CitSci.org
Monitoring nature...
... through citizen science

The Art and Science of Multi-Scale Citizen Science Support:

Guidelines, Recommendations, and Lessons Learned in Developing Cyberinfrastructure Support Systems

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Context

- Many citizen science programs
- Generating volumes of ecological data
- With different goals & objectives
- In different domains or subject areas
- Using different data collection protocols
- Having different data curation needs

Objectives

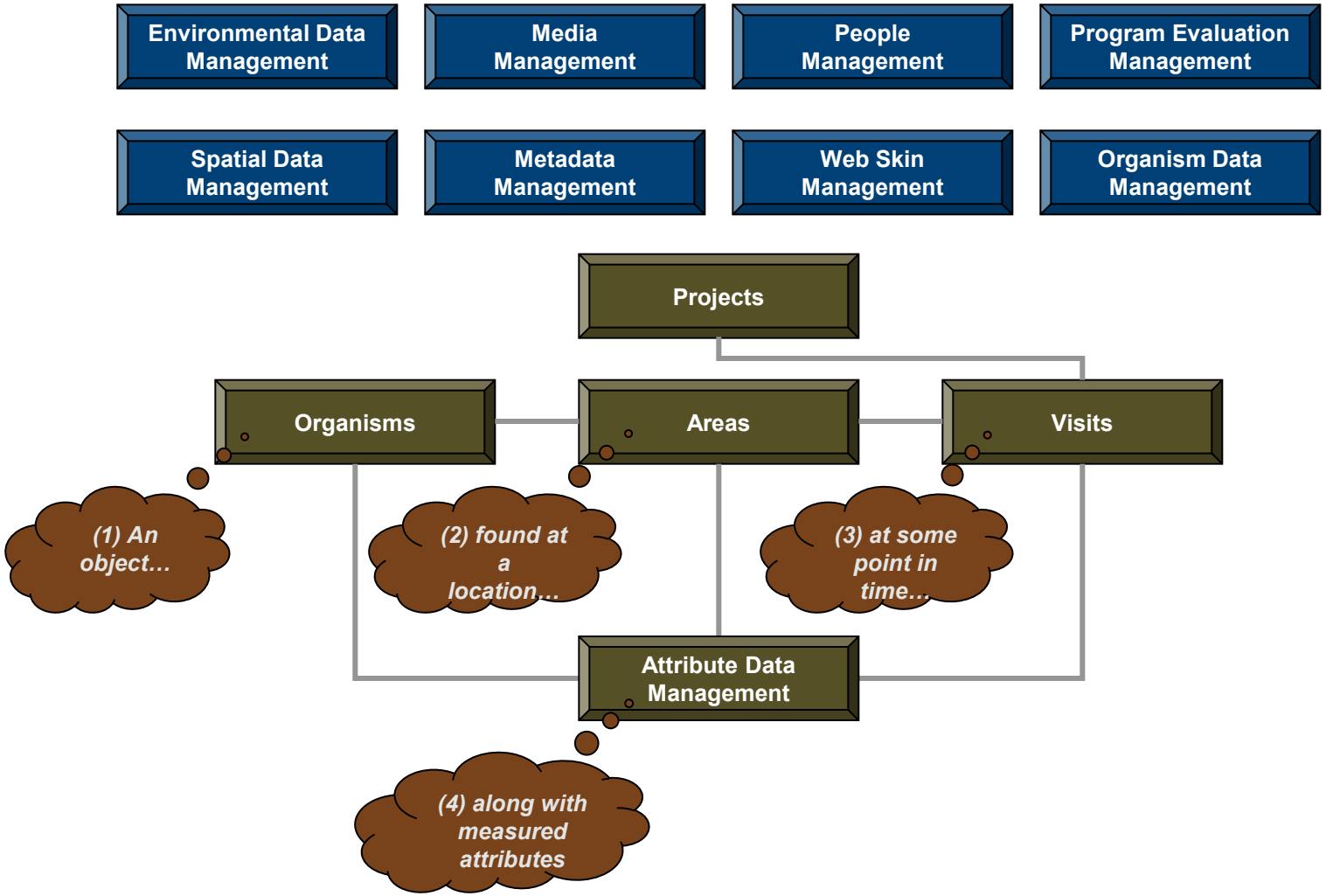
- Develop a cyberinfrastructure system in support of citizen science programs
- Offer guidelines to those developing cyberinfrastructure systems for programs operating at multiple spatial and temporal scales in many domains

