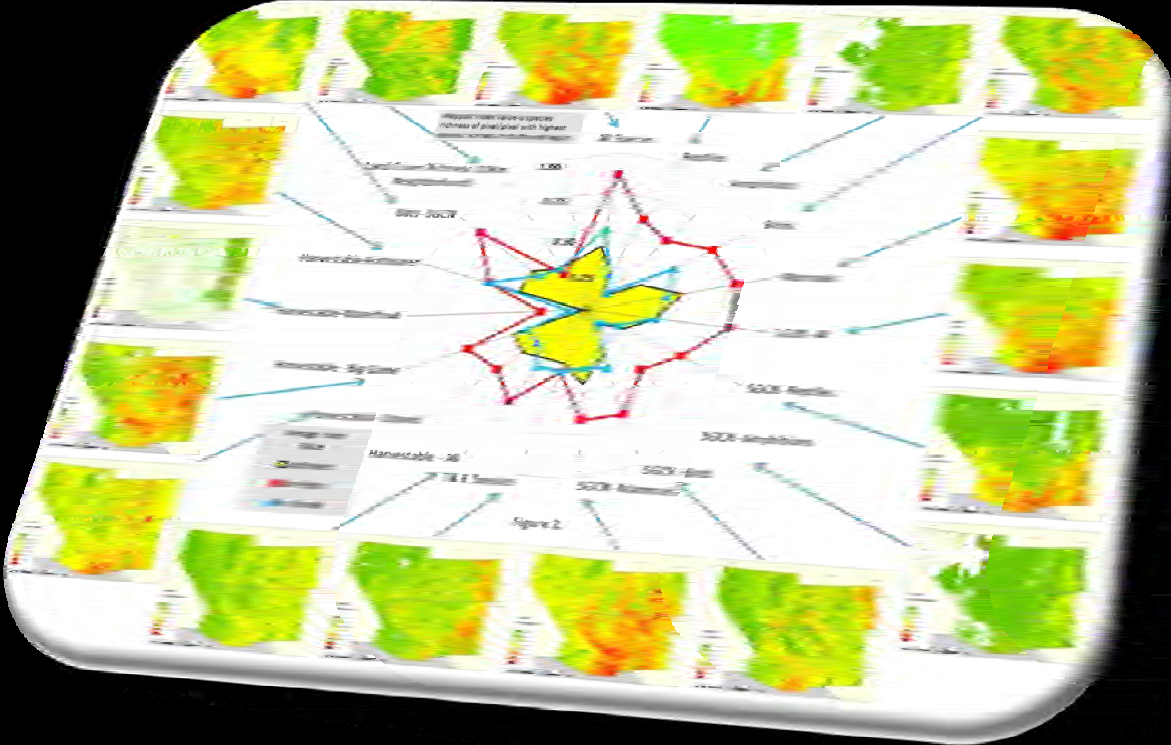


Quantifying and Mapping Habitat-Based Biodiversity Metrics Within an Ecosystem Services Framework

ACES Conference, Ft . Lauderdale, FL
Dec 12-14, 2012

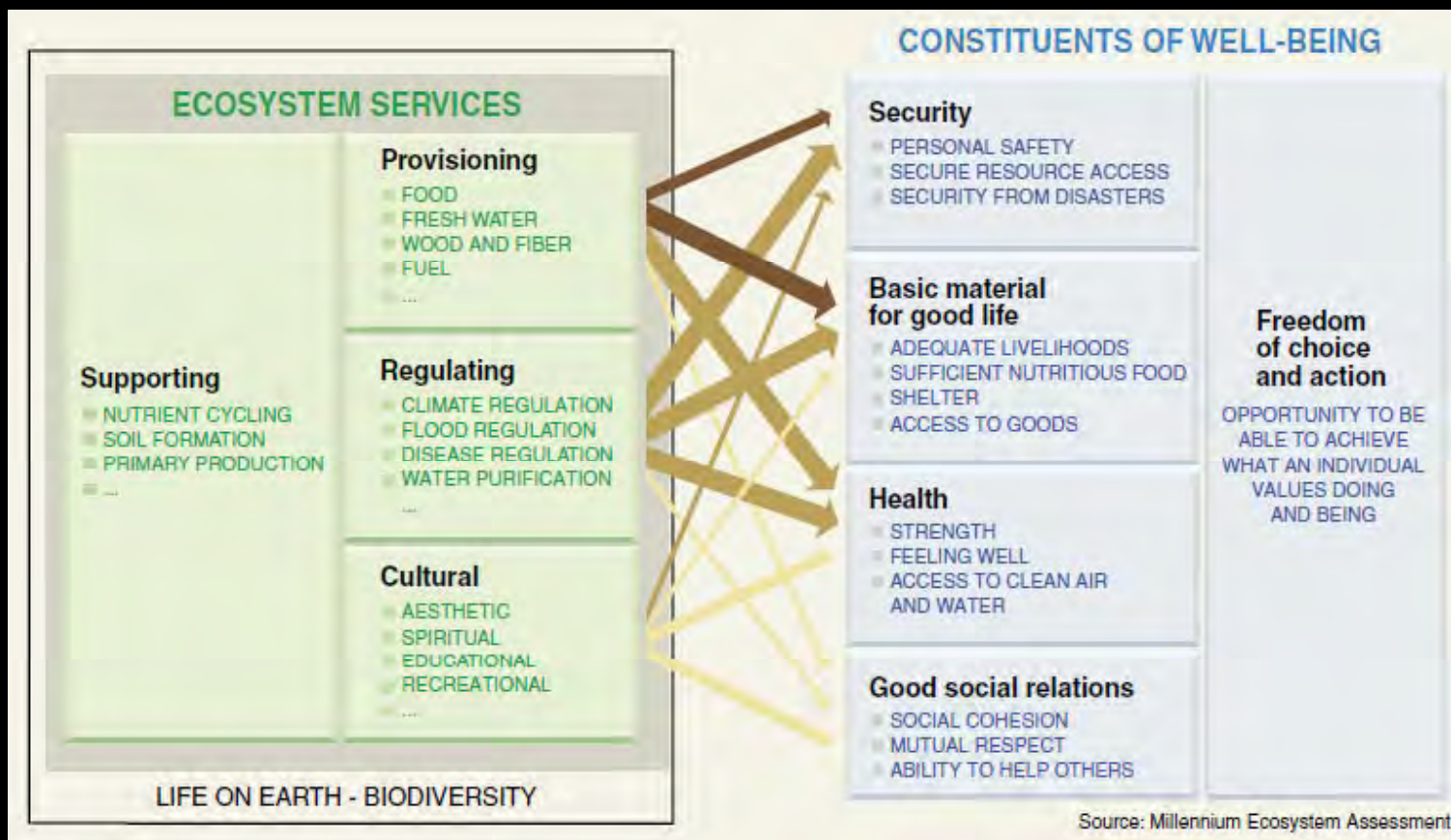


- William Kepner, EPA
- Ken Boykin, NMSU
- David Bradford, EPA
- Rachel Guy, UGA
- Darin Kopp, NMSU

