSed, hand digitized or converted from external records and added to an ArcInfo coverage. Other data are entered into an Access database from field forms. Data is primarily collected by CDFA or county employees. Work is under way to allow web-digitizing and reporting using ArcIMS Internet mapping software.

Needs Addressed. The CDFA "A"-rated weed database was created to address the following needs of the Weed and Vertebrate Program:

- Managers need rapid access to data to run programs more efficiently and strategically from headquarters
- Biologists need to become more like managers and bring in collaborators

- Retirements are looming at CDFA and most seed banks outlast even the young biologists
- Successes more impressive at the population level
- Exact information needed to charge landowners appropriately
- Distribution information is necessary for planning and fund raising
- There is a need to analyze what factors are correlated with eradication success

Information in Database. Each weed record in the database contains the following "core" information about each infestation:

- Genus and species
- Latitude and longitude (centroid or perimeter)
- Gross acreage of coverage
- Net acreage of coverage
- Ownership
- Date
- Collector
- Voucher information
- Derived info added later including eradication status

Additional extensive data are entered into the database for each management activity. A management record is entered for every visit to a weed infestation for any reason.

For the weeds not covered by CDFA's "A"-rated database, little information is currently in electronic form. A major initiative is underway to establish local weed GIS databases associated with the 42 Cooperative Weed Management Areas (CWMAs) in the state (<http://pi.cdffa.ca.gov/wma/>). The draft Idaho noxious weed strategic plan was used as the basis, about three years ago, to write a California strategic plan that served as a guiding framework for a \$5 million legislative appropriation that now provides cost sharing to local CWMAs. A coordinated implementation of ArcView GIS by the CWMAs will hopefully fill in the major gaps in knowledge of weed distributions for another tier of exotic invaders.

Major Obstacle. The major obstacle to creating local or shared databases of invasive noxious weeds is the lack of funding for trained personnel to conduct surveys and enter the data into data-

bases. The technology for displaying and delivering the information requires a small fraction of the resources compared to the systematic inventory

of state lands for invasive weeds. Additional information on the California program is available at <http://pi.cdfa.ca.gov/wma/>.

SELECTED LOCAL PROJECTS

Moderator:

Roy Reichenbach, Wyoming Department of Agriculture

Contributors:

Rod Cook, La Plata County, CO

Nyleen Troxel-Stowe, Socorro Soil and Water Conservation District, NM

Bill Bellah, Dawes County, NE

Perspectives of the role of inventories and mapping in the management of noxious weeds have been provided by representatives from three federal agencies and five state-level weeds specialists. In order to provide perspectives from all levels, three individuals were asked to share their experiences with collecting data and producing maps at the local level.

La Plata County, CO. The noxious weed management program in La Plata County was initiated in 1992, one year following the passage of the Colorado noxious weed law in 1991. About one-half of the slightly over one million acres in the county is private land and about one-half is public land. The county program is concerned primarily with the 30,000 parcels of private lands. Each year, the entire county road system, involving about 600 miles of road, is mapped. Being familiar with the biology of the plants to be mapped and the conditions under which they are most visible is critical. For instance, yellow toadflax does not bloom in a drought and Russian knapweed and yellow toadflax are quite visible as the snow melts in the spring, but much less visible as the grass begins to "green up." These same weeds become more visible again in the fall when the grasses become golden.

Geographical Information System (GIS) and ArcView have been in use for five years and are critical to the mapping of over 4,000 weed infestations a year. They also are critical for preparation of individual maps to go with over 3,000 letters that

are sent to property owners each year to encourage them to control noxious weeds on their property. These letters stimulate many requests for information and assistance. For the total effort to be effective, rapid response is critical to requests such as "So I have this weed, what do I do?", "Tell me about your program," and "Can you come out and show me the weed, since I don't know what it looks like?" A web site (<http://co.laplata.co.us/weeds/>) has been established which aids in responding to requests, but having essentially the same information available on paper and personal contact are still essential for effective communication.

Thus, use of mapping with the aid of GPS and Arc-Info, letters to individual property owners, multiple approaches to providing information and a modest amount of funds for materials available for land owner assistance has resulted in substantial increases in action by property owners to manage noxious weeds. For instance, one local cooperative has reported a four-fold increase in sales of weed control materials over the last four years.

Socorro Soil and Water Conservation District, NM. Although the Socorro Soil and Water Conservation District has been in existence for some time, its focus on noxious weed management is relatively recent. Inventory and mapping efforts were increased substantially with employment of a part-time person primarily for that purpose in 1999. The District encompasses primarily the central irrigated valley of Socorro County and contains an extensive ditch and river system. The District is managed by a very active board of seven local residents.

The mapping effort in the Socorro District has evolved from the point that some unbudgeted funds became available, with the realization that more needed to be known about where the weeds were, but without a specific strategy of how to proceed other than to hire a temporary range technician/noxious weed person. As an excellent

person who loves to map weeds began working, considerable excitement was generated and uses for the data began to become apparent. A key element in development of the mapping effort was the involvement of a lot of different people. Early on, the Natural Resources Conservation Service was very helpful by providing a truck for use by the range technician.

Initial efforts included use of GPS and ArcView. The ArcInput database was based primarily on the Southwest Exotic Mapping Program web site. Data that could be downloaded from our GPS equipment were augmented with paper records. Collecting noxious plant data in the Socorro District is not without its challenges. Since most of the noxious plants are along ditches and streams, access can be very difficult and working conditions very unpleasant: mosquitoes, snakes, swamps, hot weather. Some weeds such as Russian knapweed and perennial pepperweed often grow beneath salt cedar, so a lot of extra effort is needed to “dig through” salt cedar to find these other noxious weeds. Also, in the Socorro District satellite coverage is not always adequate, particularly between 1:00 p.m. and 3:00 p.m. However, a deep desire to reduce damage caused by weeds prevailed and preliminary map of key noxious weeds in the District was completed in the fall of 2000.

Practical uses for the maps are becoming evident. In one instance, the U.S. Fish and Wildlife Service (FWS) had the opportunity to obtain some funds for control of salt cedar. A polygon map showing both old and new stands of salt cedar was produced by the Socorro district within three days to enable the FWS to take advantage of the funds and to effectively manage a targeted control effort. There was adequate interest expressed by the District board members and other land owners in the mapping effort prior to its being initiated to have confidence that the effort would be of practical use for land owners. But once the District-wide preliminary map was produced, land owners are now requesting assistance in developing management plans based on personalized maps. Thus, the mapping capability will be invaluable in designing and producing maps for individual land owners upon which to base management plans to be implemented by those owners.

Dawes County, NE. Modest funding has been allocated to weed management by the commissioners in Dawes County for a number of years. However, the emphasis during most of these years has been on application of herbicides. Mapping weeds in Dawes County is very much in its infancy, beginning primarily in 1999 with the employment of a weed superintendent who had a particular interest in mapping. Since county funds were very limited, funds were obtained through grants to purchase GPS equipment and ArcView software. Because of the very limited budget which supports one full-time employee at a minimum level, striking a balance between spraying weeds and mapping has been a real challenge.

The Nebraska weed law provides a lot of authority for local jurisdictions to take action, such as going on land to survey without permission from the land owner and to actually control weeds on private property if the land owner does not after receiving notice, and seizing land if payment is not made. However, resources are not available, at least in Dawes County, to implement the provisions of the law. Therefore, noxious weed control is, for all practical purposes, a volunteer program.

One approach to collecting data that can be used in mapping in a situation where resources are very limited is to loan GPS units to land owners and encourage them to collect data. There has been considerable interest in Dawes County among land owners in these units. Initially, attempts were made to ask land owners to collect too much data, but if they are asked to provide only two or three observations this approach can be useful. However, some validation is required and this approach alone is not likely to be adequate to set priorities for spraying by the county or to encourage land owners to take action. The desired balance in the allocation of the limited resources between data collection, mapping and weed control has been the source of considerable disagreement in Dawes County. However, there is significant recognition that noxious weeds are a serious problem. Therefore, conditions for building capacity for a balanced weed program that has land owner support exist, and there is evidence that technical assistance from the state level could be very helpful in that regard.

