APPALACHIAN
LANDSCAPE CONSERVATION COOPERATIVE

APPALACHIAN LCC CONSERVATION DESIGN: PHASE II

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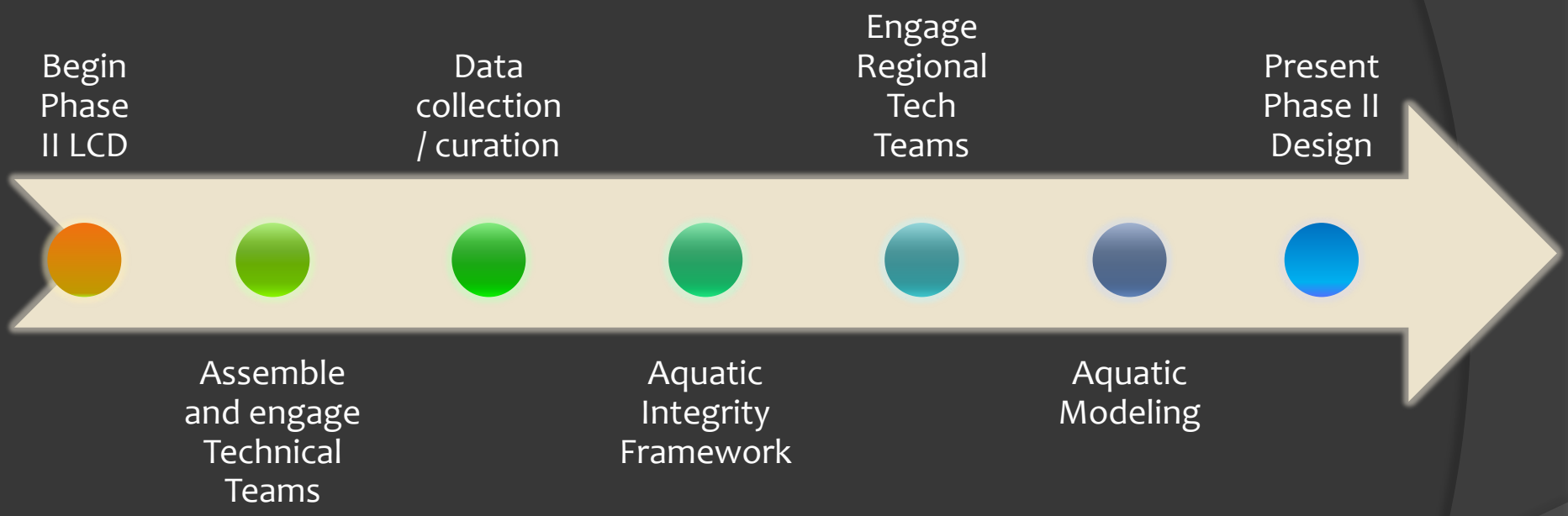
Phase II Goals

- Create a multi-metric index of aquatic condition across the LCC geography
- Create integrated aquatic and terrestrial spatial optimization
- Integration of early ecosystem services conservation targets
- Update Phase I targets were appropriate

Conservation Design Phase II Timeline



Feb 2016 → June 2016 → Oct. 2016 → Feb. 2017

Expert Consultations

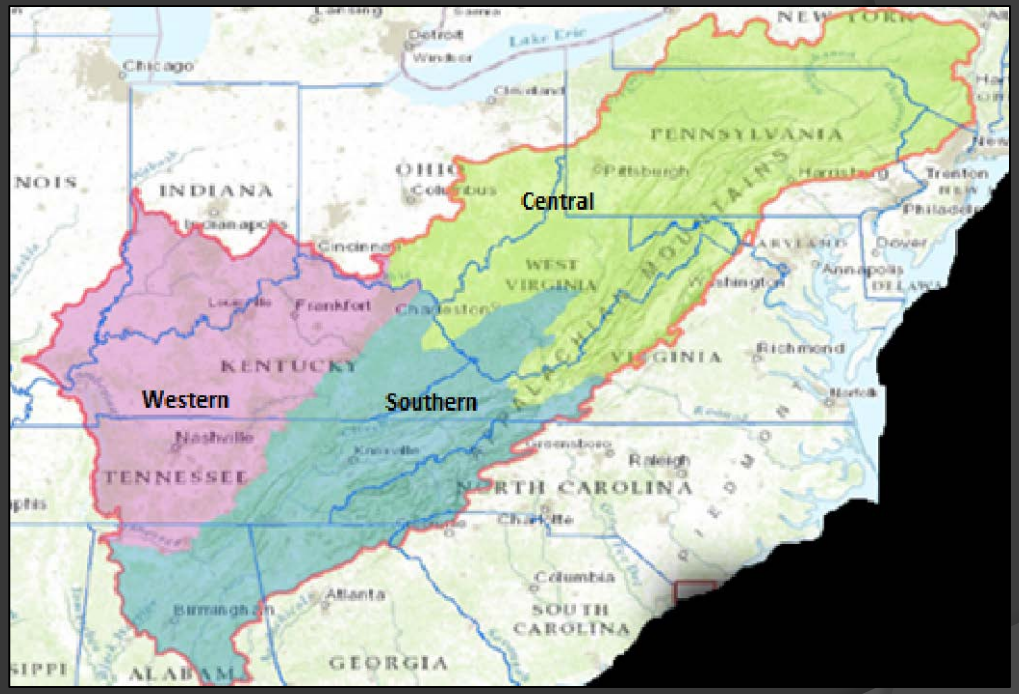
- 3 Rounds of Feedback (7 webinars) split amongst App LCC Sub-regions