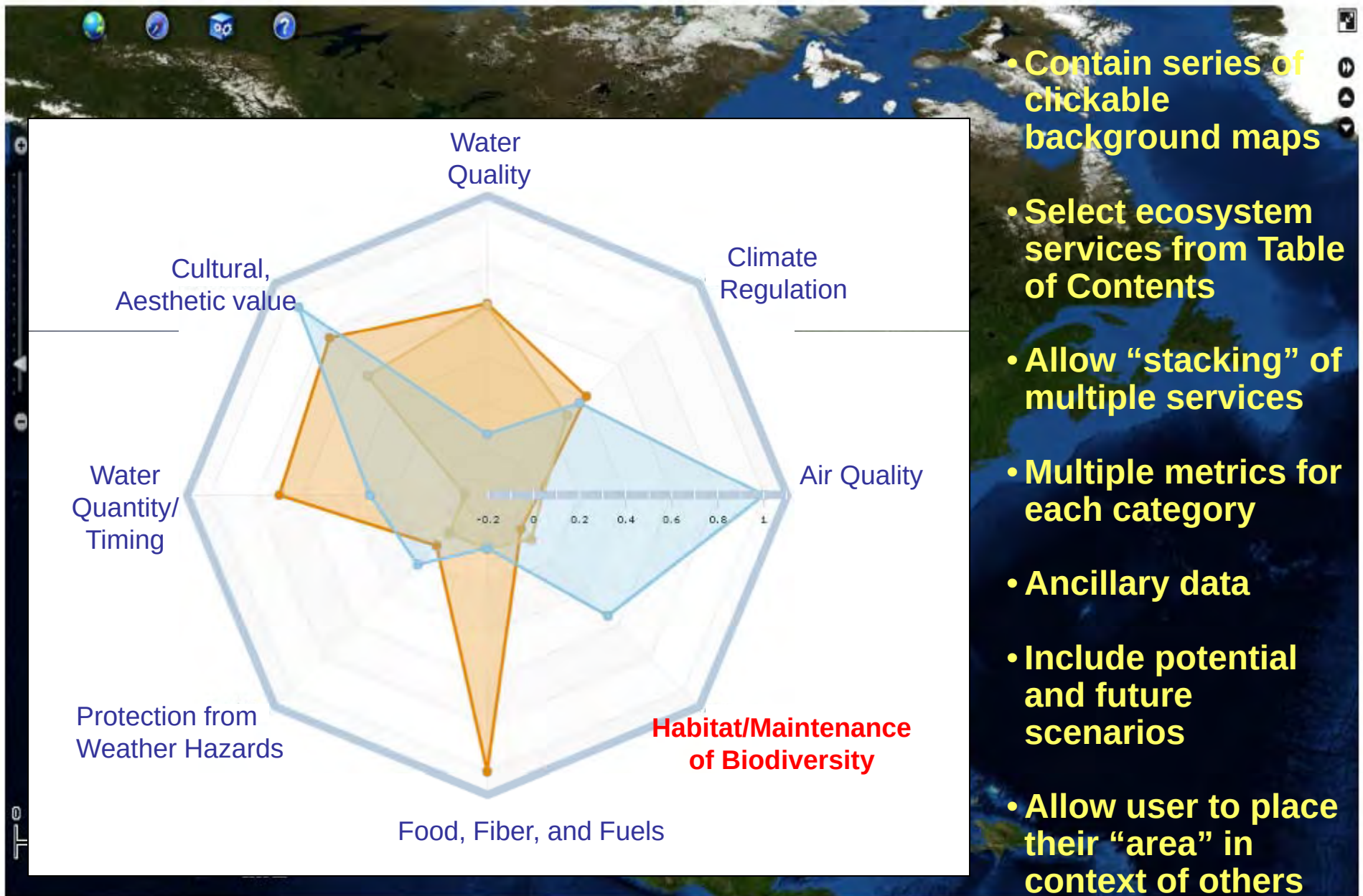
- Allison K. Leimer, NMSU
- Elizabeth A. Samson, NMSU
- N. Forrest East, NMSU
- Anne Neale, EPA
- Kevin Gergely, USGS

Ecosystem Services

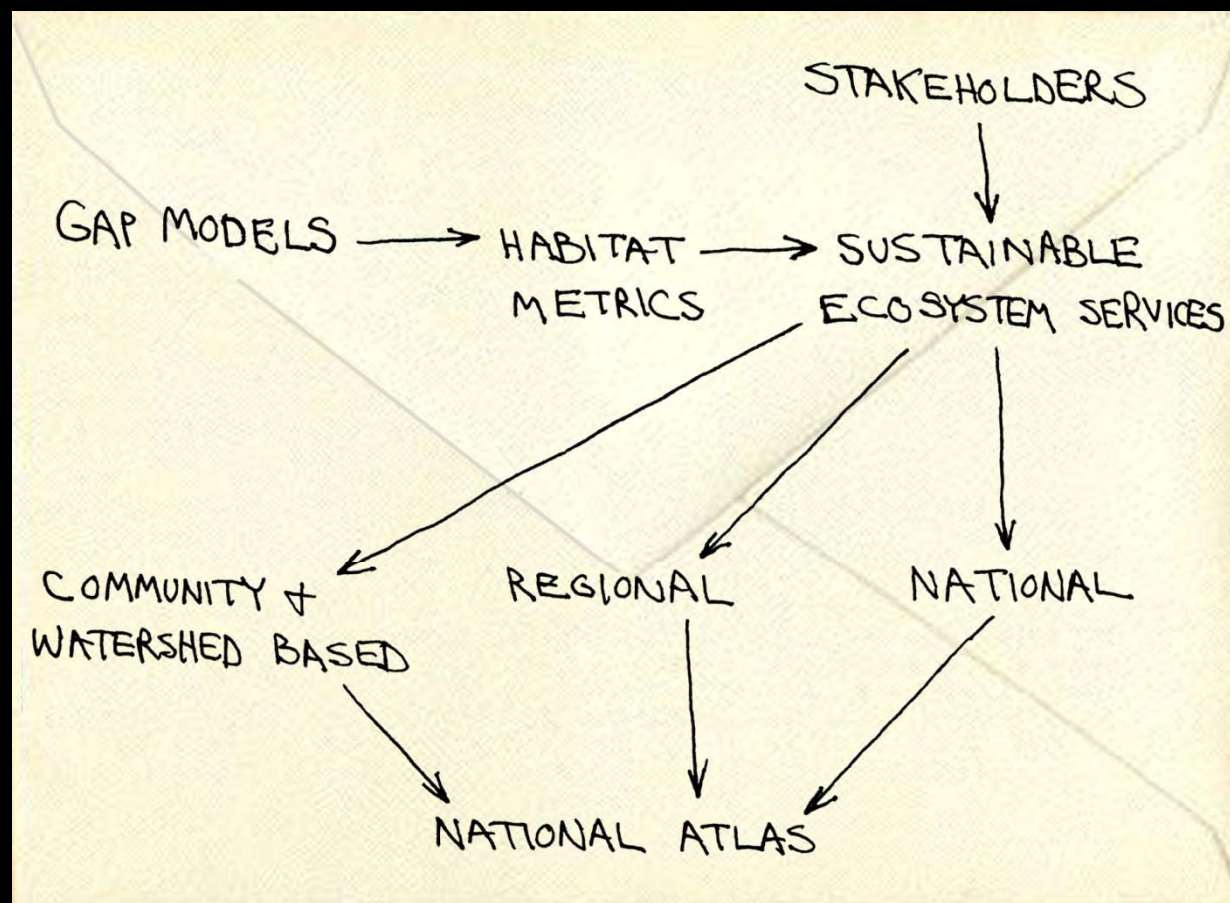
- The benefits humans derive from ecosystems (MEA 2005)
- *Provisioning services* such as food, water, timber, **habitat**, and fiber
- *Regulating services* that affect climate, floods, disease, wastes, and water quality
- *Cultural services* that provide recreational, aesthetic, and spiritual benefits
- *Supporting services* such as soil formation, photosynthesis, and nutrient cycling