SELECTED MULTI-STATE PROJECTS

Moderator:

Carol Spurrier, Bureau of Land Management

Presenters:

Craig McClure, National Park Service

Noel Poe, National Parks Service

Kathryn Thomas, U.S. Geological Survey

Andy Mason, U.S. Forest Service

Overviews of how federal groups such as the Bureau of Land Management (BLM), the U.S. Forest Service (FS), and the National Park Service (NPS) and of how selected states are using inventories and mapping to support weed management as previously described provides a useful framework to review some examples of how several jurisdictions are working together with a focus on a specific area and some technologies and approaches that might have broader application. Included here are special projects involving a national parks, a regional database, a project evaluating new technologies, and aerial survey-based database for insects and diseases. A number of additional special projects were displayed as posters that are listed elsewhere (Appendix B).

Greater Yellowstone Ecosystem and Team Leafy Spurge. The Cooperative Weed Management Area (CWMA) component of the Greater Yellowstone Ecosystem is briefly described as an example of a truly effective partnership with a major mapping component in which the NPS plays a lead role. Also, the development or expansion of three state programs have evolved from this effort. The current effort evolved from a low technology mapping project within the Henry's Fork Weed Management Area, which was completed in 1994. Presently, weed management activities within the Yellowstone area involves four federal agencies, three state agencies, at least five counties, and some local CWMA's. A total of 17 units report into the cooperative effort. The managers of the units make up the Greater Yellowstone Coordinating Committee, which jointly allocates funds for special projects and supports an executive coordinator. Geographic Information System (GIS) and Global Positioning System (GPS) are involved in mapping most of the area, although manual map-

ping is still involved with digitizing being done by the NPS. The involvement of the federal agencies has been critical in helping provide local participants with both equipment and training. Mapping, much of it fully computerized, is becoming an increasing part of setting management priorities, recording treatments and evaluating progress.

The Team Leafy Spurge project to use biological controls to control leafy spurge throughout the Little Missouri River Watershed is another example of an effective partnership initiated by USDA's Agricultural Research Service and Animal and Plant Health Inspection Service but with extensive involvement of the National Park Service through the Theodore Roosevelt National Park.

Southwest Cooperative Mapping. The Southwest Exotic Plant Mapping Program (SWEMP) is a Colorado Plateau Field Station (CPFS) program designed to develop a regional database of exotic plant distributions for the Southwest (which consists of Arizona, New Mexico and Colorado Plateau portions of Utah and Colorado). The purpose of this project is to develop and distribute information on exotic plant species distributions, as well as to provide information on the status of exotic species distributions on the Colorado Plateau and the greater Southwest. This is accomplished through a network of collaborative partnerships that contribute to data collection, compilation, and distribution. The program is based on the cooperation of the CPFS and collaborators. CPFS personnel are responsible for collating exotic plant species field data into a master regional database, generating Geographic Information System (GIS)-based distribution maps, and maintaining these data on the Internet. Collaborators are voluntary entities who are responsible for collecting exotic plant species field data and submitting these data to CPFS. These collaborators include state and federal agencies, tribal governments, universities, private consulting firms, and other interested parties (<http://www.usgs.nau.edu/swemp/>).

Aerial Surveys. Aerial detection surveys are widely used for collecting and reporting data on insect,

disease, and other types of disturbances to forested ecosystems. Forest Health Protection and the Aerial Survey Standards Working Group of the Forest Health Monitoring Program have been working for the past several years on the development and implementation of data collection and reporting standards for insect and disease aerial surveys conducted by FS units and their cooperating partners in state and federal agencies. The primary purpose of these standards is to permit the upward reporting and analysis of data collected by FS field units and their state cooperators. The first iteration of these standards was implemented through a letter signed jointly by the Forest Health Protection Director and the Forest Health Monitoring Program Manager on May 20, 1998. The Aerial Survey Standards Working Group, composed of both federal and state personnel, continue to add to and refine these standards. Recommendations for additions and changes to the standards are submitted each year to the Forest Health Monitoring Work Group for discussion and/or amendment, and then on to the Forest Health Protection Director and Forest Health

Monitoring Program Manager for approval and implementation. The Aerial Survey Standards Working Group has facilitated the development of three documents to assist in the implementation of these standards. These documents, Forest Health Monitoring Aerial Survey Standards, A Guide to Conducting Aerial Sketchmapping Surveys and Aerial Survey Geographic Information System Handbook, in addition to a number of appendices to the Aerial Survey Geographic Information System Handbook, are available electronically (http://www.fs.fed.us/foresthealth/id/id_guidelines.html).

A number of the principles associated with standards, coding, collating and interoperability associated with aerial surveys of forest insect and disease damage may be useful as systems for mapping weeds are further developed. Perhaps of particular interest is that useful data on such invasive plants as salt cedar and Russian olive can be collected in aerial mapping surveys conducted primarily for other purposes.

INVENTORIES AND DATA STANDARDS

Rita Beard, U.S. Forest Service
Danielle Bruno, Idaho Department of Agriculture
Eric Lane, Colorado Department of Agriculture

What is a noxious weed inventory? Inventories are conducted on many different levels and for many different reasons. The local weed manager is very interested in exactly where a weed is and what growth stage it is in so that he or she may effectively control the plant. A research scientist may be interested in weed population locations in a basin over time for developing spread models. A national program manager is interested in gross acreage estimates across several weed control districts for budgeting purposes. No one wants to spend time collecting data they do not need for their own purposes. Conversely, you don't want to get back home and analyze the data that has been collected and discover that necessary data is lacking.

The basic inventory has to incorporate information about the location, distribution and extent of that species across the landscape. As the North American Weed Management Association (NAWMA) mapping subcommittee began to review the needs of all user groups, from the concerned citizen to the federal agency head, some common needs arose. Everyone was interested in answering three basic questions: "What is it?" "Where is it?" and "How bad is it?" Of course, the more specific the needs of a user group, the more detailed and more accurate the inventory needs to be. The NAWMA standards do not limit the amount of information that can be collected. They only define the minimum information that all user groups are interested in.

Although the NAWMA standards subcommittee was able to break down what all user groups were interested in into three seemingly simple questions, they have proven to be quite difficult to standardize. In the weed world, “What is it?” is the weed species. There are several ways to record a weed species. There are also several ways to record “Where is it?” and more ways to define “How bad is it?” NAWMA has striven to adopt standards that allow for the greatest flexibility and greatest ease of use while working within the confines of differing international measuring systems while still maintaining comparable data. Although much can be done with conversion factors, the data collected must still be apples and not oranges.

The NAWMA standards are a way to define a common language. The goal is to compare apples to apples and oranges to oranges. The NAWMA stan-

dards provided common definitions, so an acre is an acre to people in different parts of the world. The standards allow us to tap into the core information that is necessary to develop landscape-level maps developed from information extracted from a variety of local, national and international jurisdictions. Today’s databases are much more sophisticated than before. They are very capable of converting hectares to acres or plant scientific names to plant codes if you know what conversion factor to use. The NAWMA standards are a way of defining the exchange format. If you know what you are receiving from another party, you can convert it into the proper format to fit into your database. If you are creating a new database, using the NAWMA standards in the design stage means less need for converting information later. The mapping standards are available on the Internet at http://www.nawma.org/selection_page.html.

QUALITY ASSURANCE AND ACCURACY

Ron Stinner,

North Carolina State University

Let me suggest several different views about what quality assurance and accuracy should address. These are merely hypothetical, and I ask your indulgence for any apparent misrepresentation.

Regulators

If you are a state or federal regulator, your goal is to prevent, detect and eliminate invasive or noxious species for which you have regulatory authority. You may also provide risk assessments and warnings about potentially harmful species. In this role, species distribution becomes relatively more important than densities. With an agency such as Animal and Plant Health Inspection Service, which must also deal with trade facilitation, incorrect or tentative identifications that are incorporated in public databases or publications could lead to serious economic consequences for both the U.S. and its international trade partners. On the other hand, internal agency information on new invaders is critical, even if identification is tentative. Historical distributional information is key to risk assessments, pathway analyses and,

obviously, monitoring the spread of regulated pests.

