Monitoring Invasive Plant Species

Citizen Based Monitoring Opportunities

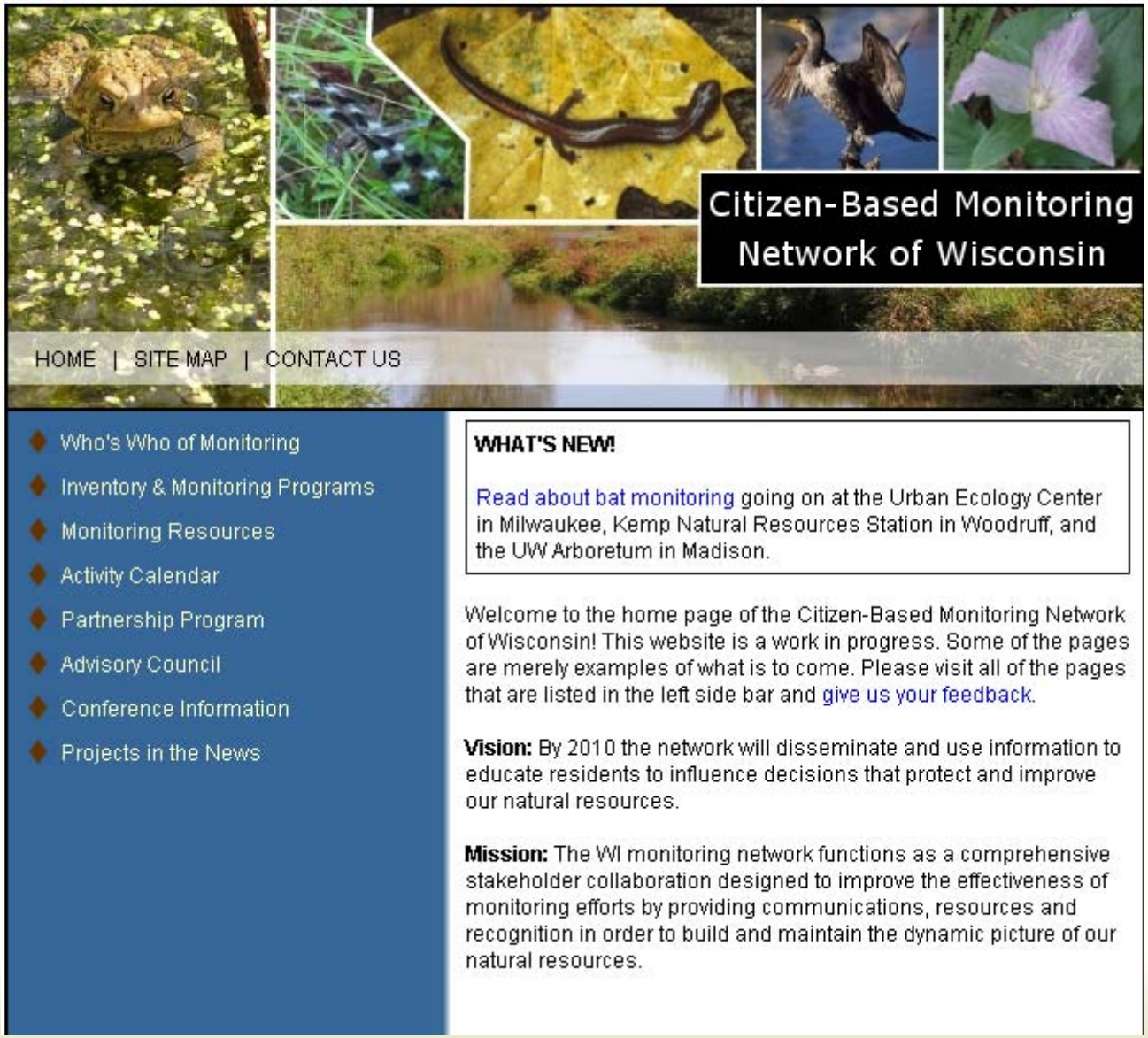
Alycia Crall
Graduate Research Assistant
University of Wisconsin-Madison

Potential Role of Citizen Scientists

- Large data source that could fill data gaps
  - improve early warning of new invaders
  - improve spatial predictive models
- Cost efficient, maximizing limited resources
- Likely to collect data relevant to local conservation and management issues
- Access to lands restricted to professional scientists

