A Database Model for Prioritizing Lands for Conservation

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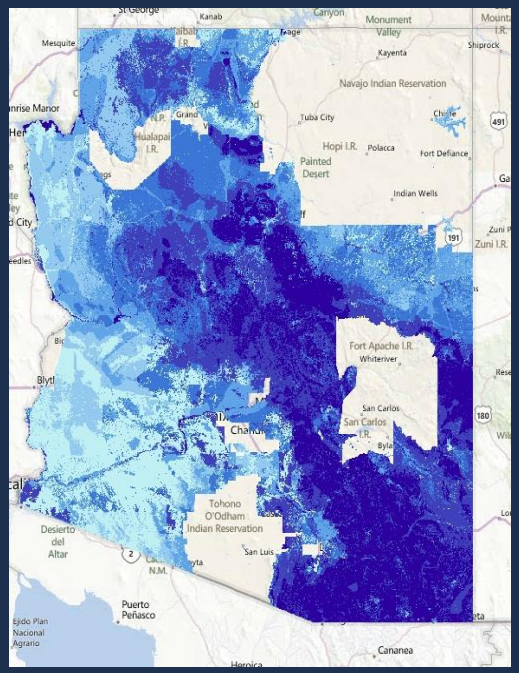


HabiMap Arizona

- Consists of a web site at habimap.org and 260 + statewide raster layers at a 30-m grid cell resolution
- Every project evaluation required a fresh and time-consuming GIS analysis
- Decided to create a spatial database

Overview of Goals

- Comprehensive statistical evaluation of HabiMap and SWAP data
- Project assessment tool – with ability to move across spatial scales
- Quality control and data integrity checks

Source Data

- SGCN predicted distribution models
- Taxonomic information for species
- SERI layer (huntable wildlife)
- Sportfish layer
- Unfragmented layer (intact ecosystems)
- Riparian layer
- SHCG layer (Species and Habitat Conservation Guide – a score)

Source Data, continued

- Vegetation (ReGAP, Brown-Lowe, AZ Breeding Bird Atlas)
- TNC ecoregion
- Tribal information
- AZGFD region and GMU layers

Derived Data

Species-level Data

- Taxonomic Group (common and scientific for grouping at multiple taxonomic levels)
- SGCN tier (Species of Greatest Conservation Need priority – some federally listed)
- Elcode – to relate to ReGAP models
- Amount of potential habitat (inside and outside tribal lands)

