CitSci.org

Fighting invasive species...

... through citizen science

A National Scale Citizen Science Program for Invasive Species

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The National Institute of Invasive Species Science

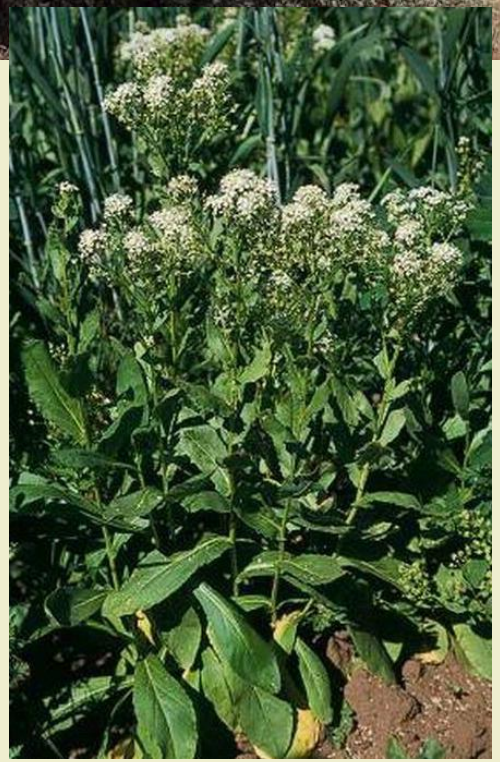
Outline

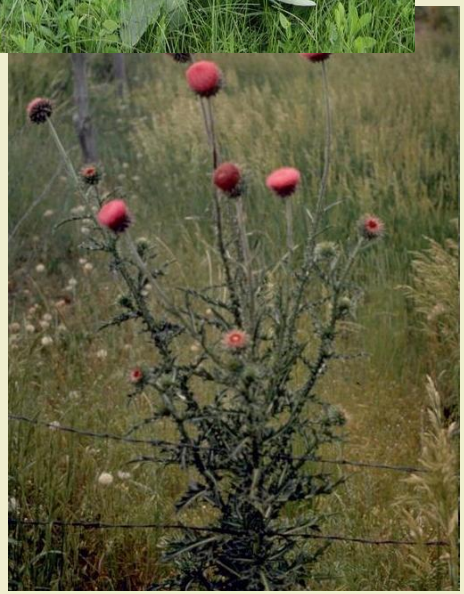
- Citizen Science Program
  - Trainings
  - Monitoring Protocols
  - Website

TRAININGS

Trainings

- Introduction to Invasives
  - Why are they a problem?
  - What can I do?
  - Species identification





Trainings

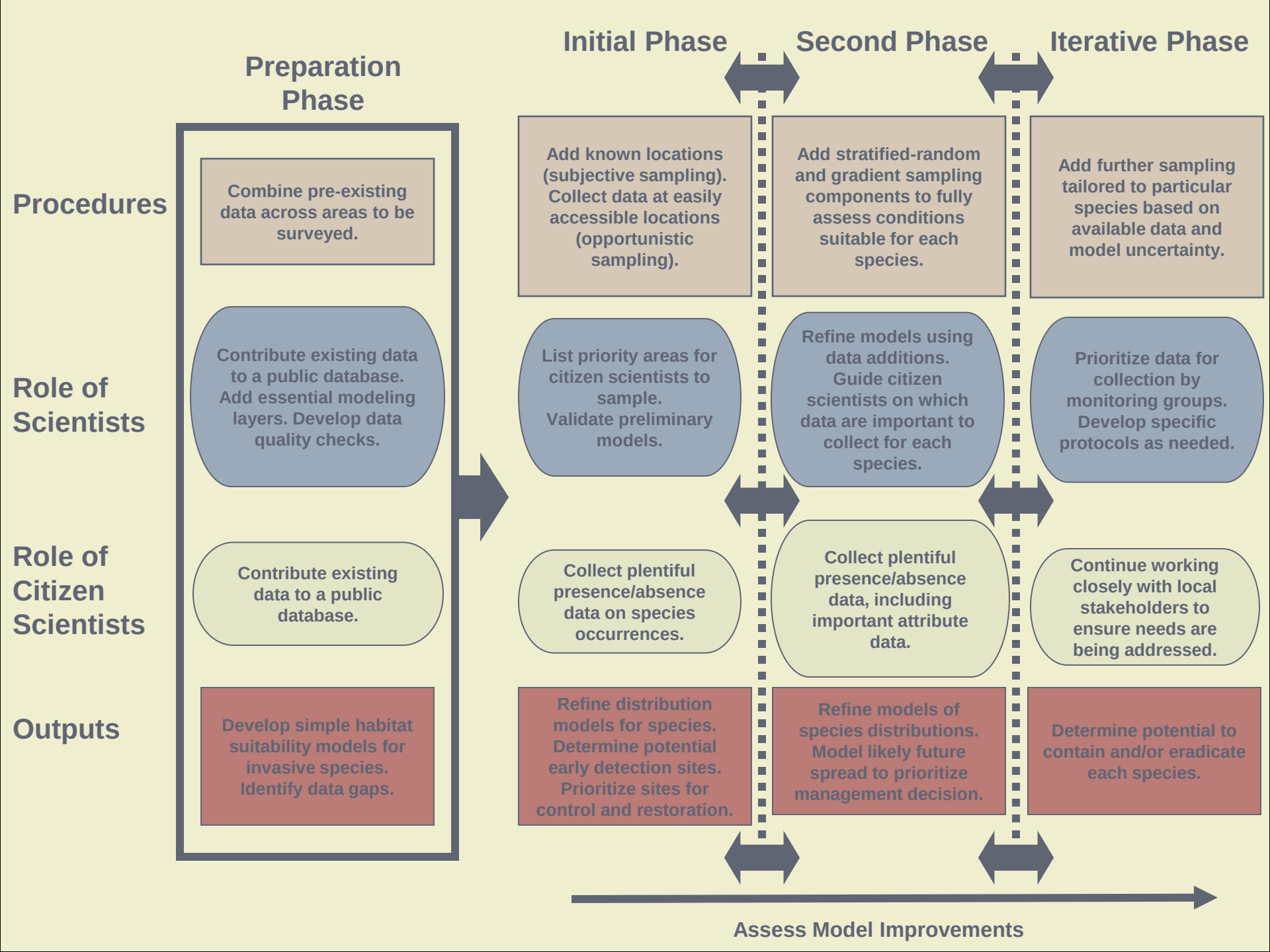
- Global Positioning Systems (GPS)
  - What is GPS and how does it work?
  - Taking a waypoint and navigation

Trainings

- Monitoring Protocols
  - Why should I monitor?
  - What data are important to collect?
  - Where do I monitor?

Monitoring Protocols

- Level 1: The simplest approach; map presence/absence of species with a GPS
- Level 2: A simple plot-based approach; least cost and time required; collect general location and abundance information
- Level 3: An approach for more experienced monitoring groups; incorporates more detailed species abundance and habitat information
- Level 4: A far more detailed approach to mapping and modeling native and non-native species distributions, primarily for researchers; expensive and time-consuming


Preparation Phase
Initial Phase
Second Phase
Iterative Phase
Procedures
Role of Scientists
Role of Citizen Scientists
Outputs
Combine pre-existing data across areas to be surveyed.
Add known locations (subjective sampling). Collect data at easily accessible locations (opportunistic sampling).
Add stratified-random and gradient sampling components to fully assess conditions suitable for each species.
Add further sampling tailored to particular species based on available data and model uncertainty.
Contribute existing data to a public database. Add essential modeling layers. Develop data quality checks.
List priority areas for citizen scientists to sample. Validate preliminary models.
Refine models using data additions. Guide citizen scientists on which data are important to collect for each species.
Prioritize data for collection by monitoring groups. Develop specific protocols as needed.
Contribute existing data to a public database.
Collect plentiful presence/absence data on species occurrences.
Collect plentiful presence/absence data, including important attribute data.
Continue working closely with local stakeholders to ensure needs are being addressed.
Develop simple habitat suitability models for invasive species. Identify data gaps.
Refine distribution models for species. Determine potential early detection sites. Prioritize sites for control and restoration.
Refine models of species distributions. Model likely future spread to prioritize management decision.
Determine potential to contain and/or eradicate each species.
Assess Model Improvements

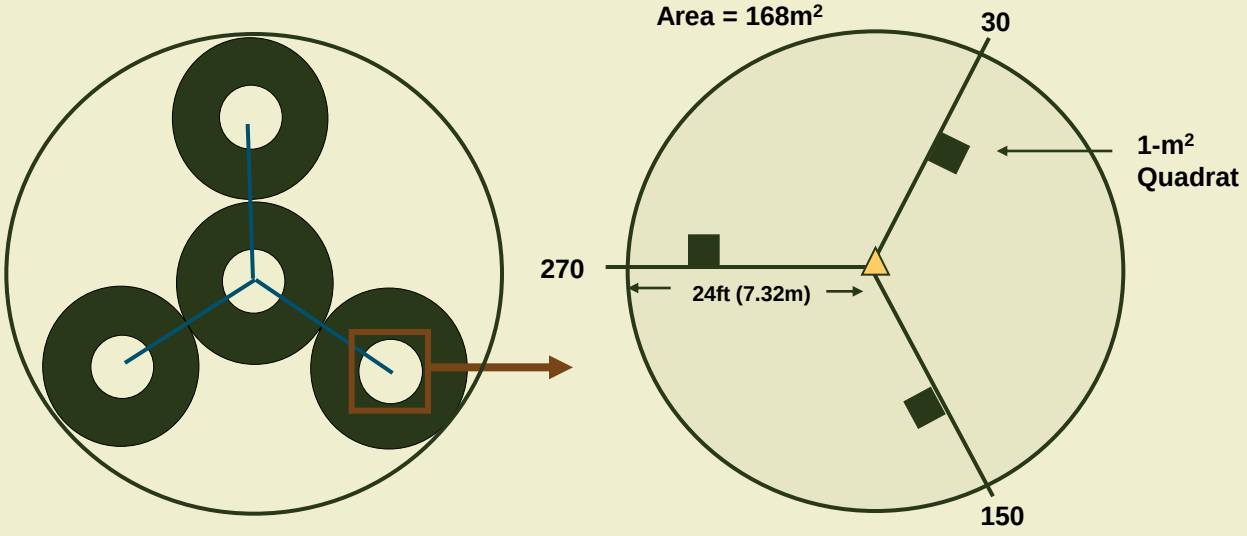
Level 1 Protocol

- Who?
  - Recorder's Name
- What?
  - Plant Name
- When?
  - Collection Date
- Where?
  - Location

Questions Addressed by Level 1

- What invasive species currently are coming into a local area?
- How widespread are these species?
- What habitats are these species invading?