1. Conceptual Framework of Aquatic Condition (Feb)
2. Discussion of Metrics, Existing Data, Models (March- April)
3. Final review of Framework, Metrics, Discussion of Thresholds (June)

Expert Consolation Representation

# of Experts *	Region
66	Central
23	Multiple
12	Southern
6	Western

* 69 Organizations



4 Spatial Scales for Predictors

- NHD Plus version 2
  - Catchment Scale
    - Within (Local)
    - Network (Cumulative)
      - Allows condition of upstream drainage area to influence scores

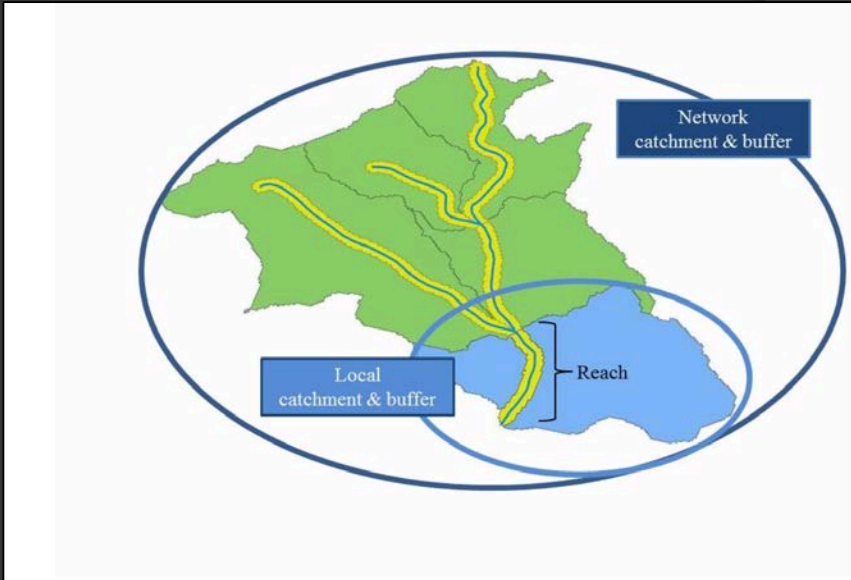


Figure 2. Stream reaches and local and network catchments and buffers (modified from Wang et al. 2011).

Final Predictors

Attribute	Aquatic Habitat metric
Flow regime	Flow Alteration from Storage (total storage/mean annual flow)
	Density and type of dam
	Altered streamflow
	Agricultural water withdrawal
	Industrial water withdrawal
Geomorphic condition	Erosive Forces
	Resistive forces
Connectivity	Density of dams: Catchment
	Density of dams: Watershed
	Density of crossings: Catchment
	Density of crossings: Watershed
Water Quality	Nitrogen
	Phosphorus
	Dissolved Organic Carbon

Attribute	Aquatic Habitat metric
Non-point sources of pollution	% Impervious Surface in Watershed, Active River Area, & Catchment
	% Natural Cover in Watershed & Active River Area
	% Agriculture in Watershed, Active River Area, & Catchment
Point sources of pollution	Comprehensive Environmental Response, Compensation, and Liability Information System site density
	Permit Compliance System site density
	Toxic release inventory site density in Watershed and Catchment
	Coal mine density
	Wind turbine density
	All mine density in Watershed and Catchment
	Natural gas well density

Final Responses

Fish	
Attribute	**Biological metric**
Shannon Diversity	Diversity
Functional Group	Invertivore Taxa
	Piscivore Taxa
	Herbivore Taxa
Taxa Quality	Lithophilic Spawners
	Taxa Preferring Coarse Sediment
	Intolerant Taxa
	Tolerant Taxa

Aquatic Macroinvertebrates	
Attribute	**Biological metric**
Taxa Quality	EPT Taxa
	5 Dominant Taxa
	Intolerant Taxa
	Tolerant Taxa

