Early Detection Protocol Development in National Parks: Integrating all the pieces

Susan O'Neil
Natural Resources Specialist
Inventory & Monitoring Program
National Park Service

USGS
science for a changing world

Early Detection Handbook

- Includes modular instructions and case studies as examples.

- Focuses on how to look; combines active sampling and passive reporting.

- Focus on terrestrial plants.

- Currently in internal review.

- Available spring 2007

Co-Authors

Brad Welch, Editor,
   Colorado State University

Karen Beard,
   Utah State University

Matt Brooks,
   USGS

Richard Cutler,
   Utah State University

Tom Edwards,
   USGS

Paul Geissler,
   USGS Status & Trends Program

Rob Klinger,
   University of California Davis

Penny Latham,
   NPS Pacific West Region

Lloyd Loope,
   USGS

Daniel Sarr,
   NPS Klamath Network

T. Scott Schrader,
   New Mexico State University

Andrea Williams,
   NPS San Francisco Network

Kendal Young,
   New Mexico State University

Inventory & Monitoring Program

- 32 networks of national park units with significant natural resources.

- Conduct baseline inventories.

- Design and implement long term ecological monitoring of "vital signs".

- Each network selects appropriate vital signs.

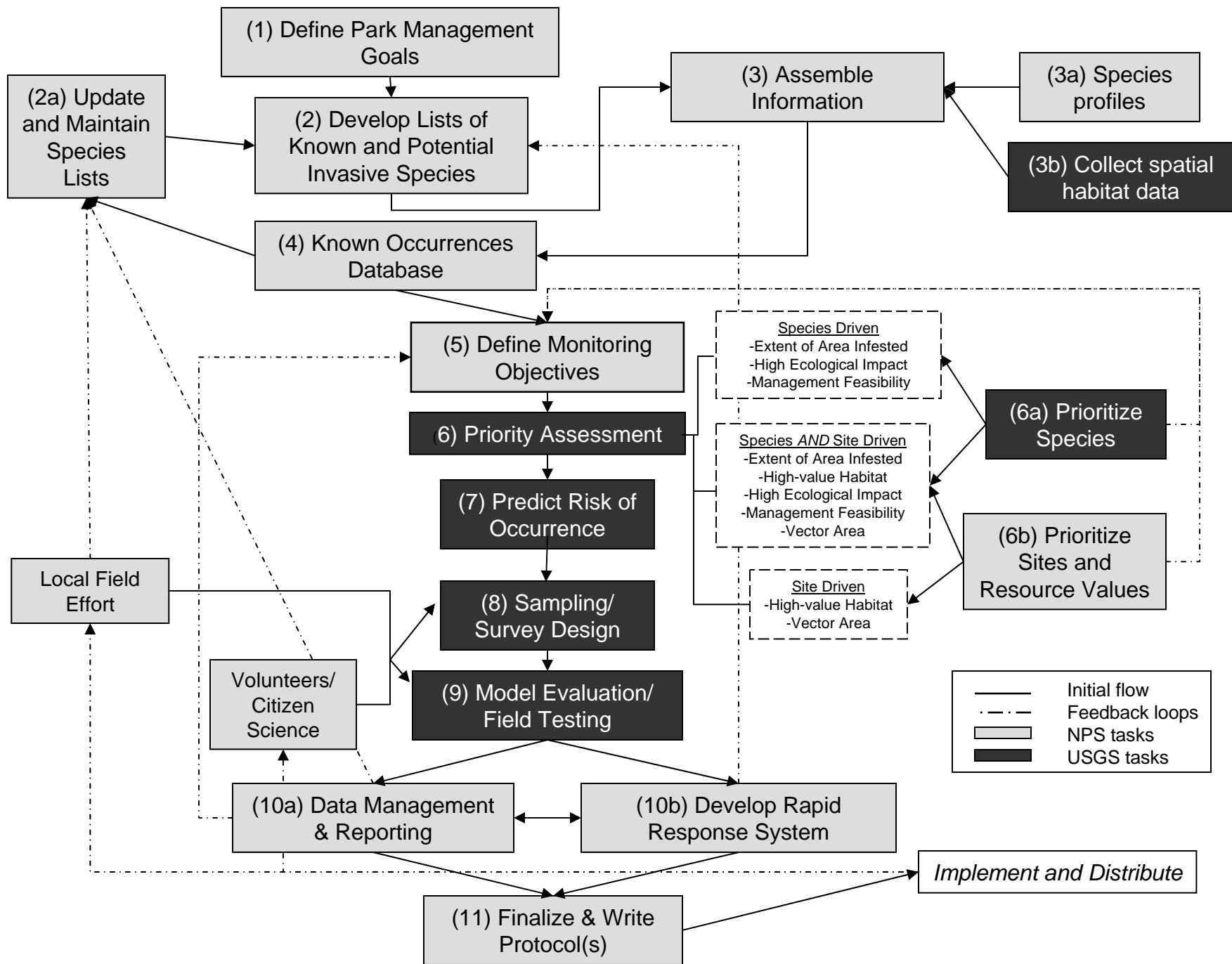- Invasive species consistently ranked in the top 3.