www.citsci.org

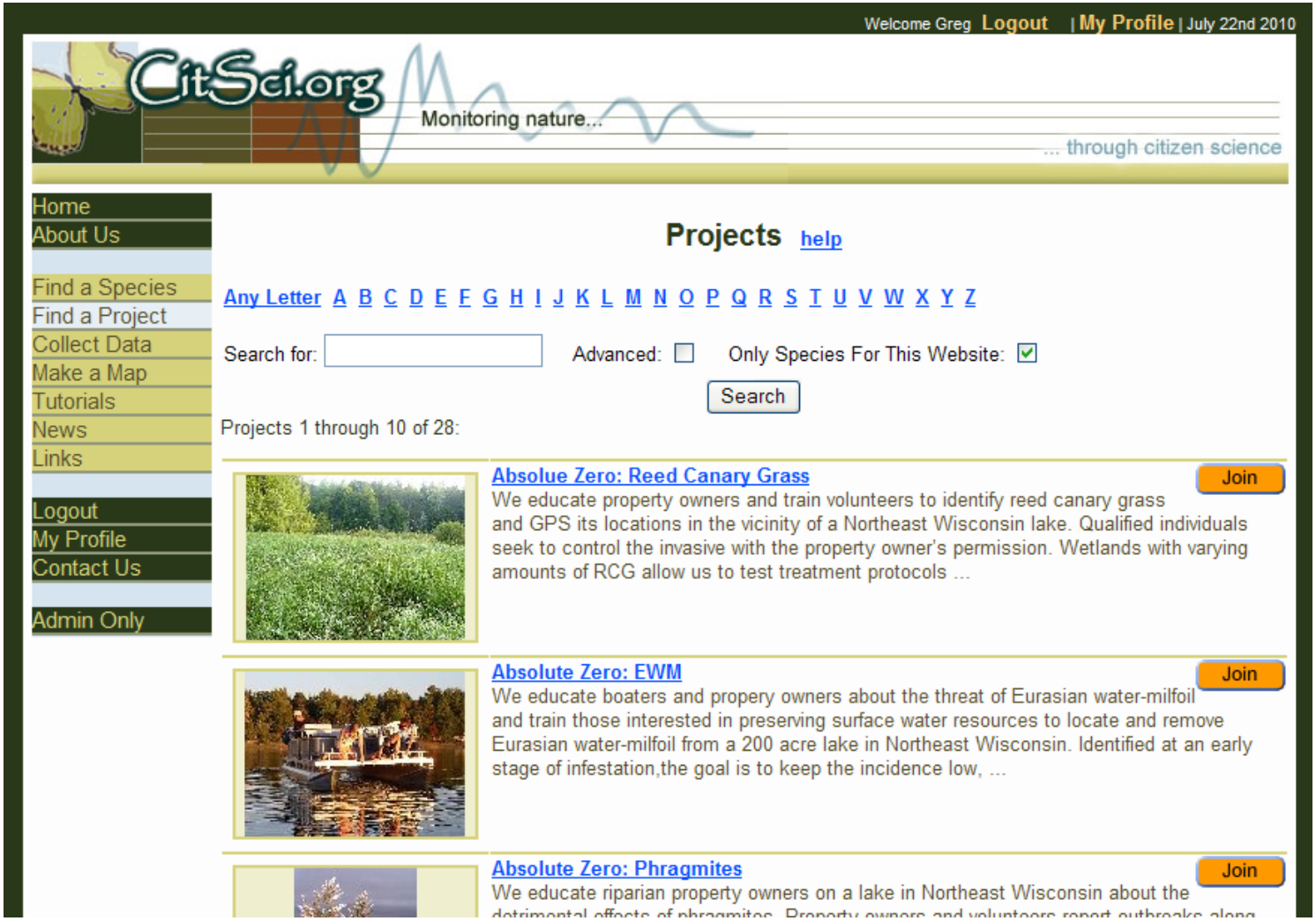
Approach

- Follow User-Centered Design
- Use iterative software development lifecycle
  - Investigation, design, development, testing, evaluation, and maintenance
- Develop CitSci.org (www.citsci.org)
  - Organize data into projects within CitSci.org
- Create cyberinfrastructure flexible enough to rapidly develop targeted “web skins”
  - Create an online website management system
- Learn from our mistakes