Derived Data

Grid cell-level data

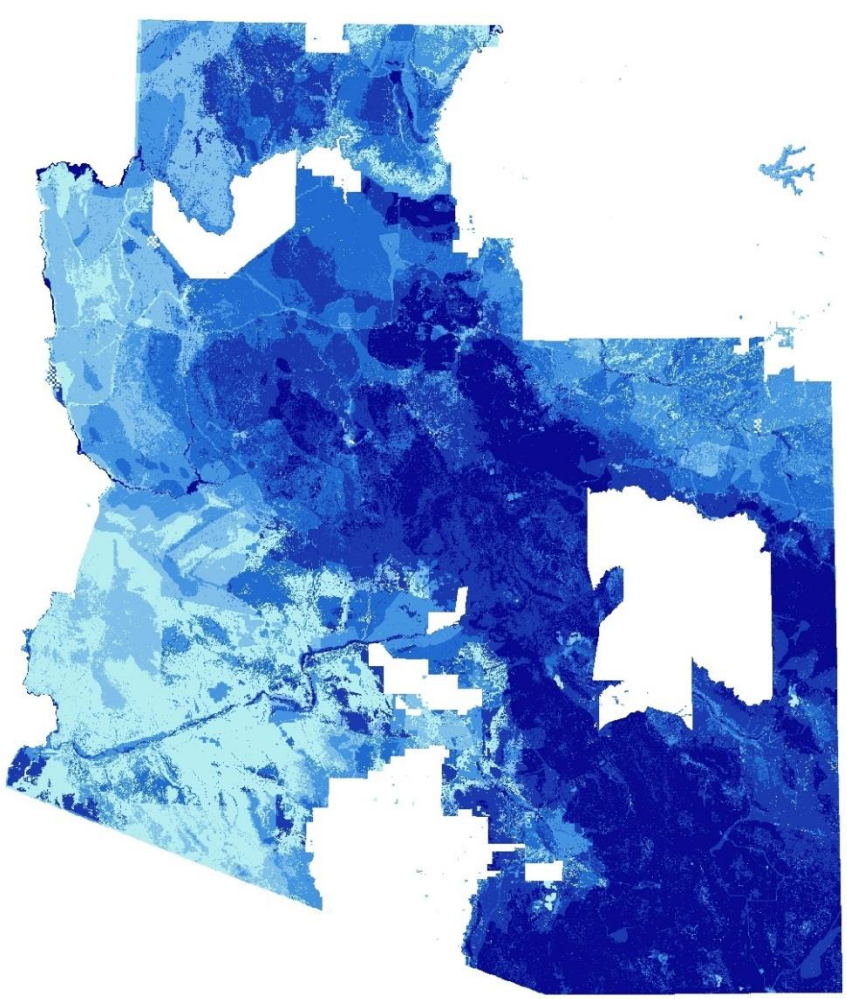
- Geographic coordinates of centroid
- Richness measure PLUS complete list of species
- Riparian, Unfrag, SERI, Sport fish, and SHCG scores + connectivity scores as available
- TNC ecoregion
- AZGFD region and GMU
- More to come

