Freshwater Biodiversity Team Update

"Far better an approximate answer to the *right* question, which is often vague, than an *exact* answer to the wrong question, which can always be made precise."

John W. Tukey

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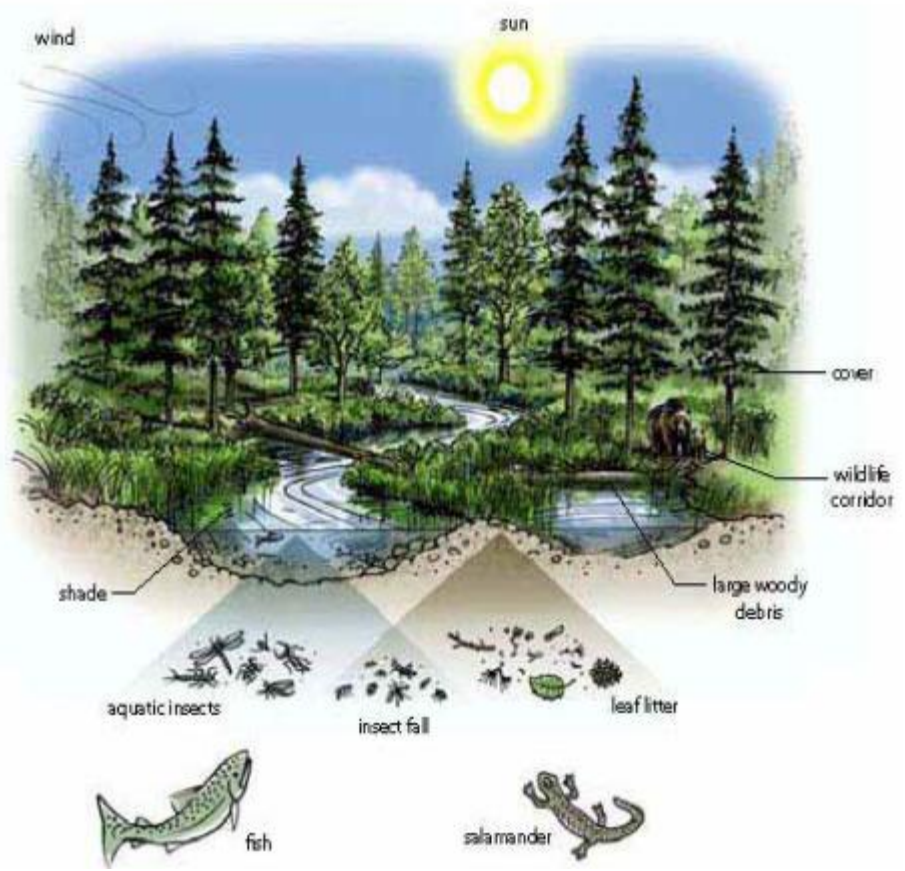
Directions

- Conservation emphasis – to sustain the natural physical, chemical and biological processes within representative ecosystems
- Managment emphasis – to conserve and restore major ecological services while meeting socioeconomic, cultural and political needs

Same root goals and not mutually exclusive

We want to maintain ecosystem structure, fonction and composition



Function processes such as:

- Fecundity, death, growth
- Food webs and feeding relationships

We use indicators instead of direct measures

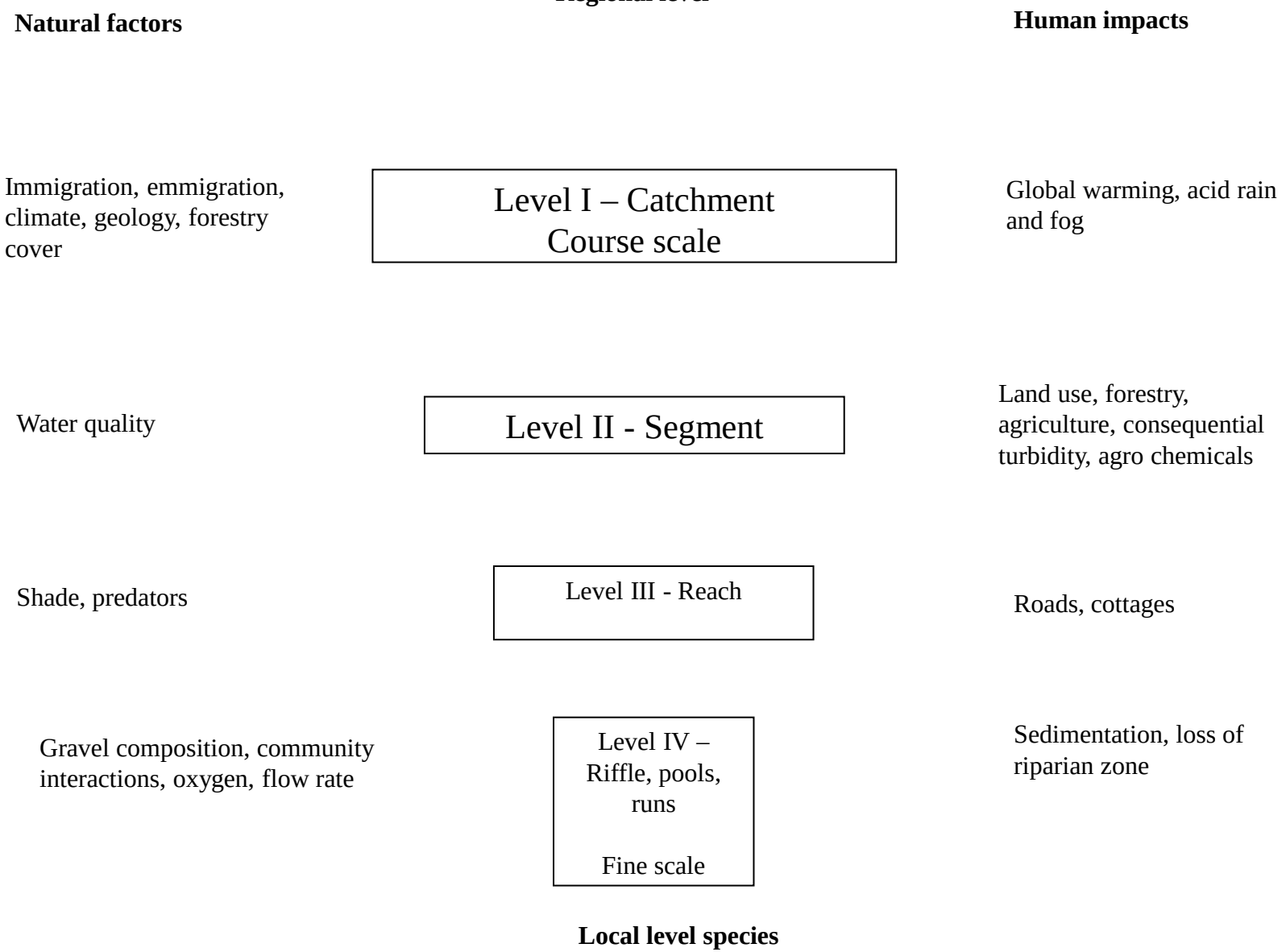
- Examples: abundance ratios, shifts in size distributions, keystone species, umbrella species

