

State Department of Transportation Vegetation Inventory Protocol Project Training Manual



State Department of Transportation Inventory Protocol Project - Training Manual

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Introduction

Invasive species continue to be a growing problem throughout the United States. Billions of dollars are spent each year for invasive species control. Highways have been implicated as suitable sites for invasion (Rentch et al. 2005) and conduits for invasion (Gelbard and Belnap 2003, Gelbard and Harrison) 2003), thus express the need for highway vegetation managers to address issues related to invasive species. However, it is not an easy issue to address. Mississippi alone has an estimated 13,700 miles of highway, which is equivalent to 27,650 lane miles and approximately 129,000 acres of roadside vegetation (Personal communications 26 Aug. 2005, Dave Thompson, MDOT). Putting this into perspective, if the entire area was sprayed once with herbicide at 25 gallons per acre (GPA), it would require over 3.2 million gallons of water. The cost in labor and herbicide would be a very large sum, as well. Thus, the importance of choosing target species becomes a critical financial management strategy.

There is a growing need for roadside vegetation managers to record, store, and maintain data as part of their invasive species management strategies. Both old and new invasive species continue to cause problems. Many of these invasive species commonly require multiple herbicide applications for successful control, which requires revisits to the same site over a period of time. Less time locating sites can save time and expenses for managers. In addition, the management of many miles of highway corridor includes thousands of landowner stakeholders. Many of these may also be concerned about invasive species and/or management activities on adjacent rights-of-way. Thus, there is a need for better precision and management tools.

GPS, global positioning system, technology is not new, but continues to improve and expand into widely used products, such as cell phones. However, functionality depends upon the intended use of the product and that is not always an easy decision. The technology itself can be a powerful tool functionally, but there are many options and prices to consider when acquiring a receiver. These receivers should store and assist with relocating location data, but what about large amounts of data, or information beyond GPS coordinates, like species and infested area? There is a growing need to develop and maintain databases where data can be stored, managed, and shared. Fortunately, databases have been developed that serve a wider audience of users. Users may be unaware of the accessibility and usability of such systems.

The purpose of this project is to provide a functional, easy-to-use, and affordable system that roadside vegetation managers could utilize as part of their invasive species management strategies. In an ever-changing world, it is not surprising that technology is also ever changing. It may seem at times that technology drives technology, while at other times it may seem that necessity drives technology. The primary goal of this research was not to drive or develop technology, but to merely investigate its possibilities as a tool for a given application. The goal was to identify the optimum and most affordable method(s) for acquiring, managing, and storing data about invasive plant species on land under management by the Mississippi Department of Transportation.

Project Overview

Collaboration with the Federal Highway Administration (FHWA) began in 2007 to develop an affordable method of collecting and storing invasive plant species data for Departments of Transportation in Mississippi and surrounding MidSouth States. Collaboration with the Mississippi Department of Transportation (MDOT) began in 2008 to determine what technology was currently in use by Mississippi DOT and possibly other adjacent states. This technology included cell phones with GPS (Global Positioning System) or camera capabilities, GPS receivers, and GIS (Geographic Information System) technology. The objective was to determine need and compatibilities of technology in current usage with existing software, databases, and technologies.

A literature review and company salesperson interviews of current technology was conducted based upon technology in current usage by DOT to determine what technology was most applicable for DOT for this application. The objective was to match current technology with the application.

Investigation of the Weed Information Management System v. 3.0 (WIMS 2009), developed by The Nature Conservancy (TNC) Global Invasive Species Team (GIST 2009), and the Invasive Plant Atlas of the MidSouth (IPAMS 2009) database, developed by Mississippi State University's Geosystems Research Institute (GRI 2009), was conducted to determine how each was applicable using NAWMA (North American Weed Management Association)(NAWMA 2009) standards in achieving DOT system goals. Field data collection, storage and acquisition of database data, system support, early detection and rapid response (EDRR), and other considerations were assessed. The objective was to identify a viable database utilizing national data format (NAWMA), which would serve as a storage and management system for DOT field data.