Atlas Vision/Implementation



Our Conceptual Envelope Model



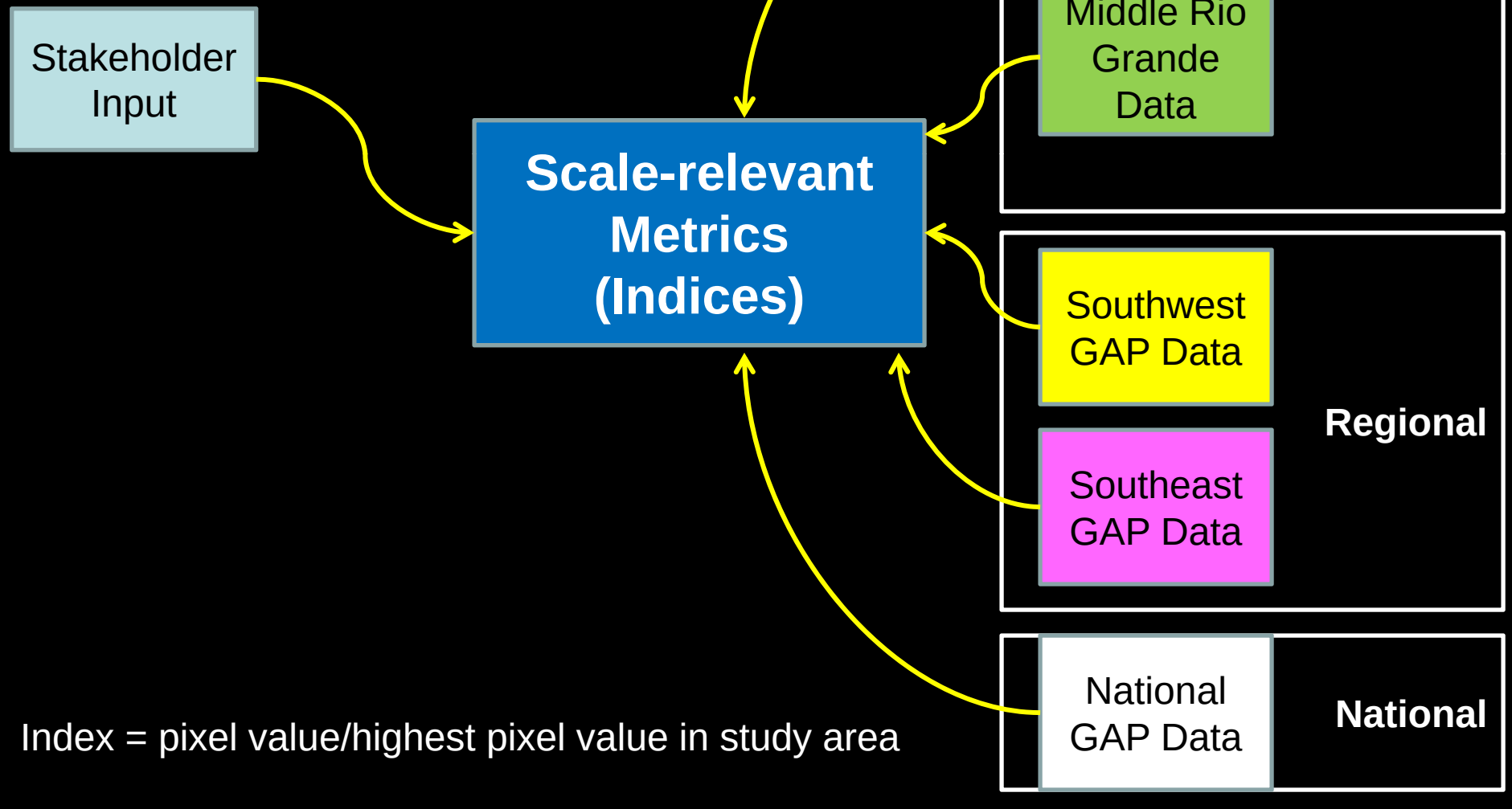
Study Approach

Develop and produce habitat provisioning metrics & maps (an ecosystem service and surrogate measure of biodiversity) based on current condition and available data for place-based, regional, and national scales of interest.



Incremental Approach to Multi-scale Analysis

Habitat/Maintenance of Biodiversity



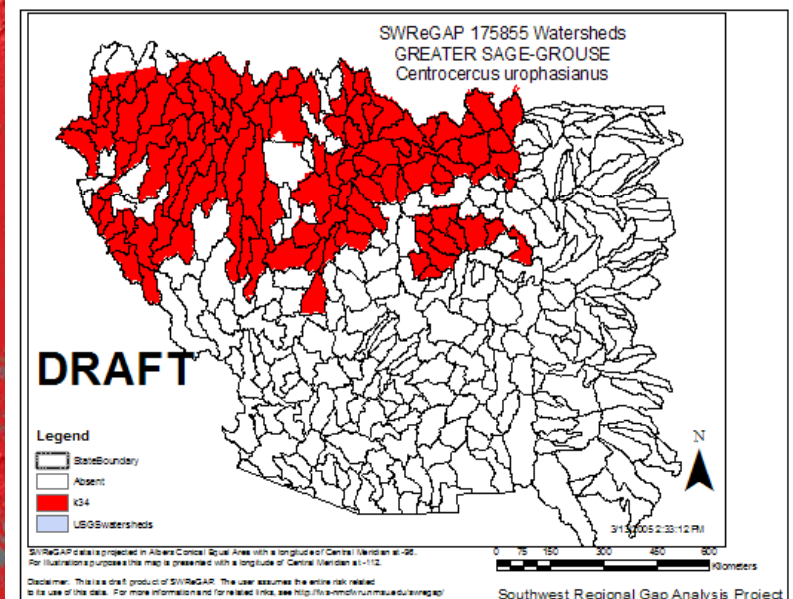
Collect and compile information on habitat associations and develop deductive habitat model for each species

Range Delineation

- Hydrologic Units

Habitat Variables

- Land Cover
- Elevation (min/max)
- Slope/Aspect
- Hydrology (Proximity)
 - Streams, lakes, springs
- Soil
- Patch Size