Why Early Detection (ED) Monitoring?

- Effective!!
- Fits NPS guidance:
  - Natural Resource Challenge
  - 2001 NPS Management Policies
  - 2006 National Invasive Species Action Plan
  - NPS Mission: "…preserve unimpaired natural and cultural resources…"
- Enhances existing invasive plant management programs.
- Collaboration with USGS Status and Trends Program.

*"An ounce of prevention is worth a pound of cure." -Benjamin Franklin*

Pacific West Region Networks
National Park Service
U.S. Department of the Interior

(1) Define Park Management Goals

(2a) Update and Maintain Species Lists

(2) Develop Lists of Known and Potential Invasive Species

(3) Assemble Information

(3a) Species profiles

(3b) Collect spatial habitat data

(4) Known Occurrences Database

(5) Define Monitoring Objectives

6) Priority Assessment

(7) Predict Risk of Occurrence

(8) Sampling/Survey Design

(9) Model Evaluation/Field Testing

Species Driven
-Extent of Area Infested
-High Ecological Impact
-Management Feasibility

Species AND Site Driven
-Extent of Area Infested
-High-value Habitat
-High Ecological Impact
-Management Feasibility
-Vector Area

Site Driven
-High-value Habitat
-Vector Area

(6a) Prioritize Species

(6b) Prioritize Sites and Resource Values

Local Field Effort

Volunteers/Citizen Science

(10a) Data Management & Reporting

(10b) Develop Rapid Response System

Implement and Distribute

(11) Finalize & Write Protocol(s)

Legend:
— Initial flow
—·— Feedback loops
NPS tasks
USGS tasks

Handbook Outline

- ## Introduction
  - Plant invasion process
  - Strategic approach to early detection

- ## Steps to early detection
  - Setting goals, objectives and scope
  - Information needs
    - Assembling preliminary information
    - Developing prioritization scheme
  - Analytic processes
    - Predicting risk of occurrence
    - Sampling/survey design
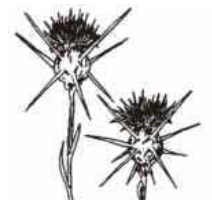
Handbook Outline

- ## Steps cont'd
  - Assessment and Evaluation
  - Implementation
    - Data management
    - Reporting
    - Management options (rapid response)
- ## Applications and Case Studies
- ## Glossary
- ## Protocol template
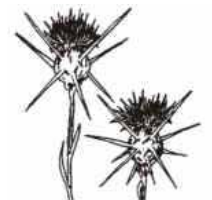
Step 1: Goals, objectives, scope

- Define geographic scale and program scope.

- Develop broad goals

- Fit objectives within goals and scope.

- Link management, monitoring and sampling objectives.

  - To detect all new infestations of the top 10 prioritized species in five designated native grassland sites within LABE over a five-year period by censusing the habitat and adjacent roads and trails each season.

Step 2: Assembling information

- Data needs for modeling species.