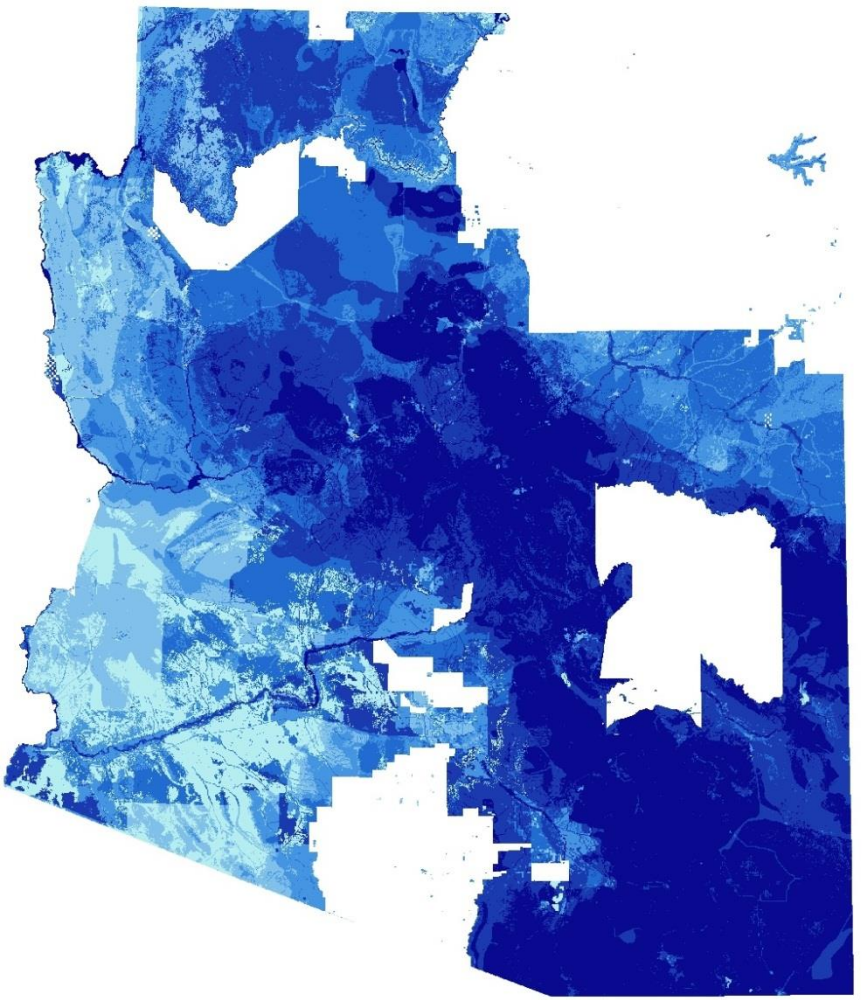
Resolution

- Tessellation of **328 million 30-m cells**
  - Times 257 species layers
  - Plus SERI, Sport fish, Unfrag, and Riparian scores
  - Plus connectivity scores as available
  - Equals more than ***86 BILLION* bits of data!**
- Tessellation of **5.1 million** 240-m grid cells
  - **1.3 billion** values for HabiMap layers