Resources

http://cbm.wiatri.net/



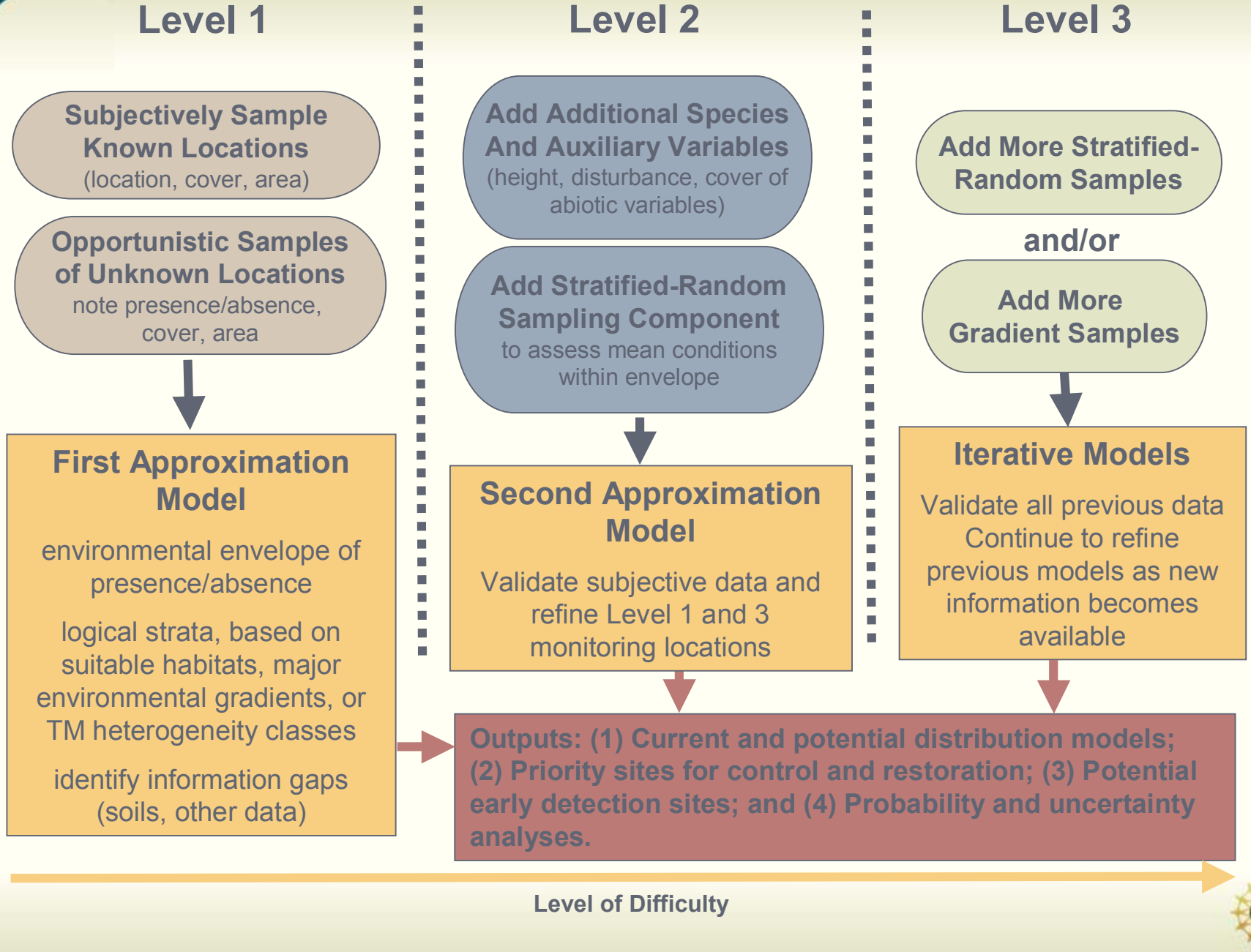
Background

- National Institute of Invasive Species Science
  - www.niiss.org
  - Major Partners: USGS, CSU, NASA
- Citizen Science Program (NSF)
  - Online tutorials
  - Monitoring protocols
  - QA/QC protocols
  - Customizable data entry forms
  - Cheap, easy to use digital field tools

How Can Citizen Scientists Monitor These Species in My Area?

Level 1 Vegetation Monitoring Protocol

- Tiered Monitoring Approach
  - Level 1: Collection of point, line, and polygon data 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


Level 1
Level 2
Level 3
Subjectively Sample Known Locations
(location, cover, area)
Opportunistic Samples of Unknown Locations
note presence/absence, cover, area
Add Additional Species And Auxiliary Variables
(height, disturbance, cover of abiotic variables)
Add Stratified-Random Sampling Component
to assess mean conditions within envelope
Add More Stratified-Random Samples
and/or
Add More Gradient Samples
First Approximation Model
environmental envelope of presence/absence
logical strata, based on suitable habitats, major environmental gradients, or TM heterogeneity classes
identify information gaps (soils, other data)
Second Approximation Model
Validate subjective data and refine Level 1 and 3 monitoring locations
Iterative Models
Validate all previous data
Continue to refine previous models as new information becomes available
Outputs: (1) Current and potential distribution models; (2) Priority sites for control and restoration; (3) Potential early detection sites; and (4) Probability and uncertainty analyses.
Level of Difficulty

