

Invasive Species Data Management Support Tools For Cooperative Weed Management Areas

Final Report to The Nature Conservancy

June 25, 2005
Revised October 7, 2005

Kathryn Thomas, PhD
US Geological Survey Southwest Biological Science Center
2255 N Gemini Drive
Flagstaff, Arizona 86001
Kathryn_A_Thomas@usgs.gov
928.556.7327

Ryan Stevens
Information System Specialist
US Geological Survey Southwest Biological Science Center
Ryan_Stevens@usgs.gov
928.556.7158

Project Overview

The Nature Conservancy, with funding through the Department of Defense Legacy Resource Management Program, and the US Geological Survey (USGS) Southwest Exotic Plant Information Clearinghouse (SWEPIC) team, as lead by Kathryn Thomas, conducted a project from July 2002 to July 2005 to develop computer tools that will help members of cooperative weed management areas (CWMA) in the southwest better manage non-native, invasive plant information and share that data within and among other CWMA's. The project was conducted in collaboration with the Sonoran Desert Invasive Species Council (SDISC) and its two member CWMA's, the King of Arizona and Borderlands.

The project was designed to deliver these computer tools through the existing USGS Southwest Exotic Plant Information Clearinghouse (SWEPIC) web site, <http://www.usgs.nau.edu/SWEPIC/index.asp> (Figure 1). This web site also hosts the Southwest Exotic Mapping Program (SWEMP) regional database, a regional database of weed species occurrences. The SWEMP database was used as the foundation for compilation of shared data. While the project focused on those land managers that are part of the Sonoran Desert Invasive Plant Council, it serves as a prototype for the larger goal of developing a weed occurrence data sharing network among CWMA's in the southwest.

Southwest Exotic Plant Information Clearinghouse

[Home](#) | [Weed Species](#) | [Weed Lists](#) | [Maps](#) | [SWEMP](#) | [APRS](#) | [AZ-WIP](#) | [Team](#) | [Site Index](#)

Centaurea solstitialis

The Southwest Exotic Plant Information Clearinghouse is a cooperative effort among the U.S. Geological Survey, the National Park Service and Northern Arizona University to organize comprehensive information on exotic plant species in the southwest on one web location. SWEPIC serves to help all people and organizations committed to protecting the ecological and economic values of southwest resources from degradation from harmful non-native weeds. The goal of SWEPIC is to provide reliable and organized information on the distribution and ecology of these weeds in the southwest, with an emphasis on forests, rangelands, and other natural areas. Please contact us if you have information or comments that should be included in SWEPIC ([SWEPIC Team](#)).

Weed Species	Weed species profiles
Weed Lists	Noxious and other weed lists for the Southwest
Maps	Maps of southwest non-native invasive plants
SWEMP	The Southwest Exotic Plant Mapping Program
APRS	The Alien Plant Ranking System
AZ-WIP	Arizona Wildlands Invasive Plants

U.S. Department of the Interior, U.S. Geological Survey
Colorado Plateau Research Station, Flagstaff, AZ, USA
URL: <http://www.usgs.nau.edu/sweptic/>

Figure 1. Entry page for SWEPIC showing the index to the six major SWEPIC information components.

The project was divided into 5 tasks as articulated in Contract # AZFO-020602 Amendment 02. Summarized, the tasks reflect the objectives of the project:

- Task 1: Interview agency managers and other land managers to identify specific data and coordination needs related to the development of data management tools.
- Task 2: Conduct at least one workshop for the user participants on how to use the data management tools.
- Task 3: Evaluate and customize the TNC-Oregon invasive plant data manager for use in the Southwest.
- Task 4: Develop web invasive plant data input form, update Arc IMS (internet map server) based maps, and develop and test web-based queries.
- Task 5: Develop user manual to support the overall Cooperative Weed Management Area Data Management System.

Task Results

Task 1: The first task of the computer tools development project involved interviewing select land managers associated with the King of Arizona and Borderlands Cooperative Weed Management Areas (CWMA) and other parties in the southwest with respect to their data and coordination needs for a computer based weed data management tool. Project staff interviewed thirty-seven people by telephone during the late summer of 2002. Project leader, K. Thomas presented a summary and synthesis of the results of these interviews to the SDISC on November 5, 2002. The results of the survey were used to inform the development of the four computer tools described below.

