

The National Institute of Invasive Species Science

A Global Organism Detection & Monitoring System

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National Institute of Invasive Species Science

Integrating Invasive Plant Species Data in the Midwest:
Solutions for Data Collection and Management

North Central Integrated Pest Management Center
Invasive Plant Association of Wisconsin
Madison, WI





Outline

- Why GODM?
- What is GODM?
- Main Features
- Core Database Design
- Potential Applications
- Data Exchange Challenges
- What is the future of GODM?



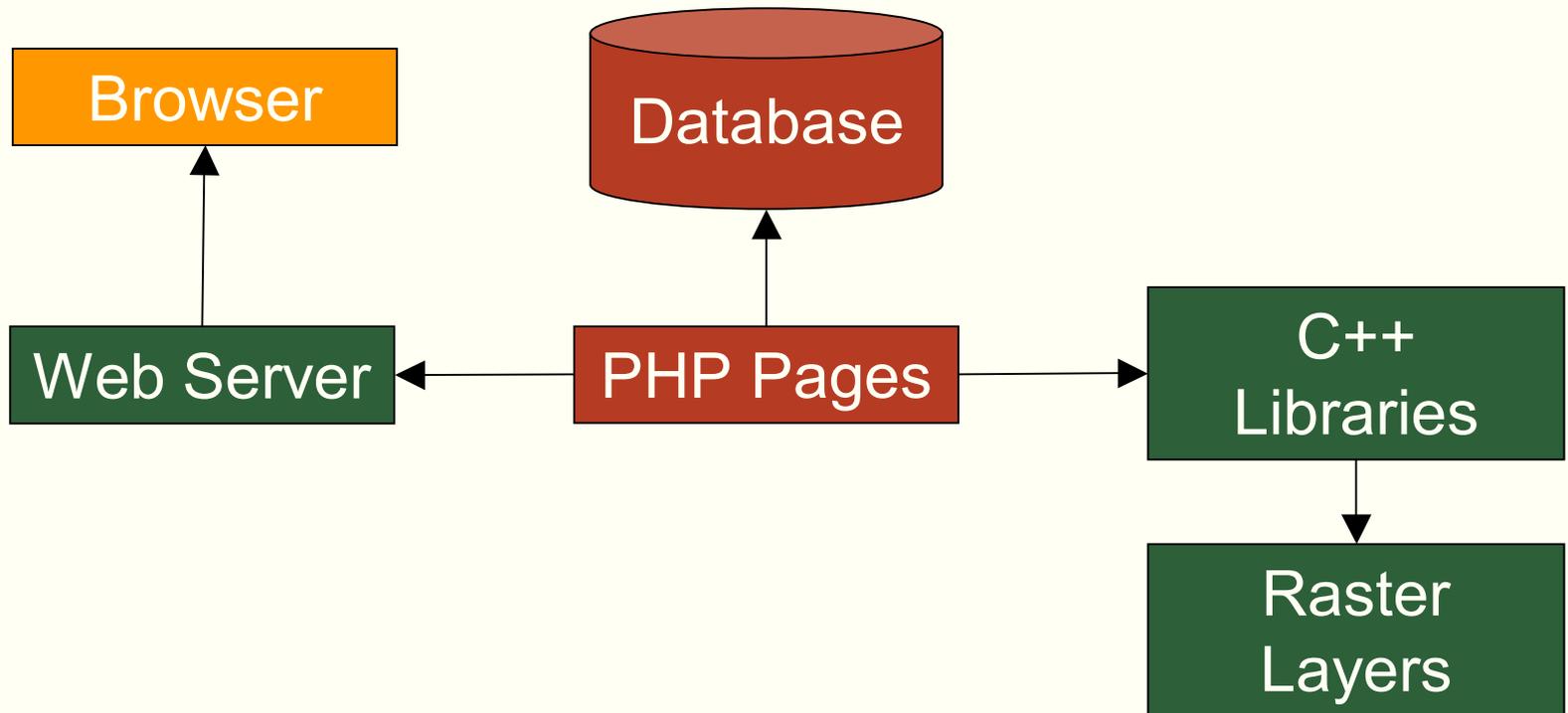
Why GODM?

- Integrated disparate data
- Multi-scale perspective
- Centralized system of common data subsets
 - Occurrence data and associated attributes
- One of many “middle-men”
 - Data exchanges with many other databases
- Awareness of what might be invading next

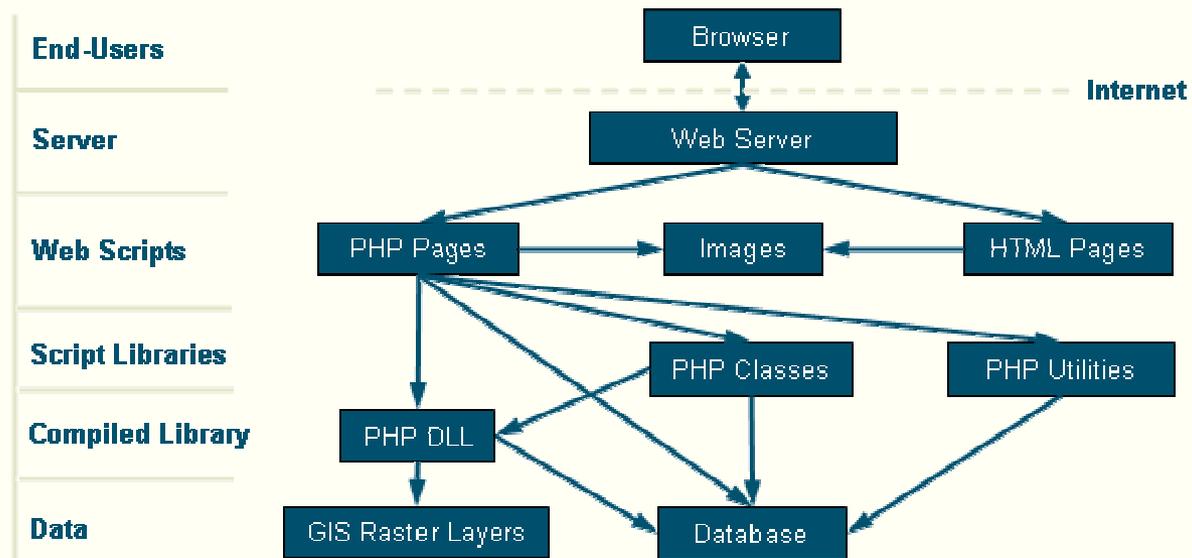
What is GODM?