Level 1 Monitoring Protocol

Level 1: Point, Line, and Polygon Data

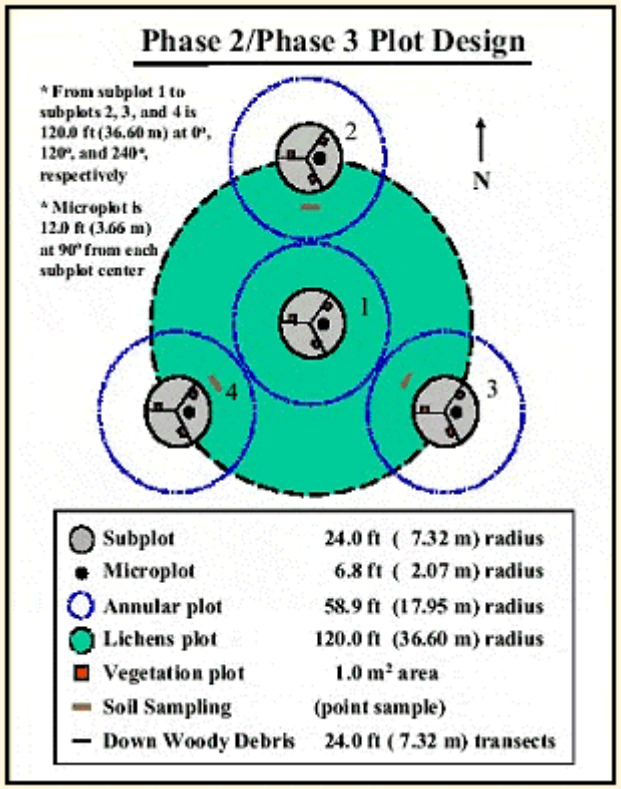
- **Who?** Recorder's Name
- **What?** Plant Name
- **When?** Collection Date
- **Where?** Location

- Additional Information:
- North American Weed Management Association
  - www.NAWMA.org
  - provide minimum mapping standards

Level 2 Monitoring Protocol

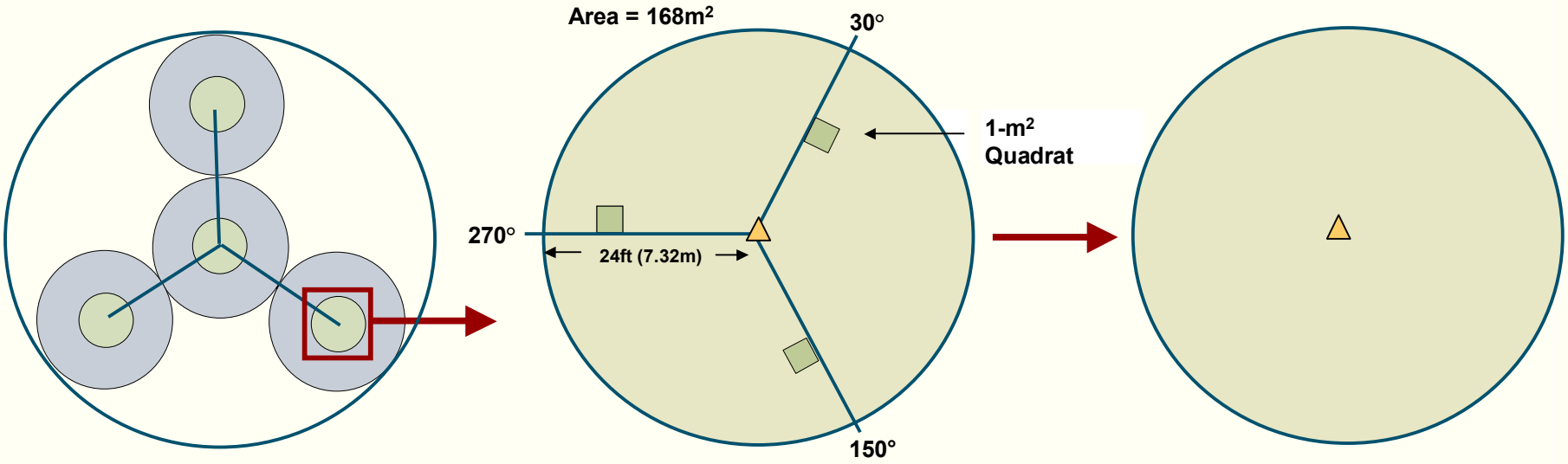
USFS Forest Inventory and Analysis

- Adopted in 1995
- Collects, analyzes, and reports info on the status, trends, and conditions of US Forests
- Includes all forest land in 50 states
- 20% of plots monitored in each state each year



See www.fia.fs.fed.us

Modified USFS FIA Plot



Levels 2 & 3: Barnett et al. 2007

Levels 1 & 2

Why Plots?