The job at hand

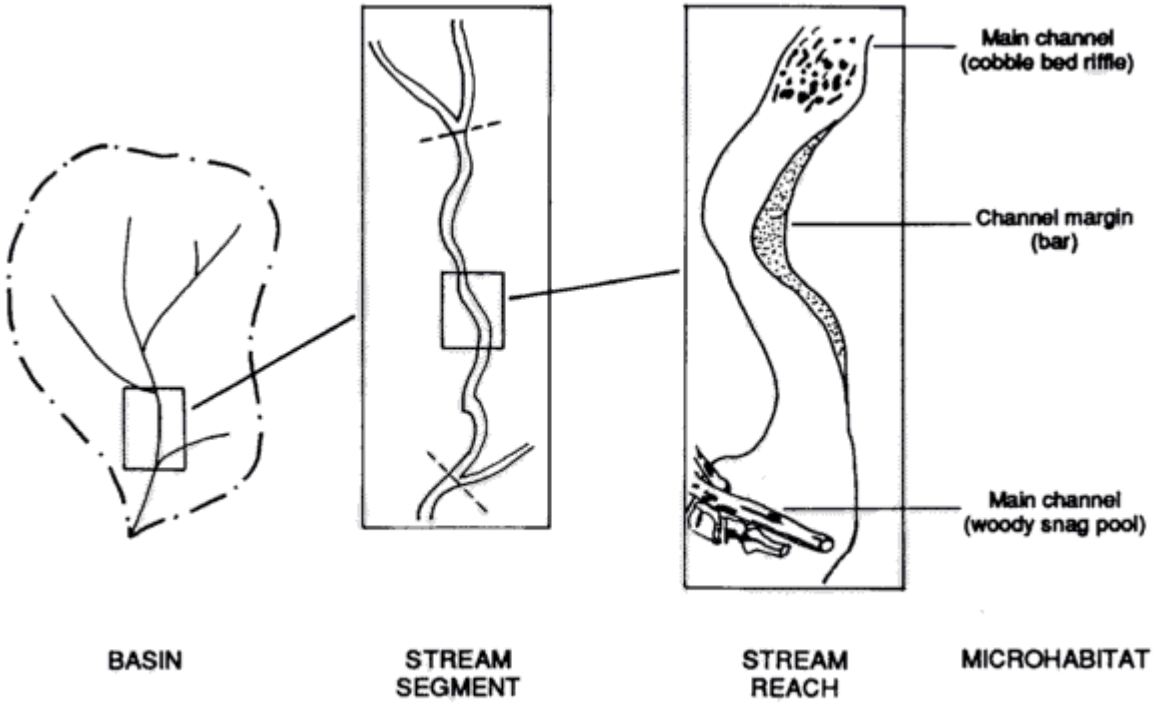
- aquatic biodiversity to include all species where at least one part on the life cycle is dependent on lotic or lentic habitat
- what is the current status of aquatic biodiversity against some reference measurement?
- how will human use of these resources affect biodiversity locally and regionally?

Biodiversity

- Exists at different scales both in space and time
  - Catchment level (course scale, usually the management unit)
  - Segment
    - common biological, chemical, hydrological, natural, and physical characteristics and processes
  - Reach
    - unit of study
  - Riffle, pools and runs, local level