- A research endeavor
- A system to store invasive species data
 - Centralized storage of single contributions, periodic large data ingests, & regularly scheduled data harvesting events
 - Common subset of attributes (site, visit, organism)
 - Controlled vocabulary
- An online mapping application
- A decision support system

System Components

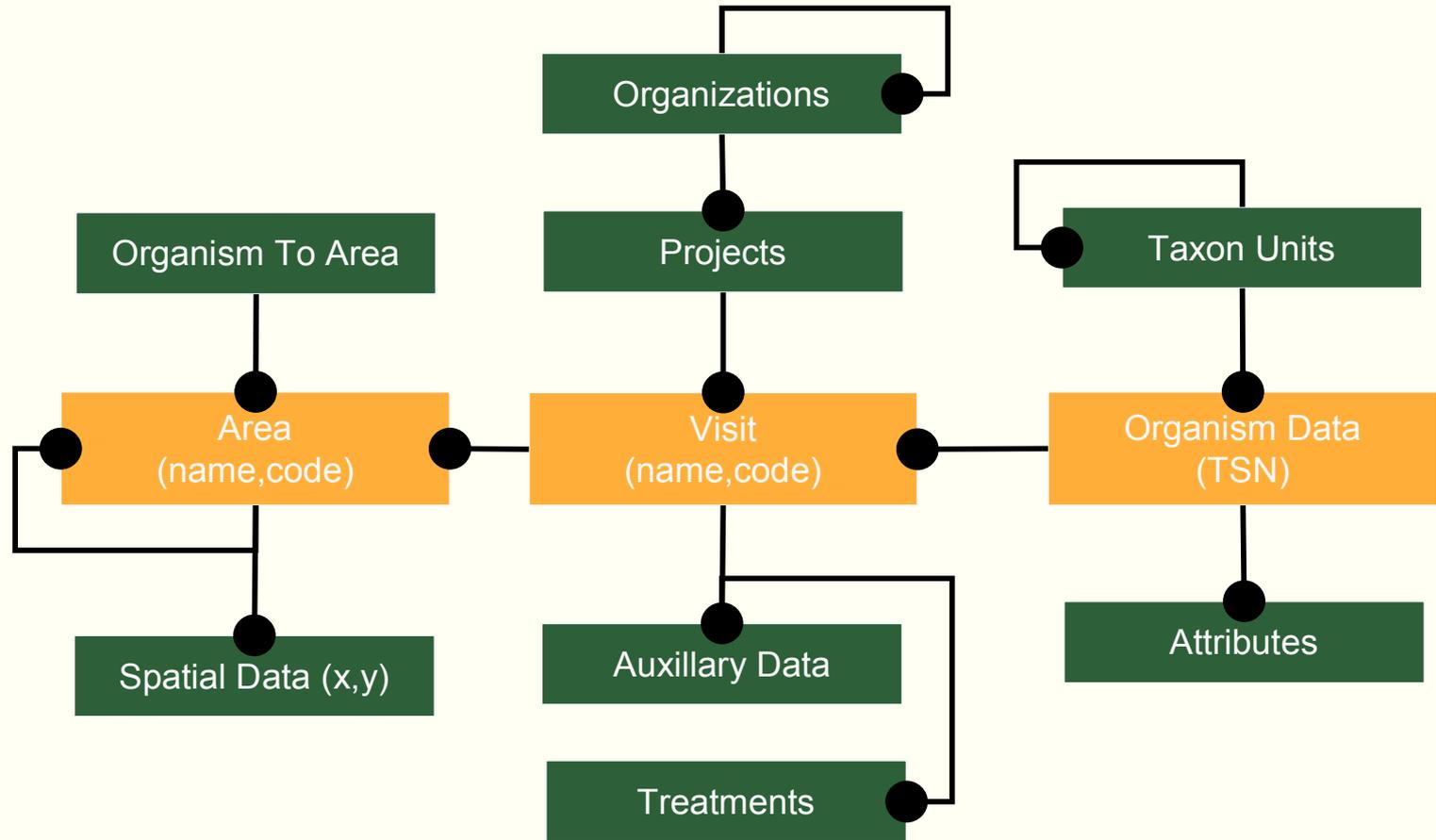


System Architecture





Core Database Design



Main Features

- **Manage accounts** (My profile, create projects, manage project members)
- **Gather data** (EcoNab PALM application, filed protocols & standards)
- **Browse data** (By location, species, organization, project, map)
- **Contribute data** (Pre-defined, file configurations, custom codes)
- **Analyze data** (Extract raster pixel values from point locations)
- **Download data** (Downloadable files as CSV, TXT, SHP, filters)