Level 2 Protocol



See www.fia.fs.fed.us

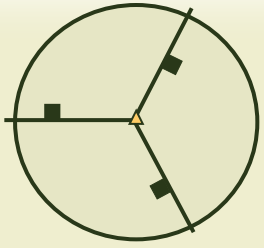
Level 2
Monitoring Plot

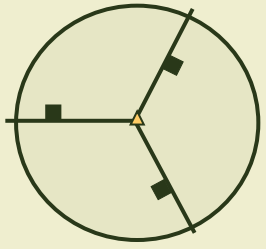
Questions Addressed by Level 2

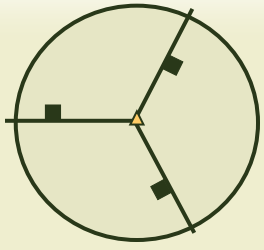
- Have our efforts to control a species been effective?
- Is the population of a species growing or shrinking over time?
- Does the population of a species differ in different habitats?

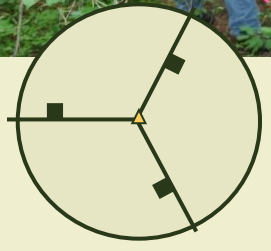
FIELD DAY

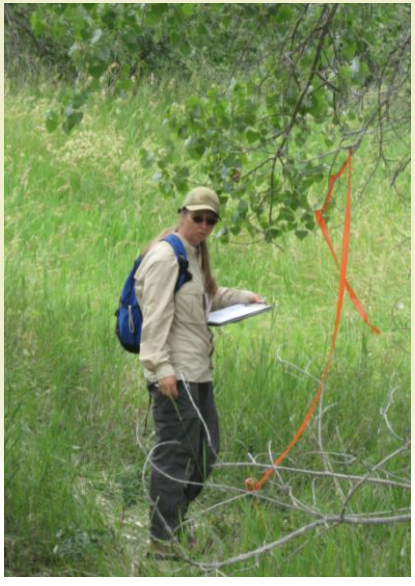
Station 1

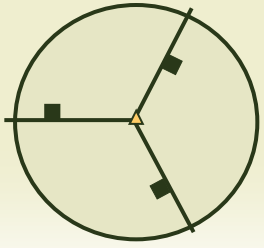