30-meter

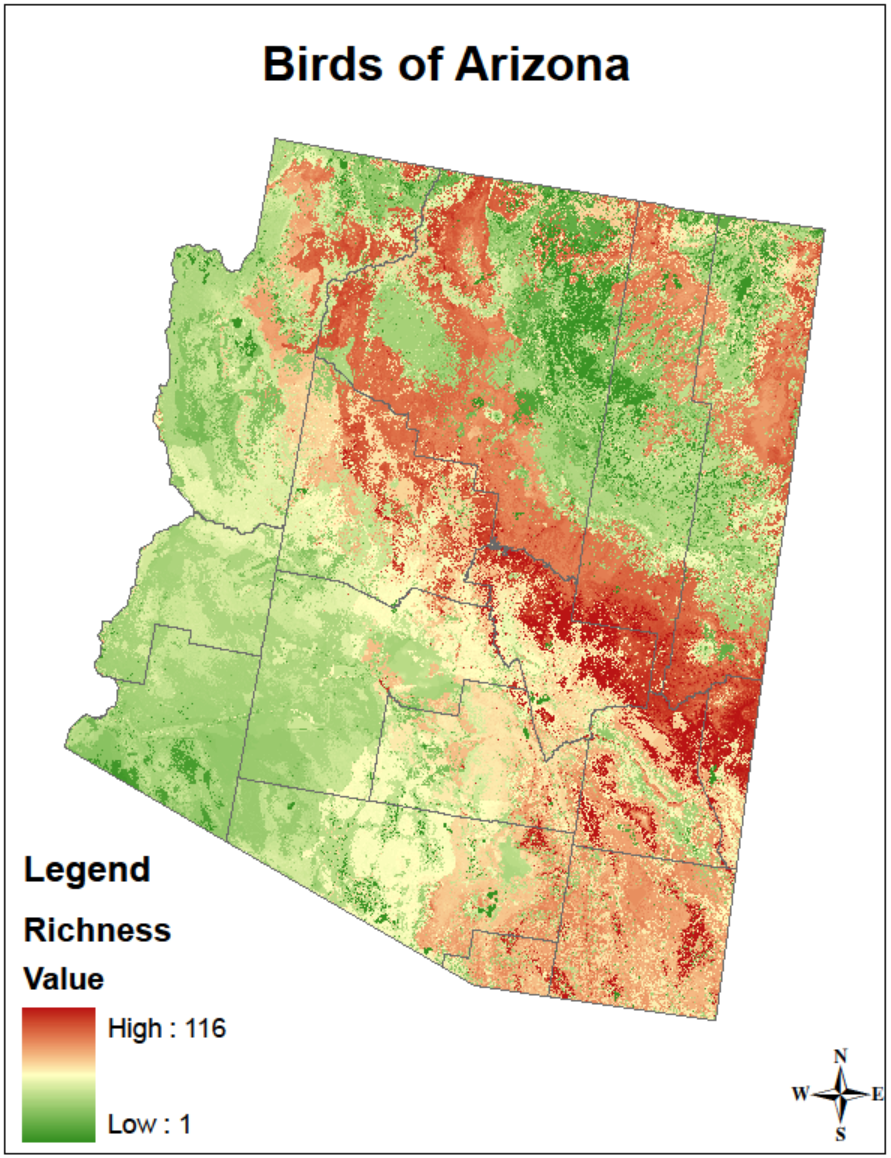
240-m

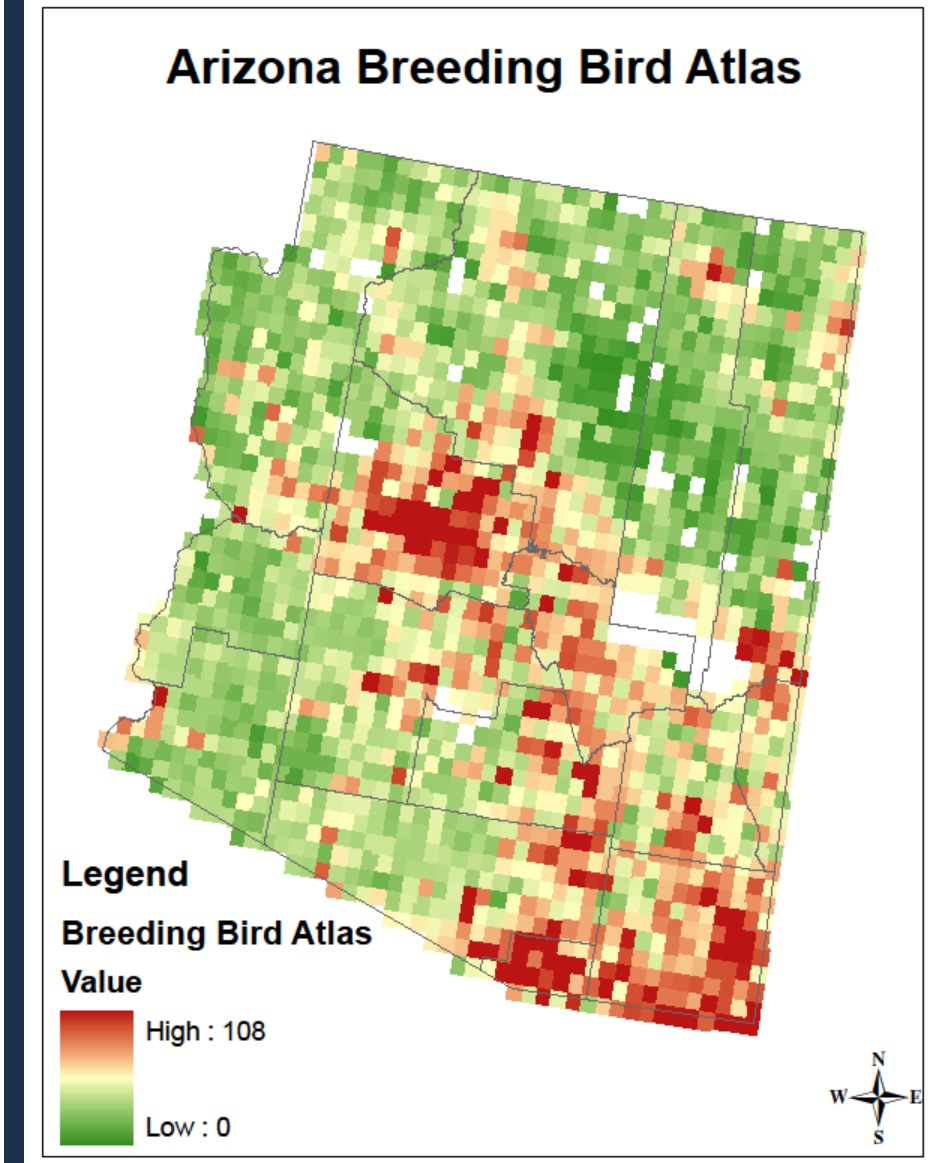




240-meter

Surveys





Data Complexity

Need species composition and other data for *every* grid cell

Richness of combined cells?