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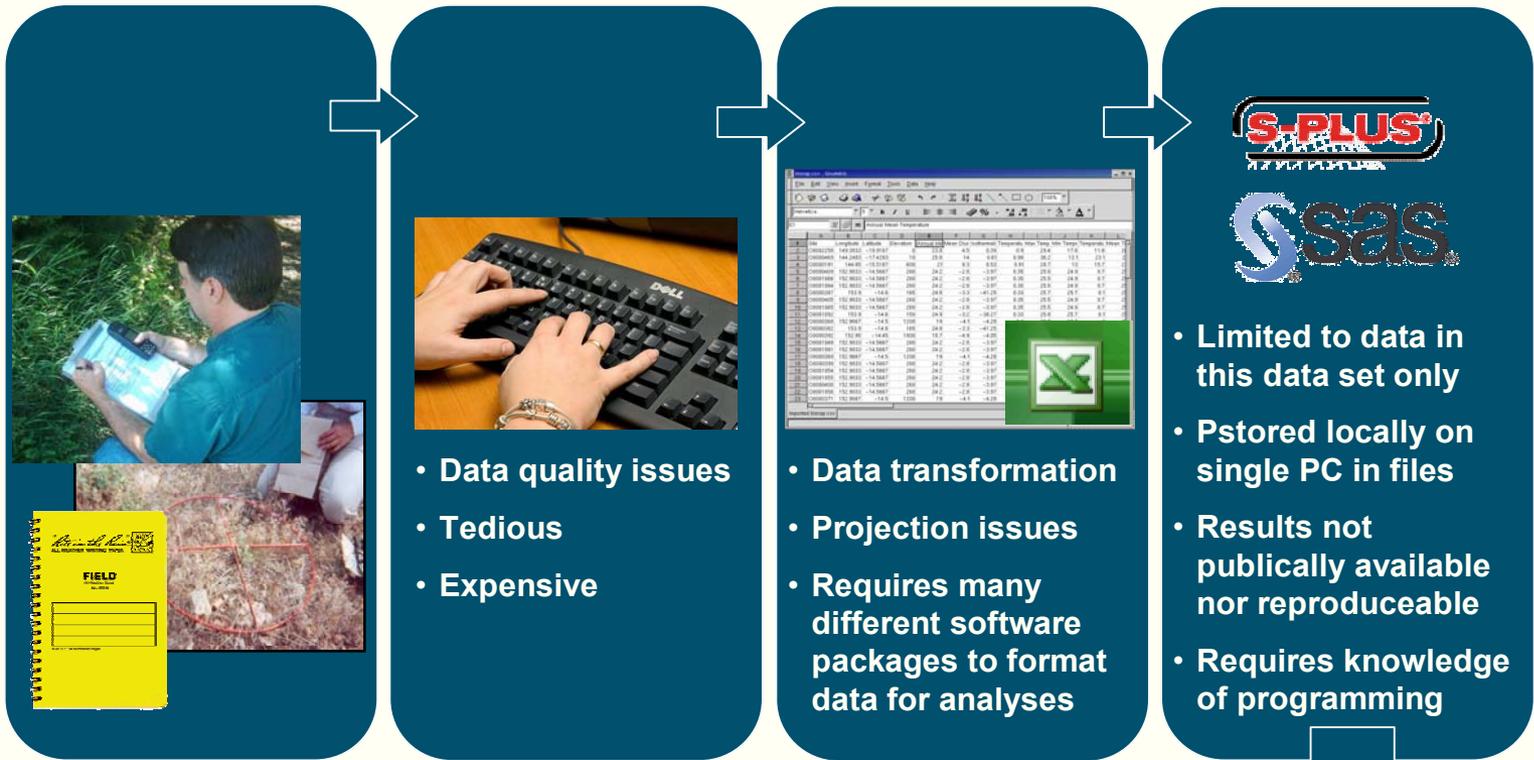
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Institute of
Invasive
Species
Science



Existing Situation

- GIS software
 - GRASS, AutoCAD, ArcINFO, ArcView, ArcMap, ArcSDE
- Internet browsers
 - Internet Explorer, Firefox, Netscape, Safari, Blazer
- Databases & online map applications
 - DBASE, Access, MSSQL Server, MySQL, Postgres, Oracle
- Numerous ArcIMS sites
 - The National Map, NBII sites
- Regionally focused systems (IPANE)
- Web-service enabled sites
 - GBIF, DiGir, VegBank, USGS NAS system
- Modeling capabilities
 - C-Squares, KGS Mapper, Google Earth, Life Mapper

Traditional workflows



- Data quality issues
- Tedious
- Expensive

- Data transformation
- Projection issues
- Requires many different software packages to format data for analyses

- Limited to data in this data set only
- Pstored locally on single PC in files
- Results not publically available nor reproduceable
- Requires knowledge of programming