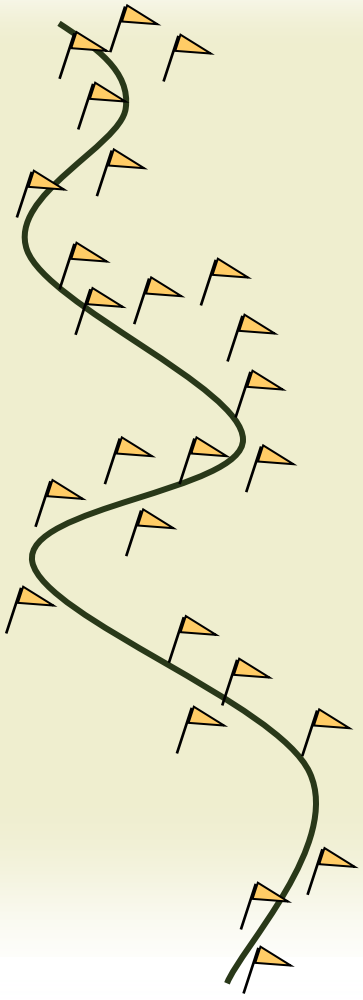




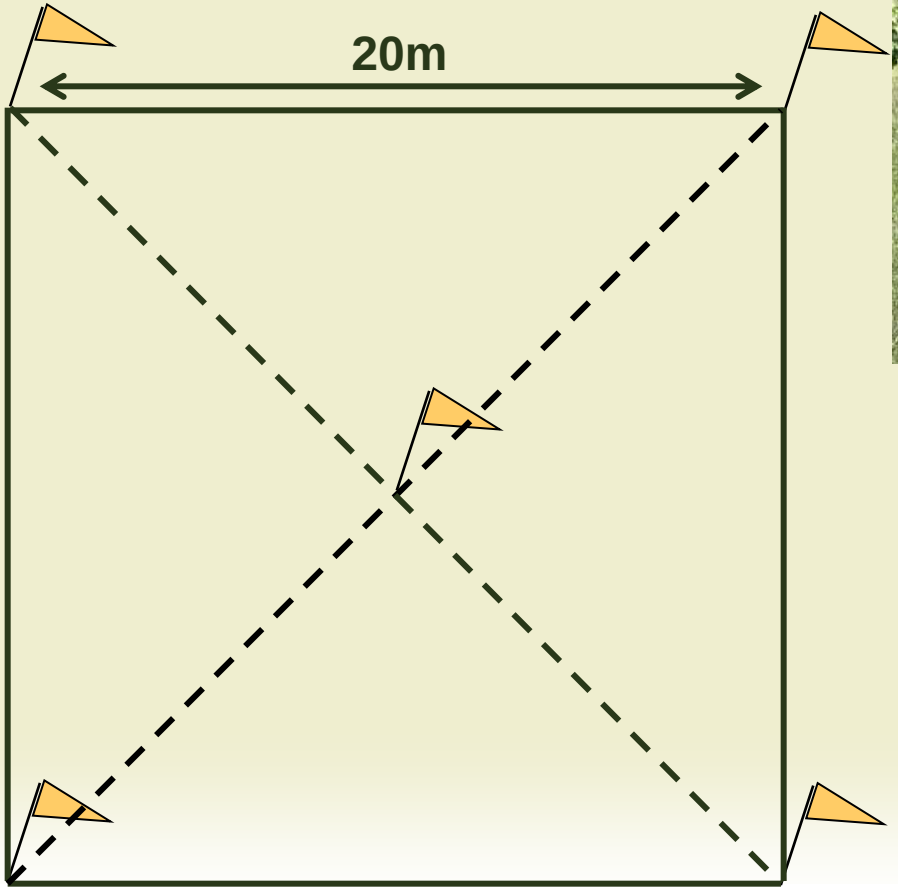




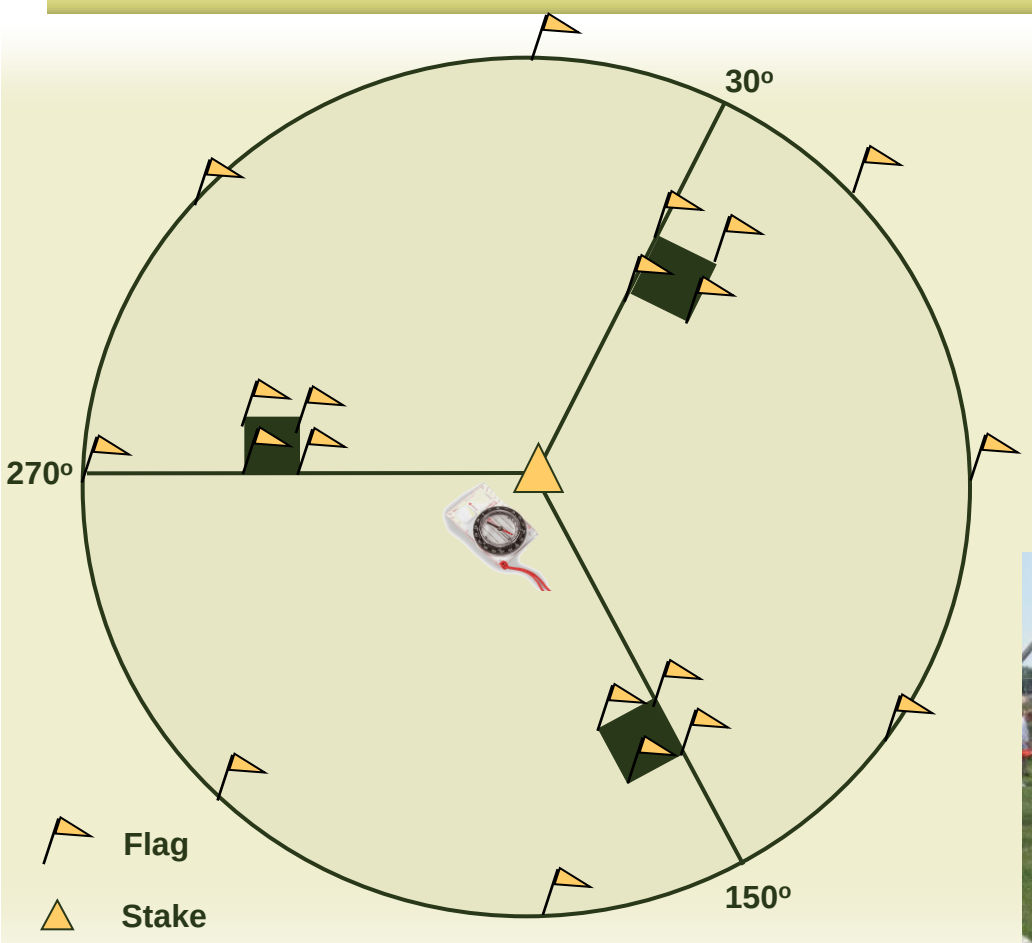
Station 2



Station 3



Station 4

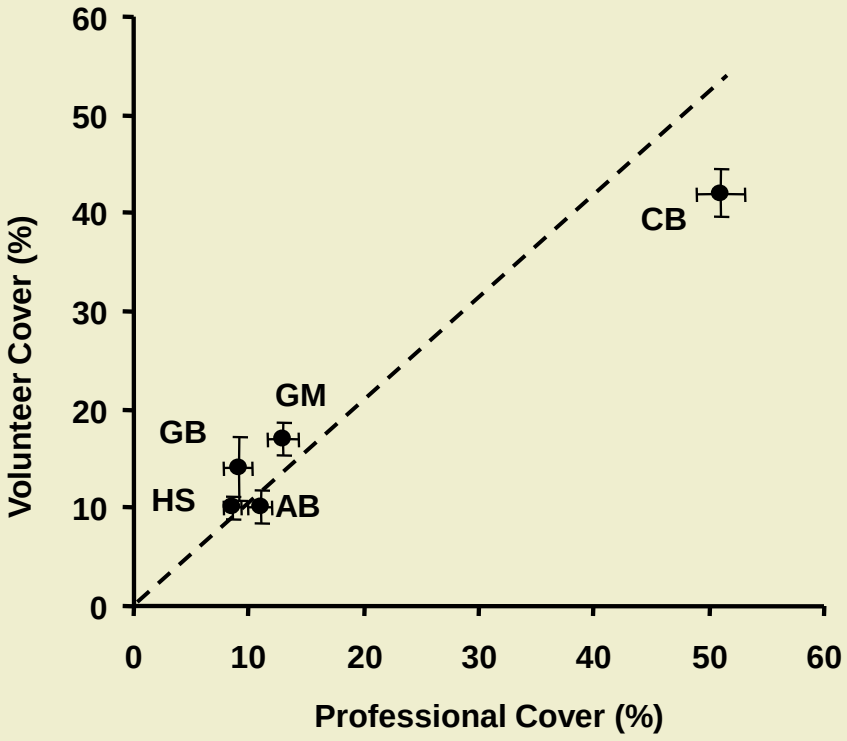


Results: Station 1

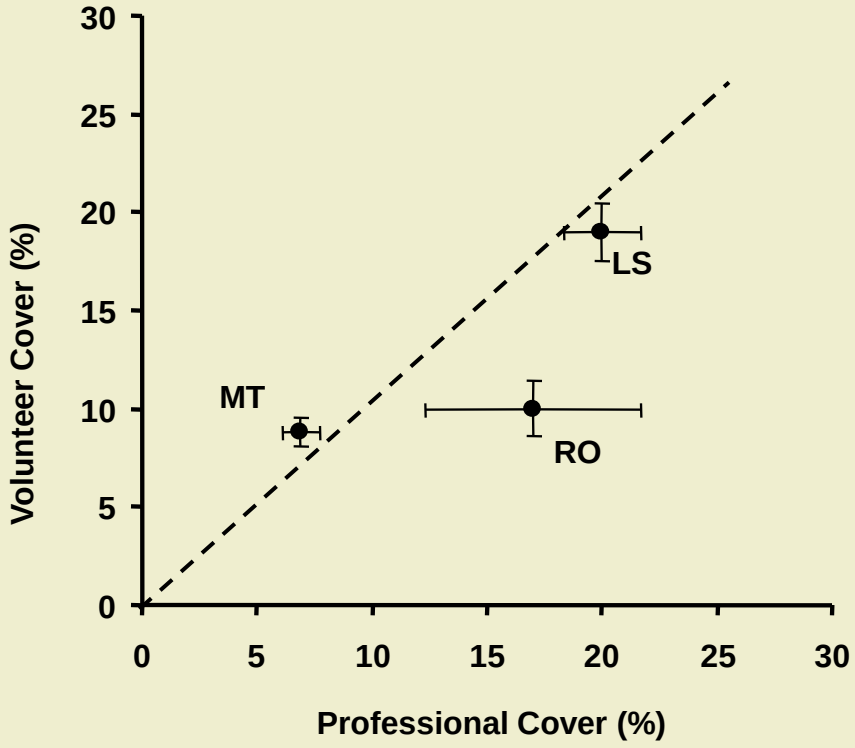
- Professionals more accurate at recording presence/absence than volunteers
  - 91% vs. 82%
  - Identification difficulty for the species affected accuracy
- Regression
  - Accuracy was correlated between volunteers and professionals (R^2=0.46; p=0.02)

Cover Estimates

A)



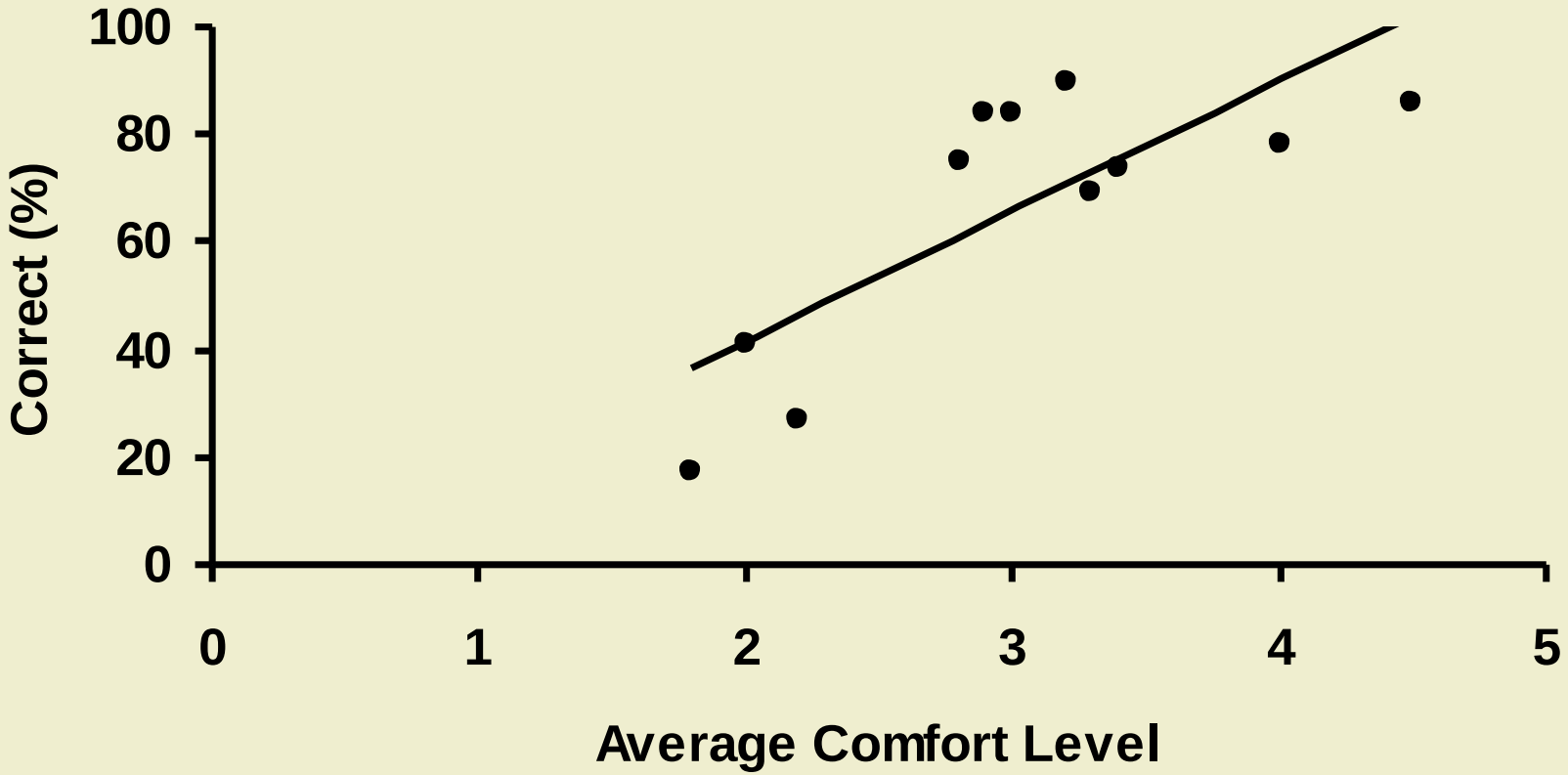
B)