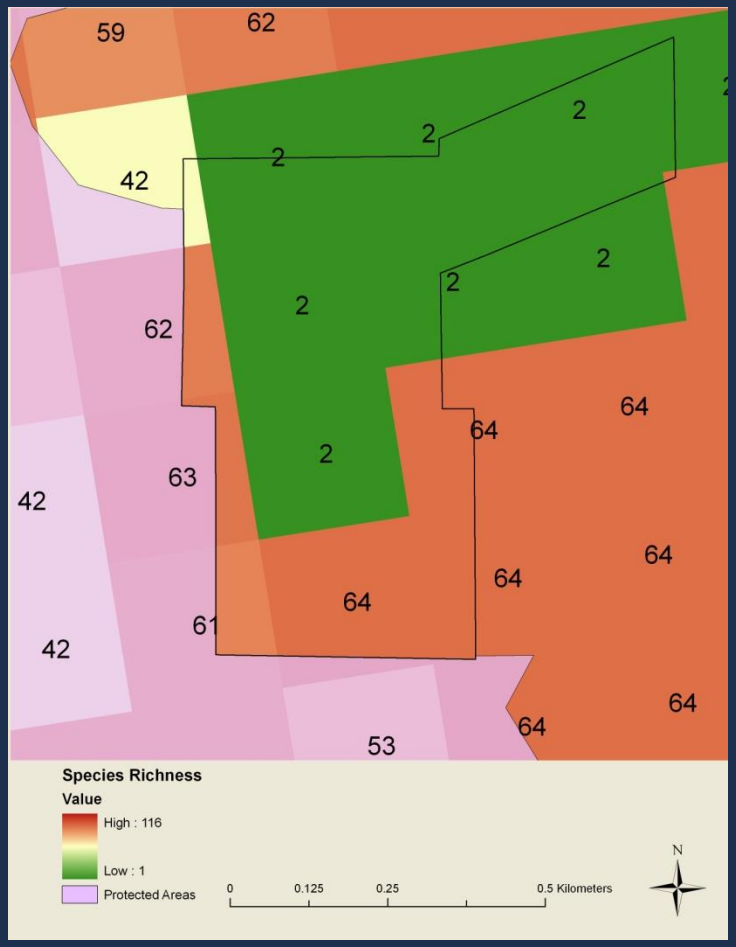
32	27	1
1	**25**	9
0	71	99

Unreasonable to join or analyze 260+ map layers for every new analysis

Parcel One

65 species

6 listed species



58 Species in Common

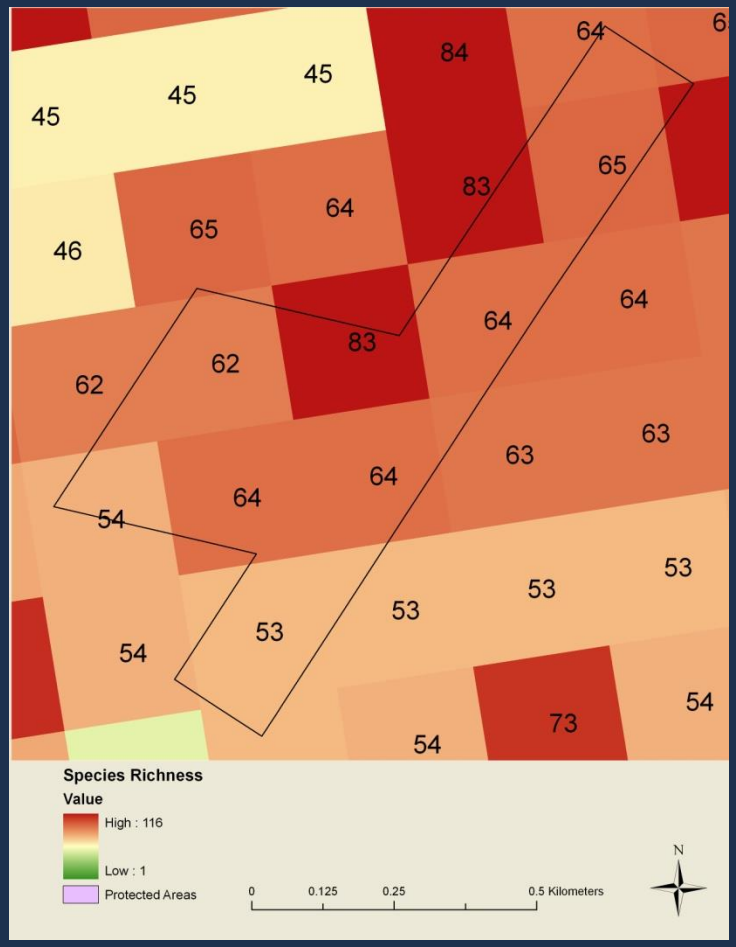
7 Unique to Parcel One

32 Unique to Parcel Two