GPS receivers with potential for DOT usage were acquired and equipment tested in the field to determine compatibility with this DOT application (Figure 1). Receivers were field tested on DOT right's-of-way in various settings. In addition, some review of smartphones, PDA's, and software was included in the investigation. The objective of this investigation was to determine the best fit for DOT applications.

Based upon information gathered, a training manual was developed to facilitate the utilization of equipment, form completion, download method(s), software, and database applications. A training session was offered to MDOT as a manual test for technology users. The objective was to provide an instructional and reference manual for DOT personnel using this method.

In July 2009, results were presented at the 12th AASHTO/TRB Maintenance Management Conference in Annapolis, MD to provide information to professionals interested in issues related to invasive plant species regionally and/or nationally.

Figure 1. GPS receivers mounted and ready for testing conducted in five transportation settings at eight locations in seven major Mississippi cities.



GPS Receivers

During the course of the study 10 GPS receivers were evaluated for accuracy/satellite locking, ease of waypoint recording, and display visibility. Only new or continued lines of receivers were evaluated. In other words, no discontinued receivers or receivers planned to be discontinued were studied. All receivers were considered affordable and ranged from suggested retail prices of \$159.99 to less than \$500.00 each. As a result of the investigation, the Garmin GPSmap 276C was selected for the DOT applications in this study (Figure 2). The accuracy over a set number of road settings, shape relative to the dashboard (Figure 3), and large display size (Figure 3) were primary factors in its selection. However, most receivers investigated had good characteristics for other applications, such as ease of handling during longer, more rugged field events. Smartphones, Personal Digital Assistant's (PDA's) and other devices which support GPS technology were discussed, but not compared in this study primarily due to service contract and software issues. Such devices will be discussed briefly in the download methods section of this manual. Thus, we do not discourage the use of such receivers since they may be functional for this DOT application. Due to the previous reasons, only the Garmin GPSmap 276C receiver will be discussed in this training manual.

Figure 2. The Garmin GPSmap 276C attached to a friction mount which can be easily placed on or removed from the dashboard.



How to Use the Garmin GPSmap 276C Receiver.

Notice: Review the owner's manual before utilizing the receiver. The manual will provide how-to and other important information about the receiver. Receiver specifications are provided in Appendix A. Technical questions not addressed in this training manual should be addressed to the manufacturer. Manufacturer contact information is provided in Appendix E of this manual.

1. Push the red on/off button and hold down briefly.
2. Once the receiver display is on, review the pages and press 'ENTER' button.
3. Continue pressing 'ENTER' until the main menu page is displayed (Figure 3).
4. Give the receiver time to acquire (lock) satellites (note: you will need to be outside in an open area for best results. Typically receivers will not acquire satellites indoors.)
5. Pressing the 'QUIT' button will enable you to scroll through the different display windows.
6. To set up the proper coordinate system, go to the main menu by pressing 'MENU' button twice. Press the arrow down or up and scroll to 'Setup' (will highlight).
7. Scroll right to 'Location' using the right arrow key.
8. Scroll down to 'Location Format' using the down arrow key.
9. Press 'Enter' and scroll to 'hddd.ddddd°' or 'UTM UPS' and press 'Enter'.
10. Check if 'Map Datum' is set to 'WGS 84'.
11. Once finished scroll back to top and left back to 'System'.
12. Scroll down to 'WAAS' and press 'Enter'.
13. Select 'Enabled' by pressing 'Enter'.
14. Scroll back to 'System' then back to 'Setup'.

About the Required Coordinate Systems

Datum (WGS-84) required.

UTM or Decimal Degrees required.

UTM (Universal Transverse Mercator) is UTM zones in the United States range from 14 to 19. Mississippi is primarily Zone 16.

Decimal Degrees are longitude/Latitude coordinates are based upon longitude and latitude grids that circle the globe. Longitudes are north-south and latitudes are east-west. These are recorded in different ways and may be confusing. For example, Degrees-minutes-seconds, Degrees-decimal minutes, and decimal degrees are not the same.

Conversion tools are available, but to help eliminate confusion, only decimal degrees or UTM coordinates are used in this protocol.

15. Once the coordinate system is setup you are ready to record or enter waypoints (GPS points). This can be done from the main menu.