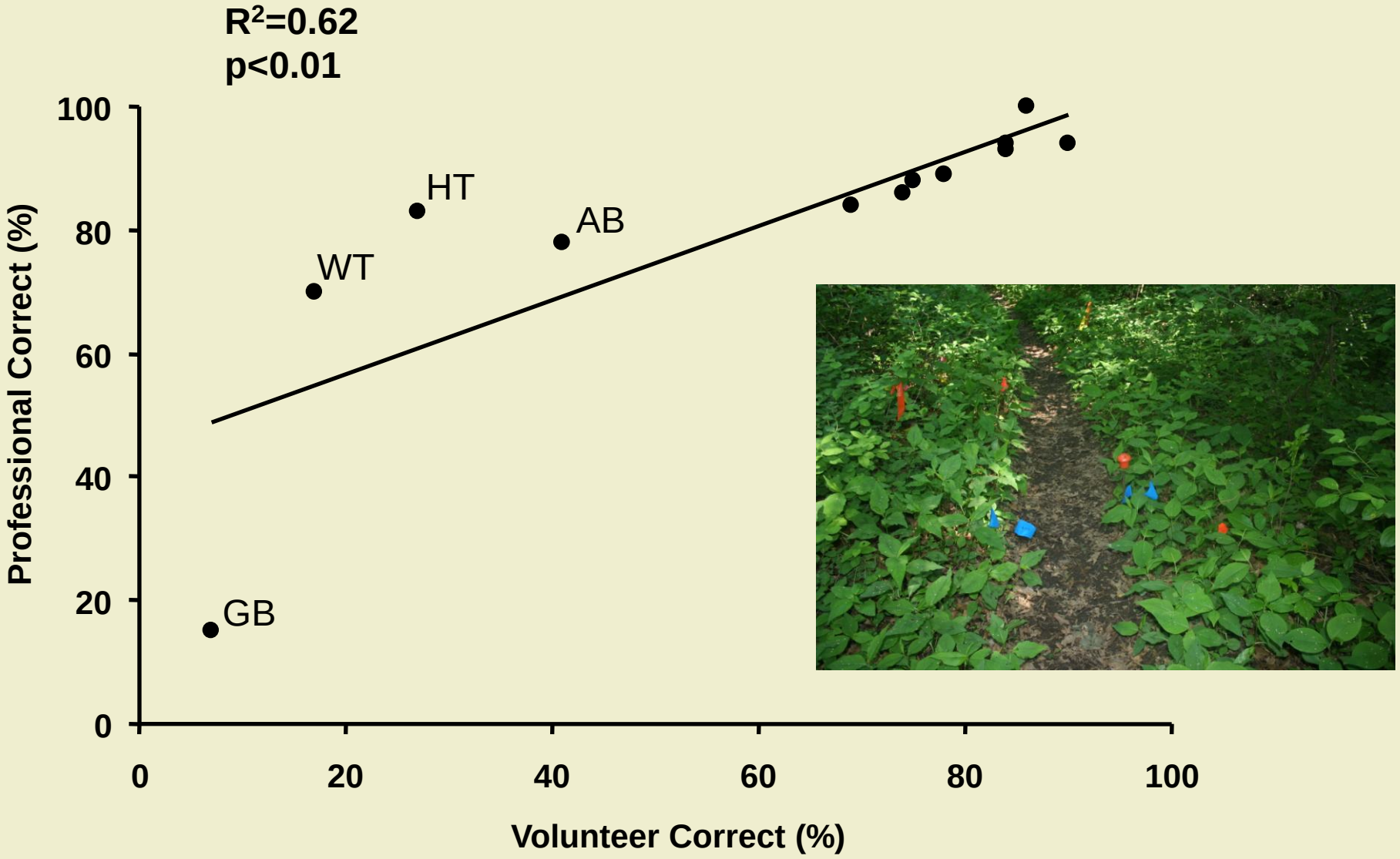


Results: Station 2

- Experts more accurate in correctly identifying species than volunteers
  - 85% vs. 70%
  - Volunteers: 16% false negative identifications and 14% false positive identifications
  - Experts: 9% false negative identifications and 6% false positive identifications
- Conspicuous vs. Inconspicuous
  - Volunteers correctly identified conspicuous species 81% of the time vs. 70% for inconspicuous species
  - 62% of false ids for GB were CB

$R^2=0.79$
$p<0.01$




R2=0.62
p<0.01
100
80
60
40
20
0
Professional Correct (%)
HT
AB
WT
GB
0
20
40
60
80
100
Volunteer Correct (%)

Results: Station 3

- 69% had little or no prior experience with GPS
- UTM Zone
  - 85% recorded correctly
- Datum
  - 64% recorded correctly
- Location Coordinates
  - 84% recorded correctly
- Navigation
  - 67% recorded correctly

Results: Station 4

- Correct Plot Setup
  - 60% of the participants set up plot correctly
  - 70% of errors related to compass use

Conclusions

- Can trainees implement the protocol as well as experts?
  - Identification difficult for volunteers
    - Accuracy improved for conspicuous species
      - Bloniarz and Ryan (1996)
      - Brandon et al. (2003)
    - Certain species difficult to identify for both groups
    - Volunteers tend to be more comfortable identifying species commonly found in state
      - Brandon et al. (2003)
    - Participants' self-rated comfort level could be used to determine identification accuracy in the field

Ways to Improve

- Voucher specimens
- Photograph specimens
- Protocol changes
  - Instructions on physical characteristics that need to be photographed for inclusion in voucher
  - Include list of species that require or do not require photo or specimen vouchers

Conclusions

- Can trainees implement the protocol as well as experts?
  - GPS use
    - Found no studies looking at use of GPS by volunteers
    - Volunteers should be able to achieve similar levels of performance regardless of background or prior experience
  - Presence/Absence
    - Experts and volunteers performed similarly
  - Cover estimates
    - Highly variable
    - Requires little equipment and easy to execute in the field
    - Volunteers can provide fairly reliable cover estimates when given proper training
  - Plot setup should improve with additional compass training

Predictors of Success?

- Stations 1, 2, and 4
  - Age
  - Education
  - Science Literacy
  - Experience
  - Environmental Attitude
- Station 3: GPS Score
  - Age
  - Education
  - GPS Experience
  - Technology Attitude