- Comparable to FIA plot size and shape
- Account for species absence
- Integrate data with remote sensing information
- Long-term monitoring in a consistent, comparable data set

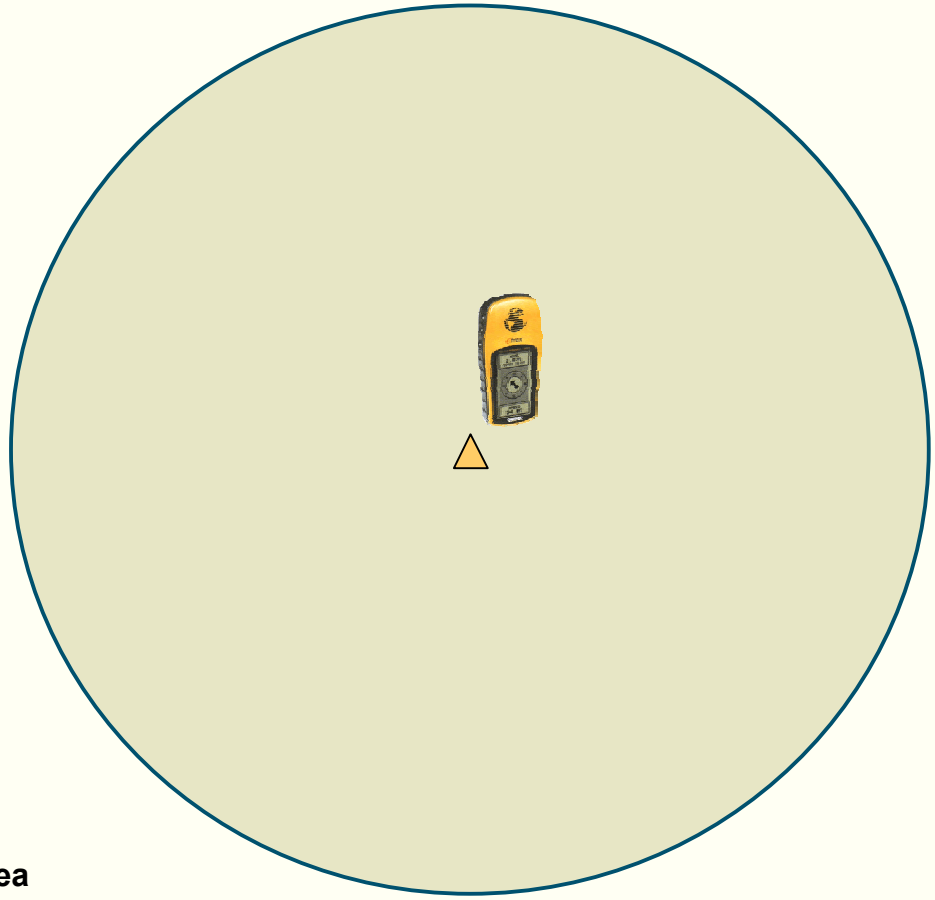
Equipment Needed

- >10m tape (1)
- Marking flags (~10)
- GPS Unit
- Ground stakes (1)
- Paper Form, PDA, or Laptop to record data
- Reference materials (floristic keys, etc.)

Locate Plot Center

1. Subjectively or randomly locate plot center.

2. Enter the following information on form.
-Date
-Time
-Recorder
-Unique Plot Name
-Coordinates for Plot Center
-Projection: UTM or Geographic
-Datum: NAD83, NAD27, WGS84
-Accuracy: should be <10m to make a valid reading