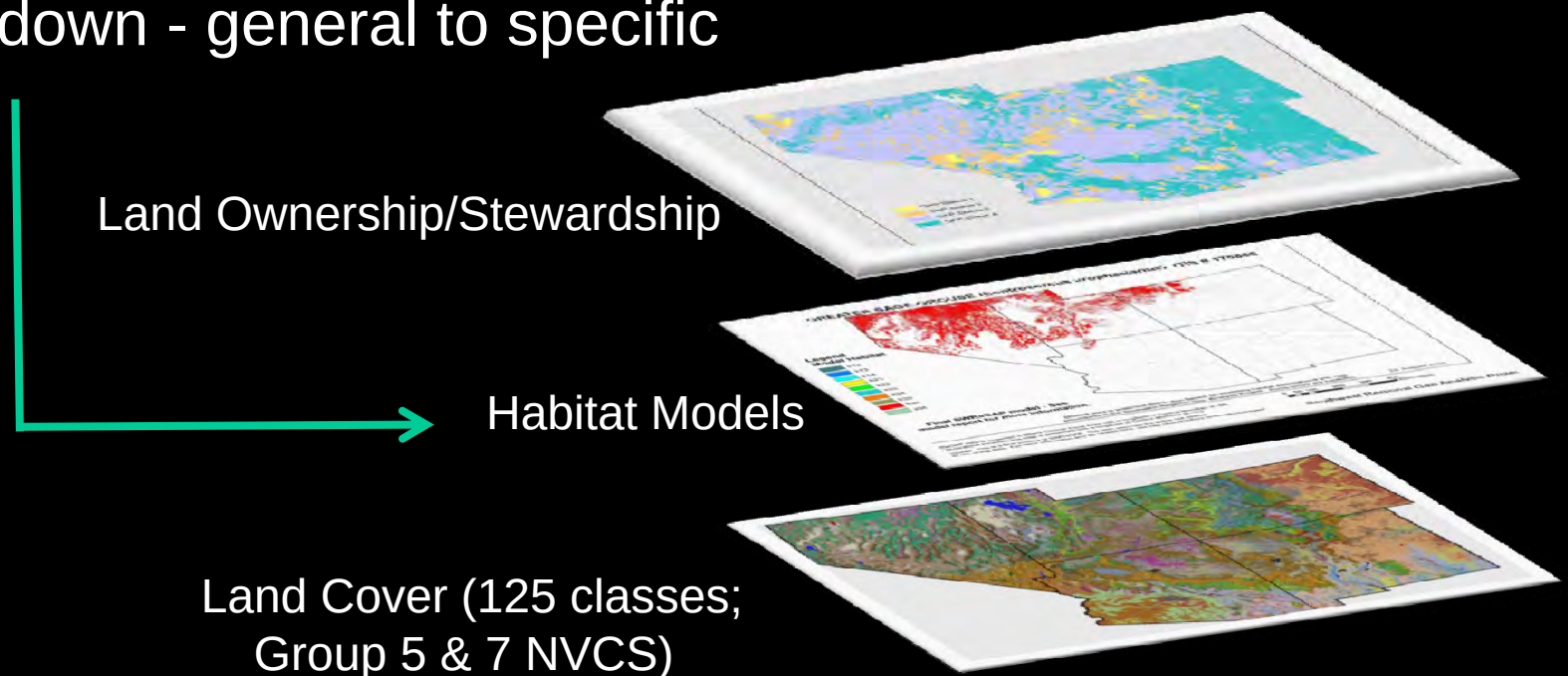


Gap Analysis Products and Data Sources

(Southwest Regional Example)

Deductive Habitat Models (817 spp)

- Knowledge based/expert based
- Wildlife Habitat Relationships
- Habitat based
- Top down - general to specific



Cluster Metrics to Measure Biodiversity

**Terrestrial
Vertebrates**

**Species of Greatest
Conservation Need**

**Harvestable
Species**

**Ecological Systems
(Land Cover)**

All Vertebrate
Species

All Vertebrate SGCN

All
Harvestable

Richness/Diversity

Amphibians

Amphibians

Big Game

Birds

Birds

Small Game

Mammals

Mammals

Upland Game

Reptiles

Reptiles

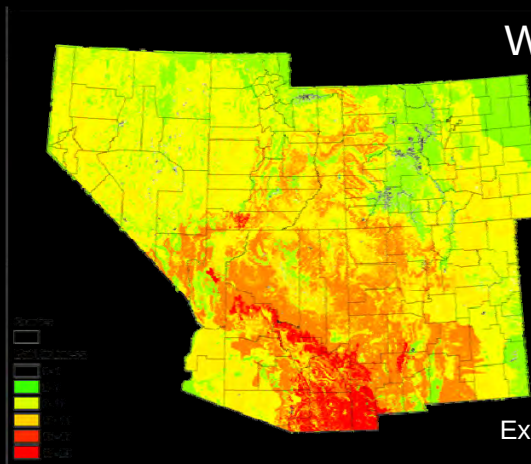
Furbearers

Bats

Bats

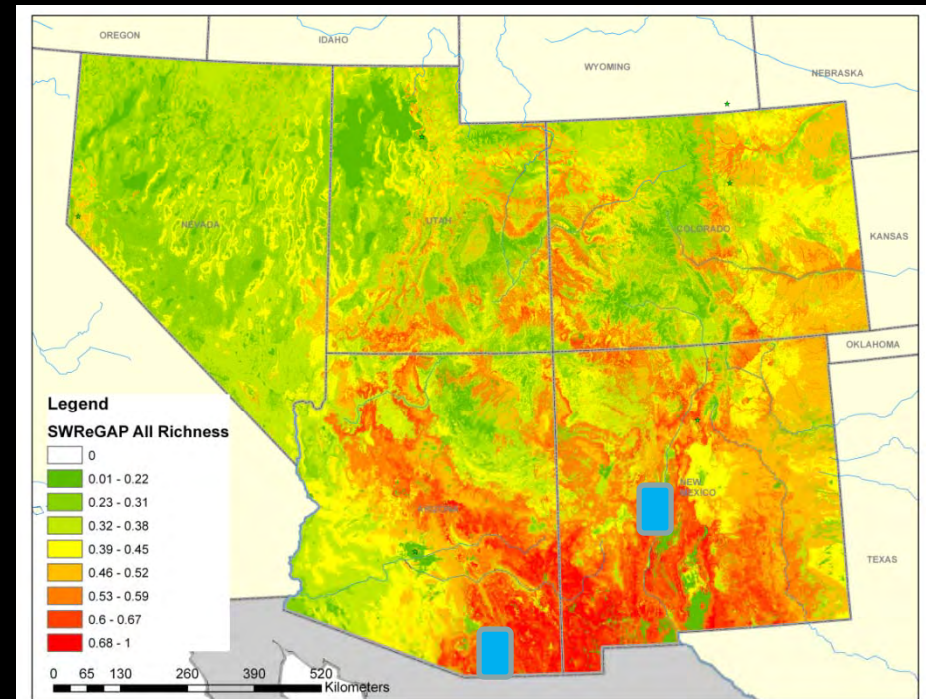
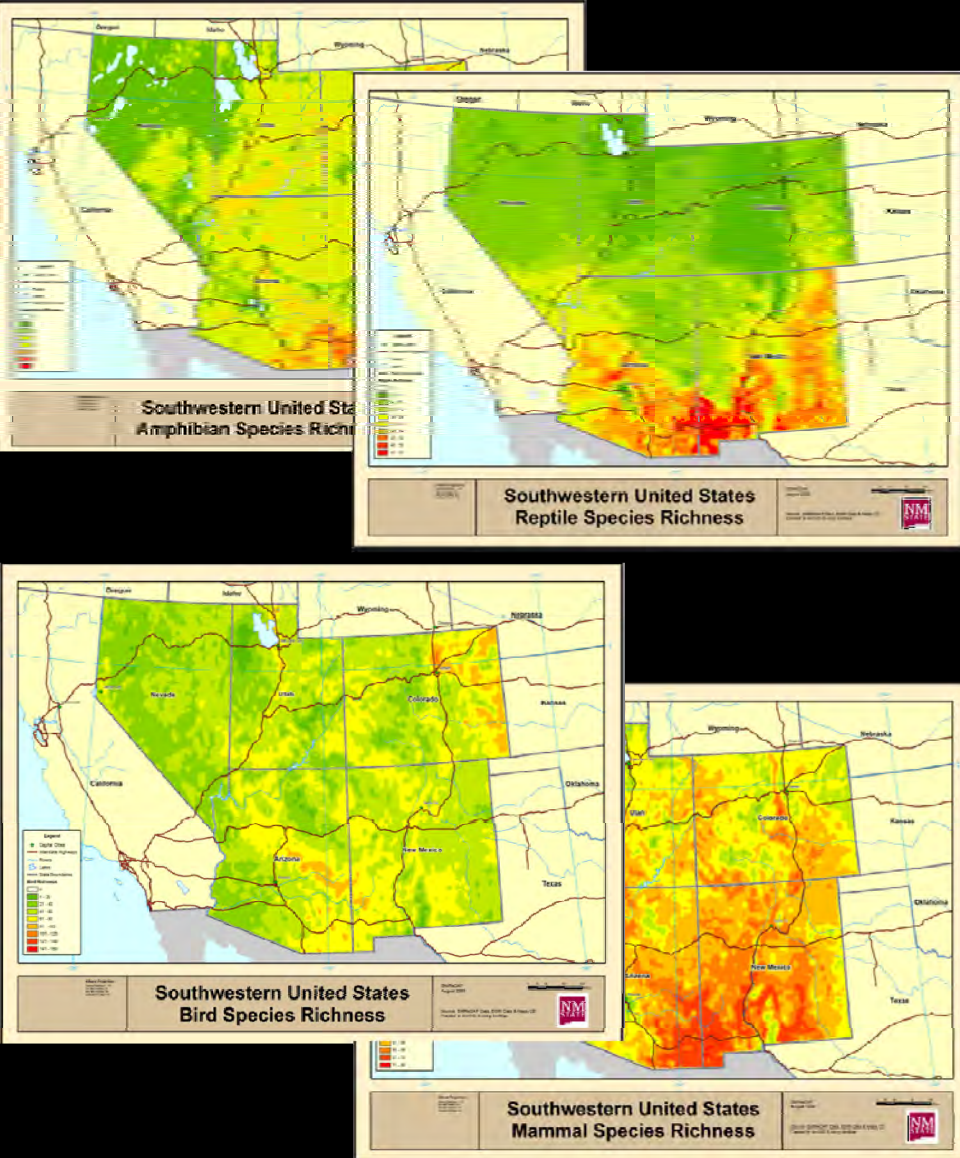
Waterfowl