The regulators’ quality assurance and accuracy standards must focus on a smaller group of species, those for which it has regulatory authority. Their concerns must consider both public and internal information. Their quality assurance and accuracy protocols must differentiate between the two sources, utilizing both, and also providing appropriate information to both internal and external stakeholders.

Weed Managers

If you are a weed manager (a state coordinator, county weed manager or work for a management agency), your goal is to manage key weed infestations; in the West, generally over large areas. To do this, you need access to both locations and numbers. You’re not generally interested in low infestations, unless they represent the first alert for a new invader. You have an interest in historical data, but more for the purpose of

demonstrating that you have obtained your management goals. Your historical interests are thus more local, except where you are watching an expanding weed population. Misidentifications by partially trained individuals are not a serious concern because you are going to send an experienced manager out to check and treat the area. When he or she finds the identification wrong, the manager will simply recognize the error. Misidentification in this situation does not have far-reaching ramifications. The key focus is on reports of higher densities of known noxious weeds over larger areas. This should be reflected in your quality assurance and accuracy procedures. These procedures will emphasize broader sampling of known weeds, often using summer hourly employees to be able to afford coverage.

Landowners

If you are a landowner, you don't generally care about invasive species databases unless they describe point sources and your land is entered in a database as one of those sources. Regardless of your concerns about invasive species, issues of confidentiality and privacy can loom large. While other groups may consider point source data as a requirement for accuracy and quality assurance, the landowner's primary concern becomes the filters used to aggregate public access to this information.

If you work for The Nature Conservancy (TNC) or other land conservation organizations, your goal will be to protect and preserve your natural systems. Thus, the emphasis will be on managing critical communities or endangered species. This would involve careful monitoring of invasive species at key locations. Correct identification at these locations and information on historical spread become foremost. Rapid information about the first invaders on your land, particularly in threatened communities, may be your primary concern. By the time large numbers occur (the focus of the weed manager above) it may be too late to save the keystone species or community.

Your quality assurance and accuracy standards will emphasize the importance of correct identification for low-density plants, both because of endangered species, but also because of the importance of "first alerts," when eradication of

an "endangering" species is easier and tactically feasible with minimum potential harm to the native species.

Marketers of Seeds and Plants

Finally, if you are a nurseryman or seedsman, you are very concerned with species listed as "invasive" or "noxious" and certainly do not want misidentifications (of the ornamental species you sell, in particular). You also don't want to be prevented from importing or transporting species that are already established in the destination area, perhaps under another name.

General Considerations

Please note that I am not suggesting that a Bureau of Land Management or U.S. Forest Service weed manager is not concerned about historical distributions, or that someone working for The Nature Conservancy is focused on their lands exclusively. For all of these groups, it is a matter of the relative importance of specific types of information to their mission. Given a system of finite resources, each organization establishes their data criteria and standards relative to the importance of that type of data to their responsibilities. A database with high accuracy for one group may be inadequate or inaccurate for another. An important corollary to this is that a quality assurance program for one may well not work for another.

We must accept that intended uses drive the perspective, scope and types of accuracy in these diverse databases. We must also recognize that that the primary purpose of each of these databases is to meet specific needs of the agencies and organizations supporting the development and implementation of these databases. For large scale regulatory and management decisions, however, the sharing and integration of data are necessary. If we can develop protocols that allow for sharing, while at the same time noting the qualitative differences in the information content, we will achieve our goal for science-based decisions. These protocols must include evaluation of the total information content by individuals experienced in the management area of concern with increased sensitivity to, and knowledge of, the individual data sets and the intended uses of the information.

SHARING DATA

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Sharing of data occurs at many different levels: individual, county, district, state, region, national and international. In addition, several organizations exist at most of the different levels. Therefore, sharing data takes on many forms. A review of general aspects associated with privacy, scale and integration is provided, followed by comments about on-line databases and some practical considerations.

Privacy

A Federal Perspective. Everyone involved with databases – and especially private land owners – has concerns about privacy when it comes to sharing data and other information, particularly when the federal government is involved. There is often some degree of paranoia when people give their personal information to the government because “they don’t know what the government is going to do with it.” Some comfort can be derived from the fact that all federal agencies are subject to two acts that cover the collection of information, how that information is maintained and used and who and when access to that information is allowed. These acts are the Privacy Act and the Freedom of Information Act (FOIA).

The Privacy Act is a rather narrow act that gives some special protections to private individuals. Under this act, individuals can request information that the government has collected on themselves. In relation to sharing information in databases, a private land owner who has cooperated with a federal agency in collecting data on noxious weeds on his land over a period of several years can request that information under the Privacy Act, whereas, somebody else could not get access

to that same information under the provisions of this act.

FOIA is a broader act and is more likely to be relevant to sharing data on invasive plants. FOIA allows any person, federal agency or state agency the opportunity to request information from a federal agency. This act was passed because agencies were, on a day-to-day basis, making arbitrary decisions about what they would release to or withhold from the public that they were serving. Based on what was asked, a person might get the information the next day or might not ever get the information. So, Congress decided that they needed to give federal agencies some guidelines on when they could and could not release information.

Congress and the courts have made it clear that the information that people request, if it falls within the scope of what federal agencies are supposed to do, will be made available. Therefore, information on noxious weeds collected on federal land will be available under FOIA. However, information collected or recorded by federal agencies about private lands may be protected under one of the exemptions provided for in FOIA. The two exemptions most relevant to data on noxious weeds are the exemption that covers financial and commercial information and the exemption dealing with privacy. These exemptions provide some means for protecting private information from being released. However, decisions on what information to release under FOIA are made on a case-by-case basis after weighing the privacy interest against the public interest. Release of information at a scale that will not allow for the identification of individual property owners is often a desirable approach to providing useful information to the public without jeopardizing the desire for privacy. However, some federal agencies have judged that legal land descriptions are not private information. Therefore, it may be possible for very site-specific personal information to be derived by a third party. This situation, combined with a general uncertainty about what the federal government is going to do with information, creates barriers to sharing information.

People are much more likely to openly share information if they understand how the information is going to be used and particularly if they can see how they will benefit. Federal agencies often can be most effective by developing partnerships with state and local groups. In these situations, cooperative agreements or memorandums of understanding can be very useful so that everybody knows who has access to what information and what they are expected to do with that information. Thus, there are no big surprises as to who is releasing information and what kind of information will be derived from the effort.

FOIA can also be useful to non-federal interests in those cases where there is concern about the accountability. In this situation, FOIA may be the best way for people to get access to what federal agencies are doing and to hold them accountable. Using FOIA, citizens are allowed to check against corruption and also find out what was done with money allocations.

Some Non-Federal Perspectives. Most states have some form of privacy and freedom of information legislation or policy, and although protection by laws is important, cooperation, mutual understanding and trust is by far the most efficient approach to dealing with privacy issues. Focusing on collecting and sharing data within the context of solving a problem will go a long way toward resolving issues. A number of specific examples of how sharing data is being accomplished are reflected in a number of the presentations on overviews of federal programs, examples of state mapping programs and in some case studies that have been summarized previously

Cooperative Weed Management Areas (CWMAs) are an example of how highly effective partnerships can function, including the development of local guidelines for sharing data, and provide a useful perspective on a process for dealing with the privacy issue: A CWMA brings together all interested and concerned parties in a watershed or geographical area for the purpose of combining expertise, energy and resources to deal with common weed problems. It provides an open forum for the concerns of all area citizens, landowners and managers to be considered and dealt with effectively. A CWMA does not diminish or super-

sede functions of any government entity such as national forests, weed districts or soil conservation districts. Rather, it integrates these entities into a viable weed management program.

Although the CWMA approach may resolve privacy issues at the local level, there is also a need to have data available at the state, regional and national levels for planning and for the allocation of state and federal resources. Aggregation of data so that individuals will not be identified is generally recognized as the best way to deal with privacy concerns. However, acceptable procedures to adapt this approach broadly do not currently exist. For example, a high-ranking state official was not willing to enter into a collaborative arrangement for a state office of a federal agency to maintain a state-wide noxious weed database, apparently based on the concern about “we don’t really know what they might do with the information.” In this case, there clearly is a need for some clarification about how data collected by county workers might be used by the federal agency, if that data were to be part of a database managed by the federal agency.