- Data / conclusions based on isolated data set
- Limited scales



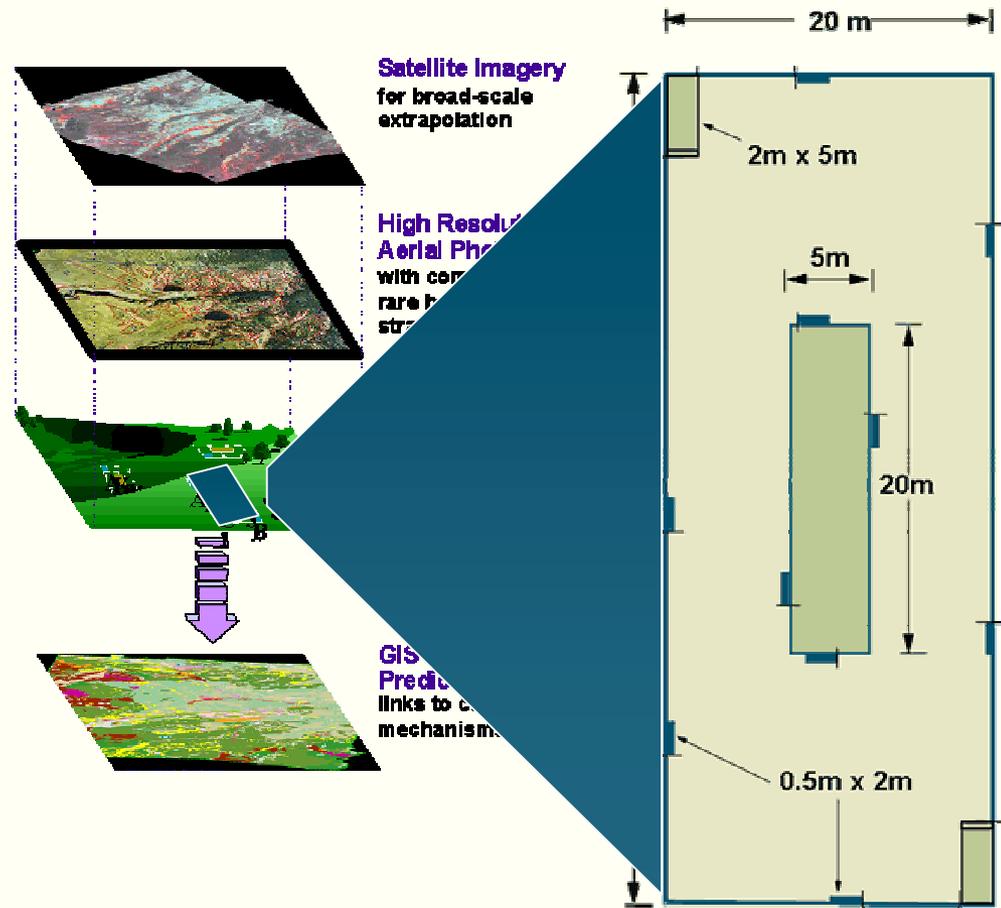
Current paradigm

- GIS software
 - By-and-large desktop use
 - Limited to isolated, organization-based datasets
- Internet browsers
 - Typically used to search for quick answers, pubs, data
 - Limited use as online GIS mapping application
- Databases & online map applications
 - Static, not real-time
 - Requires server maintenance and updates
 - Limited features / application functionality
 - Slow performance