General Database Schema



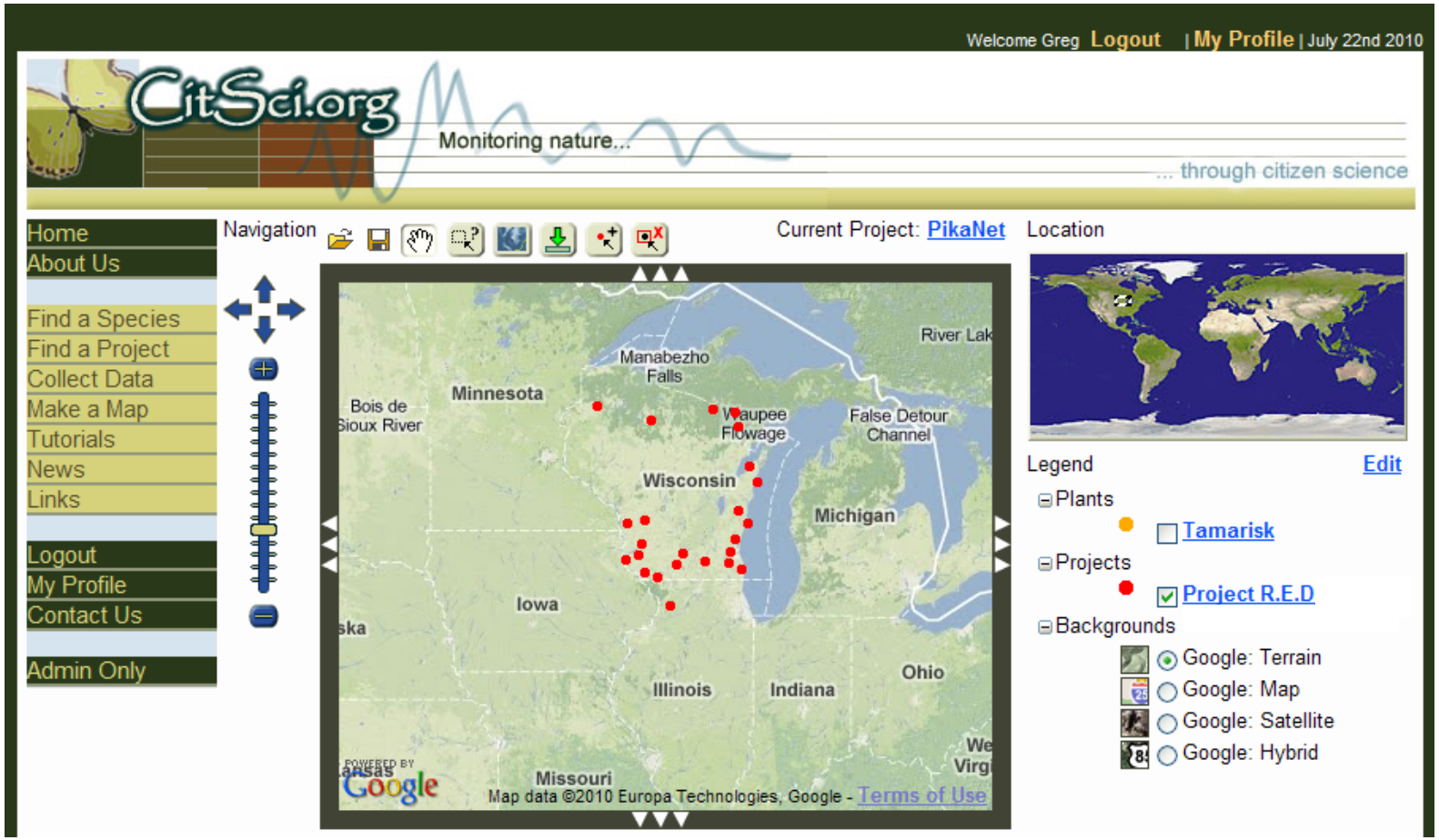
Join a Project



Enter Data

Test Server (lbis-test)
Welcome Greg Logout | My Profile | July 22nd 2010
CitSci.org
Monitoring nature...
... through citizen science
Home
About Us
Find a Species
Find a Project
Collect Data
Make a Map
Tutorials
News
Links
Logout
My Profile
Contact Us
Admin Only
Pika Monitoring Form
To Form List | To Project Information
Date of the observation
Date:
July
22nd
2010
Recorder:
-- Select a Recorder --
Authority:
-- Select an Authority --
Search Time (minutes):
Minutes
Comments:
Location information