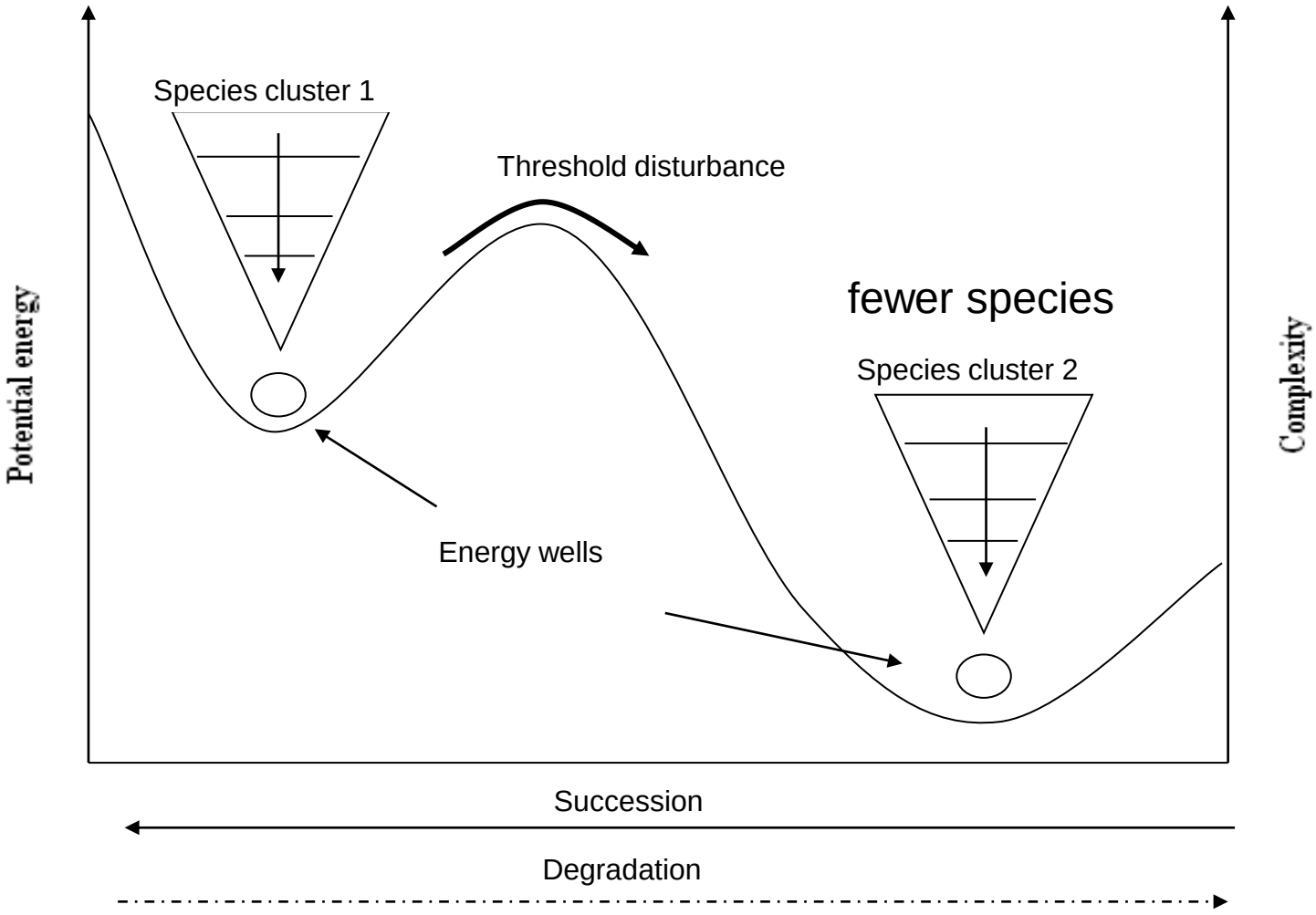
Concept of scale in measuring ecological integrity and natural and human disturbances. Modified from Malmqvist (2002).



Spare slide to explain basin, segment, reach and microhabitat

Stressors, thresholds and targets

- stressors
  - often human induced by not necessarily
    - climate change, extreme natural events, pollution, invasive species, and land and resource use
- threshold
  - the point after which we get a change of state in ecosystem function
    - can be a shift in tropic levels or food webs
    - good to know but we really don't want to be there


Species cluster 1
Threshold disturbance
fewer species
Species cluster 2
Potential energy
Complexity
Energy wells
Succession
Degradation