Scale

A number of issues of scale are reviewed to provide background for those who are exploring approaches to sharing data from specific programs as well as refining collection protocols for specific programs.

Probably the first issue related to scale is that of the system of measurement of scale: GPS (Global Positioning System) -based versus locational text descriptions. With modern GIS (Geographical Information System) layers, conversion from GPS coordinates to GIS-based databases is technically rather straightforward. The power of GIS analyses is such that serious considerations should be given to using this approach. However, in doing so, too much “legacy” information may be lost. Also, the cost of conversion from text-based data to GPS coordinates is prohibitive for most systems and fraught with potential for error.

Obviously, scale can be measured in meters or square miles, or records can contain only county or state-level information. The finer the resolution,

the more costly the monitoring, or the smaller the geographic area that can be monitored. In many cases, multiple scales are appropriate – with fine scales where endangered species or communities are involved, and larger scales where wholesale infestations are known. Unfortunately, there are no textbook formulae to define either sample size or sample unit because they are objective-dependent. Again the specific goals of each user must be considered. In addition to spatial scales, if pathways and risks are to be understood, time scales need to be included. Unfortunately, much of existing distributional data do not include the time of first occurrence or observation, so that analyzing distributional spread becomes difficult. However, adding such information after the fact may again be too costly, and for many objectives, unwarranted.

Scale also implies differentiating between interception versus systematic monitoring reports. Interceptions in and around ports require intensive sampling, often generating numerous museum specimens, but from a very restricted area. Indeed, museums often have larger collections of “rare” species than common due to selective collecting, identification and curating. This may prove a serious problem for regulators as these museums go online with their collection information. Over larger areas there are often distributional “holes” simply because no one has monitored sufficiently to know whether the species is present in a region or not. This begs the issue of intensive versus extensive sampling, again a concern of differing magnitude among the stakeholders.

After all is said and done, however, from the reporting perspective, it may well be privacy concerns that determine the scale, whether from the private landowner who resents what he sees as government intrusion or the conservation association trying to protect the location of rare and endangered communities. As previously mentioned, aggregation of data to a scale that will avoid identification of individual property owners can substantially alleviate privacy concerns. The amount of aggregation desired will vary with the size of parcels of land in the program area, but in some specific programs reporting by section (640 acres) has been quite workable. However, involvement of landowners in the decision on what infor-

mation will be collected and how it will be used is critical, because the landowners must have confidence that only the aggregated data will be made available to others. The landowner must “trust” the manager of the data.

Integration

Over time, more and more information on invasive plants will be placed in electronic form. The focus will need to be on using modern information technology to collect, share and use information in support of practical on-the-ground efforts. However, some increased integration of databases will be useful in making some management decisions and in the allocation of resources. Integration likely will be most important for those agencies responsible for managing large amounts of public lands. However, everyone involved should have some awareness of the opportunities. Therefore, this general overview of integration is provided.

There are a number of issues tied to data integration and “interoperability,” not all of which deal with technological problems. One of the main concerns is ownership. This is not an issue of “who gets credit” but rather relates to tracking responsibility and providing the recognition required to attract and to keep the funding needed for support of the individual data collection efforts.

Once databases are designed and established, the real cost is in populating the structure with information, seeing that the information is reviewed for “quality control,” and updating records to reflect new information. There can be significant costs involved and many programs are concerned that their efforts will be overshadowed by larger programs “using” their information without credit or in ways unintended and unwarranted, given the methodologies used to gather the data.

From a practical standpoint, database integration can face technological barriers. A minor, but often encountered problem relates to alterations in database structure itself after cooperative efforts have been established. If a new field is added or a field name changed, without cooperators being informed, the correct information will not be passed and much reprogramming may be needed.

Even as simple an issue as data formats can be a major obstacle, particularly if databases are being developed independently, as is often the case. All software does not allow for easy conversion. At the last International Congress of Entomology, there were at least 14 papers in six symposia dealing with databases containing information on invasive species. These papers ranged from descriptions of the "Species Analyst" program at Kansas State to separate global programs for three orders of insects. The technology used included three separate multimedia software packages, at least four separate database programs, and four almost mutually exclusive Internet-based approaches. Can such systems be interoperable? It may not be possible or even desirable unless there is significant funding for conversion and a demonstrated need to do so.

A range of approaches and software solutions are currently used for sharing information on the Internet that are not necessarily interoperable. For example, a number of museums are cooperating in using the "Species Analyst," a set of tools that use the Z39.50 protocol, and most recently, the http (or web) protocol. This is essentially a search engine for museum records, with analysis tools set on top of the data collection search engine. The older version was developed pre-web and required its own server, but this approach set metadata standards, brought museums together and has allowed some interesting analyses.

More recent web-based technology now offers a plethora of solutions. The Center for Integrated Pest Management at North Carolina State University is currently running web pages that use a wide range of technologies to search remote computers with diverse databases and text files, return the results, and put them in a new, combined database from which analyses can be made. These results are then organized, formatted and supplied to a browser from the server, all transparent to the user. However, the technology is very new and developing in-house expertise is difficult at this point. The advantage is that one group can develop the needed software with minimum information from cooperating database providers and with no "metadata" standards. This leaves the individual database owners free to develop and maintain their databases for their

goals, but at the same time share either all or selected information with other stakeholders.

The problem with such sharing is not technological but practical. The "end use" of data is a critical issue. There is the very real danger of the misuse or misinterpretation of information, particularly when it is abstracted, because of inadvertent loss of key information attached to records when numerous records are searched are when only selected fields are used for analyses.

There is not either a single or simple solution. There will be no high-quality amalgamation of data for general use. The closest may be the linking of museum databases consisting of selected specimen label information to provide distributional maps, but there is a lack of detail, explanations or caveats.

An approach that may work to realistically and appropriately integrate key databases where there is a real justification for such interoperability, is suggested. It represents an eight-step process for developing a "work plan" for approaching both the issues and the technology:

- Identify specific program needs
- Identify and justify sources of information
- Develop simple linkages and partnerships among the organizations responsible for the information
- Jointly define the level of interoperability required with all partners
- Jointly define the intended use of the information and limits to access with all partners
- Agree upon the approaches to be used for interoperability based on realistic funding and availability of expertise
- Agree upon development responsibilities among all partners
- Develop the needed software for both servers and clients, and test the systems extensively

This list is merely a broad protocol, and it does not provide the mechanism for linking large numbers of databases. For most specific problems, the data that are both needed and of sufficient quality to provide accurate answers to those problems can be found in a reasonably limited set of databases. Most likely, any efforts at integration should begin by putting together small systems to

develop a better understanding of the divergent needs and expectations of all stakeholders with respect to data quality assurance, accuracy and scale before we embrace wholesale “interoperability” as a justifiable endeavor.

National and Regional On-Line Databases

Two plant databases of regional and national scope were discussed at the workshop with special reference to sharing data. These databases, although not designed to provide distributional data to support specific weed management actions, can be valuable sources of information to design more site-specific inventory and mapping efforts.

PLANTS Database. The PLANTS Database is a single source of standardized information about plants. This database focuses on vascular plants, mosses, liverworts, hornworts and lichens of the U.S. and its territories. The PLANTS Database includes names, checklists, automated tools, identification information, species abstracts, distributional data, crop information, plant symbols, plant growth data, plant materials information, plant links, references and other plant information. PLANTS reduces costs by minimizing duplication and making information exchange possible across agencies and disciplines. This site is best viewed with Netscape or Internet Explorer version 4.0 or greater, with JavaScript, stylesheets, and frames enabled (<http://plants.usda.gov/plants/>).

INVADERS Database System. The INVADERS Database is a database of exotic plant names and weed distribution records for five states in the northwestern U.S. The spatial and temporal spread of weeds can be displayed using historic

distribution records in INVADERS. The INVADERS web site contains actual examples of how land management and weed regulatory agencies are using these data to improve their weed management programs. Noxious weed listings are provided for all U.S. states and six southern tier Canadian provinces. The INVADERS database structures and web-based query interface are a generalized software design that can cover other regions and/or provide a national/continental scale system for early detection, tracking and strategic management of invasive species (<http://invader.dbs.umd.edu/>).