Average Fish Score

+

Average Aquatic Macroinvertebrate Score

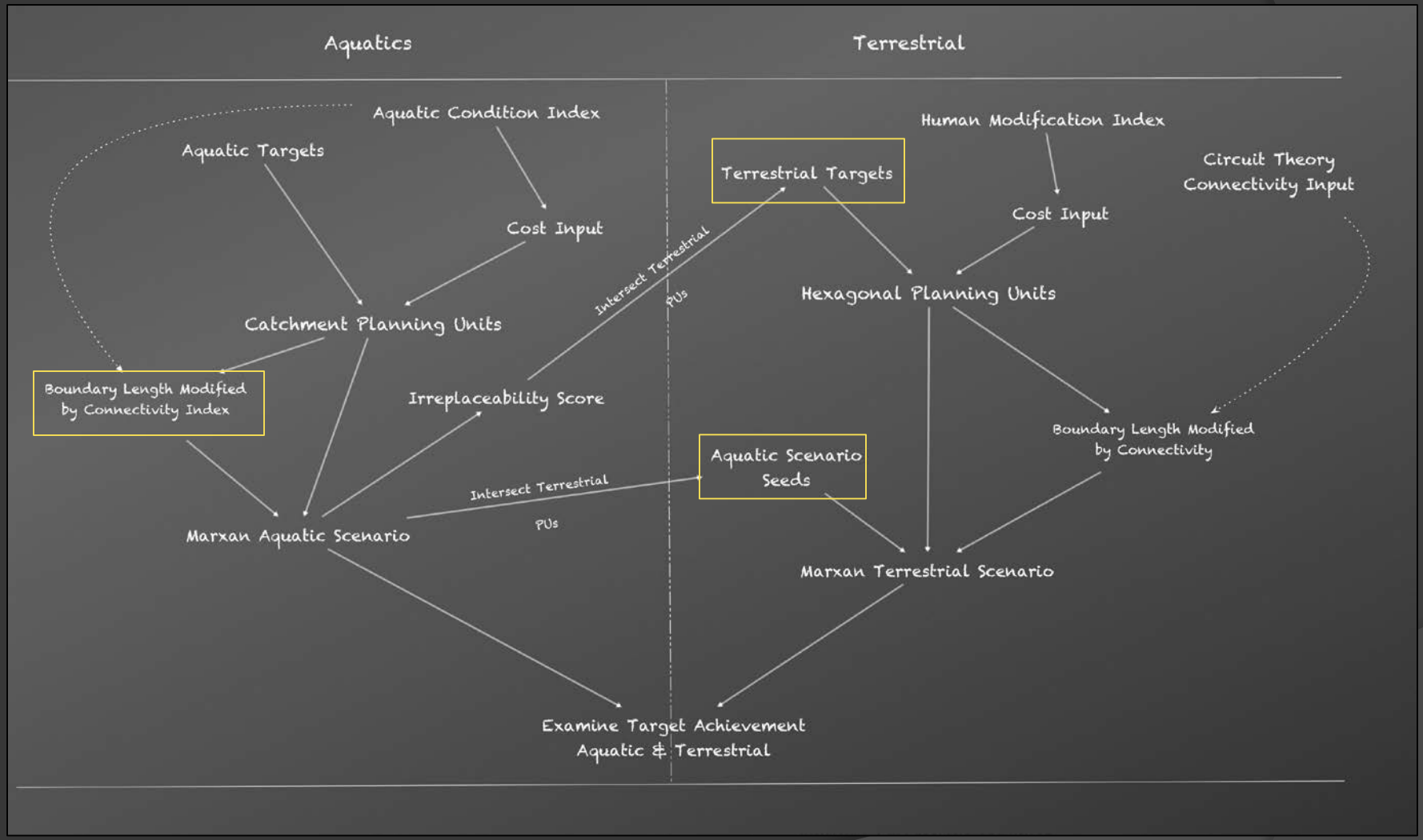
Average Aquatic Response Score

New and Revised Terrestrial Targets

Phase II Integration into LCD

- Incorporate Targets/Goals based on Aquatic condition into Marxan
  - Integration of Aquatics and Terrestrial Goals/Targets for maximum connectivity
  - Ability to weight aquatic conservation areas that simultaneously benefit for terrestrial targets
- Aquatic planners can directly use condition index to prioritize regionally significant areas