Task 2: Two intermediate (* 2002 and April 2004) and one final presentation (April 2005) were made to the SDISC where all or part of the computer tools updates were presented and discussed. The final presentation at Gila Bend presented all products developed for the project (described below).

Task 3: An initial objective of the project was to develop a desktop database application suitable to manage field-collected data for weeds, track infestation process over time, and to share occurrence data among members of the SDISC. Concurrent to the initiation of the project, the project team became aware that TNC in Oregon had developed a desktop application that provided a first approximation to this objective. The project team evaluated this desktop application, known as the Weed Information Management System (WIMS) and accepted it as a suitable initial framework for desktop data management of weed data. During the course of our work, WIMS underwent a major revision by the Oregon team and was publicly released by TNC as WIMS version 2.1b. The project team made modifications to version 2.1b of WIMS to make its use compatible to weed problems in the Southwest and provide these modifications on the SWEPIC web site as SW-WIMS version 2.1b. The modifications were made for both Windows 2000 and Windows XP operating system. A copy of each is included on the accompanying CD.

The WIMS database is currently undergoing a third revision that is expected to be available later in 2005. With each revision, the platform has become more stable; however, each revision has required separate evaluation and consideration for

applicability for the southwest. The USGS SWEPIC/SWEMP team will make all effort to provide review of the new update and to provide southwest modifications as applicable.

One feature of WIMS that received considerable alteration during the last TNC update was the connectivity of WIMS to a handheld PDA system. We have determined that data collected using the WIMS program in a PDA can be downloaded into the 2.1b version of SW-WIMS; however, tables added specifically for SW-WIMS will remain empty if data is collected in this manner.

Task 4: Three web based computer tools were developed for the project: an interactive map display, a data entry tool, and a data query tool.

The interactive map was developed using ArcGIS Internet Map Server and allows web clients to view, query and print maps of all or portions of the Southwest Exotic Mapping Program (SWEMP) regional database of weed occurrences. The interactive map is accessed through the SWEPIC home page (<http://www.usgs.nau.edu/SWEPIC/>), Maps link.



Figure 2. The interactive map display above shows occurrences of *Brassica tournefortii* as of 2003 in the Southwest as an example. All weeds selected in the rectangular boxes in the Layers area (left side) will be displayed. Only one weed can be active (circular box) at a time.

The interactive map display provides capability for displaying the occurrences of one or more weed species (Figure 2), providing supporting data for weed occurrences (Figure 3), displaying data at multiple resolutions with different backgrounds (Figure 4), and providing a 'quick map' of weed species (Figure 5). The interactive map display pulls

data from the regional SWEMP. The SWEMP regional database is updated with contributed data and, as described below, will be one method by which cooperative weed management area data can be compiled and made available again to members of any cooperative weed management area. To facilitate that exchange we developed a mapping of cooperative weed management areas in the state of Arizona (Figure 6) that can be viewed on the interactive map display and is also used in the query tool.