16. If you are simply writing the waypoint coordinate on a hard form, you can acquire the waypoint from the main menu on the center right-hand side (Figure 3). You are finished.
17. If you are saving waypoints in the receiver, then from the main menu, scroll up or down using the arrow key to 'Points'.
18. Once on 'Points' press the 'MENU' button. Pressing the 'ENTER' button will display the 'New Waypoint' information. Press the 'ENTER' button again to save the waypoint. Waypoints are number in order from '0001' to '9999', unless manual labels are assigned.

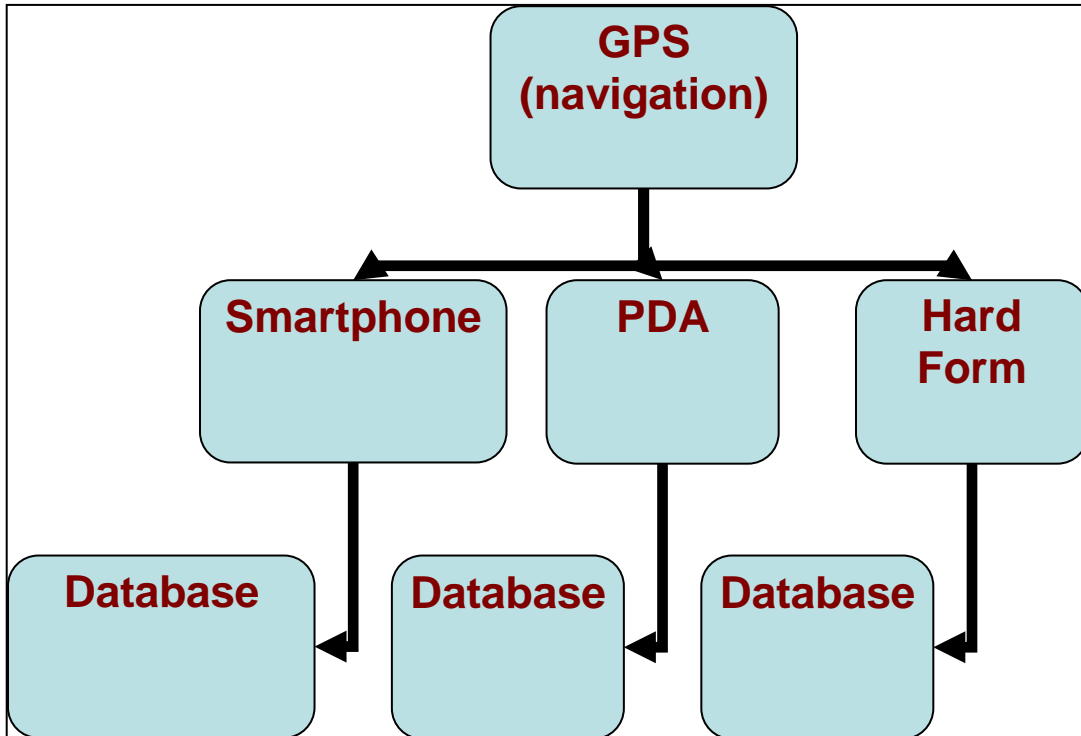
Figure 3. Garmin GPSmap 276C display. Notice the display size, WAAS enabling, and ~9 ft accuracy with seven satellites.



Smartphones and PDA's (Optional)

Basic Information. Just during the course of this investigation technology was changing. Due to the high variability in user abilities, data uploading methods remain relatively flexible for this application (Figure 4). These methods should embrace the technology enthusiast as well as those desiring very simple, relatively non-technical methods.

Figure 4. Organizational chart showing three possible methods for uploading data to the IPAMS database.



These methods include both PDA's and smartphones (Figure 5). Field Survey data in the proper format may be uploaded from a PDA or smartphone to IPAMS. Contact the IPAMS webmaster in Appendix E. Additionally, smartphones with web access can potentially enable users to login to IPAMS and enter the data directly into IPAMS on the phone. If interested in this method, contact the webmaster in Appendix E.