Target

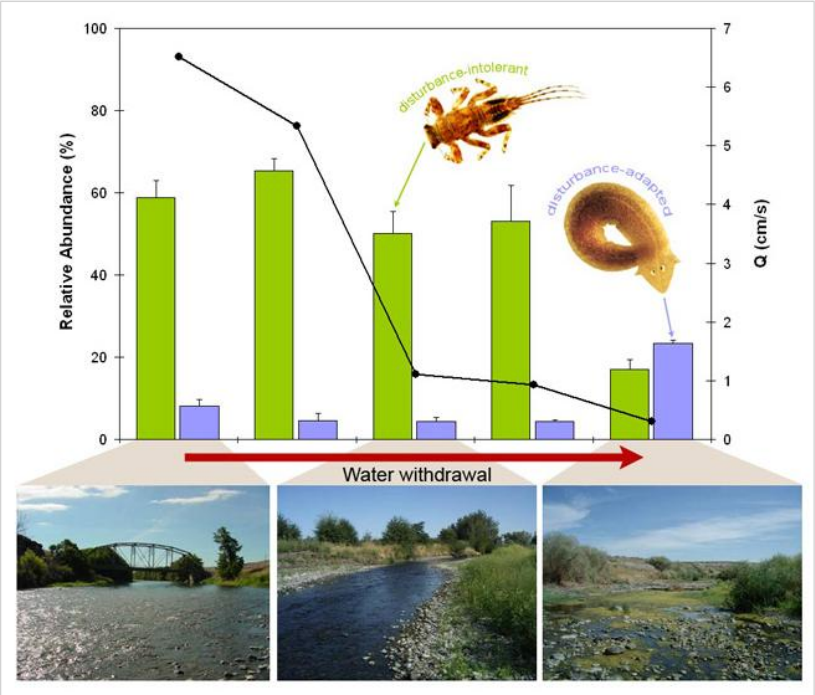
- Biodiversity targets are statements of desired outcomes related to specific biodiversity values

- Example : The famous 2010 Biodiversity target of the EU stated in 2001, to halt the decline of biodiversity by 2010.

Indicators

- Allow us to assess ecosystems function rather than specific species requirements
  - Example: food webs as revealed by feeding guilds
- We don’t want a species to arrive at a threshold point
  - Indicators should be sensitive enough to give an early warning of a fundamental shift

Indicateurs and thresholds



Example:

loss of macroinvertebrate diversity with increasing water withdrawal

Tools

- Airborne thermal imaging (FLIR)
- High resolution texture or elevation data (LiDAR)
- (Ecological Risk Index, Limberly 2007)

Species prediction models

- Rodríguez-Castañeda G, Hof AR, Jansson R, Harding LE (2012) Predicting the Fate of Biodiversity Using Species' Distribution Models: Enhancing Model Comparability and Repeatability. PLoS ONE 7(9): e44402.

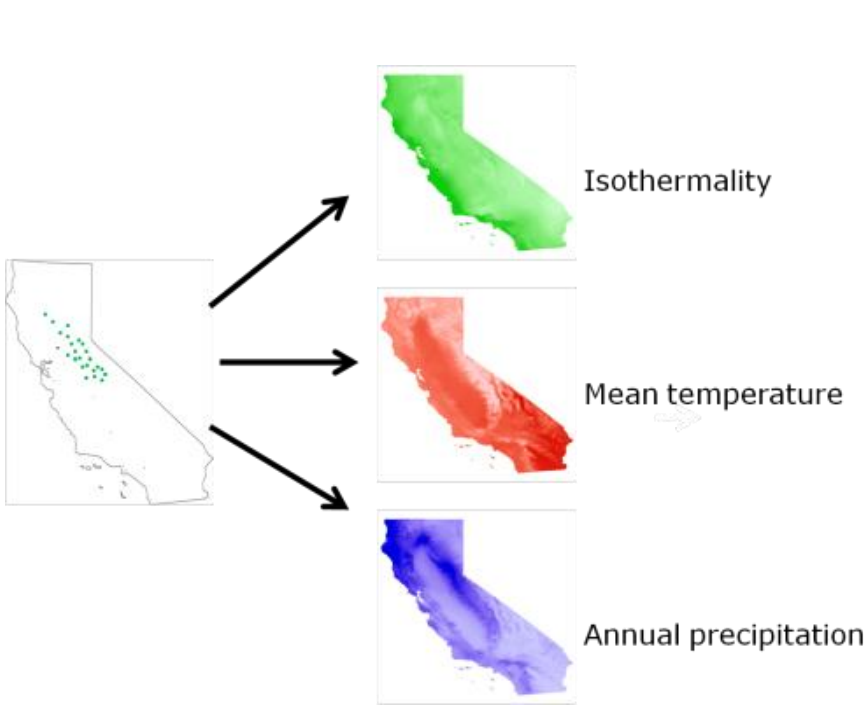
- Gusian et al. 2013. Predicting species distributions for conservation decisions. Ecological letters. 16(12): 1424-1435.