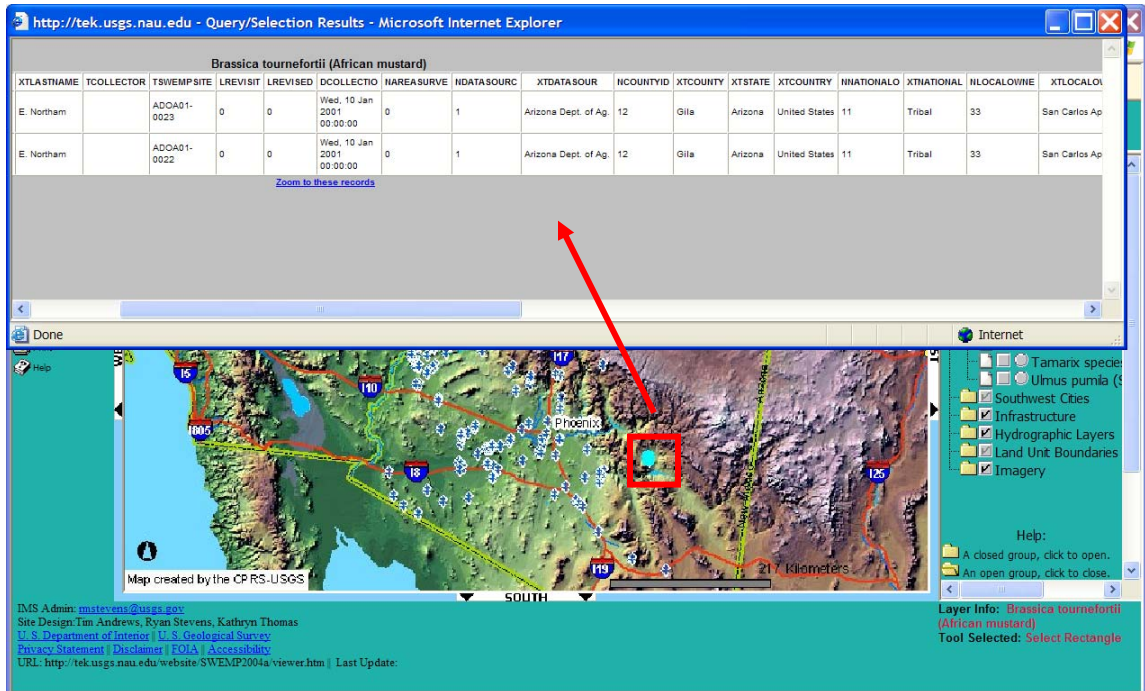


Figure 3. The data for selected occurrences can be viewed directly in the interactive map display. Here the 'Select Rectangle' tool was used to select two of the *Brassica tournefortii* occurrences.

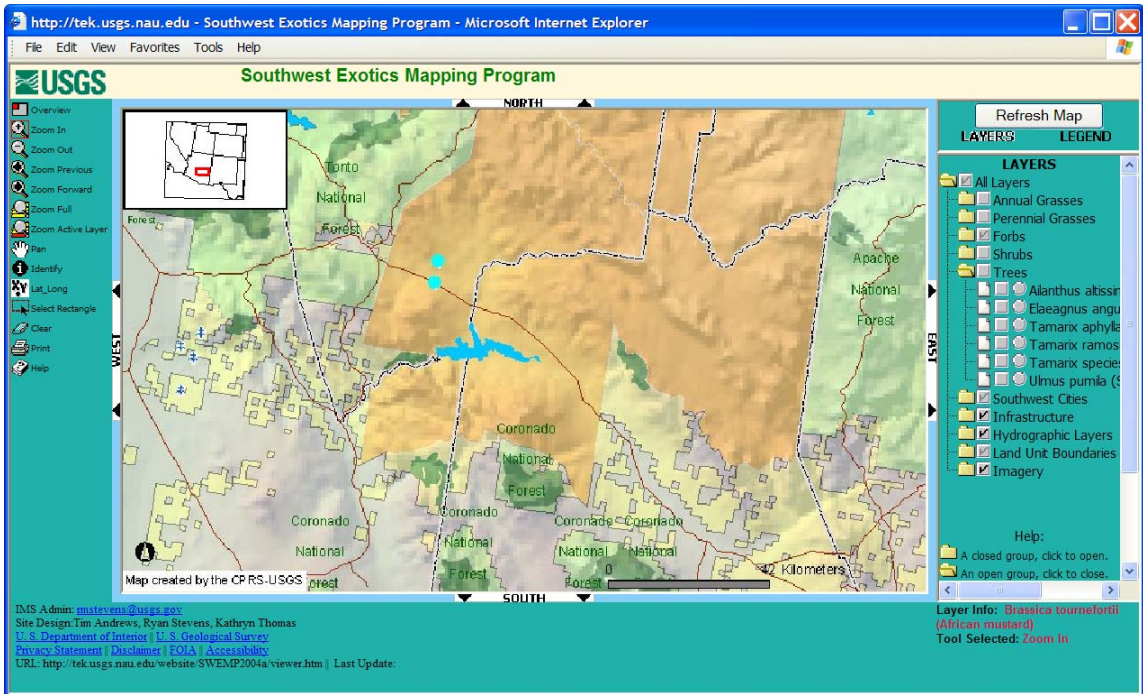


Figure 4. The interactive map display automatically changes the background as the 'Zoom In' tool is used. Another way to change the background is to change the selections for the Infrastructure, Hydrographic Layers, Land Unit Boundaries, and Imagery layers.