GPS

Stake

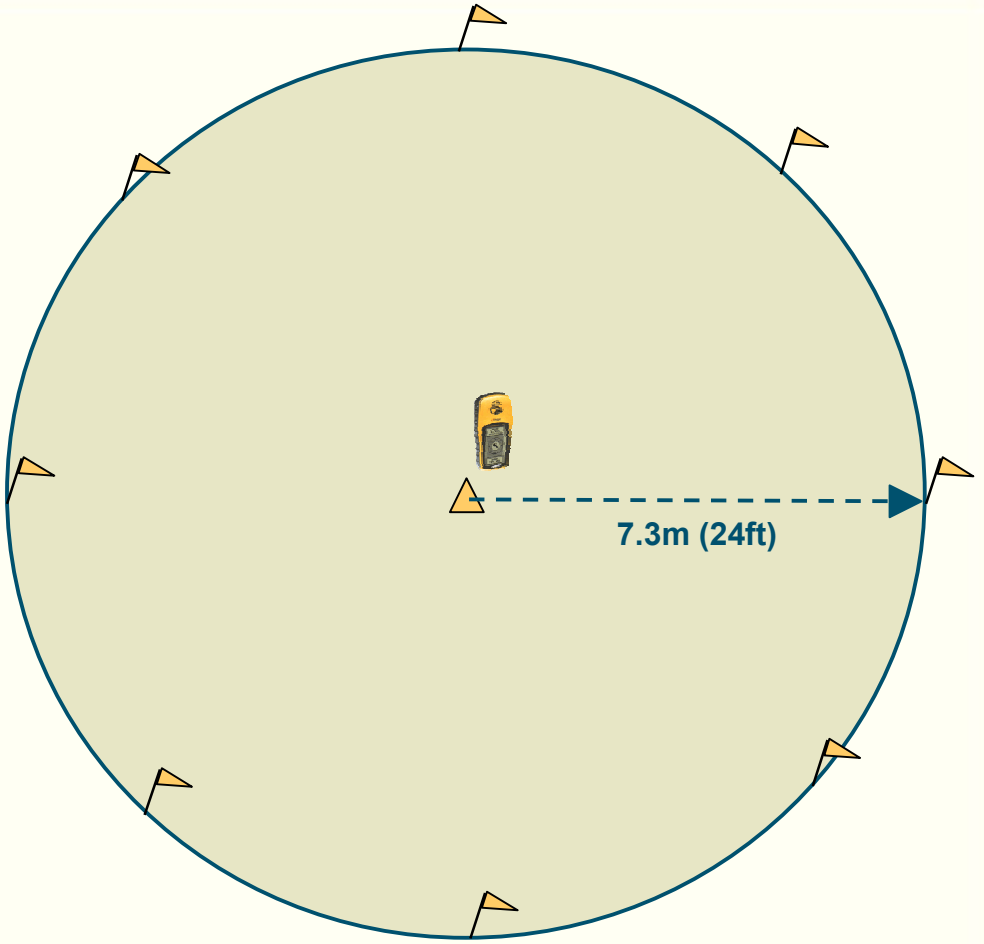
Plot Area

Define Plot Area

1. Mark the center of the plot with a stake.

2. Attach a 10 meter measuring tape to the plot center and measure out 7.3 meters in any direction.

3. Mark this location with a flag. Hold the tape while walking in a circle to define the edge of the circular plot while placing flags in the ground periodically to define plot area.