Name:
Required
Datum:
WGS_84
Required
Longitude[1]:
Required
Latitude[2]:
Required
Accuracy[3] (meters):
Required

Make a Map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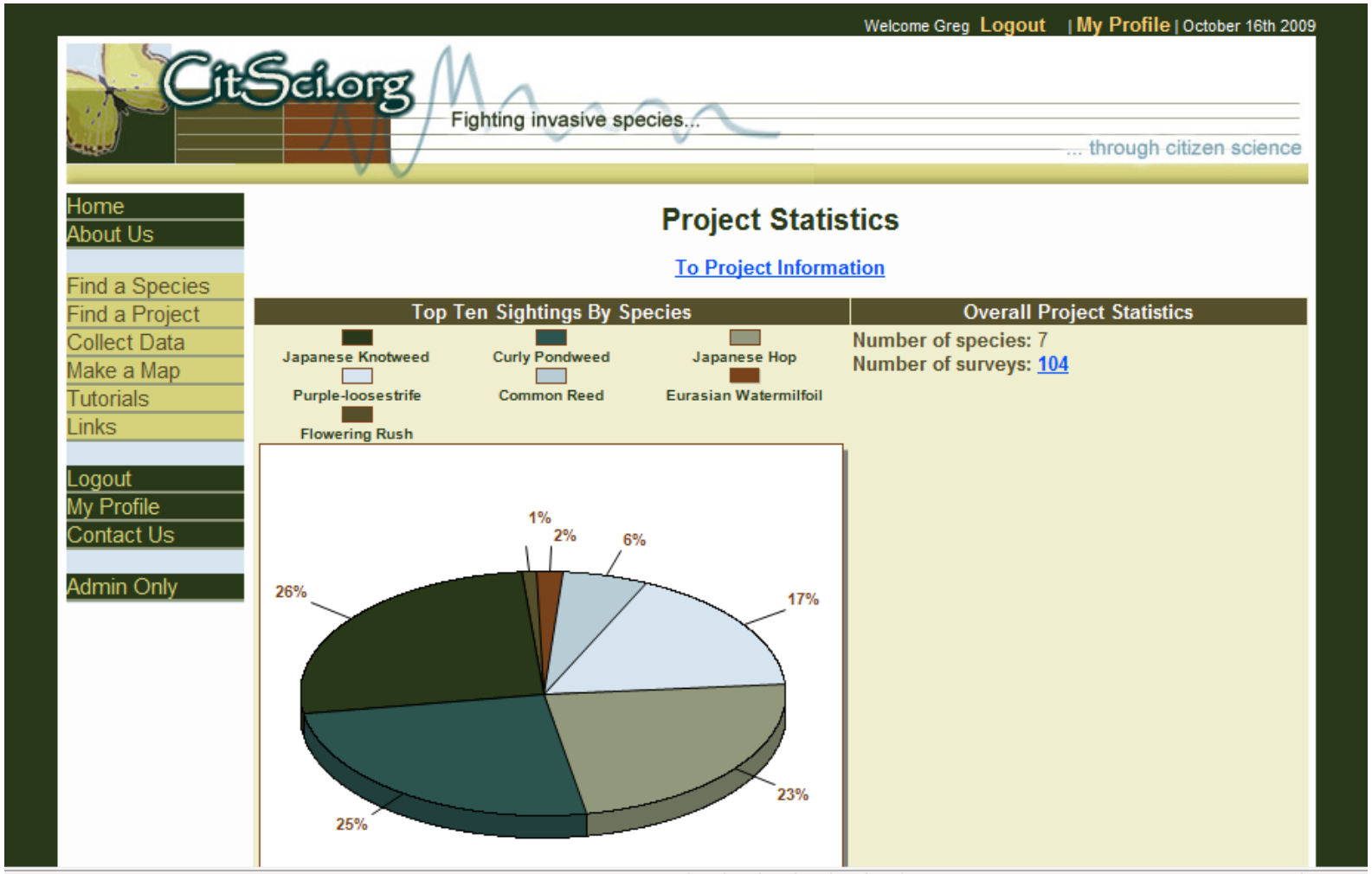
My Profile
Contact Us
Admin Only
Navigation
Current Project: PikaNet
Location
Legend
Edit
Plants
Tamarisk
Projects
Project R.E.D
Backgrounds
Google: Terrain
Google: Map
Google: Satellite
Google: Hybrid
Minnesota
Wisconsin
Michigan
Iowa
Illinois
Indiana
Ohio
Missouri
Manabezho Falls
False Detour Channel
Bois de Sioux River
Map data ©2010 Europa Technologies, Google - Terms of Use