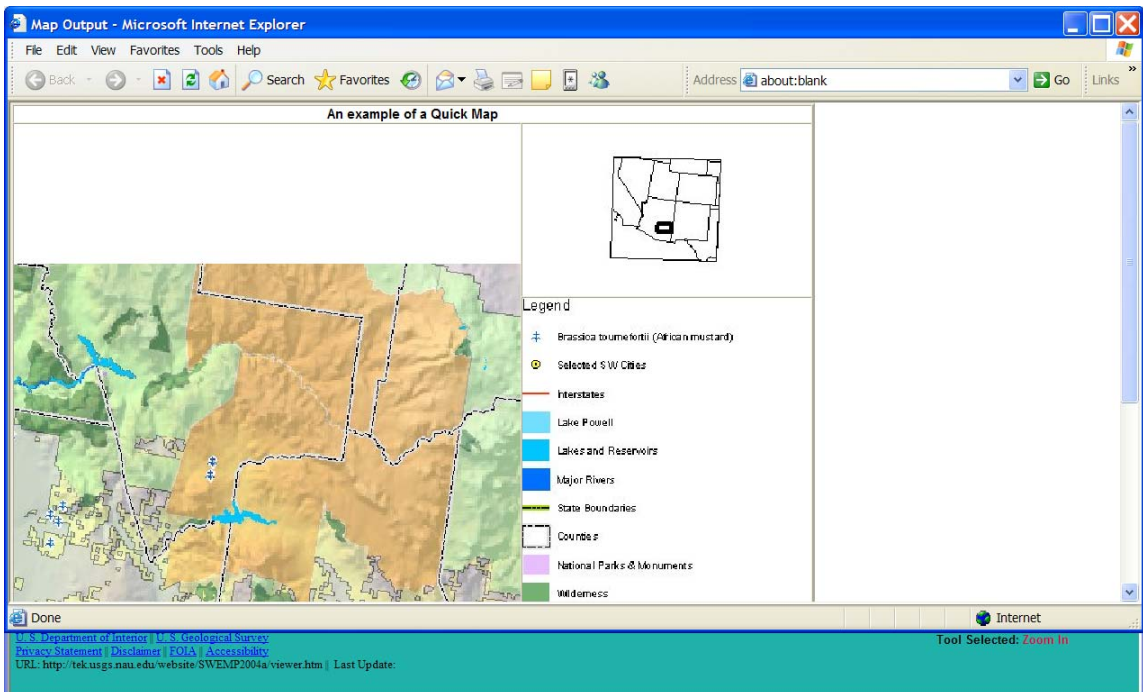


Figure 5. A 'Quick Map' can be printed from the interactive map display. The 'Legend' was made active and the 'Print' tool used to create the map. Quick Maps can be designed, titled and printed by the web user.