WEBSITE

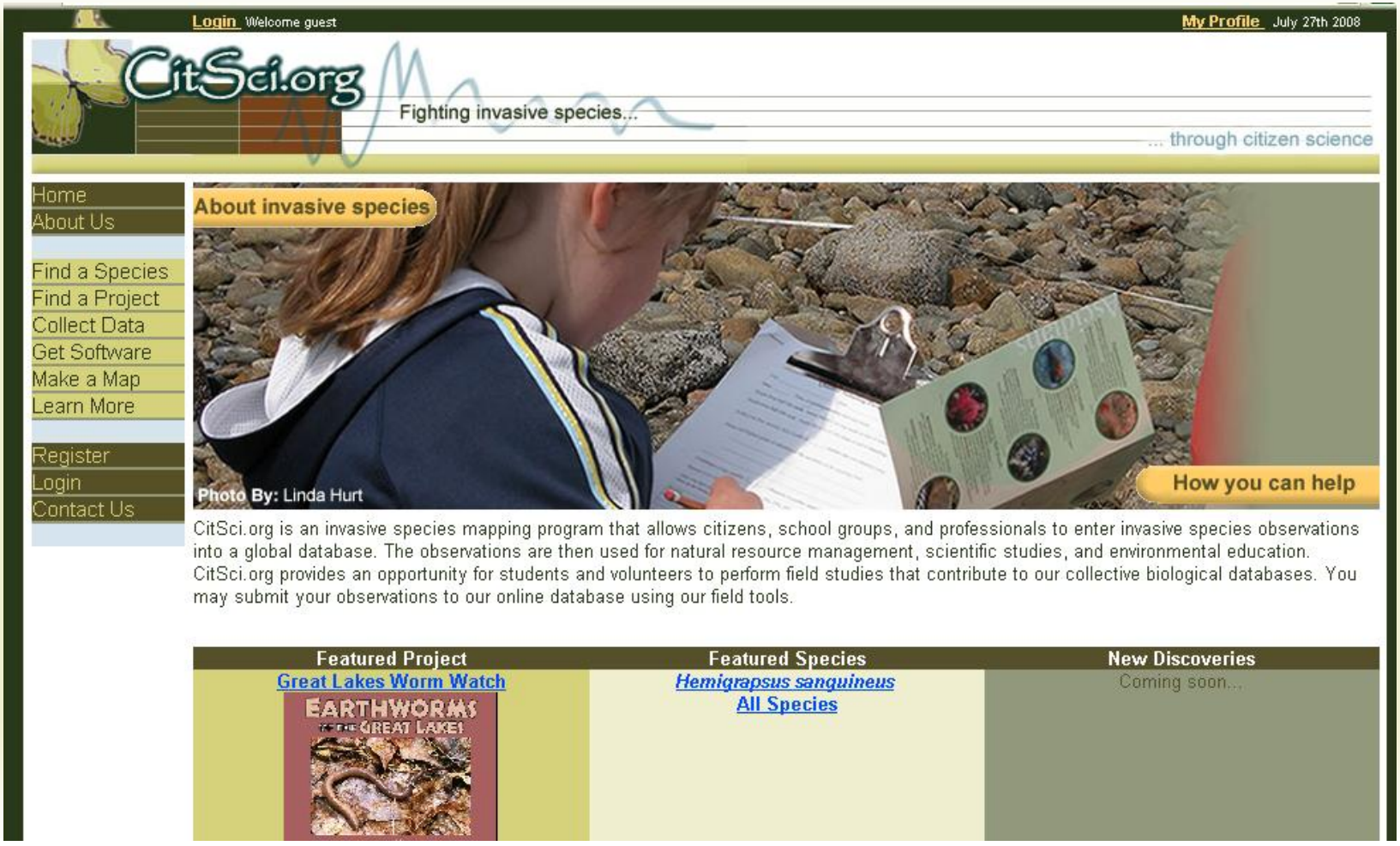

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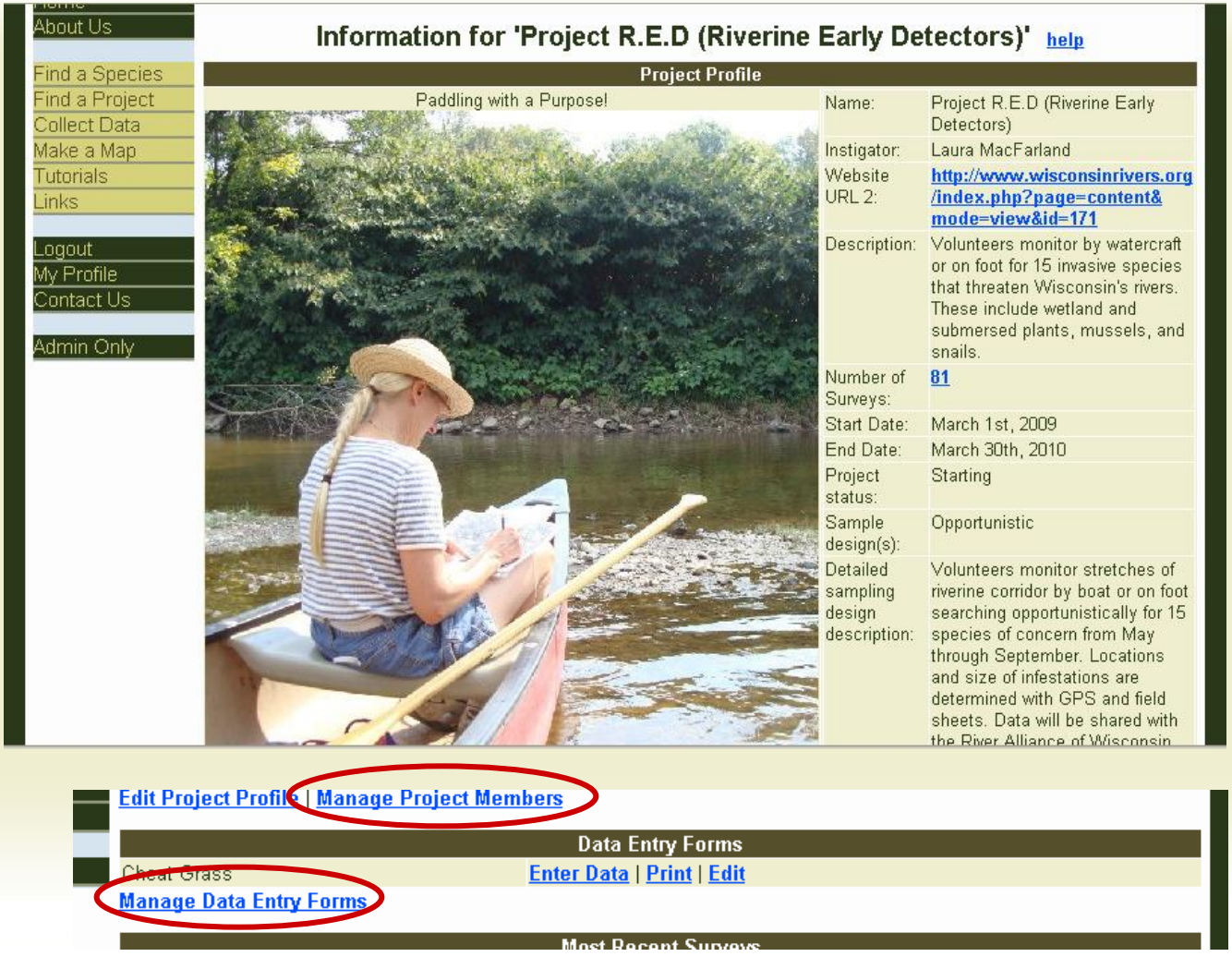
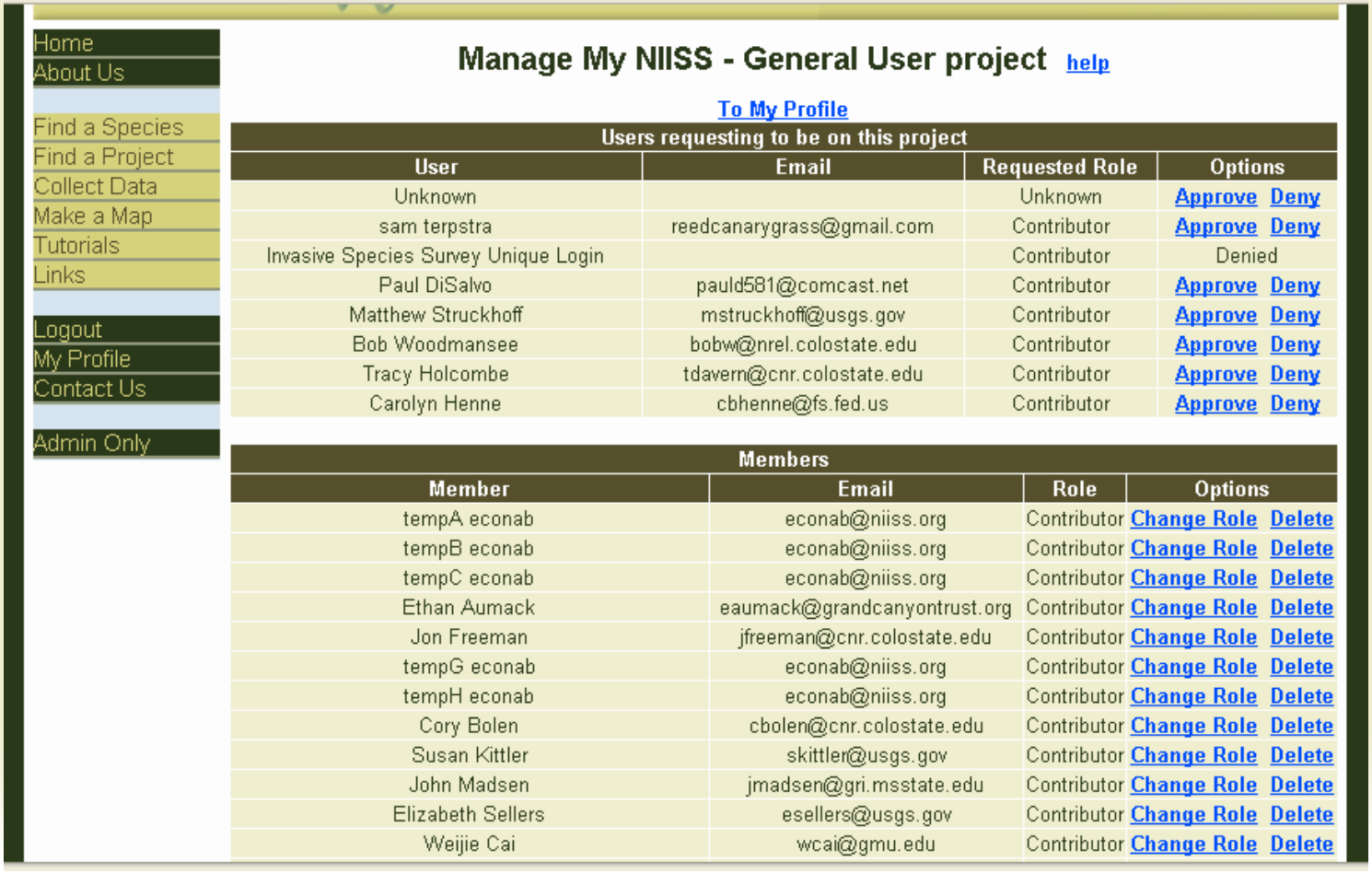
Photo By: Linda Hurt
How you can help
CitSci.org is an invasive species mapping program that allows citizens, school groups, and professionals to enter invasive species observations into a global database. The observations are then used for natural resource management, scientific studies, and environmental education. CitSci.org provides an opportunity for students and volunteers to perform field studies that contribute to our collective biological databases. You may submit your observations to our online database using our field tools.
Featured Project
Great Lakes Worm Watch
EARTHWORMS
Featured Species
Hemigrapsus sanguineus
All Species
New Discoveries
Coming soon...