Seventeen databases available on the Internet, containing some information on invasive plants, that may be of interest are listed in Appendix E. Also, most web sites maintained by state departments of agriculture contain some information on noxious weeds.

Practical Considerations

With the wide array of information technologies that are available, the opportunities for sharing data and other information are unlimited. The intrigue and interest that can be generated for using these technologies must be balanced with practical use. That practical use has two primary aspects:

- Management (control and containment) of noxious weeds on the ground
- Resource allocation or acquisition – “legislators like maps”

The challenge rests with involvement of all interested parties in making good judgments for what approach and actions best fit specific situations.

VIEWS FROM NON-FEDERAL STAKEHOLDERS

Moderators:

Gordon Brown, U.S. Department of Interior
Frannie Decker, New Mexico Department of Agriculture
Tom Dille, Riley Memorial Foundation
Tim Playford, Dow AgroSciences

Contributors:

Ogden Driskal, Double Spear Ranch, Devils Tower, WY
Ray Holes, Lazy H Livestock, White Bird, ID
Jim Klinker, Arizona Farm Bureau
Jeff Menges, National Cattlemen's Beef Association
Bruce Taubert, Arizona Game and Fish Department
Jennifer Vollmer, BASF

Non-federal stakeholders made presentations throughout the workshop. A series of quotes from those presentations are provided as a summary of their views.

"We see things happening (with invasive rangeland plants) at a local level that are astounding. I'd love to see it on a regional scale and take it past the state boundaries. There is no reason we should have a state boundary involved at all."
Ray Holes

"... I came (to this workshop) wondering why the federal government should be providing the overall framework for the whole thing (invasive rangeland plants). (However), because of (all of) the issues that go with it ... it looks to me like the federal government or agencies should be providing (a) framework ..."
Ogden Driskal

"Cattlemen, property owners and farmers are leery of legislation, executive orders and laws. Sometimes they have good intentions, but sometimes the language, when it is implemented, will come back and bite us. Because when it is implemented, we find out that there was a hidden agenda. This is the problem with the very vague and broad language in the definitions in the Executive Order."
Jeff Menges

"I suggest that today the emphasis on alien invasive species is a policy looking for a process. We ...

need to remember that this is a society that is governed by the people for the people. Short-term political agendas either reach short-term political failures or long-term actual failures."
Bruce Taubert

"Let me say that farmers and ranchers will be reluctant until the goals ... to collect and use data are understood and until rock solid protections exist for private landowners and those who lease public and state trust land."
Jim Klinker

"Ranchers know that there is a problem, they want to do something about it. But, nobody likes feeling that they have to do something because someone signs something in Washington, DC, so they have to comply ... Once production agriculture is comfortable with the effort, I think we can be a powerful ally in the Congress and be extremely instrumental on making things happen on the ground."
Jeff Menges

"Focus on the species that are agreed to be the 'bad' ones. Stop sending mixed messages ... There is no profit to that for anyone. Stop telling our hunters and anglers that many sport fish and wildlife are the root of all evil. Start getting support for massive efforts to halt the expansion ... of truly "bad" organisms. There is no need to deal with the species that are middle of the road right now."
Bruce Taubert

"I would love to see a single mapping system (for rangeland invasive plants) with a single set of standards ... I'm not sure that right now all of you guys can agree on a system and if you don't agree on one, the private land owners sure aren't going to know which one to be a part of. You can't make them be a part of it. It is a deal where people have to want to participate, and what you are doing must be of value to them for them to want to participate."
Ogden Driskal

"From the point of view of industry and those we are working with ... land managers, the most important thing is a database that can be searched. We don't need data at the individual owner level, we need county level data to guide our salesmen. We need state and national level data to guide development of new products and continue existing products."
Jennifer Vollmer

“There is no question that from a rancher’s perspective, there is definitely a weed problem. If plans for mapping out invasive weeds are done right, we can get a lot of support from people in the country to implement it.” *Jeff Menges*

“Finance good science. What we do not know by far exceeds what we do know. In every successful

venture that any game and fish agency in the U.S. has been in, good science is the basis for success.” *Bruce Taubert*

These quotes that come from those close to the “grass roots” should be useful in guiding future actions by all of those that can contribute to dealing with rangeland noxious weeds.

ISSUES, IMPEDIMENTS AND OPPORTUNITIES

Facilitators and Reporters:

Danielle Bruno, Idaho Department of Agriculture

Frannie Decker, New Mexico Department of Agriculture

Ron Hiebert, National Parks Service, DOI

Eric Lane, Colorado Department of Agriculture

James Olivarez, Forest Service, USDA

Roy Reichenbach, Wyoming Department of Agriculture

Tim Reuwsaat, Bureau of Land Management, DOI

Ron Stinner, North Carolina State University

A number of issues surfaced in the breakout groups and in other discussions that effect the operations of cooperative programs in general and the development and sharing of information to support on-the-ground management of noxious weeds specifically. The reports from the breakout groups made it clear that serious discussions took place on how to address many of these issues to improve weed management programs. Issues receiving the most attention were private landowner involvement, developing local mapping capacity and privacy issues.

Private Landowner Involvement

- Impediments
 - Embarrassment factor of publicizing the weeds on one’s property
 - Fear of enforcement once weed locations are provided
 - Loss of local control of the information
 - Potential effects on land value/sale

- Opportunities

- Involve private stakeholders early in the process of developing a weed mapping effort to promote and ensure comfort and cooperation
- Provide access to one universal mapping system that is useful to many landowners and provides opportunities to private stakeholders to understand and benefit from the system
- Growers are all familiar with Global Positioning Systems since it is in the combines and used to collect weed data as crops are raised and harvested – ask them to contribute to the county map
- When the county provides cost-share dollars, they should require a record/map of noxious weeds treated
- Focus on the issue as a problem to be resolved by the group, not individuals
- Emphasize the use of mapping to make efforts more cost-effective
- Make providing information voluntary but also make it simple for data transfer
- Educate landowners about the impacts of weeds to promote action

Developing Local Mapping Capacity

- Impediments:
 - Lack of financial and staff resources
 - Lack of will to implement mapping as part of a program
 - Lack of standard protocols that make it easy for people to start
 - Lack of decision-makers’ understanding that mapping is a useful component of a weed management program

- Opportunities:
 - Promote value of weed mapping as part of an integrated weed management program to county weed supervisors, weed management professionals and county commissioners
 - Build a better system that others will recognize and want to change over to
 - Streamline systems so that there are fewer databases that are incompatible
 - Provide technical assistance and development to local programs
 - Provide common data dictionary, standards and other tools to simplify adoption and use

Privacy

Many of the privacy concerns are closely related to private landowner involvement. Therefore, involvement of landowners at the local level as indicated above will alleviate many of the privacy concerns. However, there are some impediments and opportunities particularly related to state and federal agencies that are worthy of note.

- Impediments:
 - General distrust of government
 - Lack of understanding of how information will be used
- Opportunities:
 - Develop cooperative agreements or memorandums of understanding in association with local, state and federal partnerships so that everybody involved knows who has access to what information and what they are expected to do with that information
 - Aggregate data for general distribution to a scale that will avoid identification of individual property owners
 - Establish unambiguous exemptions to the release of data to third parties by federal and state agencies that will prevent, directly by name or indirectly by geographical description, identifying individual owners of property

PRINCIPLES AND LEADERSHIP

Tom Dille

Riley Memorial Foundation

Why are we collecting all of this information? What do we do with all of this information? I think that those questions lead the challenge. As a number have said before, let's not drown in information while starving for readily available wisdom.

We came here to discuss collecting, sharing and using information. A great deal was accomplished. The more we discussed the issues, the clearer it became as to where we needed to go. At the beginning, we focussed on data collecting and mapping. And for those of you who have been involved from the beginning, I believe you would agree with me that a great deal of learning and progress has been achieved on collecting and sharing. Then we began to talk about using all of this information and picture became a little less clear.