T & E Species



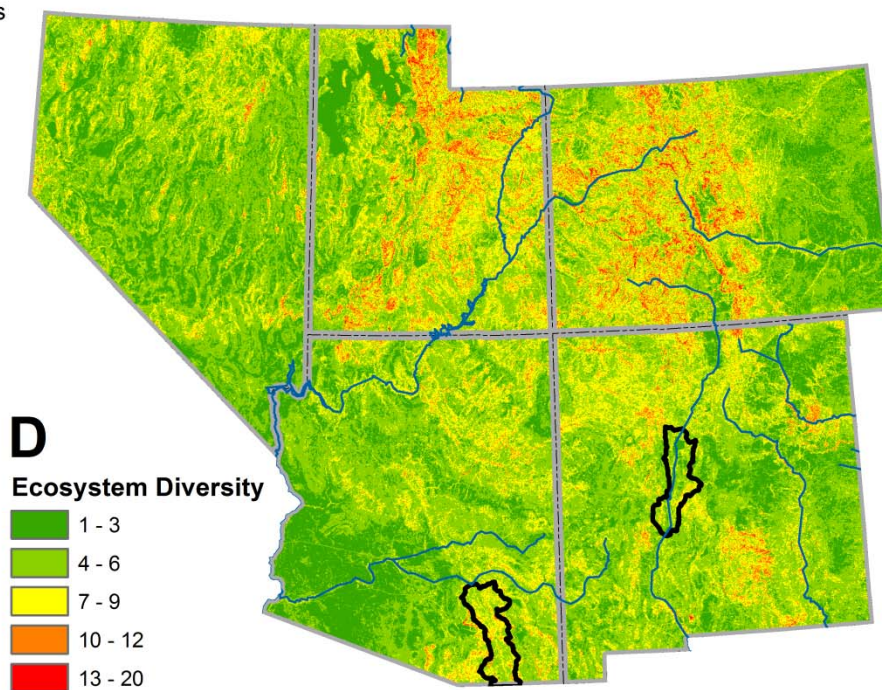
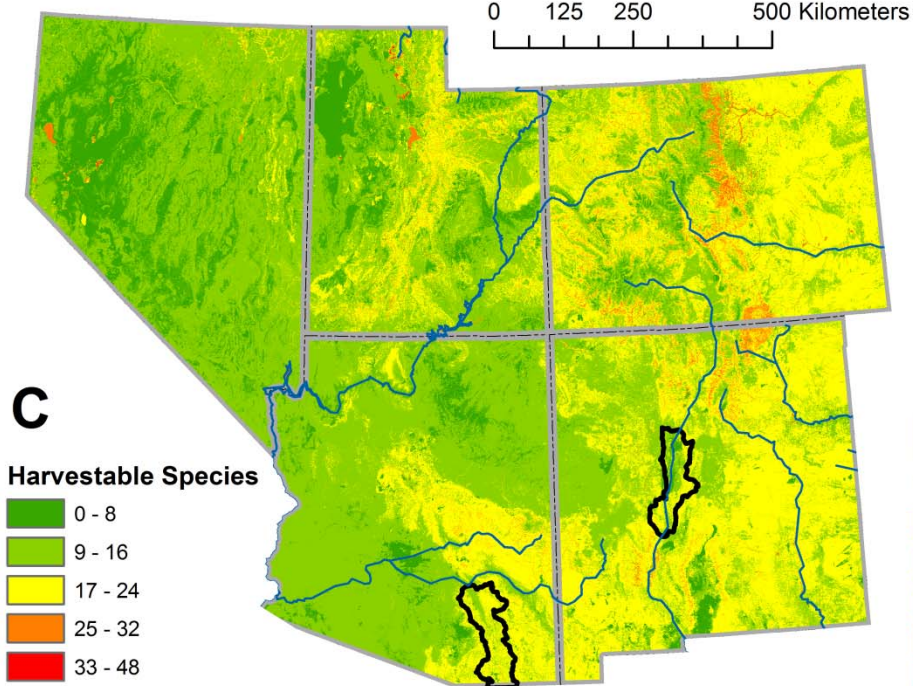
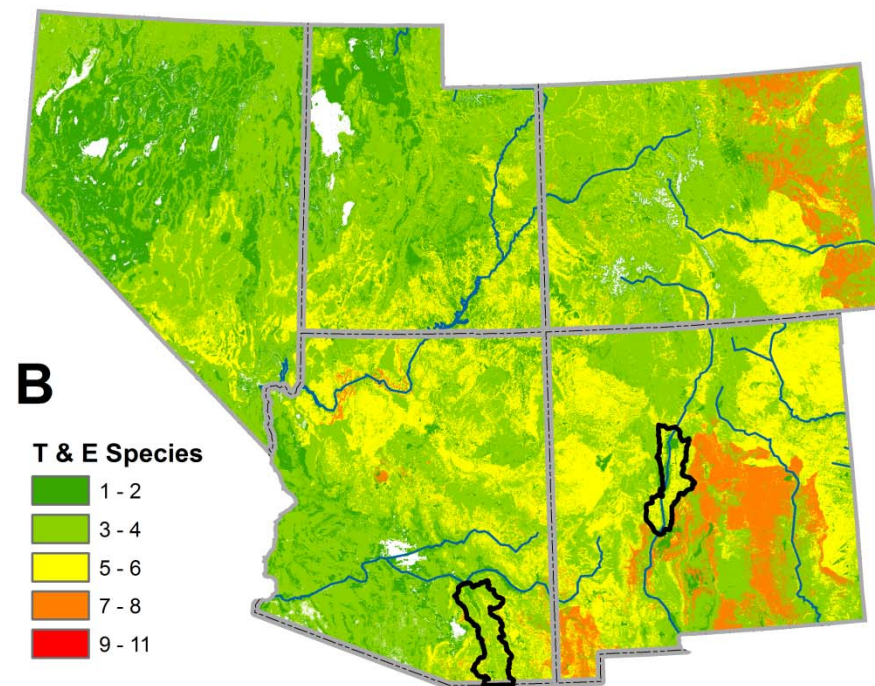
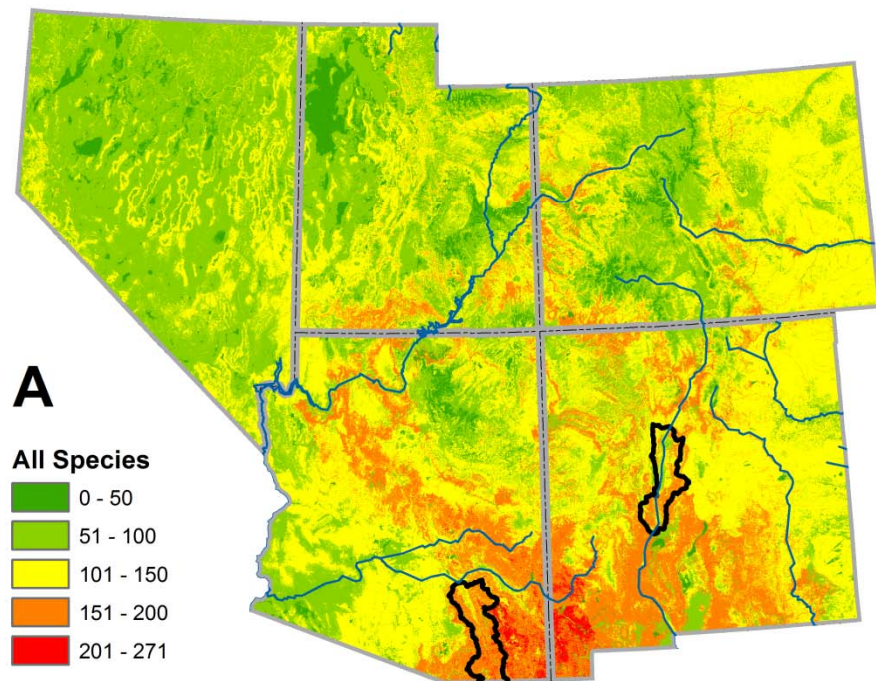
Example - All Bats