Project Page



Manage Project Members



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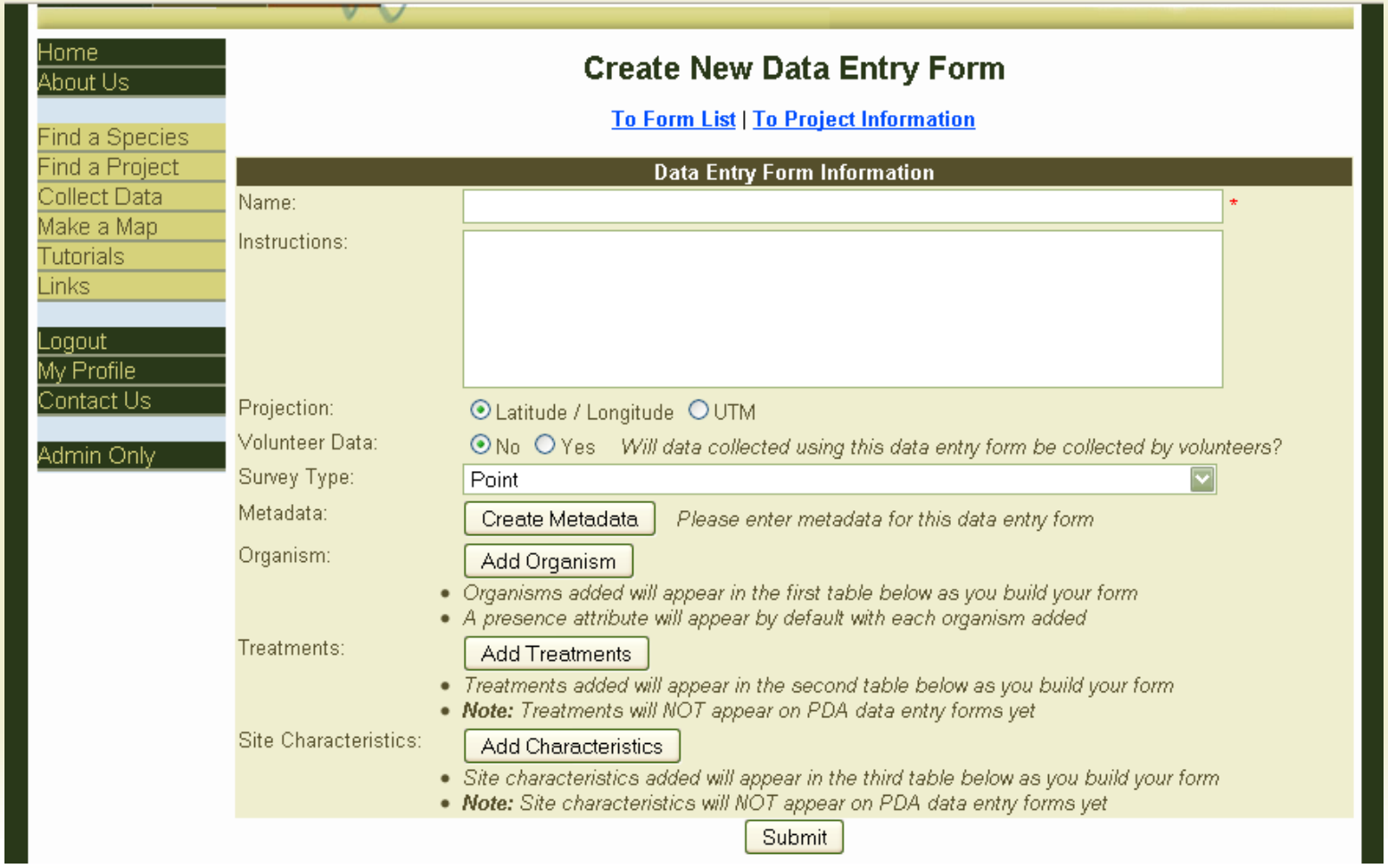
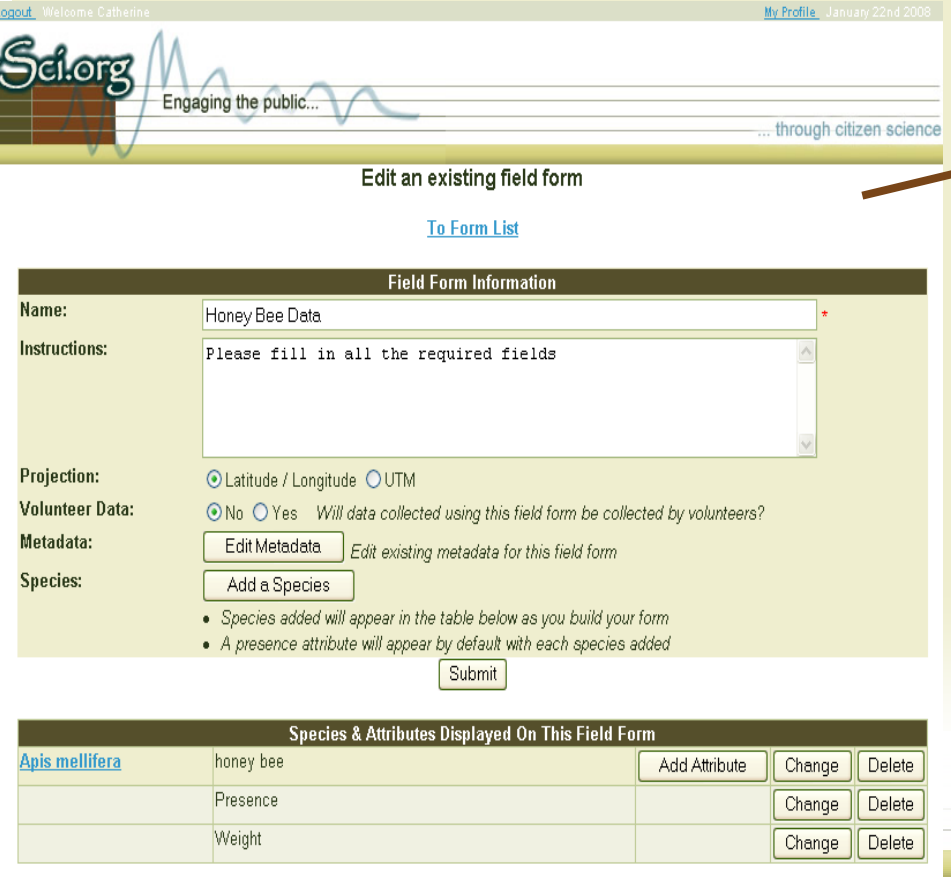
Users requesting to be on this project			
User	**Email**	**Requested Role**	**Options**
Unknown		Unknown	Approve Deny
sam terpstra	reedcanarygrass@gmail.com	Contributor	Approve Deny
Invasive Species Survey Unique Login		Contributor	Denied
Paul DiSalvo	pauld581@comcast.net	Contributor	Approve Deny
Matthew Struckhoff	mstruckhoff@usgs.gov	Contributor	Approve Deny
Bob Woodmansee	bobw@nrel.colostate.edu	Contributor	Approve Deny
Tracy Holcombe	tdavern@cnr.colostate.edu	Contributor	Approve Deny
Carolyn Henne	cbhenne@fs.fed.us	Contributor	Approve Deny

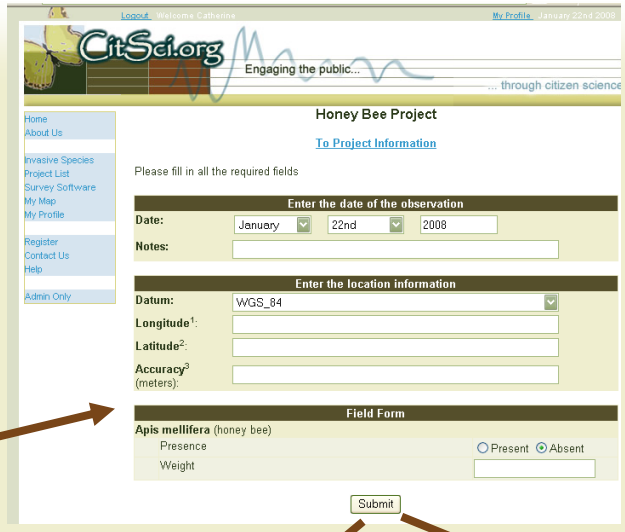
Members			
Member	**Email**	**Role**	**Options**
tempA econab	econab@niiss.org	Contributor	Change Role Delete
tempB econab	econab@niiss.org	Contributor	Change Role Delete
tempC econab	econab@niiss.org	Contributor	Change Role Delete
Ethan Aumack	eaumack@grandcanyontrust.org	Contributor	Change Role Delete
Jon Freeman	jfreeman@cnr.colostate.edu	Contributor	Change Role Delete
tempG econab	econab@niiss.org	Contributor	Change Role Delete
tempH econab	econab@niiss.org	Contributor	Change Role Delete
Cory Bolen	cbolen@cnr.colostate.edu	Contributor	Change Role Delete
Susan Kittler	skittler@usgs.gov	Contributor	Change Role Delete
John Madsen	jmadsen@gri.msstate.edu	Contributor	Change Role Delete
Elizabeth Sellers	esellers@usgs.gov	Contributor	Change Role Delete
Weijie Cai	wcai@gmu.edu	Contributor	Change Role Delete