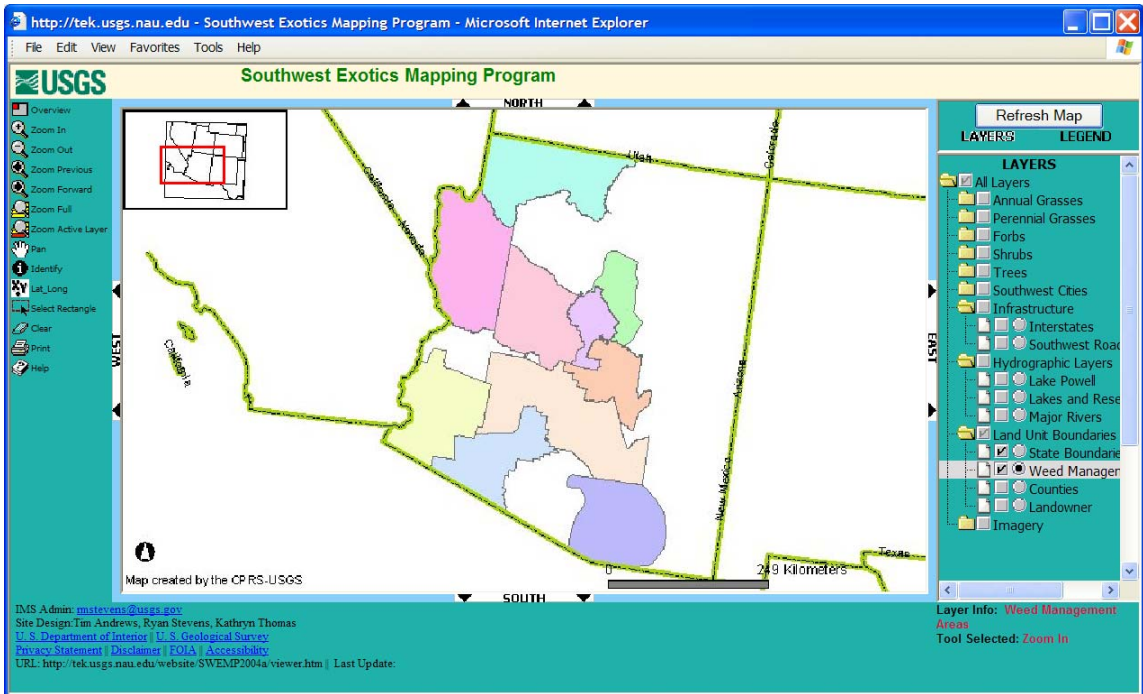


Figure 6. The interactive map display includes a current map of cooperative weed management areas in Arizona.

The second product is the data entry tool. The tool provides an on-line site where 'opportunistic' sightings of weed occurrences can be registered on-line. This data entry system includes a security system where the person entering the data must register prior to entering the weed occurrence data (Figure 7). Data is entered in three steps (Figure 8). The entered data is compiled into the SWEMP database and, once processed, will be provided on-line with the next update of SWEMP.

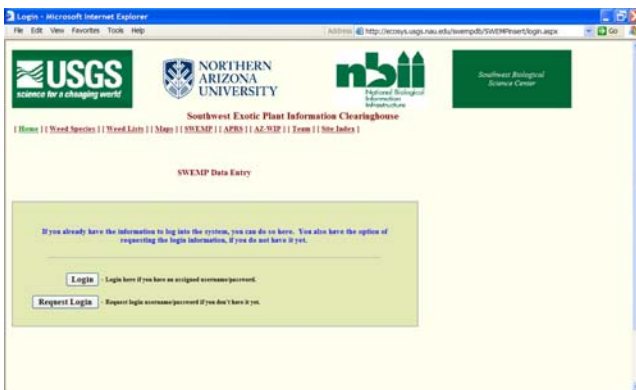


Figure 7. The registration page for the data entry tool. Registration provides web site security and a level of quality control to the weed data

Figure 8a. In the first step of data entry, basic information is added about the data collector, date of observation, and general location of infestation.

Figure 8b. In the second step of data entry, the geographical coordinates for the infestation location are entered.

Native Name	SWEP Code	Infested Area	County Area	County Cause	State	Common Name	Scientific Name
Chickweed	ALPS	3	1	1	Arizona	Alchemilla	Alchemilla infestans

Figure 8c. The species name is entered in the third step. After each weed species is entered, the data appears at the bottom of the screen. Multiple weeds can be entered for each site.

The third tool is an on-line data query tool (Figure 9). This tool allows land managers and any web client to query the SWEMP regional database by selecting settings on up to four criteria (weed name, land administrator, size of infestation, and geographic location). The queried data can be downloaded to the client's computer for further examination.