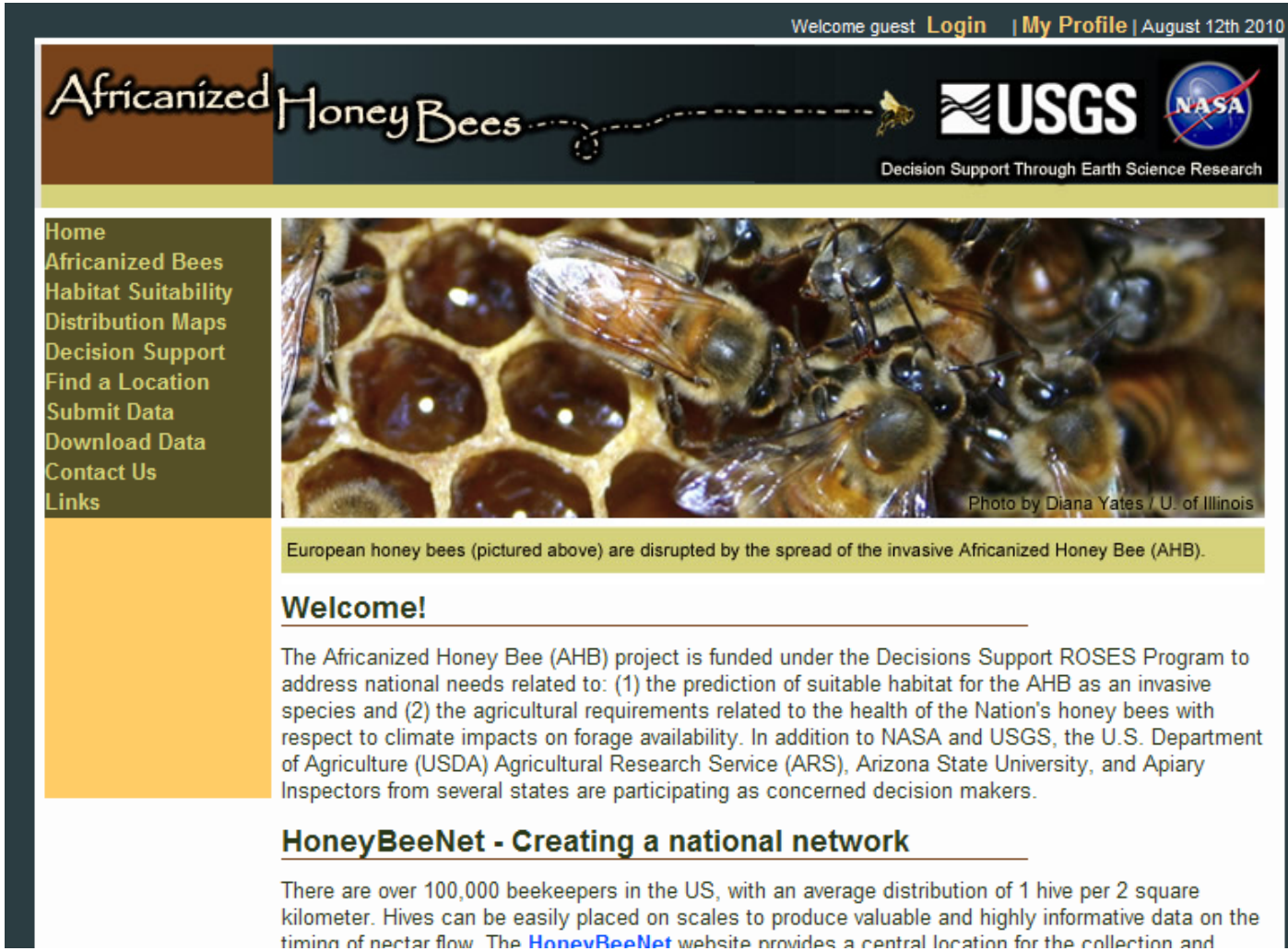
View Project Statistics