Figure 5. Example of a Personal Digital Assistant (PDA)(HP iPAQ)(left) and a smartphone (Blackberry Curve)(right).



Field Survey Form Standards

NAWMA Field Survey Form. This field survey form is based upon the NAWMA (North American Weed Management Association) standards ([http://www.nawma.org/NAWMA mapping standards](http://www.nawma.org/NAWMA_mapping_standards)). More information about NAWMA is provided in Appendix B of this manual or can be found at <http://www.nawma.org/>. It is a national standard and thus data fields are consistent and can be shared with other databases in the United States. Each field survey form data field will be discussed (Figure 6).

General Information:

- Site Number: On NAWMA form, but not required by IPAMS.
- Collection Date: Date species data was collected as YYYYDDMM.
- Examiner Name: Name of data collector.
- State: State where species was found.
- County: County where species was found (IPAMS can provide this information if not available at the time of collection).
- National Ownership: See dropdowns in IPAMS, or refer to www.nawma.org mapping standard website. E.g. STAT.
- Local Ownership: See dropdowns in IPAMS, or refer to www.nawma.org mapping standard website. E.g. DOT.
- Source of Data: IPAMS.

Location Information (Datum WGS-84 required)(DD or UTM required)

- Decimal Degrees: Longitude and latitude (use a '-' in front of the latitude)
- UTM: Zone (most of Mississippi is in Zone 16), Northing and Easting.

Plant Information:



- Invasive species: (Spelling not that critical on hard form since IPAMS provides drop-down).
- Genus: Genus
- Species: Specific epithet
- Intraspecific Name(s): var., ssp., etc., if applicable.
- Infested Area: Species area of coverage with the gross area.
Unit of Measure: Acres or sq.ft.
- Gross Area: Overall area in which invasive species are established.
Unit of Measure: Acres or sq.ft.
- Canopy Cover (%): Percent of gross area covered by species.

Associate Species (Optional): Spelling not that critical on hard form since IPAMS provides drop-downs.

Comment Field (Optional): Additional information, such as highway, which side of highway, etc.

Figure 6. Example of a NAWMA dataform utilized by the IPAMS database. This form has five prefilled data fields for 'Examiner Name' and 'State'.

**INVASIVE PLANT ATLAS OF THE MIDSOUTH
FIELD SURVEY FORM (NAWMA)**

General Information

Site Number _____ Collection Date (YYYYMMDD) _____

Examiner Name: Last Maddox First: Victor Middle Initial L

State: AL National Ownership _____ Local Ownership _____

County _____ Source of Data: _____

Location Information

<p>Decimal Degrees:</p> <p>Latitude: N _____</p> <p>Longitude: W _____</p>	<p>Datum: <u>WGS-84</u> (required)</p> <p>UTM: _____ Zone: _____ Year: _____</p> <p>Easting: _____</p> <p>Northing: _____</p>
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Plant Information

GENUS _____ SPECIES _____

INTRASPECIFIC NAME(S) _____

Common Name _____

Infested Area _____ UNIT OF MEASURE _____

Gross Area _____ UNIT OF MEASURE _____

Canopy Cover _____ %

Associate Species (Optional)

Comment Field (Optional)

7/16/09

Invasive Plant Atlas of the MidSouth (IPAMS) Database

Why IPAMS. The IPAMS (IPAMS 2009)(Appendix C) database was chosen as a data sink for this project. IPAMS utilizes the NAWMA standard on the Field Survey Form (Figure 6) and is a shared database through NBII (NBII 2009)(Appendix D). In addition, IPAMS is a local, regional database developed by the Geosystems Research Institute (<http://www.gri.msstate.edu/>) at Mississippi State University (<http://www.msstate.edu/>). IPAMS offers invasive species information (Figure 7), training workshops on 40 target species (Figure 8), easy access, data management, and botanist data verification. IPAMS is also developing EDRR tools.

Figure 8. IPAMS target species categorized by primary habitat. Identification and other information for these species are being offered in workshops in the MidSouth.