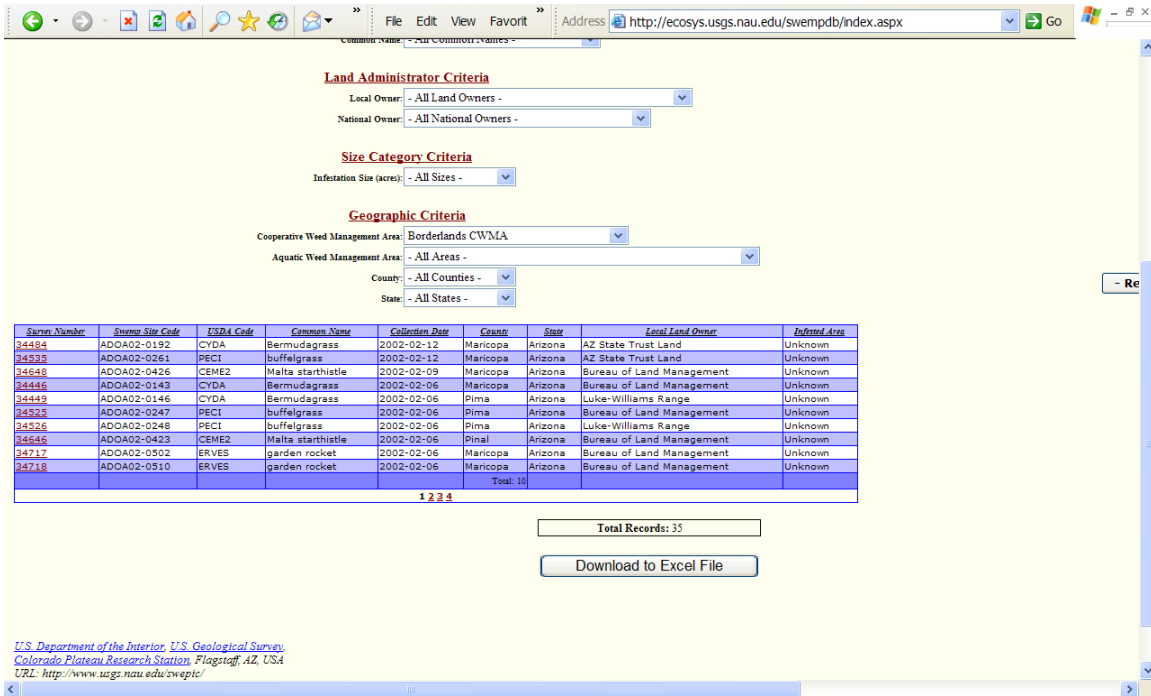


Figure 9. The data query tool criteria has been set to show all weed occurrence data contributed to the regional SWEMP database as of late 2003. The 35 records in the database are shown 10 records at a time. The entire selection, including additional data fields for each record, can be downloaded to the user's computer.