Create Data Entry Forms



Website

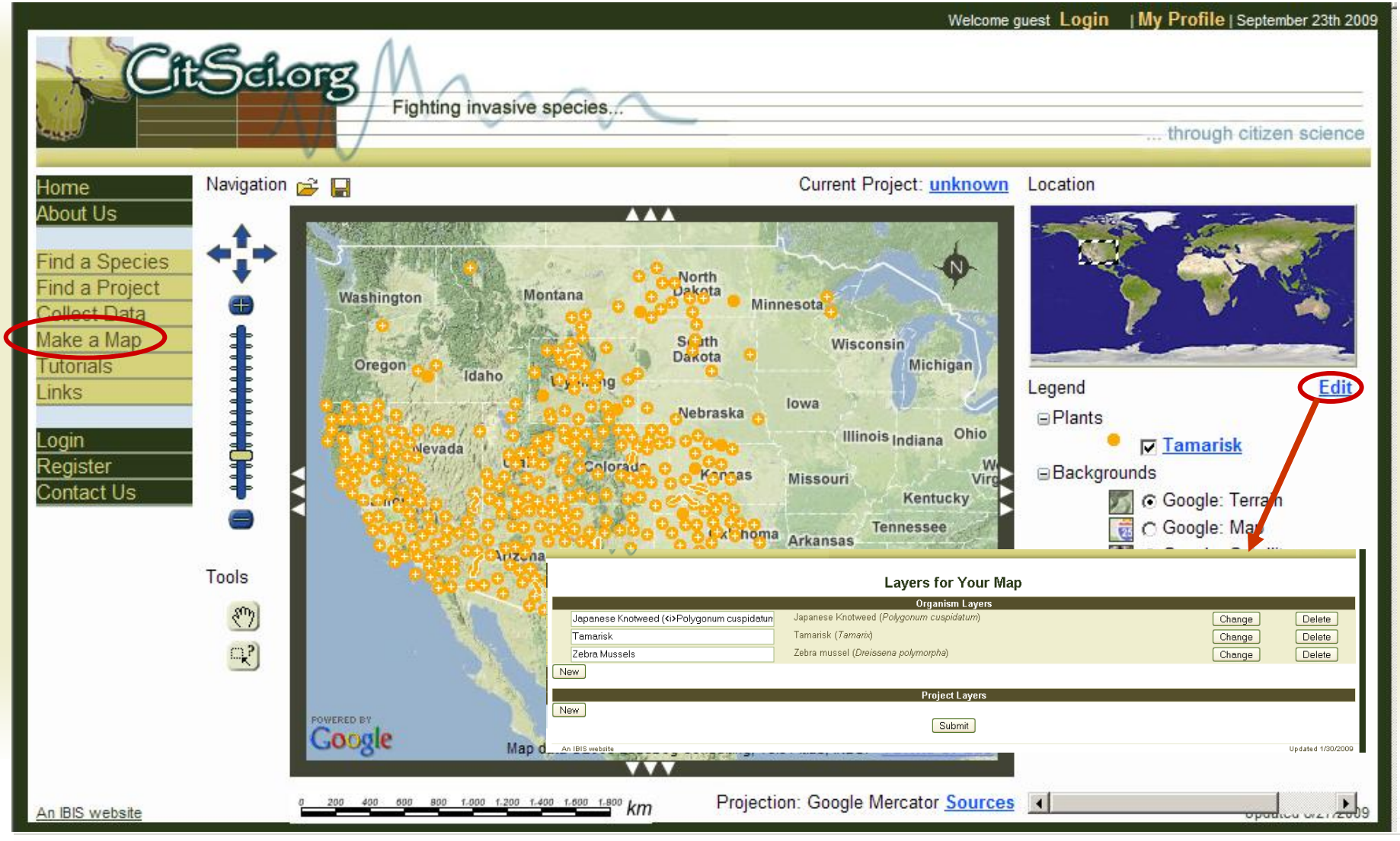

Engaging the public...
... through citizen science
Edit an existing field form
To Form List
Field Form Information
Name:
Honey Bee Data
Instructions:
Please fill in all the required fields
Projection:
Latitude / Longitude
UTM
Volunteer Data:
No
Yes
Will data collected using this field form be collected by volunteers?
Metadata:
Edit Metadata
Edit existing metadata for this field form
Species:
Add a Species
Species added will appear in the table below as you build your form
A presence attribute will appear by default with each species added
Submit
Species & Attributes Displayed On This Field Form
Apis mellifera
honey bee
Add Attribute
Change
Delete
Presence
Weight


Engaging the public...
... through citizen science
Honey Bee Project
To Project Information
Please fill in all the required fields
Enter the date of the observation
Date:
January
22nd
2008
Notes:
Enter the location information
Datum:
WGS_84
Longitude1:
Latitude2:
Accuracy3
(meters):
Field Form
Apis mellifera (honey bee)
Presence
Present
Absent
Weight
Submit


Honey Bee Project
To Project Information
Please fill in all the required fields
Enter the date of the observation
Date:
Notes:
Enter the location information
Datum:
WGS_84
NAD_27
NAD_83
Longitude1:
Latitude2:
Accuracy3
(meters):
Field Form
Apis mellifera (honey bee)
Presence
Present
Absent
Weight


Start
3:31
Saturday, December 03, 2005
Owner: A. Alexander
HP Profiles: Meeting
Outlook E-mail: 10 Unread
Appointment with C. Scott
4:00PM-5:00PM
Contacts
Messaging
iPAQ

Website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Tamarisk
Backgrounds
Google: Terrain
Google: Map
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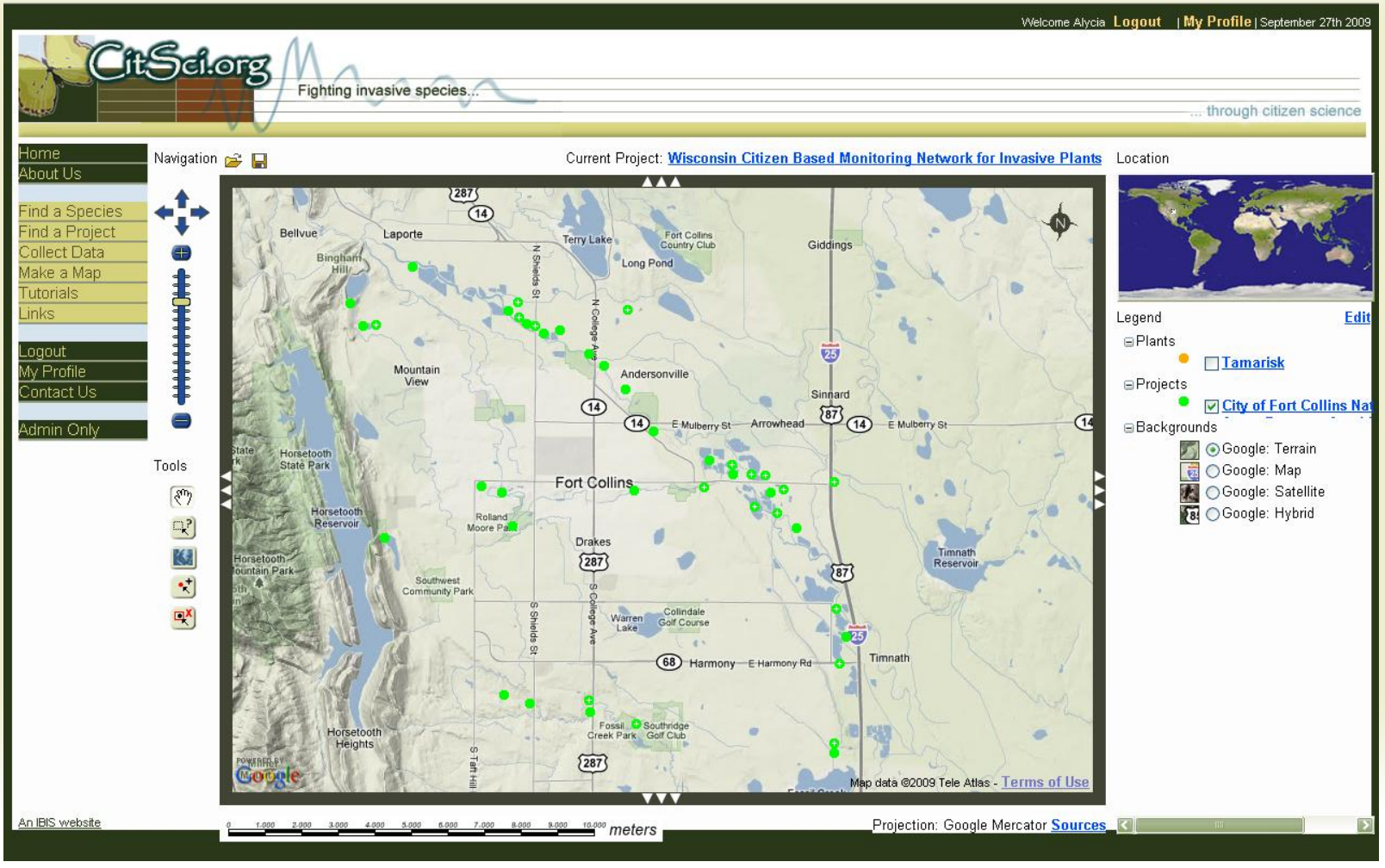
Layers for Your Map
Organism Layers
Japanese Knotweed (<i>Polygonum cuspidatum
Japanese Knotweed (Polygonum cuspidatum)
Tamarisk
Tamarisk (Tamarix)
Zebra Mussels
Zebra mussel (Dreissena polymorpha)
Change
Delete
New
Project Layers
Submit
Washington
Montana
North Dakota
Minnesota
Oregon
Idaho
Wisconsin
Michigan
Nebraska
Iowa
Illinois
Indiana
Ohio
Nevada
Colorado
Kansas
Missouri
Kentucky
Tennessee
Arkansas
POWERED BY Google
An IBIS website
Projection: Google Mercator Sources
km

Website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Edit
Plants
Tamarisk
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City of Fort Collins Nat
Backgrounds
Google: Terrain
Google: Map
Google: Satellite
Google: Hybrid
Bellvue
Laporte
Bingham Hill
Terry Lake
Fort Collins Country Club
Long Pond
Giddings
Mountain View
Andersonville
Sinnard
Arrowhead
E Mulberry St
Fort Collins
Horsetooth State Park
Horsetooth Reservoir
Rolland Moore Park
Drakes
Southwest Community Park
Warren Lake
Collindale Golf Course
Harmony
E Harmony Rd
Timnath
Timnath Reservoir
Fossil Creek Park
Southridge Golf Club
Horsetooth Heights
Map data ©2009 Tele Atlas - Terms of Use
An IBIS website
meters
Projection: Google Mercator Sources

QUESTIONS?