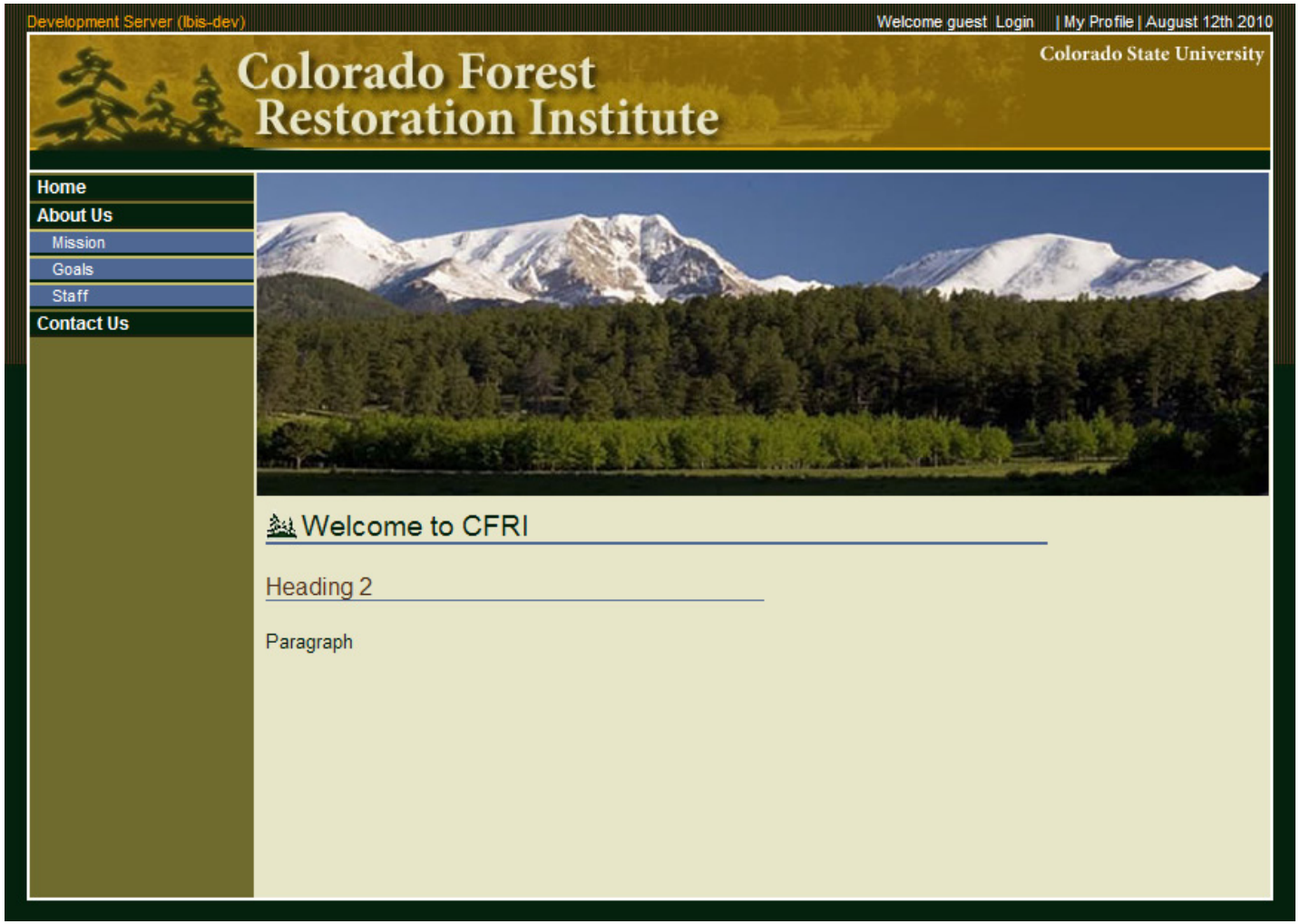
Targeted Web “Skins”