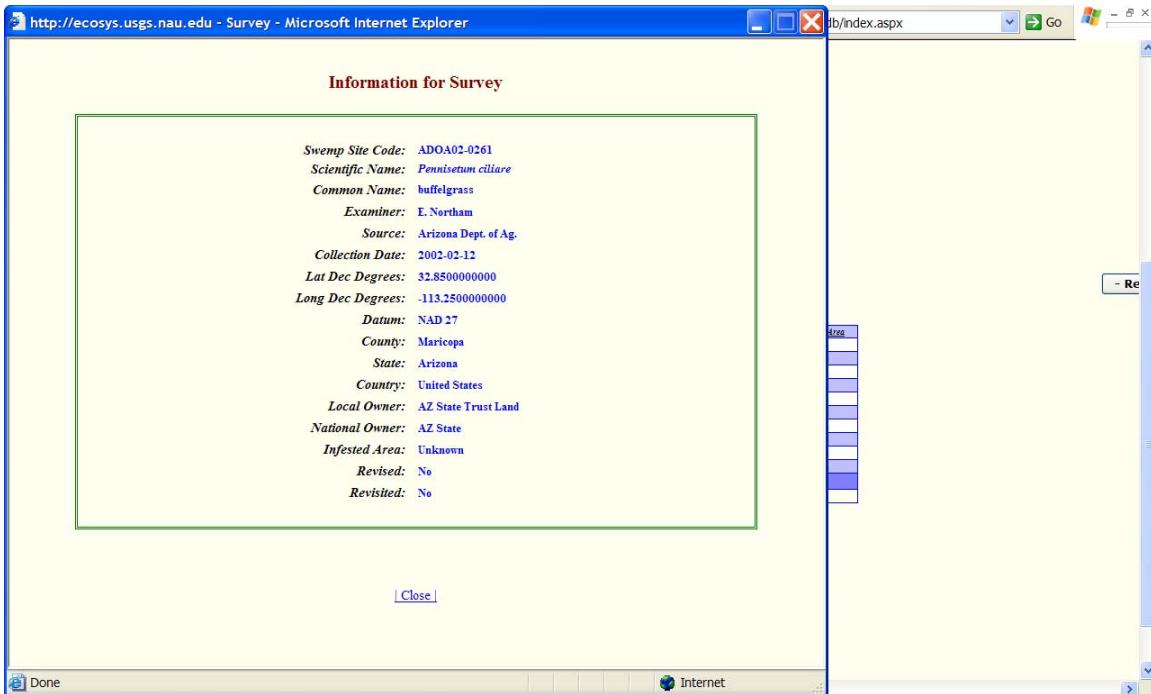


Figure 10. The data query tool also allows screen review of individual occurrence records in a query. This figure shows information for survey number 34355 shown in Figure 9.

Task 5: The "Users' Guide to Computer Tools for Information Sharing in the Southwest: SWEPIC, SWEMP, and SW-WIMS, version 1.0" was developed to provide information on each of the computer tools and to being a collaborator in the SWEMP database. The guide is available for download, with other information, at: <http://www.usgs.nau.edu/SWEPIC/swemp/swempA5.asp> (Figure 11). The manual is also provided as Appendix A to this report.

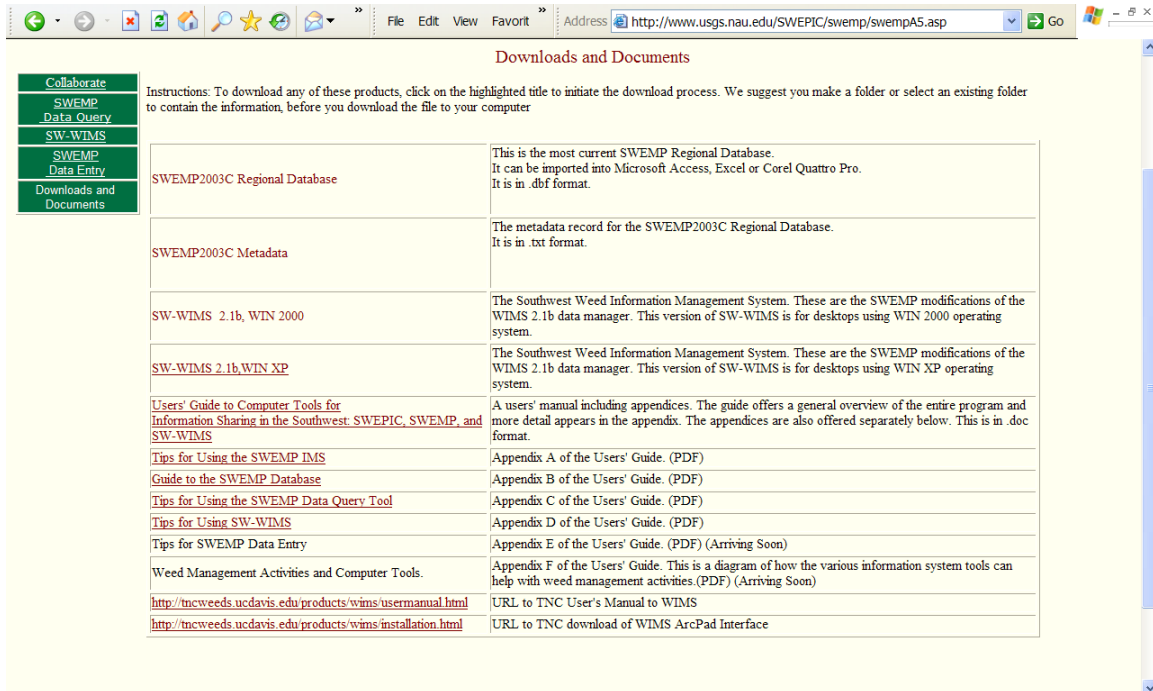


Figure 10. The Downloads and Documents page on SWEPIC provides the 'User's Manual' as a pdf and each of the appendices separately. The current SWEMP regional database, metadata, both versions of the SW-WIMS and links to the TNC web site for WIMS are also presented on this page.