Parcel Two

90 species

7 listed species



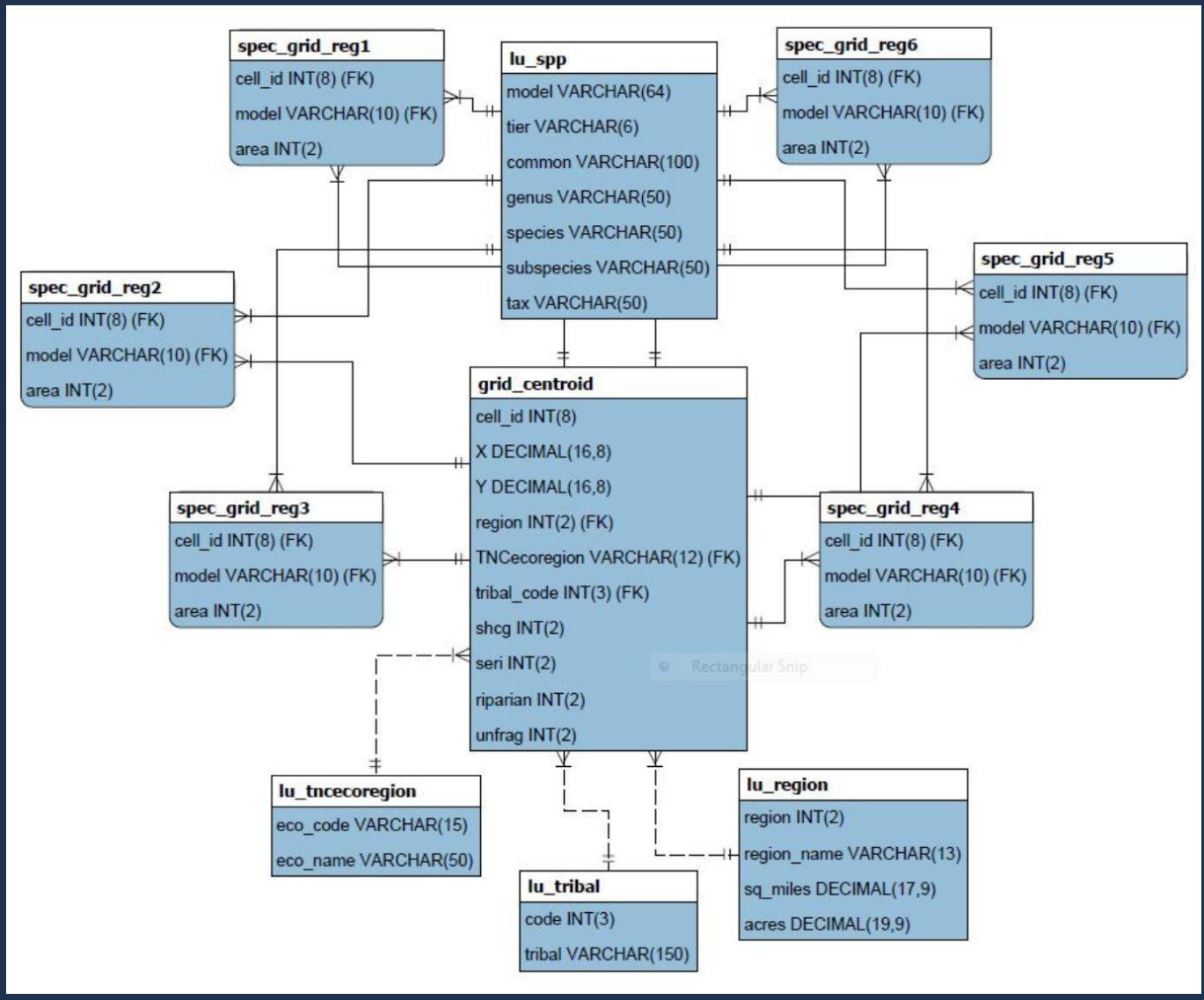
Database Solution

- Access geodatabase not viable at this scale
- MySQL
  - Open-source Transact-SQL database solution
  - Will be converting to MS-SQL soon as Agency standard, but MySQL is free and portable