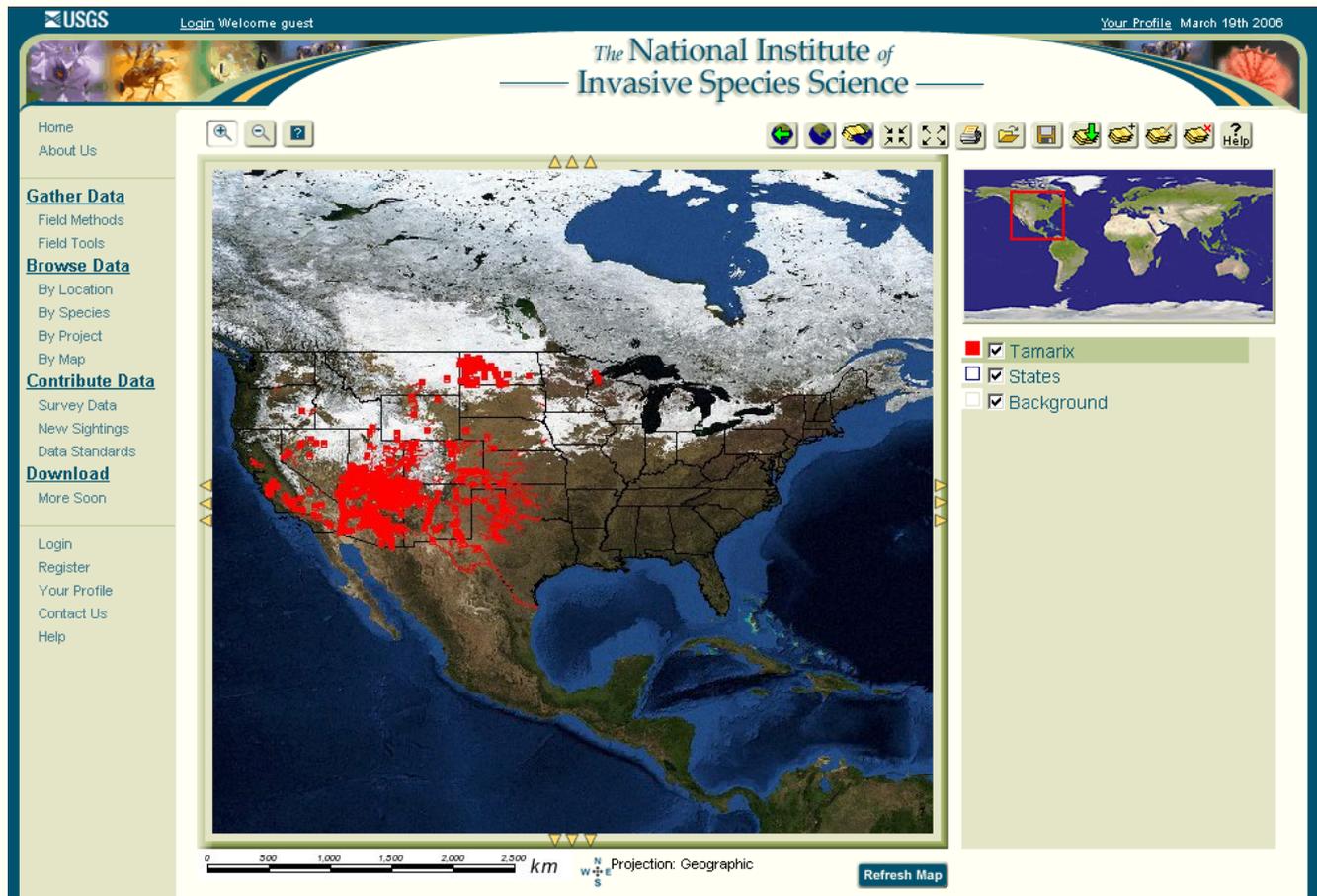


Multi-scale usage

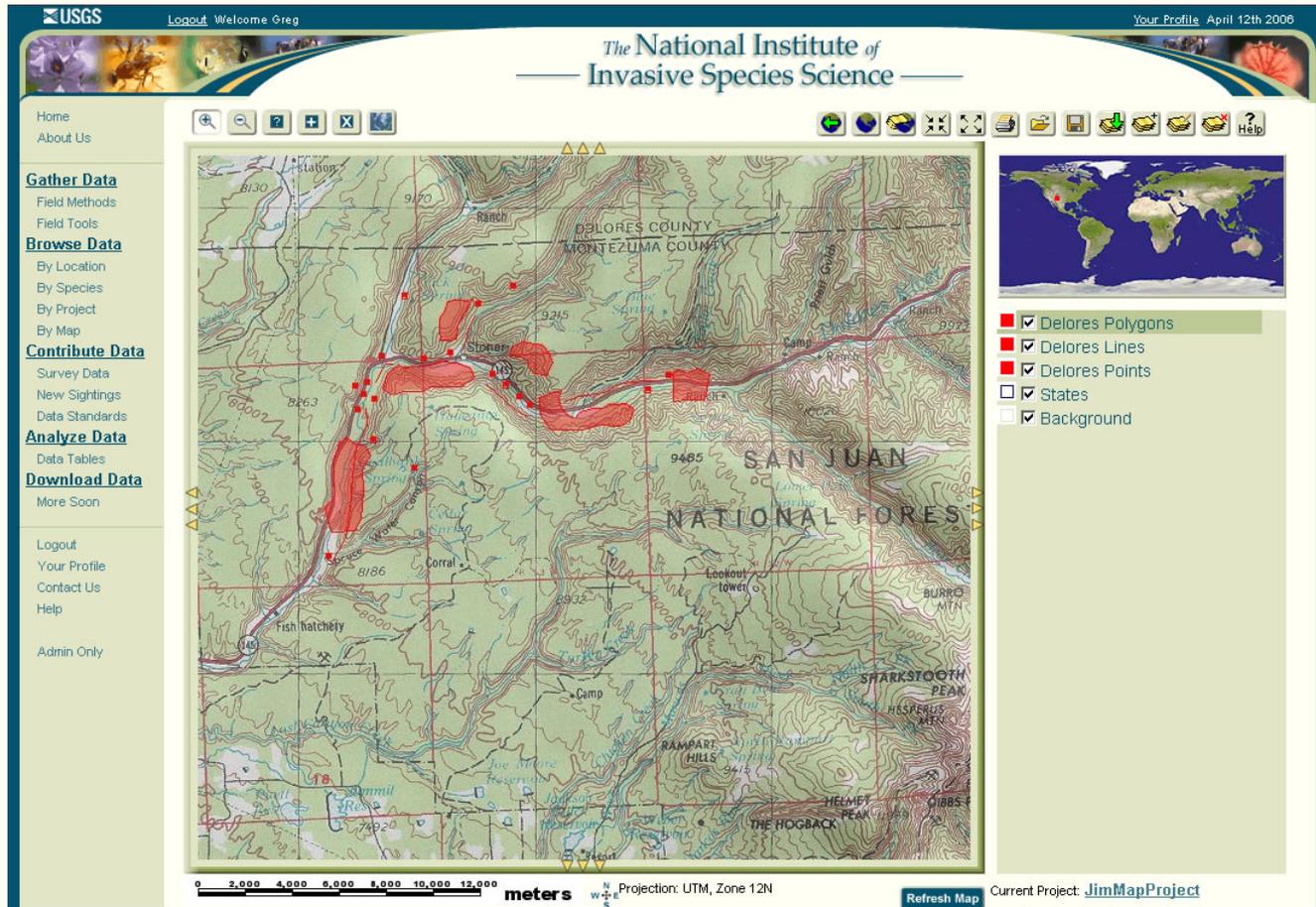
- Population
 - Plot data
 - Subplot data
 - Auxiliary data
- Community
 - Collection of plots in aspen
- Landscape
 - All plots as point locations for species



Example Map – Tamarix locations



Example Map – Points, lines, polygons



Future Directions

- GIS use
 - By-and-large internet applications & web services
 - Uses data from multiple sources
- Internet use
 - Advanced web applications
 - Online editing capabilities, dialogs, etc.
- Online mapping applications
 - Real-time data updating while you watch (AJAX)
 - Web services enable better user customization
 - True web based 'applications'
 - High performance, fast



Paradigm shift re: online GIS and workflows

- Built to be **used** by **ecologists**, not programmers
- Created with end-users in mind
- Developed to be **reusable** modules that are **compatible** with other tools
- Capable of providing output(s) in **many formats** quickly and easily
- **'Analysis-ready'** and capable of repeated results
- Easy to use and **simple**



Future workflows



- Data / conclusions based on merged data sets or isolated data sets
- Multiple spatial / temporal scales
- Repeatable analyses & results can be compared with results from new techniques

Acknowledgments



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Tom Stohlgren, Catherine Jarnevich, Tracy Davern, Geneva Chong (USGS)
 Mohammed Kalkhan, Jim Graham, Alycia Crall,
 Paul Evangelista, Rick Shory, Sara Simonson, Dave Barnett (CSU, NREL)
 Ed Sheffner, John Schnase, Jeff Morissette, Jeff Pedelty, Jim Smith, Neil
 Most, Woody Turner (NASA), Tim Carleson, Annie Simpson, Hilary Drucker,
 Jim Quinn, Ginger Bradshaw, Sunil Kumar, and many, many others...