GPS

Flag

Stake

10 m Measuring Tape

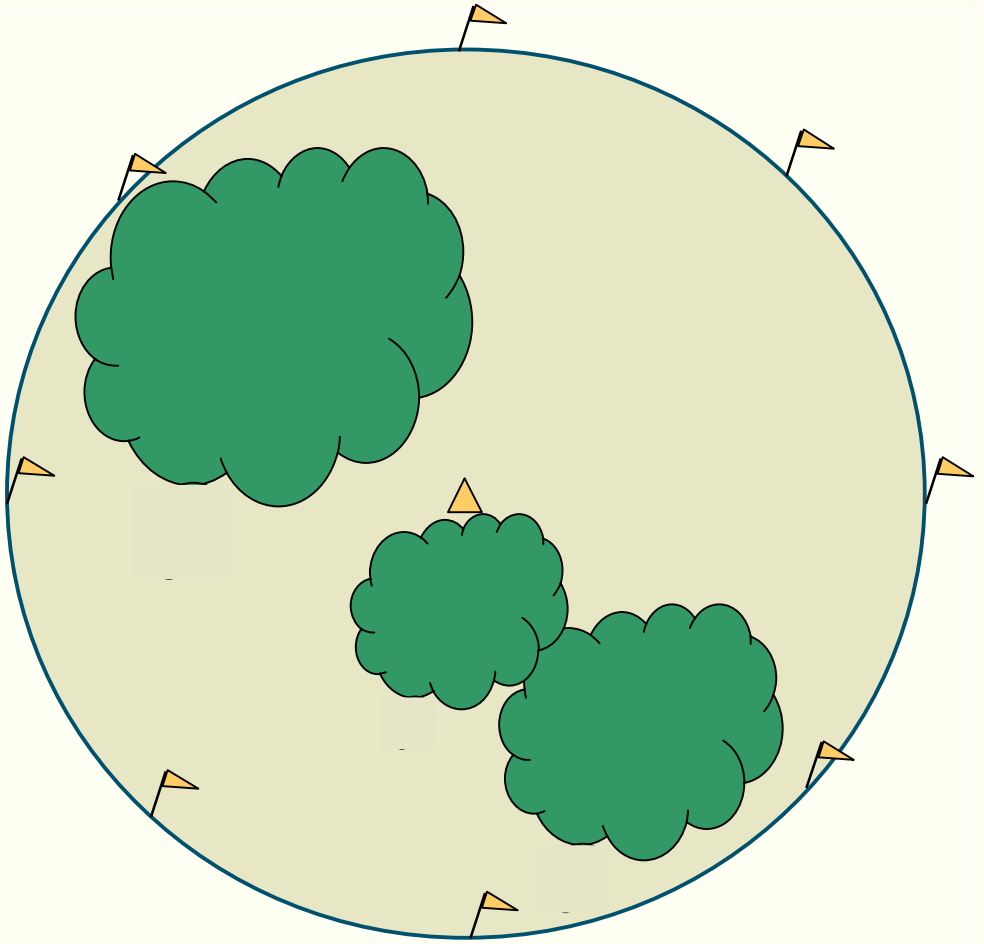
Plot Area

Record Vegetation Data

1. Identify species of interest in plot area. Record and note degree of uncertainty in identification.

2. Mark all species in plot as present and estimate percent cover.

3. Mark all species of interest not in plot as absent.



Tips for Estimating Cover

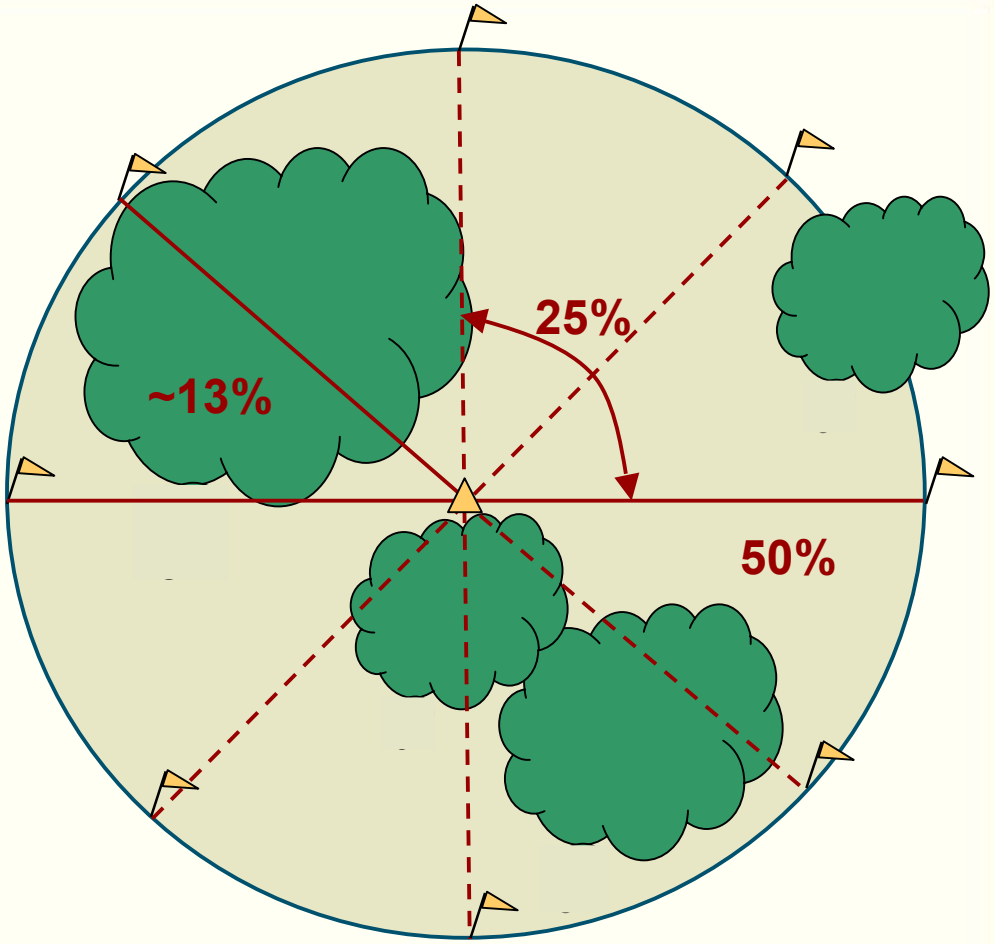
1. Record species that overhang the plot area even if the plant is not rooted in the plot.

2. Visually or using flagging tape, divide the circle into sections.

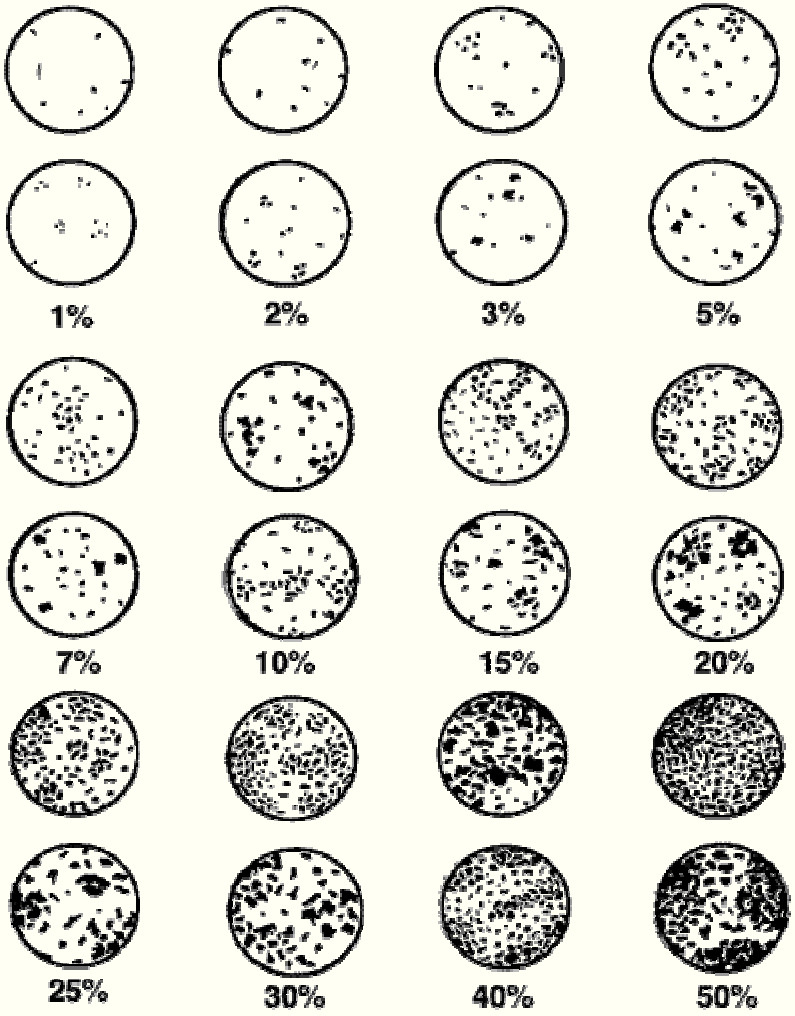
3. Area= 168m^2 or 1809 ft^2
   so 1%= 2 m^2 or 18 ft^2
   with 1.5 m or 4.8 ft diameter