Invasive Plant Atlas of the MidSouth IPAMS Target Species

Scientific Name	Common Name(s)	Primary Habitat
<i>Commelina benghalensis</i> L.	Benghal dayflower (tropical spiderwort)	Row Crop
<i>Crotalaria spectabilis</i> Roth	showy rattlebox	Row Crop
<i>Digitaria ciliaris</i> (Retz.) Koel.	Southern Crabgrass	Row Crop
<i>Digitaria sanguinalis</i> (L.) Scop.	Large Crabgrass	Row Crop
<i>Galinsoga quadriradiata</i> Cav.	shaggy-soldier (hairy galinsoga)	Row Crop
<i>Sorghum halepense</i> (L.) Pers.	Johnsongrass	Row Crop
<i>Xanthium spinosum</i> L.	spiny cocklebur	Row Crop
<i>Carduus nutans</i> L.	nodding plumeless thistle (musk thistle)	Pasture
<i>Imperata cylindrica</i> (L.) Beauv.	cogongrass	Pasture
<i>Rosa multiflora</i> Thunb. Ex Murr.	multiflora rose	Pasture
<i>Solanum viarum</i> Dunal	tropical soda apple	Pasture
<i>Sporobolus indicus</i> (L.) R. Br.	smut grass	Pasture
<i>Alfilaria petiolata</i> (Bieb.) Cavara & Grande	garlic mustard	Managed Forests
<i>Elaeagnus pungens</i> Thunb.	thorny olive	Managed Forests
<i>Hedera helix</i> L.	English ivy	Managed Forests
<i>Lonicera maackii</i> (Rupr.) Herder	Amur honeysuckle	Managed Forests
<i>Lygodium japonicum</i> (Thunb. ex Murr.) Sw.	Japanese climbing fern	Managed Forests
<i>Mimosa pigra</i> L.	black mimosa	Managed Forests
<i>Nandina domestica</i> Thunb.	sacred bamboo	Managed Forests
<i>Pueraria montana</i> (Lour.) Merr.	kudzu	Managed Forests
<i>Wisteria sinensis</i> (Sims) DC.	Chinese wisteria	Managed Forests
<i>Ailanthus altissima</i> (P. Mill.) Swingle	tree of heaven	Rights of Way
<i>Albizia julibrissin</i> Durazz.	silktree (mimosa)	Rights of Way
<i>Ligustrum japonicum</i> Thunb.	Japanese privet	Rights of Way
<i>Ligustrum sinense</i> Lour.	Chinese privet	Rights of Way
<i>Rottboellia cochinchinensis</i> (Lour.) W.D. Clayton	itchgrass	Rights of Way
<i>Triadica sebifera</i> (L.) Small	Chinese tallowtree	Rights of Way
<i>Arundo donax</i> L.	giant reed	Wildland
<i>Cayratia japonica</i> (Thunb.) Gagnepain	bushkiller	Wildland
<i>Lonicera japonica</i> Thunb.	Japanese honeysuckle	Wildland
<i>Microstegium vimineum</i> (Trin.) A. Camus	Nepalese browntop (stiltgrass)	Wildland
<i>Vitex rotundifolia</i> L. f.	roundleaf chastetree (beach vitex)	Wildland
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	alligatorweed	Aquatic
<i>Eichhornia crassipes</i> (Mart.) Solms	common water hyacinth	Aquatic
<i>Hydrilla verticillata</i> L.f. Royle	waterhyme (hydrilla)	Aquatic
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	parrotfeather	Aquatic
<i>Lythrum salicaria</i> L.	purple loosestrife	Aquatic
<i>Myriophyllum spicatum</i> L.	spike watermilfoil (Eurasian watermilfoil)	Aquatic
<i>Rotala rotundifolia</i> (Buch.-Ham. ex Roxb.) Koehne	roundleaf toothcup	Aquatic
<i>Salvinia molesta</i> Mitchell	kariba-weed (giant salvinia)	Aquatic

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Setting Up and Managing IPAMS User Accounts. Account information is for account and contact information only within the scope of the IPAMS system. Your information will not be shared with any other organization. **Red** on the account setup page indicates required field. User IDs are 6-25 alphanumeric characters. Underscores '_' and dashes '-' are also allowed. Passwords are 8-25 alphanumeric/special characters. At least one

special character must be used. Special characters include ~!@#\$%^&*()_+-={}|[]:;<>?.,/.