3rd Party Modules

C++ Libraries
TIFF Library
PNG Library
JPEG Library
AIGridIO from ESRI
Shapefile from ESRI
Proj4 from DOI
GeoTIFF
ECW from ERMapper

PHP
Fpdf
PHP
Extensions...

Other
Windows 2003 Server
SQL Server
Internet Information Server

Research versus Production

Attribute	Research	Production
Quality	Accurate	Robust
Number of Users	Few	Lots
Technology	Latest and Greatest	What works
Learning Curve	Typically Long	Short
Support	?	Must
Documentation	Minimal and techy is ok	Must be complete and easy to understand
Bottom Line	If it's cool they will come	If it doesn't work, they will go elsewhere

Invasive Species Mapper - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Copy Paste

Address http://squall.nrel.colostate.edu/cwis438/Browse/Map/Scene_Basic.php?SceneID=90031 Go Links Zend Studio Debug Profile

USGS Login Welcome guest Your Profile March 19th 2006

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Home About Us

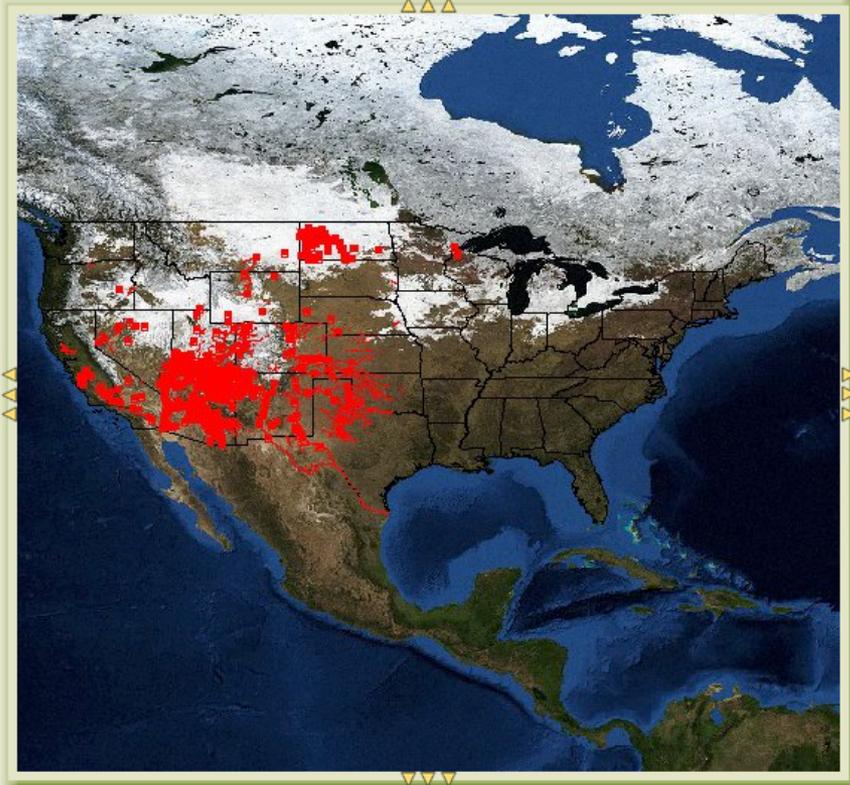
Gather Data
Field Methods
Field Tools

Browse Data
By Location
By Species
By Project
By Map

Contribute Data
Survey Data
New Sightings
Data Standards

Download
More Soon

Login
Register
Your Profile
Contact Us
Help



Projection: Geographic

Refresh Map

X=-121.3091 Y=65.36852

Internet



- Tamarix
- States
- Background



Logout Welcome Greg

Your Profile April 12th 2006



Home About Us



Gather Data

Field Methods Field Tools

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By Location By Species By Project By Map