   10%= 17 m^2 or 181 ft^2
   25%= 42 m^2 or 452 ft^2
   50%= 84 m^2 or 905 ft^2

4. This measure is an estimate, so don't spend long periods of time trying to determine an exact measurement.



Tips for Estimating Cover

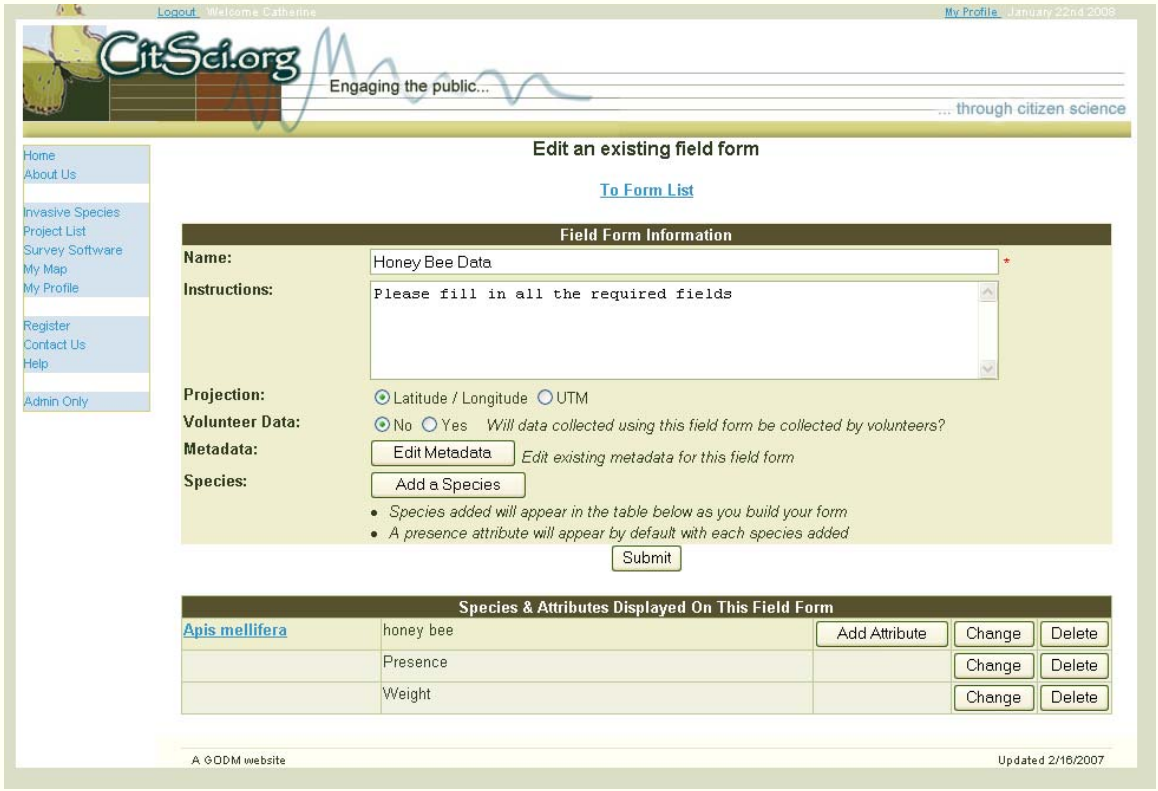


From B.C. Ministry of Environment, Lands, and Parks, B.C. Ministry of Forests. 1998.