Regional Analysis



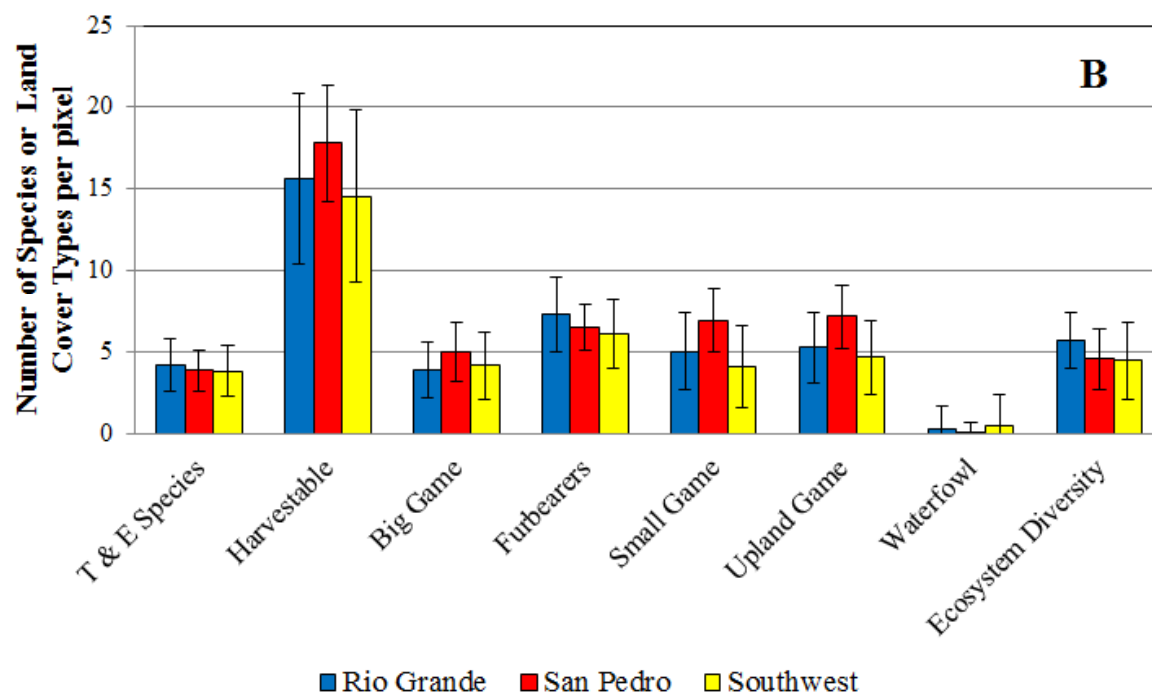
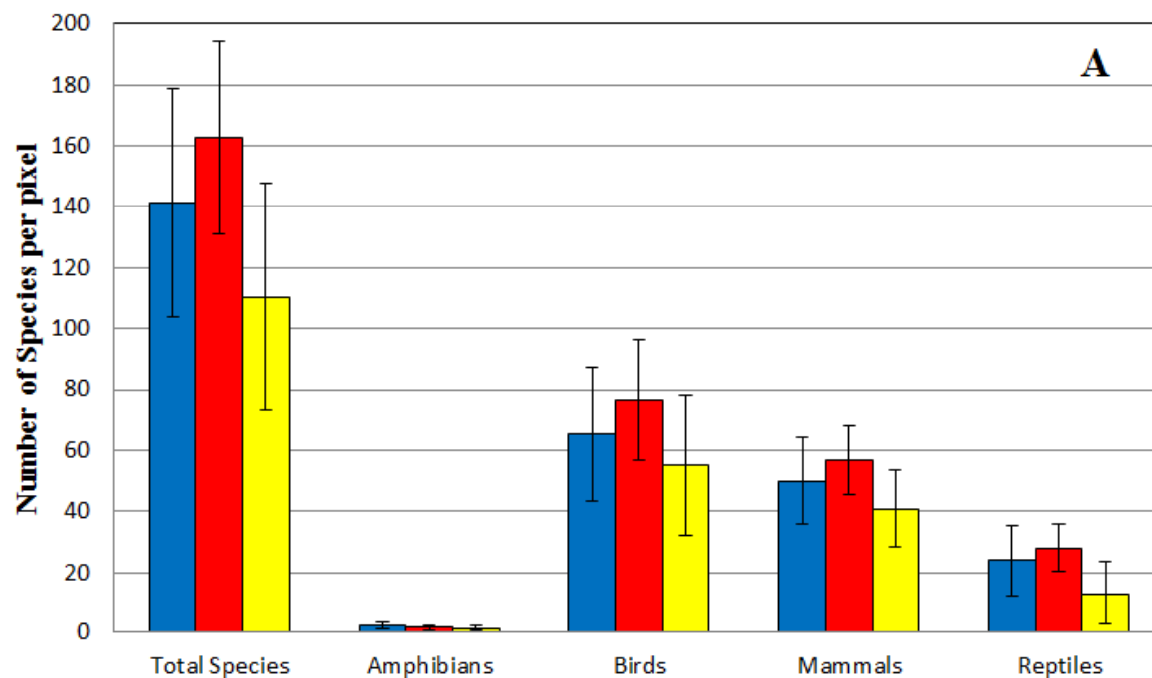
</										

Biodiversity Metric (Richness)	Rio Grande (9,723 km ²)			San Pedro (8,317 km ²)			Southwest (1,389,000 km ²)			Total Number Species/ Classes in SW
	Max	Mean	SD	Max	Mean	SD	Max	Mean	SD	
T & E Species										
Richness	10	4.19	1.56	7	3.89	1.26	11	3.81	1.55	21
Harvestable Species Richness										
All	35	15.60	5.20	36	17.79	3.62	48	14.54	5.23	93
Big Game	8	3.91	1.72	9	5.02	1.77	10	4.17	2.07	15
Furbearers	13	7.34	2.31	10	6.50	1.42	15	6.10	2.12	21
Small Game	20	5.03	2.32	20	6.91	1.95	22	4.07	2.52	36
Upland Game	11	5.26	2.16	11	7.16	1.94	14	4.66	2.22	31
Waterfowl	24	33	1.41	23	0.09	0.65	25	0.47	1.89	25
Ecosystem										
Diversity	13	4.55	1.86	13	5.68	1.73	20	4.45	2.32	125