A Cooperative Weed Management Area Information System

The three web based computer tools (interactive map, data query tool, and data entry tool) and the downloadable tool (SW-WIMS) are all key features of an evolving regional cooperative weed management area information system (Figure 11). This project provided an opportunity to add and refine components of the data sharing system including strengthening the data compilation and data delivery aspects of the SWEMP regional database. The overarching goal of the project, to provide improved means for cooperative weed management areas to manage and share weed occurrence data more readily, is facilitated through the regional modifications to SW-WIMS and distribution through SWEPIC. Sharing of data is facilitated through the two new outlets for SWEMP data - the interactive maps and the data query feature. In addition, the improvements will aid in sharing of data for Southwest weed occurrences with national database programs, such as the National Institute for Invasive Species Science.

CWMA Data Management System

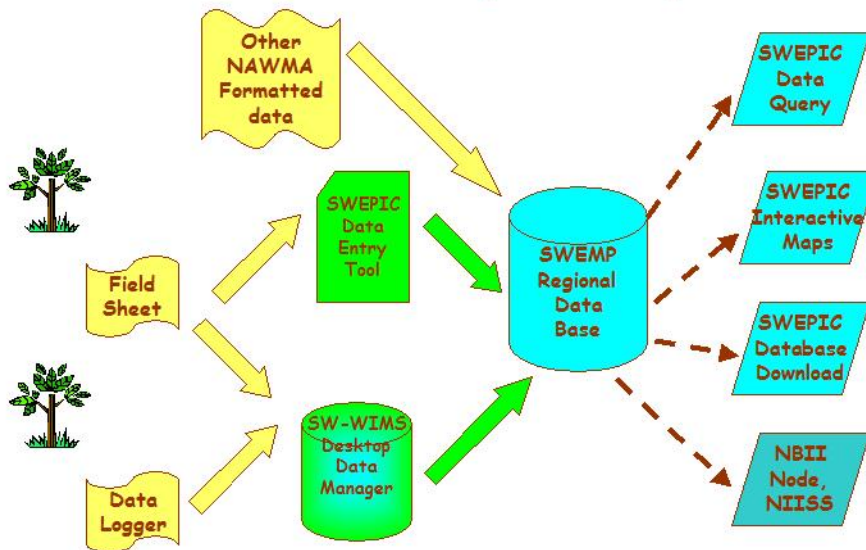


Figure 11. The components of weed occurrence data sharing in the southwest. Members of a CWMA have several ways to contribute data to the SWEMP regional database. The data is compiled with other contributions, and after quality control, is made available through SWEPIC in several ways. Complete records for any one CWMA can be obtained through the data query tool, as illustrated in Figure 9.

Implementation

This project does not provide a terminal product but rather a series of products that will be implemented among a wider audience than the SDISC prototype group. Four regional presentations on how CWMA's can use SWEPIC and the computer tools are scheduled, with one of the four already given to the Sonoran Regional Monitoring Partnership in early June 2005. A USGS fact sheet is also planned to provide background information on the information system.

The SWEPIC/SWEMP team is coordinating with the version 3 developers of WIMS and with the University of Arizona developers of another PDA based weed-mapping system to plan for further implementation of the new WIMS version, any resulting SW-WIMS modifications, and PDA connectivity.

Acknowledgements

The USGS Southwest Biological Science Center thanks The Nature Conservancy and the Department of Defense Legacy Resource Management Program for financial support for the project. We thank Dr. John Hall of the Conservancy and Nina Chambers of the Sonoran Institute for conception of this project and their collaborative support and input

during the project implementation. The members of the Sonoran Desert Invasive Species Council also provided valuable feedback and comment on the development and presentation of the computer tools. We also thank the TNC-Oregon WIMS team, Drs. Steve Buttrick and Mandy Tu, for their interest and cooperation in modifying the WIMS data manager for use in the southwest.