- Data needs for prioritizing sites and species:

  - Introduction/colonization phase

  - Establishment phase

  - Spread and equilibrium phase

- Data ranked in order of importance

- Data quality: how to determine and factor in prioritization
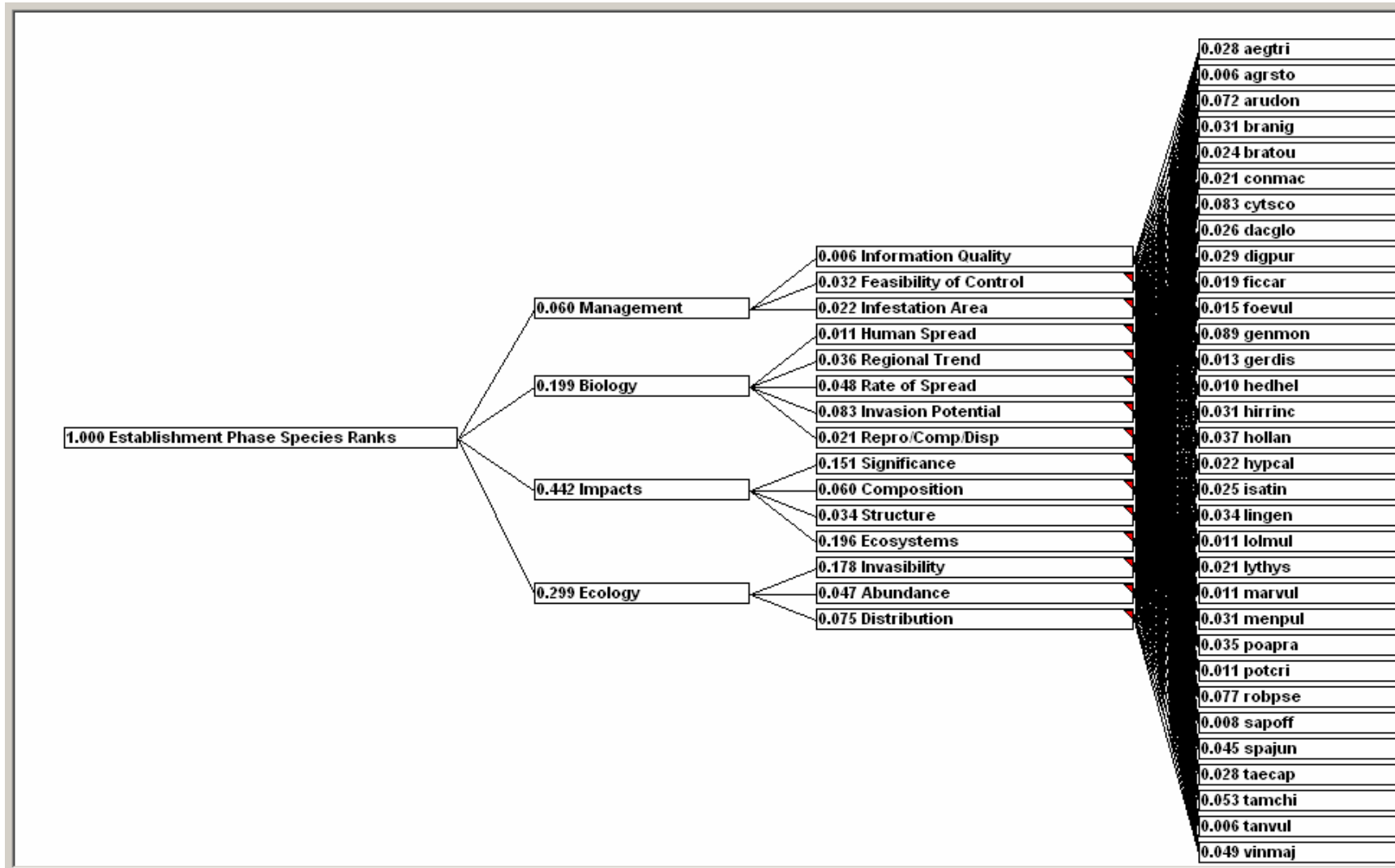
- Where to look for the data

Step 3: Prioritization

- Tested prioritizing species at Whiskeytown NRA, CA

- Separated species into 3 phases based on existing data.

- Used Analytical Hierarchy Process to weight criteria.

- Incorporates measures of uncertainty in the matrix.