Once an account is established, you can enter invasive species data into the database.

Entering data into IPAMS from the Field Survey Form (NAWMA).

1. Log into IPAMS.
2. Under 'Tools' on the left side, click on 'Submit Surveys'.
3. Click on 'Location Info' under 'Sections' left side of the page.
4. Enter the GPS coordinate (UTM or DD) and click on 'View Location' below the map.
5. View the map display and compare with county and road information on the dataform. If correct proceed, if not determine if the GPS is incorrect or other problem(s) exist.
6. Click on 'General Info' and fill in the fields. Fields with a red asterisk are required fields. Other fields are optional.
7. Click on 'Plant Info' and select 'Species' from the drop-down. Again, fields with a red asterisk are required fields. At least one image is required since data forms are verified by a botanist. Up to three images can be provided. The image provided should show a close-up of the plant, clearly showing leaf arrangement, flowers, and/or fruit that may exit.
8. Click on 'Assoc. Specs' IF you have recorded 'Associate Species' on the dataform, which is optional. Select from the drop-down list. If you have more than one species, hold the 'Ctrl' button on the keypad down as you click on each species. They should appear in the list to the right.
9. Click on 'Comments' IF you have provided comments in the 'Comment Field' on the dataform, which is optional.
10. When you are finished, click the 'Submit' button.
11. If you have more forms submit another.
12. When finished logout, but clicking on 'Logout' at the top right side of the page.

Managing Surveys in IPAMS.

1. Log into IPAMS.
2. Under 'Tools' on the left side, click on 'Manage Surveys'.
3. You can subset your reports based on State, County, Collector, and/or Species.
4. Select the report you wish to edit. The information for that report will be displayed on the right side of the page. Click the 'Edit Survey' button to edit this report.
5. You may edit the survey information in the same manner as it was submitted. Images may also be updated.
6. When you are finished, click the 'Submit' button.

Figure 7. Cogongrass [*Imperata cylindrica* (L.) Beauv.] information page (shortened here for demonstration purposes) available on the IPAMS database at www.gri.msstate.edu/ipams.

IPAMS Invasive Plant Atlas of the MidSouth
[Home](#) [About](#) [Contact Info](#) [Register](#) [Login](#)

Scientific Name: ***Imperata cylindrica* (L.) Beauv.**
Cogongrass

Common Name: **Cogongrass**

Family: Poaceae
USDA Plant Code: IMCY
Habitat: Terrestrial; fields, rights-of-way, open forest
Growth Habit: Perennial Graminoid
Native Environment: S.E. Asia

Distribution

United States
 Currently, cogongrass occurs as a weed in Alabama, Florida, Georgia, Louisiana, Mississippi, Oregon, South Carolina, Texas, and Virginia, and it continues to spread. Several thousand acres are infested with cogongrass in the southeastern United States, and more than 1.2 billion acres worldwide.

MidSouth
 In the MidSouth it occurs in Alabama, Louisiana, and Mississippi with the highest concentrations along the Coastal Plain.

IPAMS Surveys:

Control Methods

Biological
 Transferring data from alpha1p.hpc.msstate.edu...

Downloading data from Microsoft Excel, PDA or other device to IPAMS (Optional).

These methods may be possible, but require the assistance of the IPAMS webmaster. Contact the IPAMS webmaster via the website or using the contact information in Appendix E of this manual.

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Appendix A. Garmin GPSmap 276C Specifications.