More emphasis should be placed on how we use data and mapping to provide solutions to the key needs and, as we move forward, spend more time using data. This must happen, and we must now involve all stakeholders. At this workshop and at our earlier stakeholders roundtable, we have heard some distinctly different views – yesterday from the National Cattlemen's Beef Association and the Arizona Farm Bureau, earlier this year from the seed trade and turf and ornamental industries. We must listen to and involve these groups. We must also involve those stakeholders at the local, state and national level to develop a climate that will foster voluntary involvement. You can't force people. You who work for agencies can be told, "It is your job, do something." But the private stakeholders have to come on board through some kind of voluntary desire to be involved in

the data and mapping to address the invasive species challenge.

We must move toward addressing how to apply technology to address the issues of invasive species. We have to involve all stakeholders and understand their needs and concerns. We tend to get wrapped up with those that are involved in the technology of data gathering and discrimination. Most of us here understand this initiative. There are some others who will be impacted, who don't understand the issues but are willing to learn, and others who would have nothing to do with this matter that could torpedo our attempts to move forward. If we don't take the time to understand their concerns and their needs, early in the process, we will pay dearly later on. So, ask for input before making a decision. Insure interagency cooperation and linkages to coalitions. Involve local leadership, organizations and stakeholders so that they become the engine that drives this machine.

There are three operating principles that I urge you to keep in mind:

- **Use processes now identified.** These are the processes that have been presented, discussed and suggested improvements reviewed. We also learned about the key dos and don'ts from programs already in place or being put in place. Use those processes and build on them. Also, use those processes to help to create a vision that is developed by not only national organizations, but more importantly, with local input. The vision cannot just be from the top down. The top has the responsibility to get it moving. But the final vision has to have the input from the local level.
- **Involve the public.** Educate and inform those in the general public so they will support solutions using good science. Folks, we are using science. We need to make sure that the public doesn't say, "Oh, that is some of that science connected to agriculture in general or specifically food and fiber production, and that is bad." Good science is what is going to get us through this, both in the application, the data collection and so forth. And we need to keep reminding people and educating on the value of good science.
- **Remember one size does not fit all.** Create an oversight committee that includes not only the bureaucrats, but also the local people. Remember when you are requesting financing to base it on your ability and capability to use it. Don't overreach when you ask for money. And always remember, communicate, communicate, communicate, and build partnerships, build partnerships, build partnerships.

Yesterday, somebody said, "... you guys are running a 100-yard dash, (or that is what it appears to be) but in reality you are actually in a 26-mile marathon." That is a great summary. Before we take the next steps, it is critical that you make decisions on how to move forward with actions that are well defined to deliver specific results. Now if we get so wrapped up in pulling together data and maps and we forget what we are going to do with it, we could miss the whole point. So, you have to move forward with defining real issues and not perceived wish lists.

Finally, recognizing that the Riley Memorial Foundation does not come up with conclusions and tell you what to do, we try to act as a catalyst to create a vehicle where people with different views can come together and then move forward. We'll give input to people, but we won't make the decision. It is up to others to provide the leadership. However, that leadership must provide three things:

- **Vision.** Leadership must help create a vision. We need a clear definition of where we want to go. Why is that important? The problem is multi-faceted – involving individuals, multiple disciplines, governmental agencies at local, state and federal levels and impacting both the private and public sectors. To move forward, there must be an idea of where we want to be in the future.
- **Alignment.** We must be aligned to move in the same direction. Alignment doesn't mean all getting in locked step and walking down the same road. Alignment means getting in a harness – whether you're connected with a double tree to one end of the wagon or the side of the wagon – but at least you are in harness and you are moving in the same direction. It just means that when we pull, we are going

forward and not backward or getting stuck. Alignment is to put together the multi-faceted stakeholders organizations so that we move forward together even though we may be totally disconnected structurally.

- **Motivation.** You have to have motivation so that you create an environment where individuals want to be part of the invasive species initiative and then become active participants. Remember, motivation is not something that is self-generated. You have to plan motivation. That may not be your responsibility, but in

order to motivate other people to help you do what needs to be done, you have to think about how to go out and get people interested in the principle.

There is a lot of good work underway, and there are many opportunities out there. Each of us is in a position to contribute, and I urge you to approach your responsibilities with renewed vigor and work with others. Do your part in dealing with the ever-increasing threat from invasive noxious weeds.

OUTCOMES, NEEDS AND SUGGESTIONS

Outcomes

A major outcome from the workshop was the extensive exchange of information among workers with similar interests. Some were synergised to improve what they were doing; some refined their plans to initiate electronic based programs; and some began to learn about the many possibilities for the first time. Another major outcomes was the realization that increased involvement of the private sector will be critical to develop the conditions to get the involvement and support needed to improve and expand noxious weed mapping and treatment programs.

Needs and Suggested Actions

Needs related to leadership, coordination, and increased technical assistance were evident but also evident was an increased commitment among both federal and state agencies to address some of these needs. However, it was also evident that the noxious invasive species problem is great and that those charged with dealing with the problem do not have the resources needed.

Many opportunities for improving programs were identified, but perhaps the two greatest overall needs were capacity building at all levels and needs for greater inputs from non-federal stakeholders. The workshop focused on collecting, sharing and using information with a concentra-

tion on inventories, mapping and computerized databases, but within the context that "... we always have to strike a balance between the resources that we are expending on data gathering, data management, data access and data use with the need to get stuff done on the ground." Within this context it was clear that carefully designed mapping efforts can contribute to more effective utilization of resources for controlling or preventing noxious weeds. However, it was also clear that, with hundreds of millions of acres of land threatened and tens of millions of acres already infested, the current total capacity is not adequate to deal with the problem. Total capacity needs to be increased to take full advantage of mapping and related database efforts. Some approaches to building capacity include:

- Increase emphasis on the development of cooperative weed management areas to increase the interaction among local, state, tribal, and federal actions
- Streamline systems so that there are more databases that are compatible so that sharing and integration is more feasible when appropriate and desirable
- Provide technical assistance and development to local programs and to on-the-ground federal personnel
- Utilize a minimum number of basic elements from uniform standards at the operational level

- Develop or refine state and federal agency strategic and implementation plans to provide more specific guidance for on-the-ground actions
- Increase resources available at all levels

In addition to encouraging increased inputs from non-federal stakeholders at the local level, there is a need for an overall quantitative understanding of how users of both private and public lands view noxious weeds and how they should be managed. Specifically, the needs in question could be addressed by the following actions:

- Conduct a quantitative professional survey of users of public and private lands in the western states to assess attitudes towards management of rangeland noxious weeds and of state agencies and state-level interest groups to assess their activities related to invasive species and obtain views on the desired role of federal agencies
- Analyze results of the surveys in an interactive mode to develop guidance for federal, state and local organizations and develop policy options, including possible incentives, for improving the management of noxious weeds on private and public lands

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ACRONYMS

AGFD	Arizona Game and Fish Department	NPS	National Parks Service, DOI
APHIS	Animal and Plant Health Inspection Service, USDA	NRCS	Natural Resources Conservation Service, USDA
ARPS	Alien Plant Ranking System	OSU	Oregon State University, Corvallis, OR
ARS	Agricultural Research Service, USDA	RC&D	Research Conservation and Development, USDA
BLM	Bureau of Land Management, DOI	RMF	Riley Memorial Foundation
BRD	Biological Resources Division, USGS	ROBO	Release of Beneficial Organisms in the United States and Territories
CDFA	California Department of Food and Agriculture	SDA	State Department of Agriculture
CPFS	Colorado Plateau Field Station	SEC	Office of the Secretary
CWMA	Cooperative Weed Management Areas	SITE	Students Investigating Today's Environment
DOI	U.S. Department of Interior	SWEMP	Southwest Exotic Mapping Program
FOIA	Freedom of Information Act	SSWCD	Socorro Soil & Water Conservation District
FS	Forest Service, USDA	TAES	Texas Agricultural Experiment Station, Texas A&M Research and Extension Center
FWS	U.S. Fish and Wildlife Service, DOI	TNC	The Nature Conservancy
GIS	Geographic Information System	UM	University of Montana, Missoula, MT
GPS	Global Positioning System	USAF	U.S. Air Force
ISAC	Invasive Species Advisory Committee	USDA	U. S. Department of Agriculture
ISDA	Idaho Department of Agriculture	USGS	U.S. Geological Survey, DOI
MDWFP	Montana Department of Fish, Wildlife and Parks	WGA	Western Governors' Association
NFS	National Forest System	WSNCB	Washington State Noxious Weed Control Board
NAWMA	North American Weed Management Association		
NCBA	National Cattlemen's Beef Association		
NCSU	North Carolina State University, Raleigh, NC		