Whiskeytown NRA Species Establishment Results

WHIS Establishment Phase scores
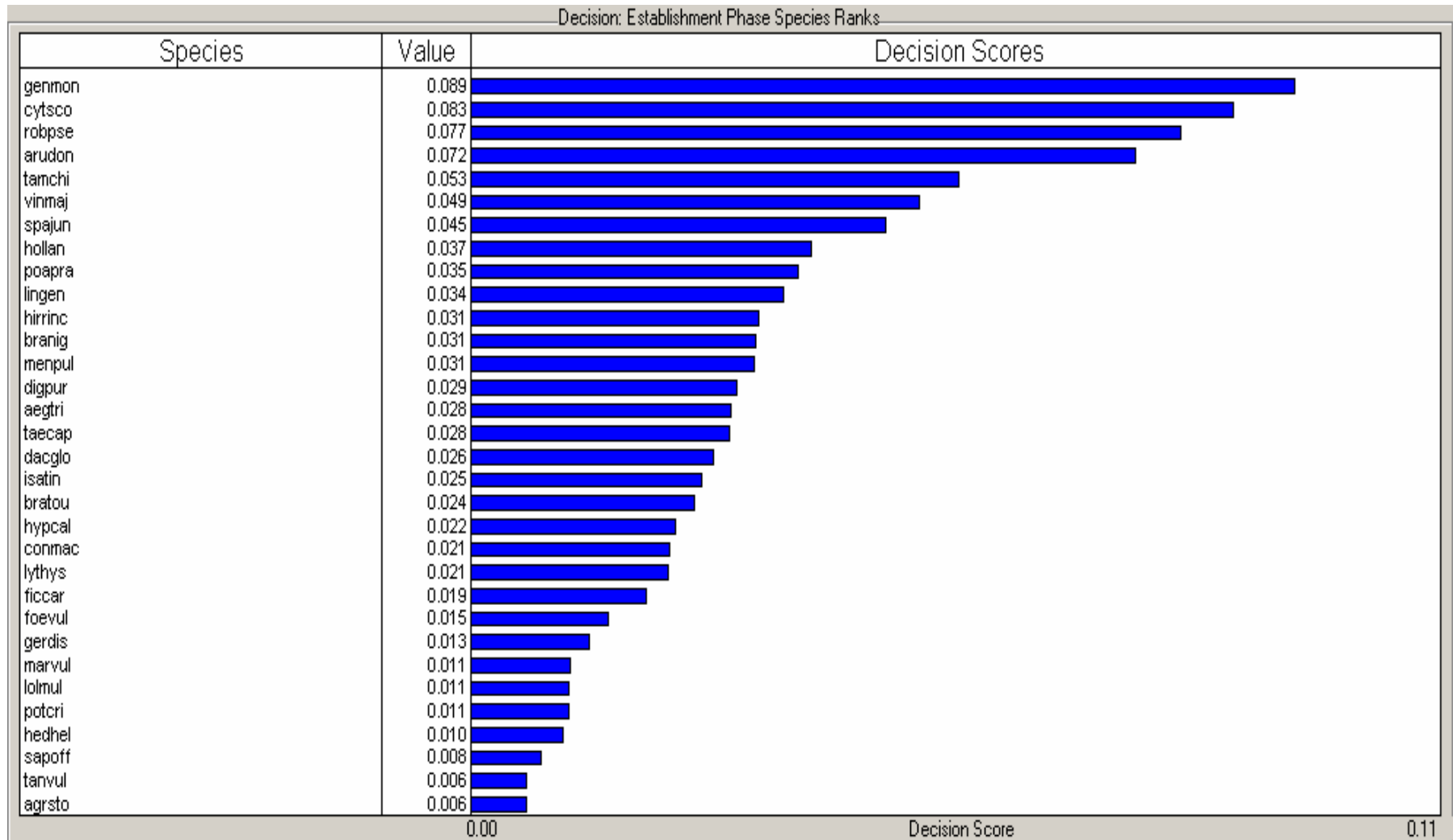
Step 4: Modeling

- A model is needed to make searching efficient and predict risk of occurrence.