The following information was acquired at:

<https://buy.garmin.com/shop/shop.do?pID=233#specsTab>

More information about Garmin can be found at <https://www.garmin.com/>

Physical & Performance:	
Unit dimensions, WxHxD:	5.7" x 3.2" x 1.9" (14.5 x 8.1 x 4.8 cm)
Display size, WxH:	3.0" x 2.2" (7.6 x 5.6 cm)
Display resolution, WxH:	480 x 320 pixels
Display type:	256-color TFT
Weight:	13.6 oz (385 g)
Battery:	rechargeable internal lithium-ion
Battery life:	up to 15 hours
Waterproof:	yes (IPX7)
High-sensitivity receiver:	no
Antenna:	detachable
NMEA input/output:	NMEA 0183
RoHS version available:	yes
Maps & Memory:	
Basemap:	yes
Preloaded maps:	no
Ability to add maps:	yes
Built-in memory:	none (cannot load maps to internal memory)
Accepts data cards:	Garmin data cards
Waypoints/favorites/locations:	3,000
Routes:	50
Track log:	10,000 points; 20 saved tracks

Features:	
Garmin radar compatible:	no
Garmin sonar compatible:	yes
CANet® compatible:	no
Garmin Marine Network™ compatible:	no
Touchscreen:	no
Supports AIS (tracks target ships' position):	no
Supports DSC (displays position data from DSC capable VHF radio):	yes
Audible alarms:	yes
Tide tables:	yes
Hunt/fish calendar:	yes
Sun and moon information:	yes
3-D map view:	no
Auto Guidance:	no
Automatic routing (turn by turn routing on roads):	yes
XM WX Weather & Radio for U.S. compatible:	no
Voice prompts (e.g. "Turn right in 500 ft."):	no
Speaks street names (e.g. "Turn right ON ELM STREET in 500 ft."):	no
Remote control:	no
Headphone jack/audio line-out:	yes
Audio/video input/output:	no
Portable:	yes
Automotive/motorcycle-friendly:	yes

What's in the Box:

- GPSMAP 276C
- One basemap below
Americas: Americas Autoroute
Europe: Atlantic Autoroute
Pacific: Pacific Autoroute
- USB cable
- Power/data cable
- Marine mount
- AC charger
- Trip & Waypoint Manager
- Owner's manual
- Quick reference guide

Appendix B. North American Weed Management Association (NAWMA)

NAWMA (2009) is a network of public and private professional weed managers who are involved in implementing any phase of a county, municipal, district, state, provincial or federal noxious weed law. There are active state weed and roadside vegetation associations and societies devoted to weed science organizations. Other organizations focus on federal legislation and others are comprised of federal and state middle level managers. There is now a Cooperative Weed Management Area (CWMA) in Mississippi, a statewide organization with similar functions.

Until NAWMA, there was no North American organization serving the educational, professional improvement, and networking needs of the on-the-ground, local vegetation or exotic plant manager.

NAWMA is comprised of county weed managers, and local area managers in the state, federal, and provincial land agencies such as the Forest Service, National Biological Survey, and the Bureau of Land Management.

By joining NAWMA, you gain access to a wealth of information and experience from people who manage noxious and exotic vegetation programs on a day-to-day basis.

In NAWMA, you become a part of a North American-wide network of people involved in preserving our natural resources from the threat of invasive noxious weeds and non-native exotic vegetation.

NAWMA's Objectives:

To foster cooperation among noxious weed managers, throughout North America in the exchange of information, education, training, weed management practices, programs, and technologies.

To empower North American noxious weed managers by improving their professionalism and the image of noxious weed managers.

To assist in the development of uniform international, national, provincial, and state weed management legislation and regulation.

To foster cooperation and involvement in noxious weed management among federal, provincial, state, municipal district, county, and private land managers throughout North America.

To coordinate enforcement in noxious weed management among federal, provincial, state, municipal, district, county, and private land managers.

To promote the funding of weed management projects, research, and programs that are international, national, or regional in scope and effectiveness.

More information about NAWMA can be found at <http://www.nawma.org/>.

Appendix C. Invasive Plant Atlas of the MidSouth (IPAMS)

About IPAMS. The IPAMS (IPAMS 2009) database was developed in collaboration with the United States Geological Survey (USGS) and other agency databases and structures, and the Invasive Plant Atlas of New England (IPANE), with mechanisms and procedures in place to ensure data transmission both upward (nationally) and downward to the local level for rapid assessment and response.

The Invasive Plant Atlas of the MidSouth (IPAMS)(Figure 7) is a project of the Geosystems Research Institute (GRI 2009), Mississippi State University, Mississippi State, MS.