Alycia Crall
crall@wisc.edu; 970-227-3310

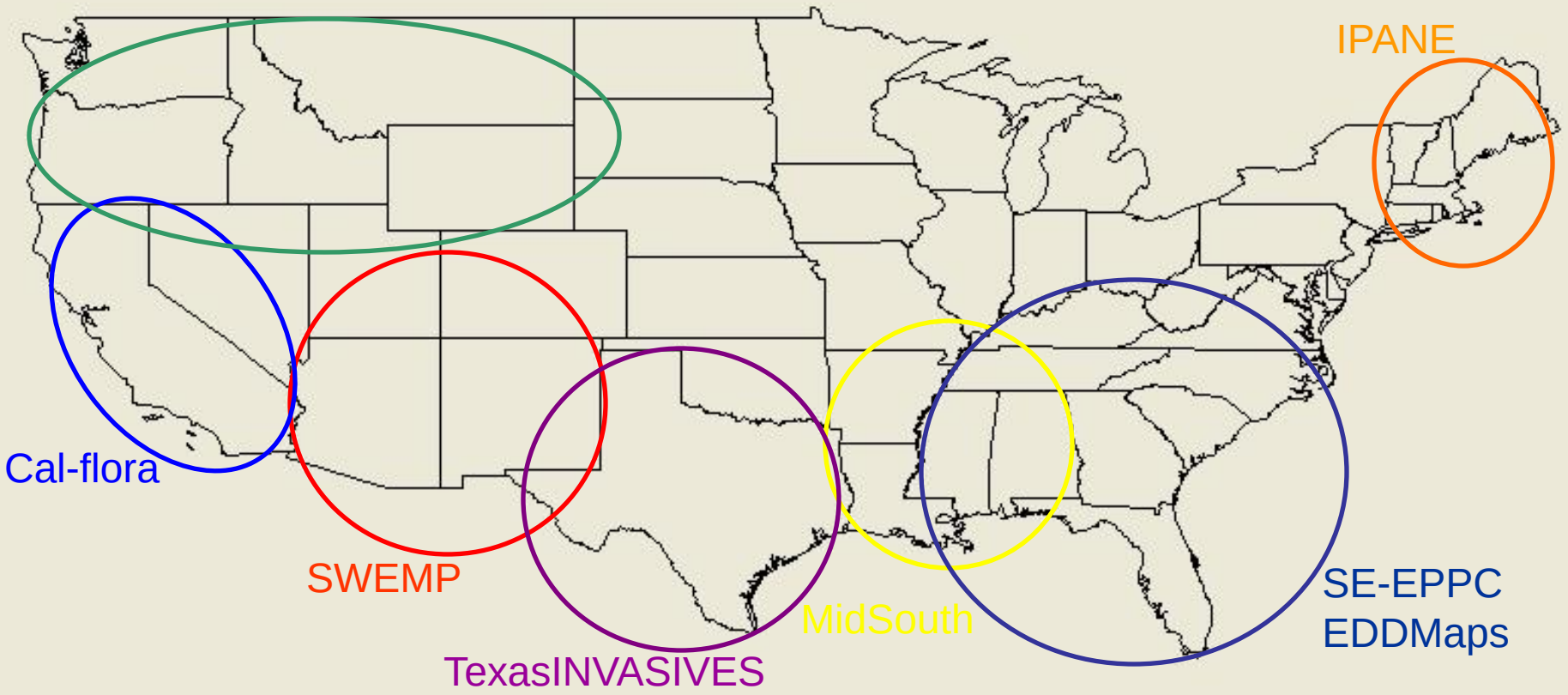
The Problem

- Invasive species
  - Impact biodiversity, ecosystem function, human health, and the economy
- Issues of Data Synergy
  - Large data gaps (spatial and temporal)
  - Crosier and Stohlgren 2004 (Weed Technology)
  - Crall et al. 2006 (Frontiers in Ecology and the Environment)
    - 319 databases
    - 43% not online
  - Minimizes effectiveness of early detection/rapid response
- Why Not Share Data
  - Sensitive Data
  - Inability to Share

Background and History

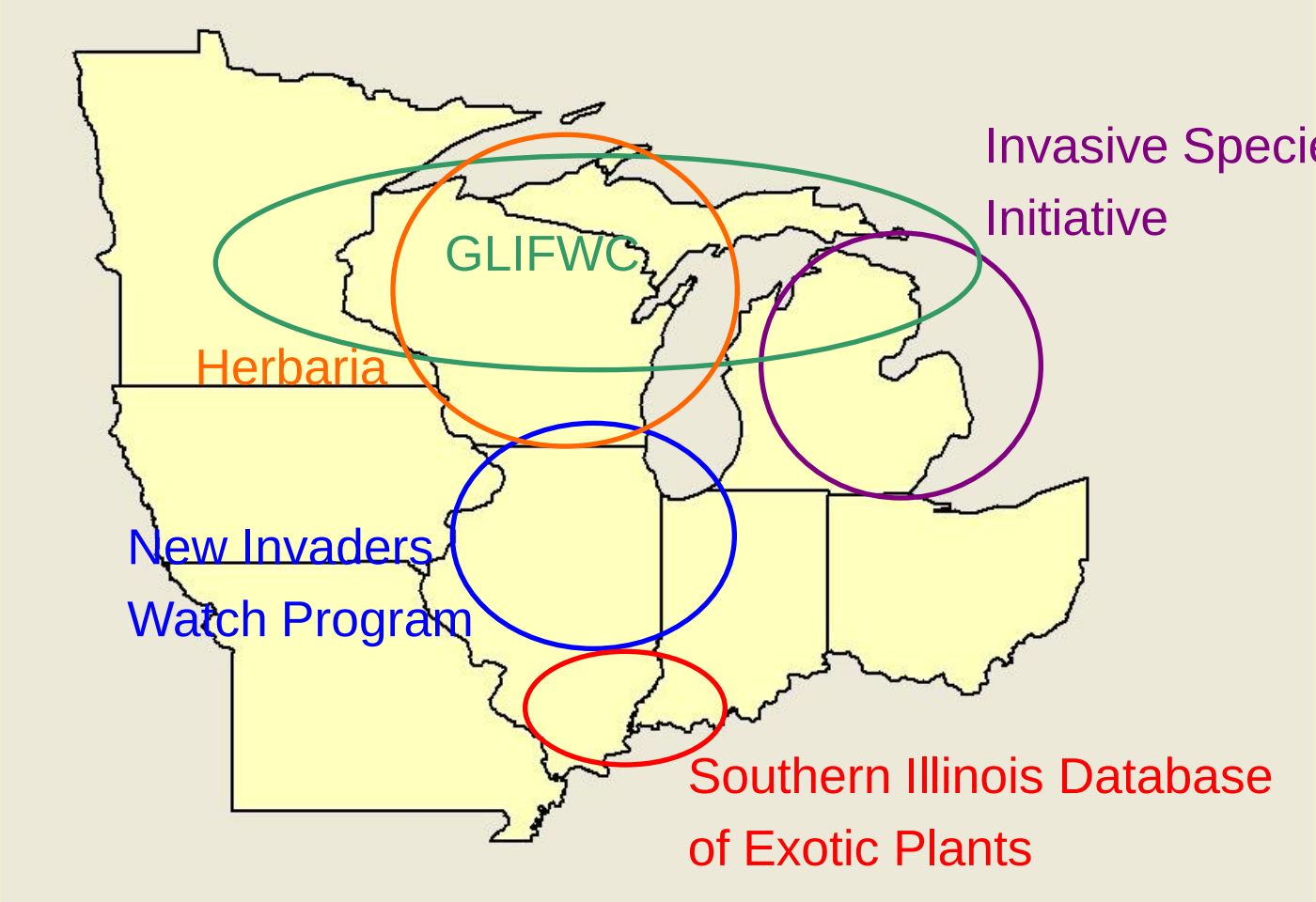
- National Institute of Invasive Species Science
  - Established in 2000
  - www.niiss.org
  - Major Partners: USGS, CSU, NASA
- Citizen Science Program (NSF)
  - www.citsci.org
  - Major Partners: CSU, UW-Madison, USGS

The Problem in the Midwest



Background and History

- Integrating Invasive Plant Species Data in the Midwest: Solutions for data collection and management
  - January 24-25, 2008
  - Regional
    - New Invaders Watch Program
    - Southern Illinois Database of Exotic Plants
    - Michigan State University Invasive Species Initiative
    - Great Lakes Indian Fish and Wildlife Commission
  - National
    - The National Institute of Invasive Species Science
    - iMapInvasives



- Currently exist in isolation from one another
- Lack the ability to combine data from other regions and neighboring states
- Do not have capacity to support additional data contributors

Background and History

- Global Invasive Species Information Network (GISIN)
  - Pull data from member sites
  - Share data with member sites
- Data Contributors
  - GISIN >100 databases; NISbase; NAS; SWEMP; IPANE; VegBank; CAIN
  - SAIN, The Cactus Moth Detection and Monitoring Network (CMDMN), FWS, Tamarisk Coalition, Colorado State Forest Service, Grand Canyon Trust, ND Dept of Ag, SD Dept of Ag, Invasive Tracers, 4H Community Mapping Program, NatureServe

Background and History

- International Biological Information System
  - Websites
    - AHB - Africanized Honey Bee website
    - CitSci.org - A website in support of citizen science
    - COTrails - A trails mapping website for Larimer County, Colorado
    - GISIN - The Global Invasive Species Information Network
    - MSP - The Math and Science Partnership - Online Environmental Literacy Assessment
    - NIISS - The National Institute of Invasive Species Science
    - SABCC - The Southern Arizona Buffelgrass Coordinating Committee buffelgrass website
    - TMAP - The Tamarisk Map; the single largest collection of Tamarisk locations in the world
    - USGS RAM - The USGS Resource for Advanced Modeling (RAM)

In your perfect world, what features would an online early detection mapping and alert system have? Brainstorm as many ideas as you can and then prioritize the top five features you have come up with.