- Conceptual models

- Analytical models
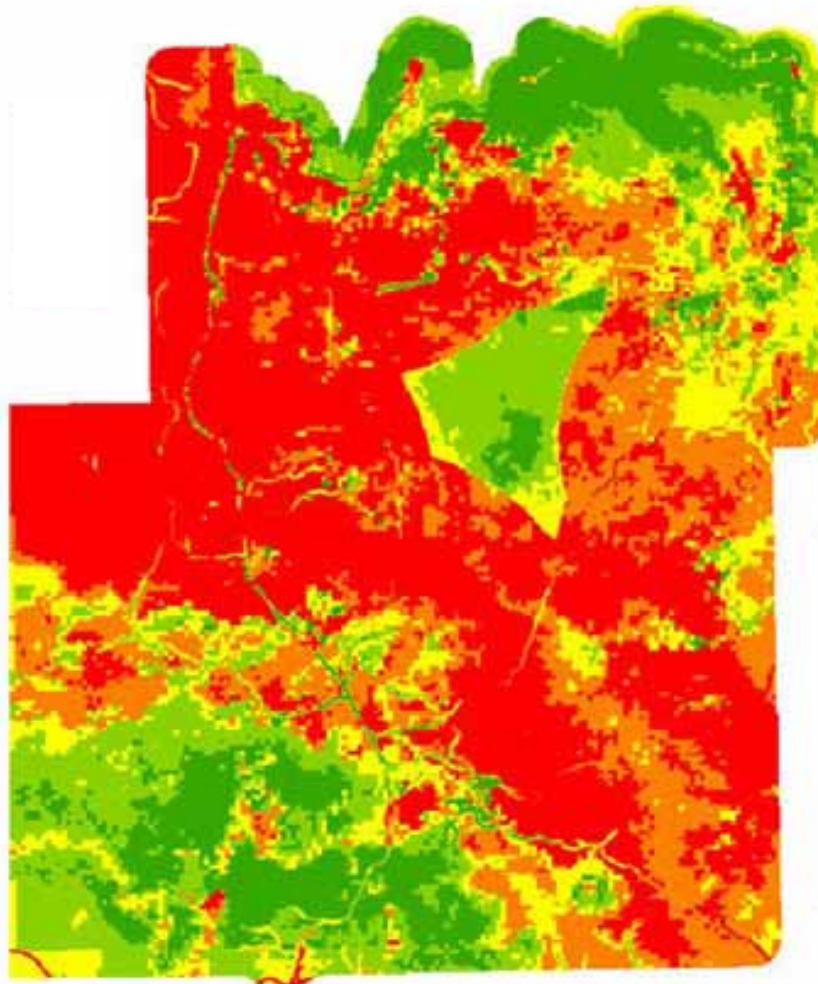
  - Plot-based approach

  - Remote sensing approach

Predicting risk – Plot based

- Type of training data.

- Augmenting spatially explicit models with non-spatial data.

- Methods for analyzing statistical relationships.

- Extrapolating to park.

- Software availability
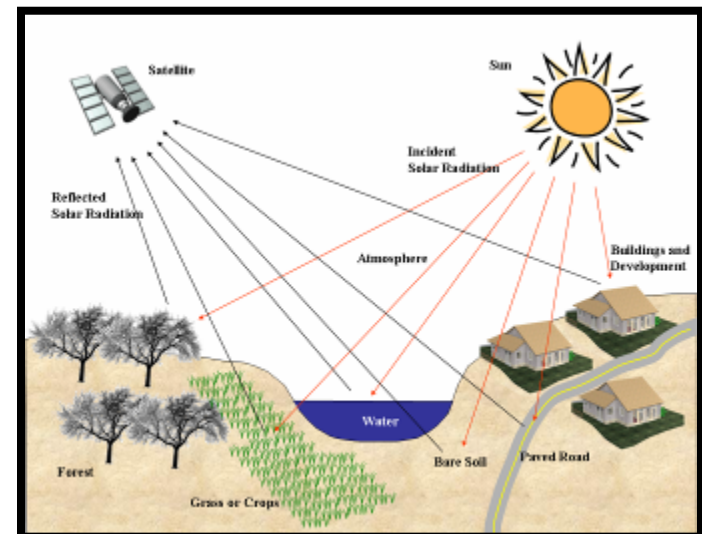
Verbascum thapsus at Lava Beds Ntnl Monument