IPAMS' Purpose. Invasive weedy plants are a widespread problem throughout the United States. Their growth is often widely dispersed, with little scientific ability to predict why they occur in a given location. In addition, historical human activities such as urbanization, agriculture, and forestry have a marked effect on the distribution and spread of invasives. This integrated project will quantify relationships of weed distribution and spread with land use, then use that information directly in educating agriculture stakeholders, natural resources managers, and other interested parties on potential human-induced opportunities for invasive species spread.

IPAMS will provide information on the biology, distribution, and best management practices for forty weedy plant species. Outreach and extension activities include developing training programs for volunteers to identify and report invasive species using IPAMS, developing an efficient Early Detection and Rapid Response (EDRR) system for invasive plants, developing best management practices workshops, and developing an online mapping system. Research activities include conducting systematic regional vegetation surveys to assess the distribution of key invasive plants, developing models for predicting the occurrence of target species based on land use and cover, and evaluate the relative effectiveness of professional versus volunteer surveys.

Early Detection and Rapid Response. IPAMS is a unique tool for early detection and rapid response. Trained volunteers regularly check areas for invasive species. When they encounter an invasive species, they record the location by GPS, the plant and other information about the plant population. On the IPAMS Web site, they input this information and alert researchers and government officials of the new infestation. This gives those decision-makers more time in taking appropriate steps and treating an infestation early, before it spreads further.

Support for IPAMS. U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service (CSREES), National Research Initiative, Biology of Weedy and Invasive Species Program, directed by Dr. Michael Bowers under award #2007-55320-17847. Additional support has been provided by the U.S. Geological Survey Invasive Species Program and the National Biological Information Infrastructure under award #04HQAG0135.

IPAMS Collaborators

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IPAMS Partners

[U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service \(CSREES\)](#)

[U.S. Geological Survey \(USGS\)](#)

[National Biological Information Infrastructure \(NBII\)](#)

[MS Department of Agriculture and Commerce](#)

[MS Master Gardeners](#)

[SouthEastern Exotic Pest Plant Council \(SE-EPPC\)](#)

IPAMS Volunteers and Training. Potential volunteers include those from garden clubs, Master Gardeners, and other adult extension activities, youth extension activities such as 4-H programs, and workshops for production agriculture. We are developing training programs for volunteers to identify invasive species and report them using the IPAMS database. Through this web feature, we will also provide information on the biology, ecology, and best management practices for up to forty target invasive plant species. The data the volunteers collect will be combined with that from the previous research on IPAMS, which is searchable and has ArcIMS capabilities in order to produce distribution maps of species of interest.

IPAMS Project Personnel

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Appendix D. The National Biological Information Infrastructure (NBII).

About NBII. The National Biological Information Infrastructure (NBII) is a broad, collaborative program to provide increased access to data and information on the nation's biological resources. The NBII links diverse, high-quality biological databases, information products, and analytical tools maintained by NBII partners and other contributors in government agencies, academic institutions, non-government organizations, and private industry. NBII partners and collaborators also work on new standards, tools, and technologies that make it easier to find, integrate, and apply biological resources information. Resource managers, scientists, educators, and the general public use the NBII to answer a wide range of questions related to the management, use, or conservation of this nation's biological resources.

The NBII Program is managed by the U.S. Geological Survey's Biological Informatics Office.

If you have a question about the management of the NBII, or if you wish to obtain more information about our Program and partnerships, please contact our Program Manager:

NBII Program Manager
USGS Biological Informatics Office
302 National Center
Reston, VA 20192
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More information about NBII can be found at <http://www.nbii.gov/>.

Appendix E. List of Contacts

Manual or Project Questions:

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GPS Tool (Garmin GPSmap 276C):

Technical questions regarding the receiver contact manufacturer.
Garmin Product Support:
For emails:
<http://www.garmin.com/garmin/cms/home/support/supportcontact>
Phone (US):
913-397-8200

Data Form Questions (Field Survey Form):

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Plant Identification or Questions about Nomenclature (Names) including IPAMS:

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IPAMS Database Questions:

General database problems or questions:
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