SQL Solution

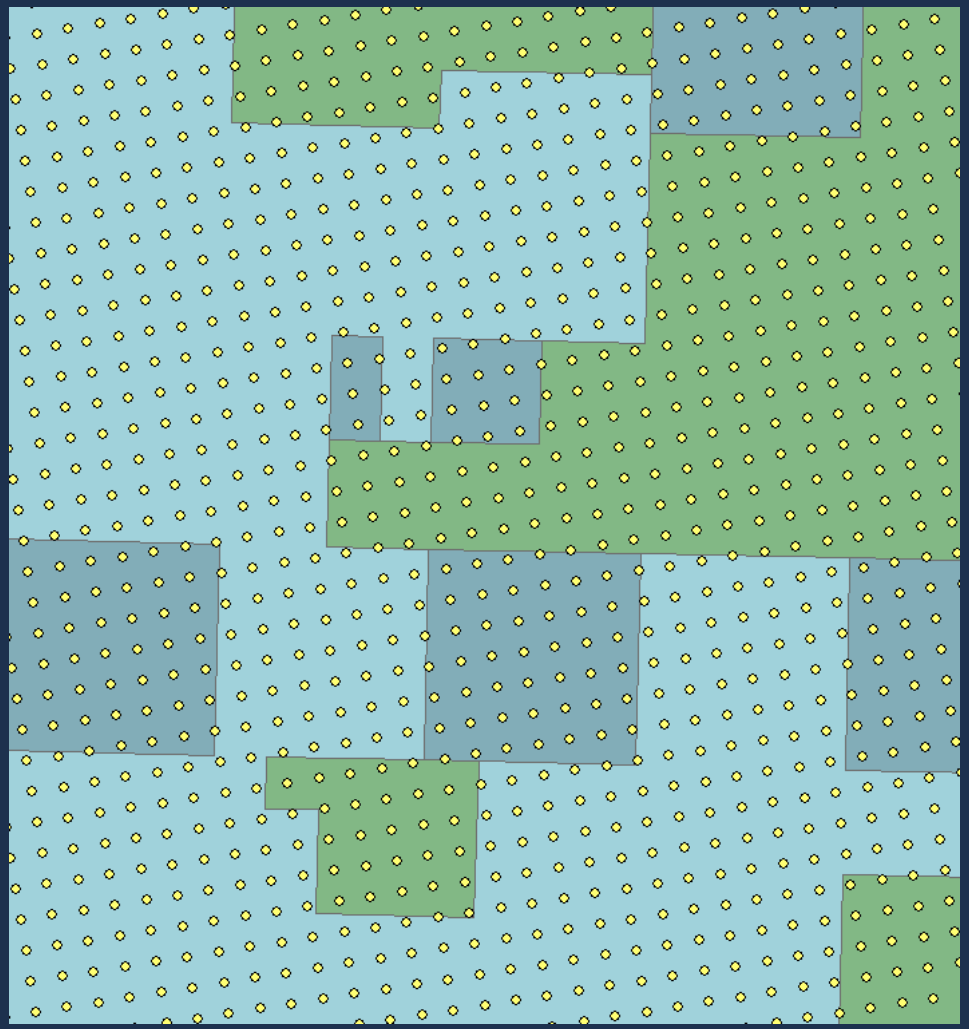
- **1.3 billion** values for 257 species in 5.1 million cells
- DB stores only positive values (implicit versus explicit data)
- **109,222,760** species-cell records – only 8% of records required by 257 raster files