High probability
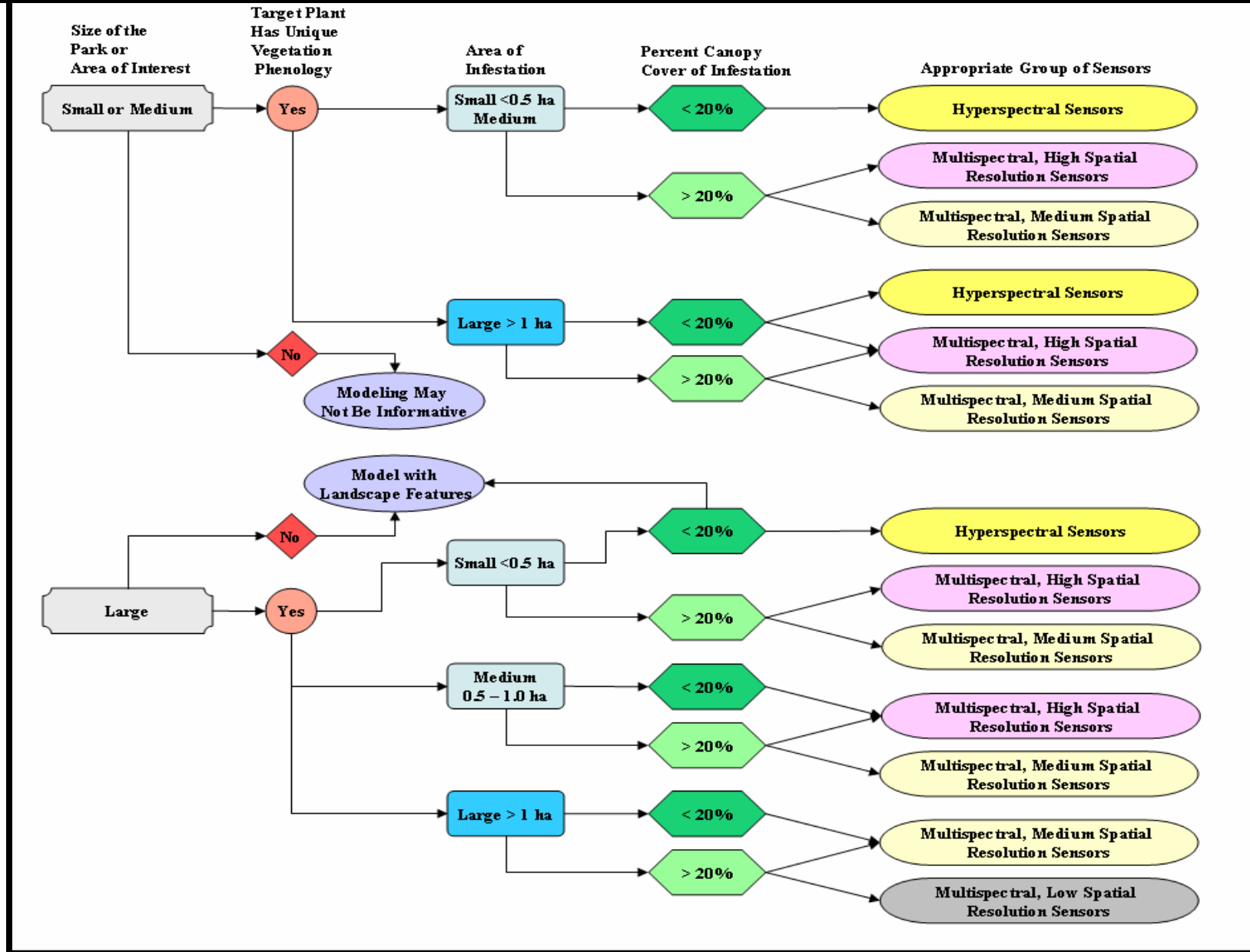Medium probability
Low probability
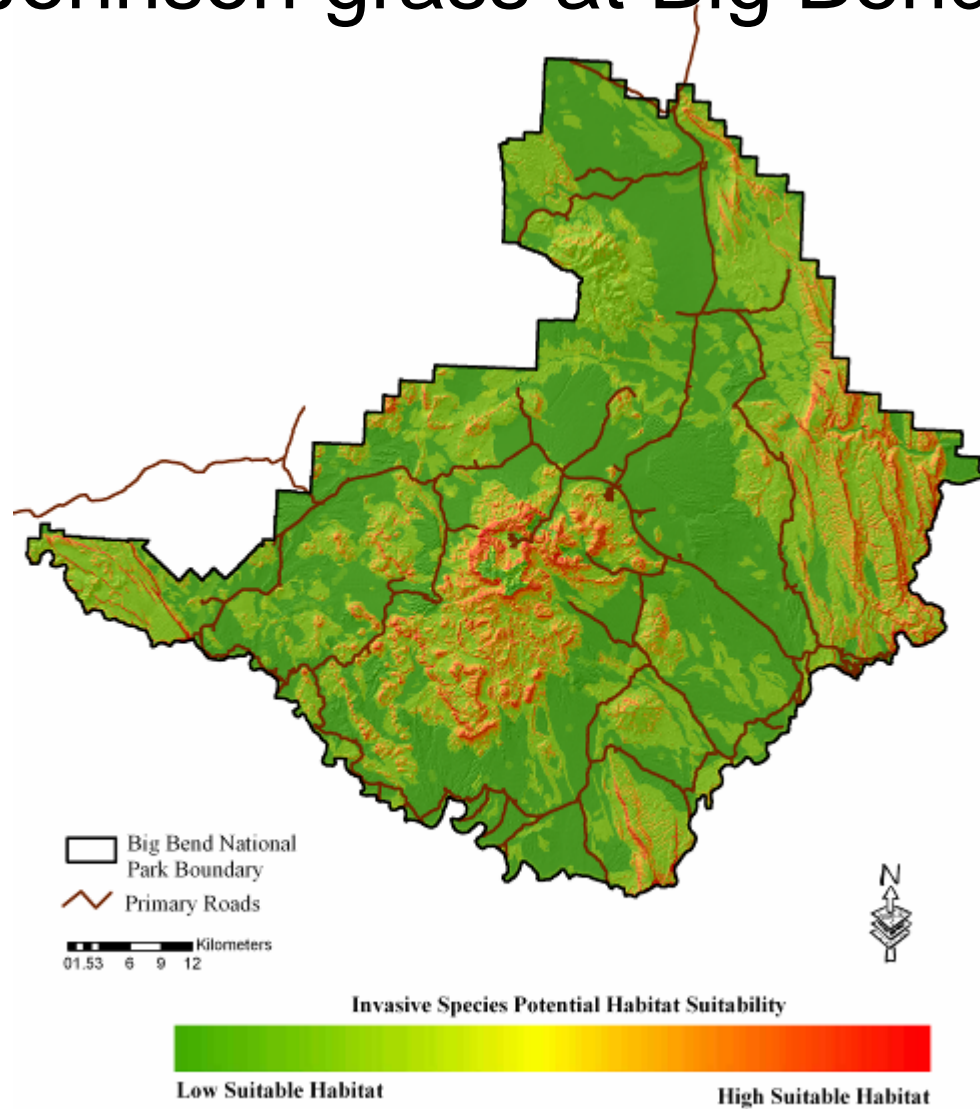
Predicting risk – Remote Sensing