- Required when features go beyond basic functionality
- Appropriate when user-base dictates focused website
- Possible when funding is available to develop custom features and provide maintenance support

Skins: Africanized Honey Bees



Skins: Forest Health Data



However…

"The hubris surrounding new technical solutions for effective data standards, data sharing, and cyber-infrastructure development may mask complications experienced by developers (Ribes and Finholt 2009)."

Novel platforms … often lack the human resources required to maintain and upgrade technology (Ribes and Finholt 2009)

Ribes, D. and T. A. Finholt. 2009. The Long Now of Technology Infrastructure: Articulating Tensions in Development. Journal of the Association for Information Systems 10:375-398

Guidelines

- Follow User-Centered Design
- Use iterative development lifecycle
  - Investigation, design, development, testing, evaluation, and maintenance
- Stay flexible and be ready to adapt
- Create short and simple documentation
- Avoid feature creep
- Build capacity (education in informatics)
- Keep it simple

Recommendations

- Start with a requirements specification
- Organize data into projects
- Customize using web skins when needed
  - Complexity of custom features required
  - Level of engagement and longevity of use expected
  - Maintenance and customer support funds available
- Allow custom data attributes by project
- Add volunteer management features
- Incorporate program evaluation features
- Make sure that data come back to volunteers
- Make the system as participatory as possible

Recommendations (cont.)

- Standardize within projects (be consistent)
- Fix data quality errors before data are entered
- Automate features where appropriate… but…
- Keep humans involved as much as possible
- Ensure data interoperability with standards where standards exist
- Use appropriate social media and web 2.0
- Focus on data sharing and data use /re-use
- Use HCI testing
- Make it fun and easy to use

Conclusions

- Carefully designed systems can support programs when built with a flexible architecture
- Web skins allow us to rapidly develop unique systems for unique circumstances, yet share common base classes and database tables
- Using standards, controlled vocabularies, and mutually exclusive attributes allows for data exchange data through web services easily
- Integrating program evaluation into cyber-infrastructure systems improves our ability to track effectiveness

Thanks!

- Dr. Jim Graham

- NSF, USGS, NASA, Nick Young, Kirstin Holfelder, Lee Casuto, Tom Stohlgren, Paul Evangelista, Sara Simonson, Michelle Kinseth, Melinda Laituri, Sophia Linn, Kris Kodrich, John Moore, NREL, CSU, ISTEC, and so many others…