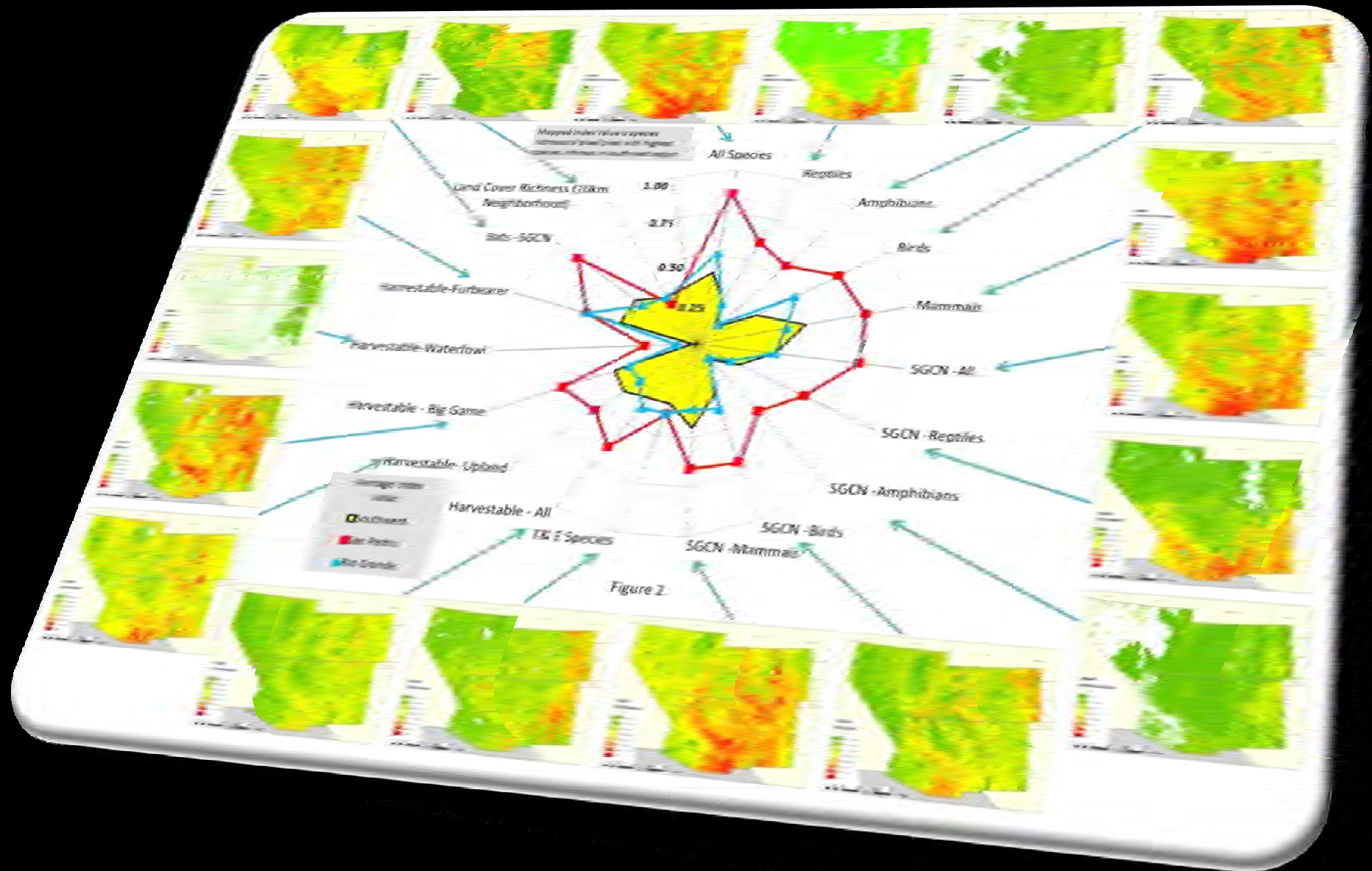


0 125 250 500 Kilometers



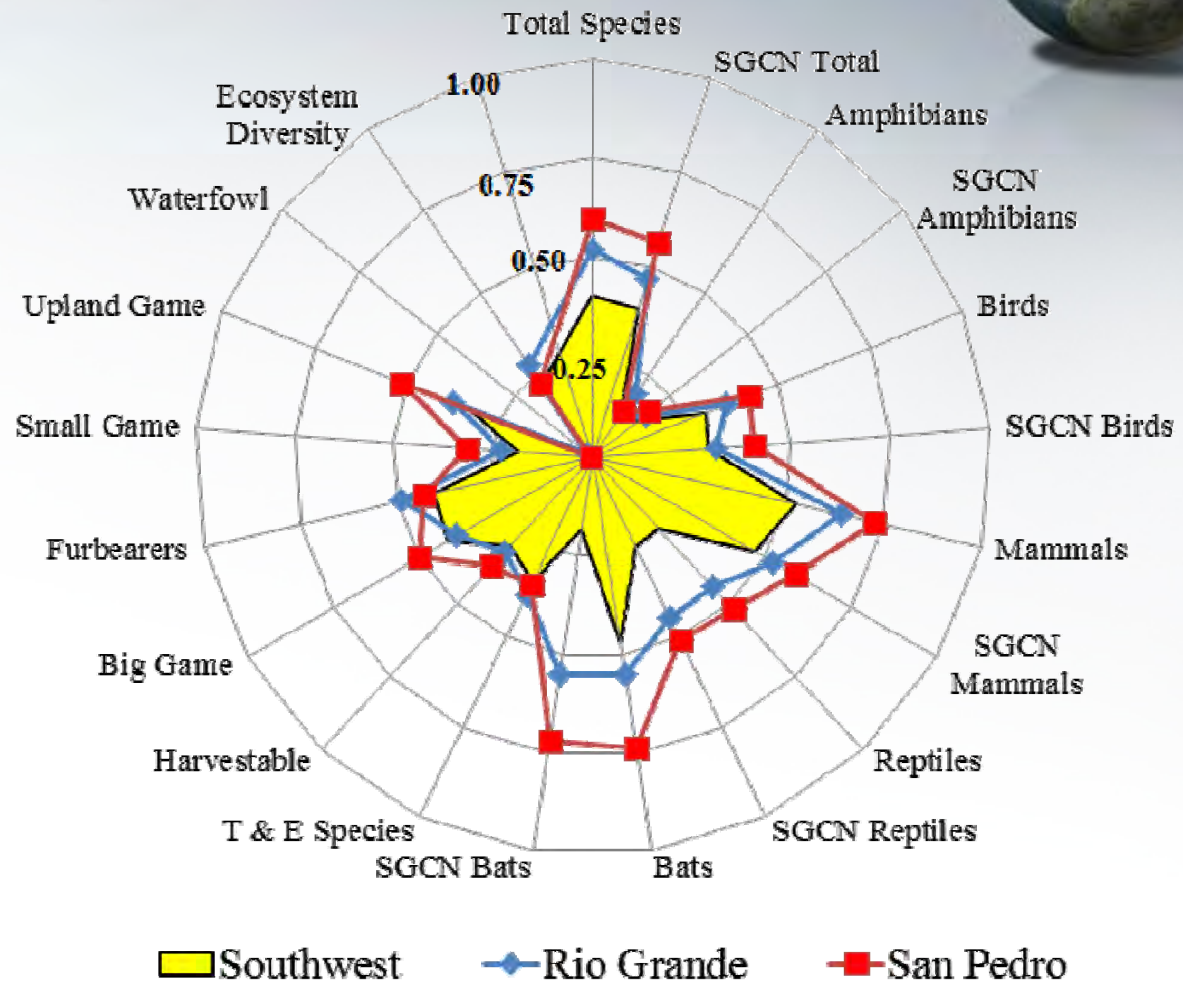


Visual Displays



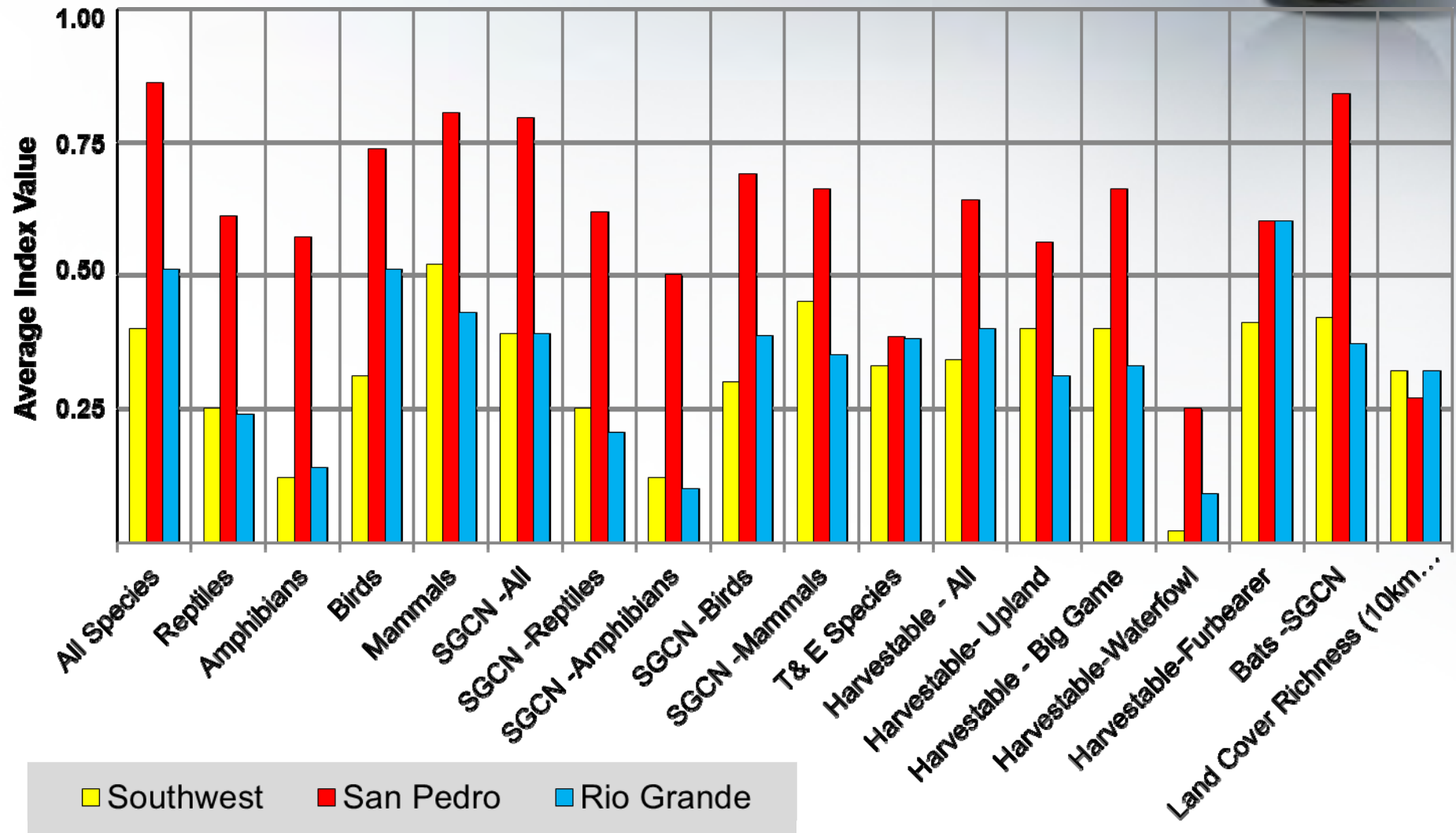
Radar Graphs

Habitat/Maintenance of Biodiversity



Bar Graph

Habitat/Maintenance of Biodiversity

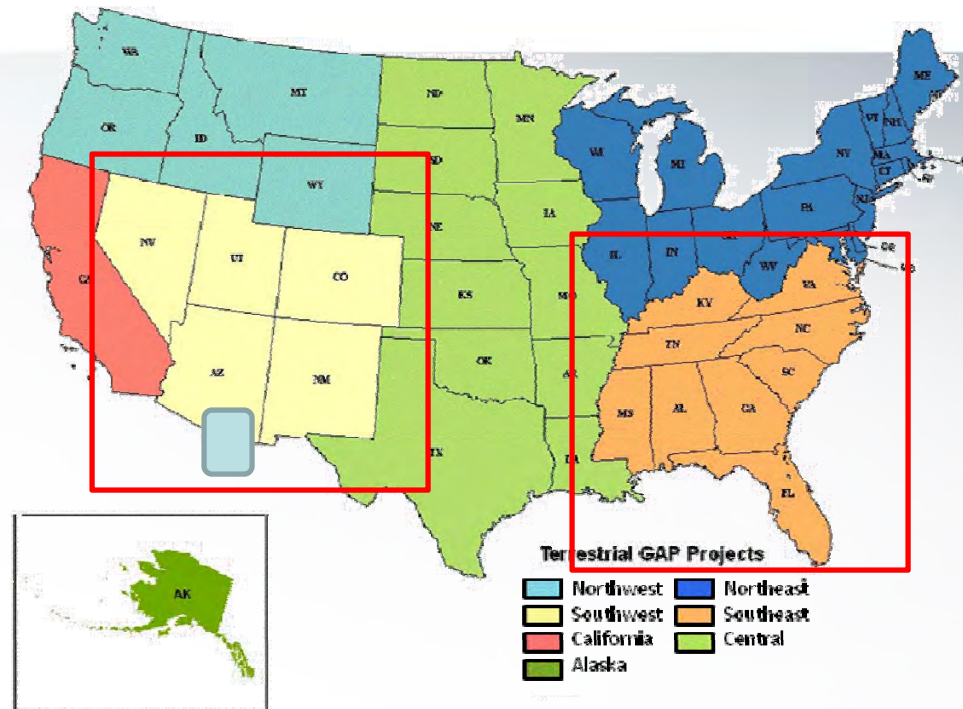




General Conclusions

- Deductive modeling appears promising for mapping and quantifying metrics of habitat provisioning at multiple scales;
- First level effort to cluster species distribution models into functional groups (metrics) is underway at local and regional scales;
- Ultimately should be applicable to national scale via EPA & USGS/GAP initiative;
- Provides reference conditions for alternative future scenarios (e.g. climate change, urbanization);
- Establish common sense *indicators of ES* for end-user and decision maker needs, e.g.
 - Landscape Conservation Cooperatives
 - State Wildlife Action Plans
 - Potentially also for IPBES, TEEB, GEO BON, DIVERSITAS, etc.

Species Richness & Mapping Approach by Scale



Taxon	San Pedro	Southwest	Southeast	Nation
Amphibians	16	37	124	310
Birds	287	435	259	719
Mammals	88	215	99	555
Reptiles	61	130	124	509
Total Species	452	817	606	2094

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<http://gapanalysis.nbii.gov>

<http://fws-nmcfwru.nmsu.edu/swregap/>

<http://www.epa.gov/nerlesd1/land-sci/gap.htm>