Contribute Data

Survey Data New Sightings Data Standards

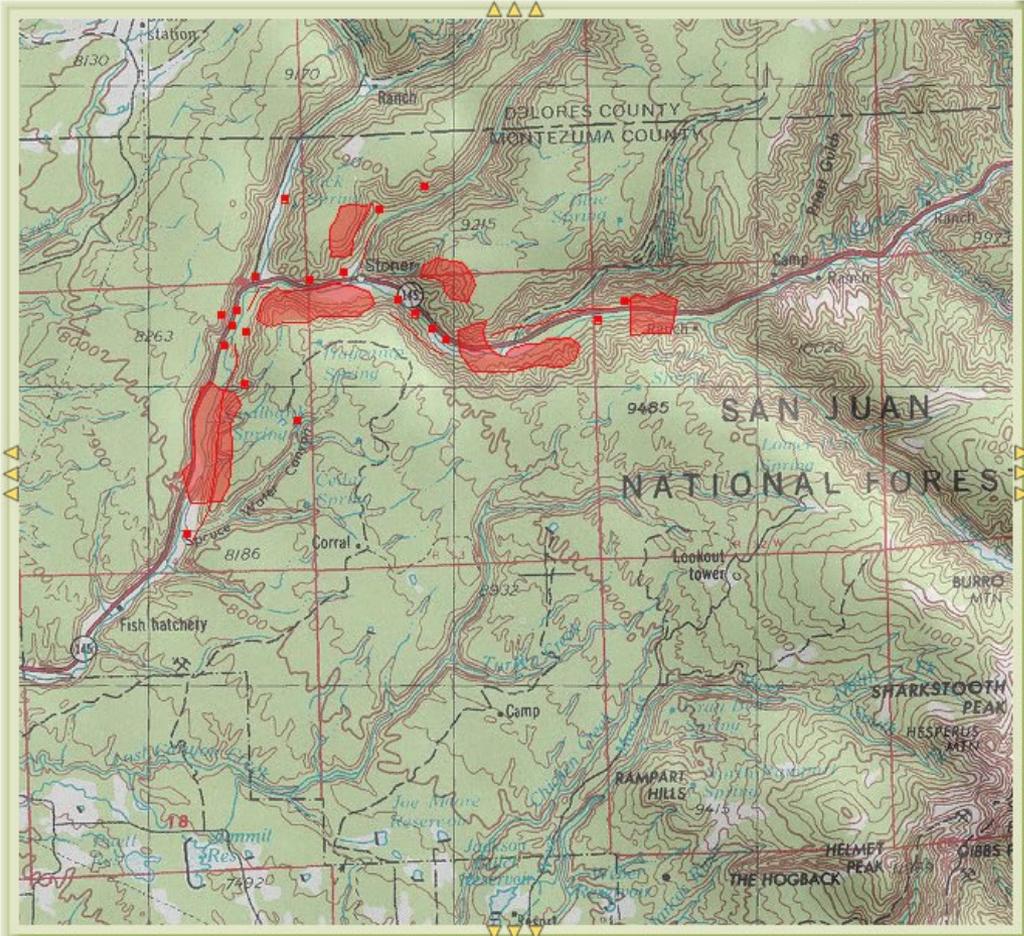
Analyze Data

Data Tables

Download Data

More Soon

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- Delores Polygons
- Delores Lines
- Delores Points
- States
- Background

0 2,000 4,000 6,000 8,000 10,000 12,000 meters Projection: UTM, Zone 12N

Refresh Map

Current Project: JimMapProject



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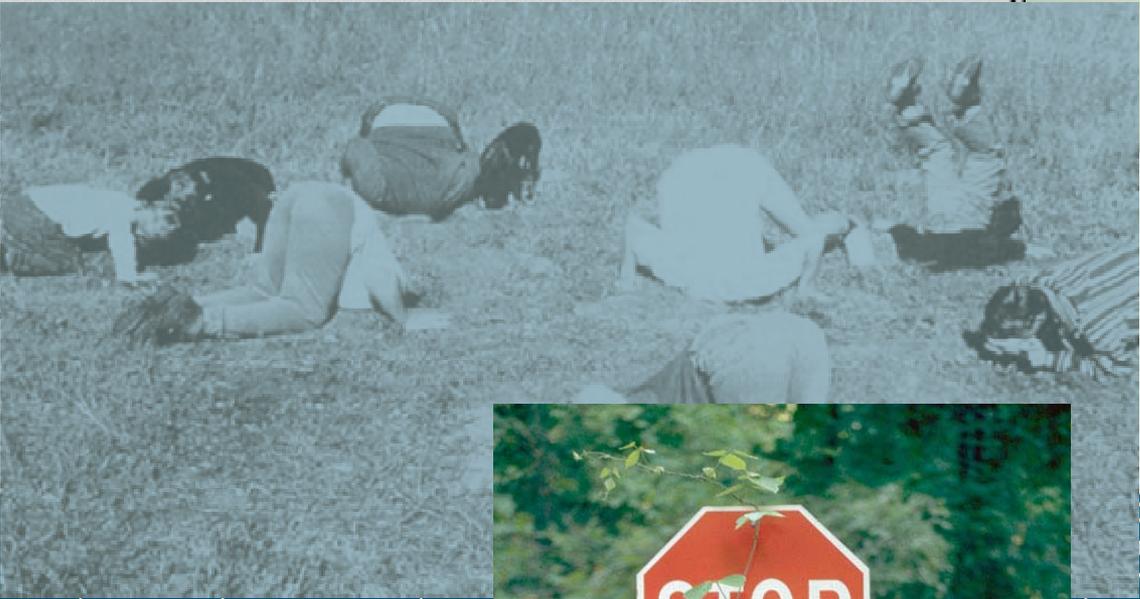
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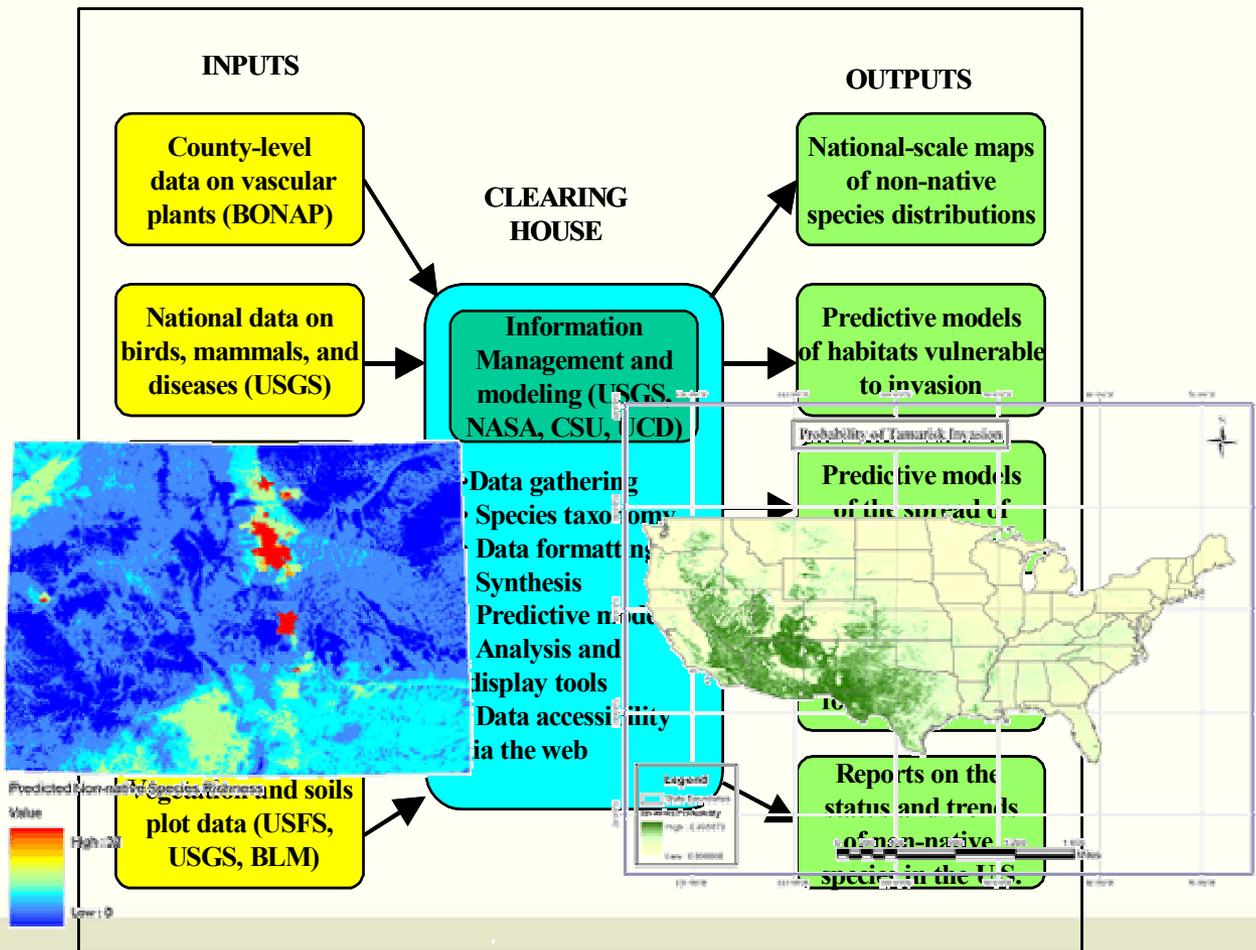
ODIS	Year	Average EVI, Date of Peak (GIS Layer: Float)
		172.73
		184.39
		194.96
		181.42
		191.25
		188.92
		176.06