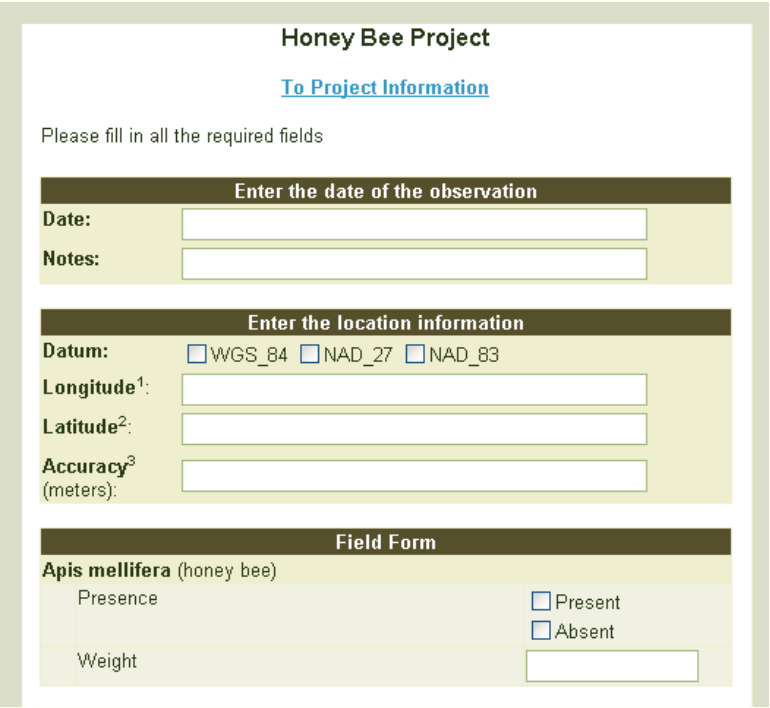
What Do We Do With Our Data Following Collection?

Customize Data Entry Forms

- Name form
- Write instructions
- Choose geographic data
- Create species list
- Unique attributes for each species



Customized Data Forms



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

Longitude[1]:

Latitude[2]:

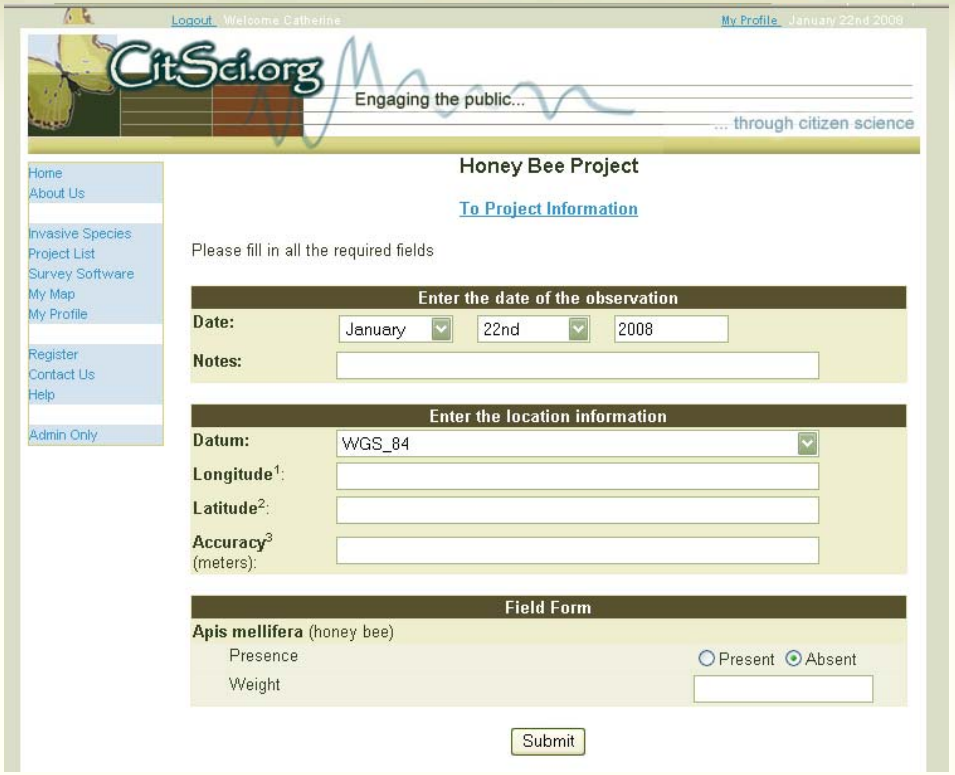
Accuracy[3] (meters):

Field Form

Apis mellifera (honey bee)

Presence ☐ Present ☐ Absent

Weight



- Download to PDA for automatic upload
- Hardcopy data collection from print version (left)
- On-line version for data entry (above)

Training Groups

- 5 in Year 1
  - Environmental Learning for Kids
  - Tamarisk Coalition
  - Invasive Tracers
  - Colorado State Forest Service
  - Several local school programs
- 10 in Year 2
  - Testing of data quality using monitoring protocol
  - Comparing citizen science to professionals

niiss
The National Institute of Invasive Species Science

Engaging the public through citizen science

www.niiss.org

For more information contact:

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

Colorado State University
Knowledge to Go Places

Powered By:
GODM

NSF