Database Diagram



Import/Export with GIS & MySQL

- Cells may be attributed with vector data
- Stored X,Y of grid cell centroids
- Spatial joins on points intersecting vector polygons



Examples of Use

- Comprehensive statistical analyses
  - Breakdown of SHCG by region and ecoregion
  - SHCG(conservation score) by SGCN species
  - Subgroup by tribal or not, etc.
- Project Evaluations and Mitigation
  - Provide a project boundary shapefile
  - Database gives you….

Examples of Use – Energy Routes

link	buffer	SHCG	SERI	Riparian	Unfragmented	SGCN_rich
B150a	4mi	6	8	10	8	59
B150b	4mi	6	7	10	8	62
B151	4mi	6	7	10	8	50
B153a	4mi	6	9	10	10	86
B153b	4mi	6	10	10	10	86
B160a	4mi	6	8	10	8	52
B160b	4mi	6	8	10	8	50
B170	4mi	6	7	10	10	57
C110	4mi	6	10	10	10	79

Examples of Use - Energy Routes

link	area_acres	tier	common	scientific
B150a	3,060.2	tier1b	Sonoran Desert Toad	Bufo alvarius
B150a	414.5	tier1b	Wood Duck	Aix sponsa
B150a	12,083.4	tier1b	Western Grasshopper Sparrow	Ammodramus savannarum perpallidus
B150a	1,082.8	tier1b	Violet-crowned Hummingbird	Amazilia violiceps
B150a	24,759.9	tier1a	Sprague's Pipit	Anthus spragueii
B150a	47,691.5	tier1b	Golden Eagle	Aquila chrysaetos
B150a	32,706.3	tier1b	Western Burrowing Owl	Athene cunicularia hypugaea
B150a	30.2	tier1b	American Bittern	Botaurus lentiginosus
B150a	27,500.9	tier1b	Ferruginous Hawk	Buteo regalis

Examples of Use - Energy Routes

link	regapdesc	BLdesc	area_acres
B150a	North American Warm Desert Bedrock Cliff and Outcrop	Rock	1,096.0
B150a	North American Warm Desert Volcanic Rockland	Rock	242.0
B150a	North American Warm Desert Wash	Lower Colo R. Sonoran Desertscrub	14.2
B150a	North American Warm Desert Pavement	Rock	28.5
B150a	Madrean Encinal	Madrean Evergreen	1,337.9
B150a	Mogollon Chaparral	Interior Chaparral	170.8
B150a	Apacherian-Chihuahuan Mesquite Upland Scrub	Semidesert Grassland	12,482.6
B150a	Chihuahuan Succulent Desert Scrub	Chihuahuan Desert Scrub	142.3
B150a	Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub	Chihuahuan Desert Scrub	13,422.0

Data Model Applicability

- Useful regardless of spatial scale
  - Smaller extent can include finer resolution
  - Can inform decisions about how places compare based on wildlife, vegetation, hydrology, impervious, land use, and so on
- Possible plans in Pima County
  - Mitigation banking and in-lieu-fee programs
  - Sonoran Desert Conservation Plan support