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APPENDIX A

INSTITUTIONS AND INTERESTS REPRESENTED

Federal Departments and Agencies

Bureau of Land Management, DOI
Fish and Wildlife Service, DOI
National Park Service, DOI
Office of the Secretary, DOI
U.S. Geological Survey, DOI

Agricultural Research Service, USDA
Animal & Plant Health Insp. Serv., USDA
Forest Service, USDA
Natural Resources Cons. Serv., USDA
U.S. Air Force, DOD

State Agencies and Tribes

Arizona Department of Agriculture
Arizona Game and Fish Department
California Department of Agriculture
Colorado Department of Agriculture
Idaho Department of Agriculture
Montana Department of Agriculture
Montana State University
Nevada Department of Agriculture
New Mexico Department of Agriculture

Nez Perce Tribe
North Carolina State University
Oklahoma Department of Agriculture
Oregon State University
Texas Agricultural Experiment Station
Washington Department of Agriculture
Washington State Noxious Weeds Cont. Bd.
Western Governors' Association
Wyoming Department of Agriculture

Local Agencies

Davis County, NE
Freemont County, WY
La Plata County, CO

Larimer County, CO
Socorro Soil and Water Cons. District, NM
El Llano Estacado RC&D, NM

Private Sector Organizations, Firms and Interests

National Cattlemen's Beef Association
Arizona Farm Bureau
Ranchers
Commercial applicators

Commercial data equipment suppliers
BASF
Dow AgroSciences
Monsanto Company

APPENDIX B

POSTERS, DISPLAYS AND DEMONSTRATIONS

Idaho/Oregon BLM Weed Database (also called Boise/Vale Weed Database)

Danielle Bruno, BLM/ISDA/FS, Boise, ID
and Bob Bolton, BLM, Lakeview, OR

La Plata County GIS Noxious Weed Mapping

Rod Cook, La Plata County Weed Manager,
La Plata County, Southwestern CO

Release and Monitoring of *Aceria malherbae* Nuzzaci, a Gall-forming Eriophyid Mite, in Field Bindweed under Different Agronomic Practices in the Texas High Plains

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Plants and Weeds

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NRCS, Information Technology Center, Scott
Peterson, USDA, NRCS, Mark Skinner, USDA, NRCS,
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Salmon River Weed Management Area; Landscape Approach to Invasive Weed Management

Leonard Lake, Nez Perce National Forest and
Carl Crabtree, Idaho County Weed Supervisor,
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Weedmapper, Online Weed Maps Distribution

Marc A. Laliberte, System Analyst, Department of
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Cooperative Weed Mapping in the Greater Yellowstone Area

Craig McClure, Ann Rodman and Freya Ross,
Yellowstone National Park, WY

Biological Control of Spotted Knapweed using *Larinus minutus* Gyllenhal at Fort Carson, CO

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Bingham County Weed Advisory Board Project

Paul Murbrook, Bingham County Weed Control
Agent, Blackfoot, ID, and Becca Winston, Winston
Leavitt, LLC, Shelley, ID

Video Mapping System

Craig Novak, Red Hen Systems, Fort Collins, CO

Ecological Area-wide Management (TEAM) Leafy Spurge

Noel R. Poe, Theodore Roosevelt National Park,
Medora, ND

Invaders Database System

Peter M. Rice, Lincoln Smith and Kerri Skinner,
Division of Biological Sciences, University of
Montana, Missoula, MT

Various Mapping Strategies Used in Wyoming

Kiana Zimmerman, University of Wyoming
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APPENDIX E

ON-LINE DATABASES CONTAINING INFORMATION ON INVASIVE PLANTS

(from <http://www.invasivespecies.gov/databases/tpdb.shtml>; additional databases can be found at http://nas.er.usgs.gov/publications/plants/plant_workshop/npwrkshp/ and http://www.nbii.gov/issues/invasive/workshops/proceeds_lv.html)

APHIS Regulated Pest List

Host: U.S. Department of Agriculture, Animal and Plant Health Inspection Service

Scope: This database contains fields such as pest type, order, family, scientific name, author, common name, source, illustration, data sheet, citation, update, comment, host distribution, and regulated site.

CalWeed Database

Host: California State Department of Food & Agriculture; California Interagency Noxious Weed Coordinating Committee; U.S. Bureau of Land Management; University of California-Davis

Scope: This database contains weed eradication project profiles, including many invasive weeds, in California. Profile data include: targeted invasive name(s); targeted species for (re)introduction; project location; lead and participating agencies; controls used; time frame for project; resource issues; and project contact information. Users can view the data by project, by targeted invasive, by county, or by control method.

Crop Profiles Database

Host: U.S. Department of Agriculture

Scope: This database profiles various crop species grown in the U.S., and includes data about the arthropod and plant pests that affect them, including invasive species. Users can search by crop type, region, and/or key terms. Each crop profiled includes listings of pest species and their potential damage, monitoring techniques, pest life history, and possible controls.

Exotic Plant Database [The Florida Exotic Pest Plant Council (FLEPPC)]

Host: Florida EPPC; Florida Department of Environmental Protection's Bureau of Invasive Plant Management

Scope: It contains over 3,100 sight records of infestations of EPPC Category I and Category II species in Florida public lands and waters. Nearly all of the records are from local, state, and federal parks and preserves; a few records document infestations in regularly disturbed public lands such as highway or utility rights-of-way. Natural area managers and other veteran observers of Florida's natural landscapes submit these records, with many supported further by voucher specimens housed in local or regional herbaria for future reference and verification.

Exotic Plants of the South Florida Ecosystem

Host: The Institute for Regional Conservation

Scope: This database presents lists of exotic plant taxa on conservation lands in a 19-county area defined as the South Florida Ecosystem by the U.S. Fish and Wildlife Service. The South Florida Ecosystem is a larger area than that covered by the Floristic Inventory of Southern Florida.

Federal Noxious Weeds Database

Host: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Center for Plant Health Science and Technology

Scope: This database has been derived from the "Federal Noxious Weed Inspection Guide - Noxious Weed Inspection System." The database contains fields such as scientific name, family name, synonym(s), common name(s), diagnostic characteristics, habitat, distribution outside of the U.S., distribution within the United States (if applicable), reason for listing as a Federal Noxious Weed (FNW), what form of the plant is most likely to enter the United States, likely pathways of entry into the United States, general notes, photographs (if available) line drawings, distribution maps (if available), etc.

Hawaiian Ecosystems at Risk (HEAR)

Host: U.S. Geological Survey; University of Hawaii
Scope: This web site provides technology, methods, and information to decision-makers, resource managers, and the general public to aid in the fight against harmful alien species in Hawaii. Its Harmful Non-Indigenous Species Database (HNIS) offers data on plant, vertebrate, and invertebrate invaders.

Illinois Plant Information Network (ILPIN)

Host: Illinois Natural History Survey; U.S. Department of Agriculture, Forest Service
Scope: ILPIN was designed to provide many different types of information about all of the vascular plant taxa found in Illinois. At this site, you can search on a species (by scientific or common name), and retrieve all the information we have compiled on the species, as well as a map of its known distribution among the counties in Illinois. Includes taxonomic, biologic, geographic, and ecologic information on 3209 Illinois vascular plant taxa.

Invasive Plants of Canada (IPCAN)

Host: National Botanical Services (Canada)
Scope: The IPCAN project compiles information on the biology, distribution and control of invasive exotic plants and for developing databases for computer mapping and analysis. Data for inclusion in these national databases are derived from specimen records in national collections, from sight records made by naturalists and professional botanists and from published reports. These databases not only provide a historical perspective on the origins and rate of spread of invasives but also allow for the determination of possible correlations with climatic and other environmental and land use factors using geographic information systems (GIS).

INVADERS Database

Host: University of Montana
Scope: The INVADERS Database is a comprehensive database of exotic plant names and weed distribution records for five states in the northwestern United States. Users can query the system by scientific or common name, or by geographic

region. The site also includes a state/provincial noxious weeds query form, as well as a database of biocontrol measures. Researchers may also submit their own data to the database.