- Types of remotely sensed data.

- When to use for invasive species.

- Building predictive models using imagery.

- Modeling vectors and pathways.

Johnson grass at Big Bend NP

Big Bend National Park Boundary
Primary Roads
Kilometers
0 1.5 3 6 9 12

N

Invasive Species Potential Habitat Suitability

Low Suitable Habitat   High Suitable Habitat

Step 5: Sampling Design

- When to use probability sampling in an ED program.

    – Assess severity: yes!

    – Increase efficiency: yes!

    – Search and destroy: No.

- Steps in designing a survey.

- Considers cost and accessibility to backcountry sites.

Designing an ED Survey

1. Develop <u>sampling frame</u>: park, adjacent areas, etc.

2. Decide on appropriate <u>sample units</u>: stretch of trail, transect, plot, etc.

3. Use a <u>conceptual or predictive model</u>: likely areas, species, pathways, etc.

4. Steps for stratified vs. unequal probability sampling.

5. Selecting sampling units.

Case Studies

- Klamath Network: details on USGS modeling and prioritization projects.

- Pacific Islands Network: details on combining a broad (island) and narrow (park) scope.

- Golden Gate NRA: details on using volunteers for ED monitoring.

Official handbook roll-out April 2007.

"Living document" with digital updates, additions.
- New case studies
- Park protocols

For copies and website info contact:
Penny Latham penny_latham@nps.gov
Paul Geissler paul_geissler@usgs.gov

USGS
science for a changing world