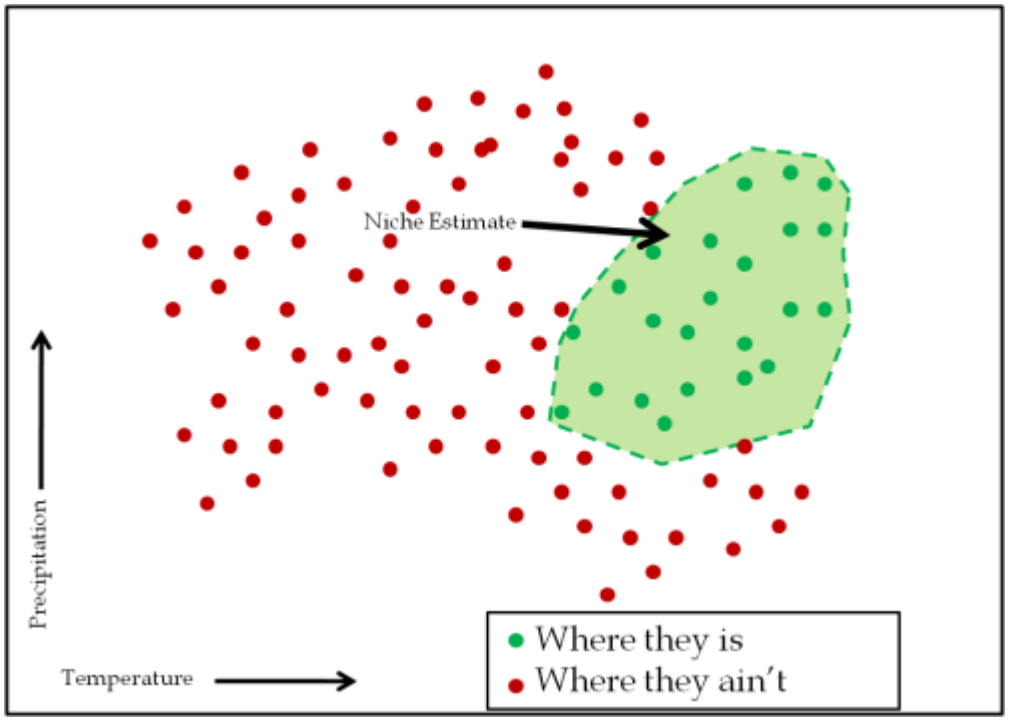
Free R

Species distribution modeling with R

Robert J. Hijmans and Jane Elith

December 13, 2013





The proposed Miramichi pilot project

- Collection of available physical and biological descriptor information
  - particular attention to species of concern
- Decision on course scale classification unit
- Assemble into database
- Decision on threshold candidates
- Framework for decision making or proposed développent route.

In the end, we will conserve only what we love. We will love only what we understand. We will understand only what we are taught.

Baba Dioum (IUCN, 1968)

The end

- http://www.gap.uidaho.edu/Bulletins/12/Overview_MissouriAquatic.htm

- Spare slide – aquatic gap analysis site

gap
KEEPING COMMON SPECIES COMMON

2003/04

Gap Analysis BULLETIN No. 12

A Geographic Approach to Planning for Biological Diversity

USGS science for a changing world

Volume No. 12, 2003/2004

AQUATIC GAP

An Overview of the Data Developed for the Missouri Aquatic GAP Project and an Example of How it Is Being Used for Conservation Planning