National Agricultural Pest Information System (NAPIS): Public Access Site

Host: U.S. Department of Agriculture, Animal and Plant Health Inspection Service; Purdue University, Entomology Department, Center for Environmental and Regulatory Information Systems
Scope: Search access to the full NAPIS database is limited to employees of the USDA; however, important information concerning plant pests, including invasives, is available from this public access site. The Pest Information section profiles hundreds of pest species, and includes fact sheets; survey and distribution maps; regulations; related links; and photos. The State Reports section highlights specific pest issues for each state.

PLANTS Database

Host: U.S. Department of Agriculture, Natural Resources Conservation Service
Scope: The PLANTS Database includes names, checklists, automated tools, identification information, species abstracts, distributional data, crop information, plant symbols, plant growth data, plant materials information, plant links, references, and other plant information. The Invasive & Noxious section of the database provides a Federal Noxious Weeds List; State Noxious Weed Reports; Invasive Plants of the U.S.; and Introduced Plants of the U.S.

Southern African Botanical Diversity Network (SABONET)

Host: SABONET is a GEF (Global Environment Facility) Project implemented by the United Nations Development Programme (UNDP). South Africa's National Botanical Institute (NBI) is the Executing Agency, responsible for the overall management and administration of the project. In addition to the GEF/UNDP funding, the project is co-funded by the USAID/IUCN ROSA through the NETCAB (Regional Networking and Capacity Building Initiative) Programme.

Scope: SABONET is a capacity-building network of southern African herbaria and botanic gardens with the objective of developing local botanical expertise. The 10 countries participating in SABONET are Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe; these countries cover an area of some 6 million square kilometres.

Southwest Exotic Plant Mapping Project

Host: U.S. Geological Survey

Scope: A regional database of exotic plant distributions for the Southwest (which consists of Arizona, New Mexico and Colorado Plateau portions of Utah and Colorado). The purpose of this project is to develop and distribute information on exotic plant species distributions, as well as to provide information on the status of exotic species distributions on the Colorado Plateau, and the greater Southwest.

Weeds Gone Wild

Host: Plant Conservation Alliance, Alien Plant Working Group

Scope: This site provides a compiled national list of invasive plants infesting natural areas throughout the U.S., background information on the problem of invasive species, illustrated fact sheets that include plant descriptions, native range, distribution and habitat in the U.S., management options, suggested alternative native plants, and other information, and selected links to relevant people and organizations.

Weeds in New Zealand

Host: Environment Bay of Plenty Regional Council, New Zealand

Scope: Terrestrial and aquatic plants in New Zealand

World Weeds Database

Host: Oxford Forestry Institute, Oxford University (UK)

Scope: The World Weeds Database displays information on more than 2,400 weed species around the world, including non-native species, ranked according to the severity of infestation. Users can view data by country, plant, genus, or family.

APPENDIX F

“Collecting, Sharing and Using Information” Western Rangeland Noxious Weeds Workshop: Weed Management Information Systems

PROGRAM

September 6-7, 2000
Bureau of Land Management National Training Center
and Four Points Barcelo Hotel, Phoenix, AZ

Wednesday, September 6

- | | |
|---|---|
| <p>8:15 am Opening Session, Washington Rooms,
Bureau of Land Management (BLM)</p> <p>Introductions
Tom Dille, Riley Memorial Foundation
(RMF)</p> <p>Welcome
Marilyn Johnson, BLM</p> <p>Greetings from the Invasive Species
Advisory Committee (ISAC)
Nelroy Jackson, ISAC</p> | <p>10:20 am Break</p> <p>10:35 am Federal Inventory and Mapping
Programs
Moderator: Eric Lane, SDA-CO</p> <p>FS
James Olivarez, FS</p> <p>NPS
Ron Hiebert, National Park Service
(NPS)</p> <p>BLM
Gina Ramos and Kathie Jewell, BLM</p> |
| <p>8:30 am Opening Remarks from State, Federal
and Private Perspectives
Moderator: Tim Playford, Dow
AgroSciences</p> <p>A State Perspective
Glen Secrist, State Department of
Agriculture, Idaho (SDA-ID)</p> <p>The BLM Perspective
Tim Reuwsaat, BLM</p> <p>The Forest Service Perspective
James Olivarez, Forest Service (FS)</p> <p>A Private Sector View of the Federal
Responsibility
Jeff Menges, National Cattlemen’s Beef
Association</p> | <p>11:35 am Data Issues with Broad Applications
Moderator: Gina Ramos, BLM</p> <p>NAWMA Standards and Sample Protocols
Eric Lane, SDA-CO and Rita Beard, FS</p> <p>Quality Assurance, Accuracy, Scale
and Integration
Ron Stinner, North Carolina State
University (NCSU)</p> <p>12:20 n Box Lunch</p> <p>Introduction of Luncheon Speaker
Gordon Brown, Department of the
Interior</p> <p>Luncheon Speaker
Bruce Taubert, Arizona Game and
Fish Department</p> |
| <p>9:20 am Existing State Inventory and Mapping
Programs
Moderator: Eric Lane, SDA-CO</p> <p>State of California
Steve Schoenig and Pat Akers, SDA-CA</p> <p>State of Idaho
Danielle Bruno, SDA-ID</p> <p>State of Montana
Barbra Mullin, SDA-MT</p> | <p>1:35 pm Privacy Issues and Freedom of
Information Act
Moderator: Frannie Decker, SDA-NM</p> <p>Federal Role
Pam Dandrea, BLM</p> |

	State Role Barbra Mullin, SDA-MT	3:45 pm	Break
	Private Rights Jim Klinker, Arizona Farm Bureau	4:00 pm	Collecting Locational Data at the Field Level – Challenges Moderator: Roy Reichenbach, SDA-WY
2:30 pm	Case Studies of Selected Projects as a Prelude to the Poster and Demonstration Projects Moderator: Carol Spurrier, BLM		Obstacles to Collecting Data Nyleen Troxel-Stowe, Socorro Soil & Water Conservation District, NM Rod Cook, La Plata County, CO Bill Bellah, Davis County Weed Control, NE
	National Database for Aerial Surveys Andy Mason, FS	4:30 pm	Highlights of the Day – A Recap
	Weed Mapper: Yellow Starthistle in Jackson County, OR Marc Laliberte, Oregon State University	4:45 pm	General Session Ends for the Day
	Greater Yellowstone Ecosystem Craig McClure, NPS	5:00 pm	Meeting of Break-Out Group Co-Moderators, Ponderosa Room, Four Points Barcelo Hotel
	Theodore Roosevelt National Park Noel Poe, NPS		
	Southwest Exotic Mapping Program (SWEMP) Kathryn Thomas, United States Geological Survey	6:00 pm	Reception with Posters, Displays, and Demonstrations, Mesquite Ballroom, Four Points Barcelo Hotel

Thursday, September 7

7:00 am	Breakfast served at Four Points Barcelo Hotel		Eric Lane, SDA-CO James Olivarez, Forest Service, USDA Roy Reichenbach, SDA-WY
8:15 am	General Session, Washington Rooms, BLM Why do we need to share data? What are the possibilities? Moderator: Ron Stinner, NCSU		Tim Reuwsaat, Bureau of Land Management, DOI Ron Stinner, North Carolina State University
	Introductory Remarks by Panel Members Glen Secrist, SDA-ID Peter Rice, Univ. of MT Scott Peterson, Natural Research Conservation Service, USDA	11:00 am	Breakout Groups Report to Workshop Participants Moderator: Paul Gertler, Western Governors' Association
	Discussion	11:30 am	Private Stakeholder Perspectives on Current Activities and Future Needs Moderator: Tom Dille, RMF
9:15 am	Charge to Breakout Sessions Tom Dille, RMF		Ray Holes, Rancher, ID Ogden Driskal, Rancher, WY Jennifer Vollmer, BASF
9:30 am	Breakout Sessions Facilitators and Reporters: Danielle Bruno, SDA-ID Frannie Decker, SDA-NM Ron Hiebert, National Parks Service, DOI	12:15 pm	Closing Remarks Tom Dille, RMF
		12:30 pm	Adjourn