Future Vision

Detection
Mapping
Forecasting
Control



July 21, 2006



D e t e c t i o n
M a p p i n g
F o r e c a s t i n g
C o n t r o l



The National Institute of Invasive Species Science

Logout: Welcome Greg | My Profile: July 25th 2006

Gather Data
Field Methods
Field Tools

Browse Data
By Location
By Species
By Organization
By Project
By Map

Contribute Data
Survey Data
New Sightings
Data Standards

Analyze Data
Spreadsheets
GeoRasters

Download Data
Spreadsheets

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Legend:

- Michigan
- California
- Montana
- CSU Research Data
- Zebra mussels
- Pascoyrum smithii
- States
- Background

Scale: 0 1,000 2,000 3,000 km | Projection: Geogra | Refresh Map | Current Project: CSU Research

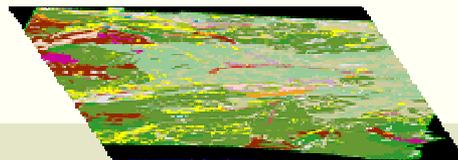
August 9, 2006



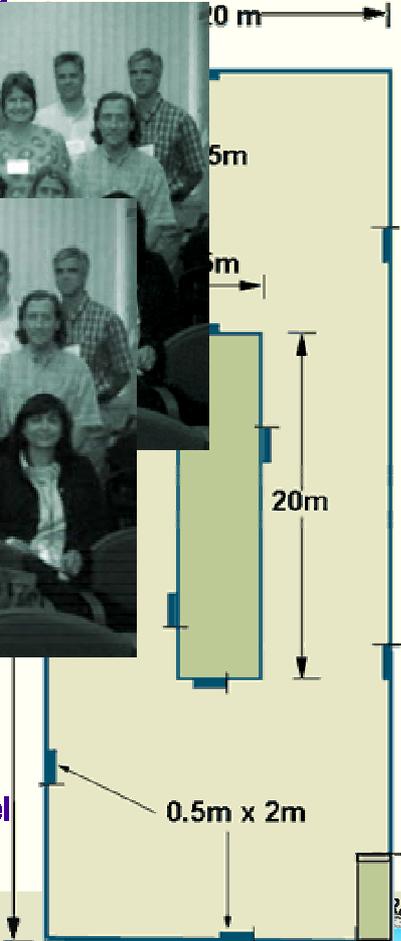
Past and present workflows

Detection
Mapping
Forecasting
Control

- Field s
- His
- Date



**GIS Based
Predictive Model
links to causal
mechanisms**



August 9, 2006



Colorado's Worst Invasive Species

Top Ten Plants

1. Canada thistle
2. Diffuse knapweed
3. Field bindweed
4. Hoary cress
5. Jointed goatgrass
6. Leafy spurge
7. Musk thistle
8. Russian knapweed
9. Spotted knapweed
10. Yellow toadflax



Extra stuff