Phase II Aquatics Methodology

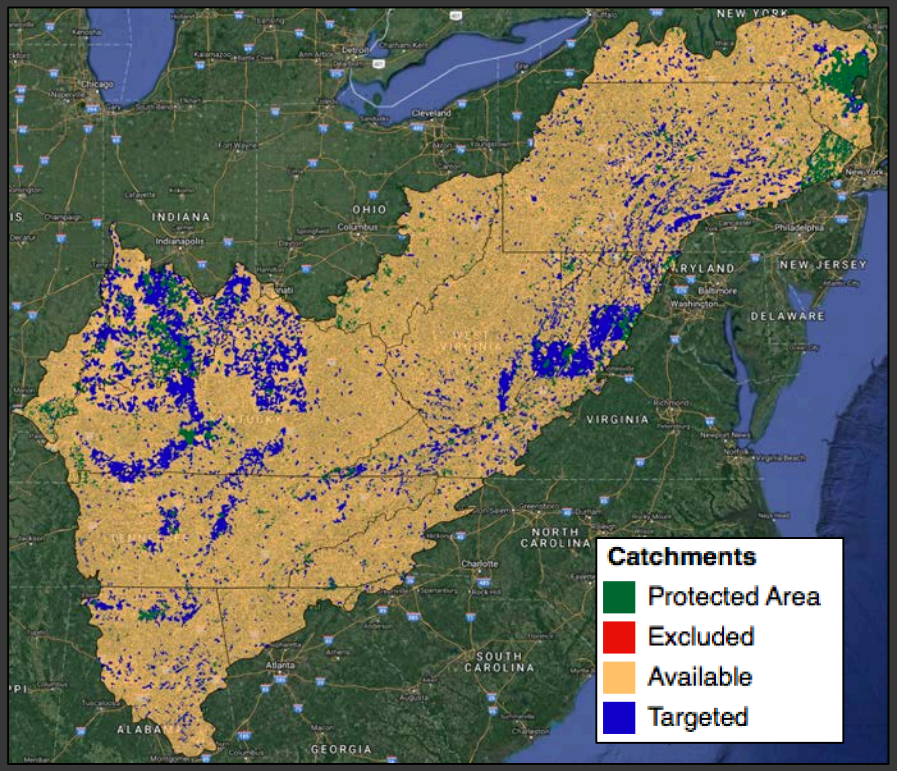


Many ways to view Data

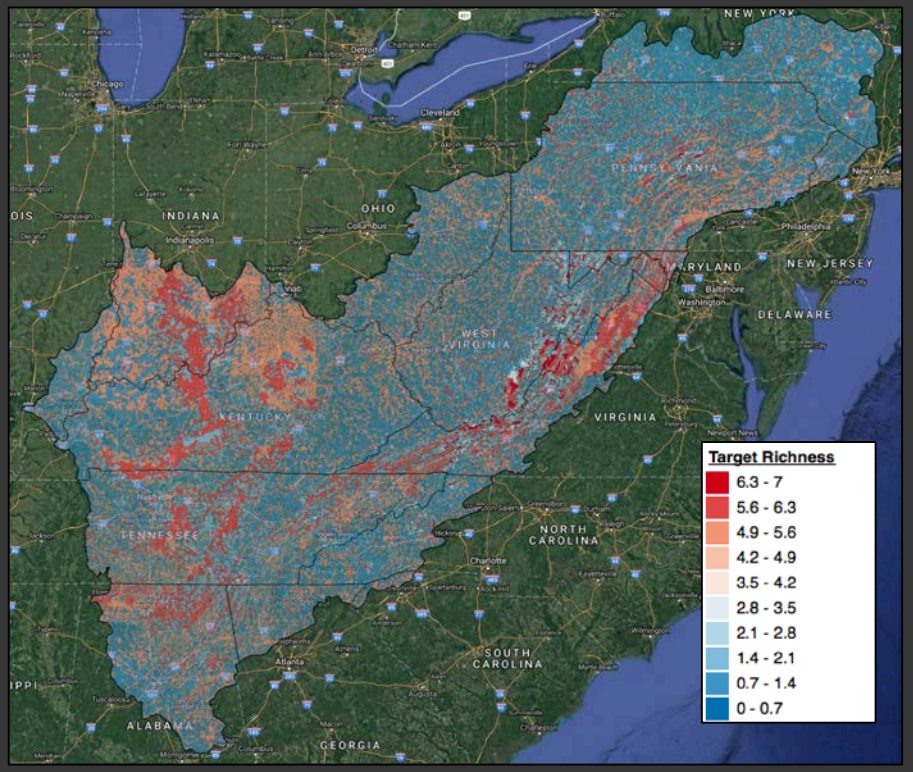
- Unique Individual Conservation Targets (n = 27)
- Overall aquatic condition scores (not shown)
- Aquatic spatial optimization (marxan output)
- Sub-indices of aquatics predictions
  - E.g., Fish, Bugs, Tol. Spp.
- Overall terrestrial spatial optimization (aquatic + terrestrial)

Aquatic Scenario

Near-optimal Aquatic Solution

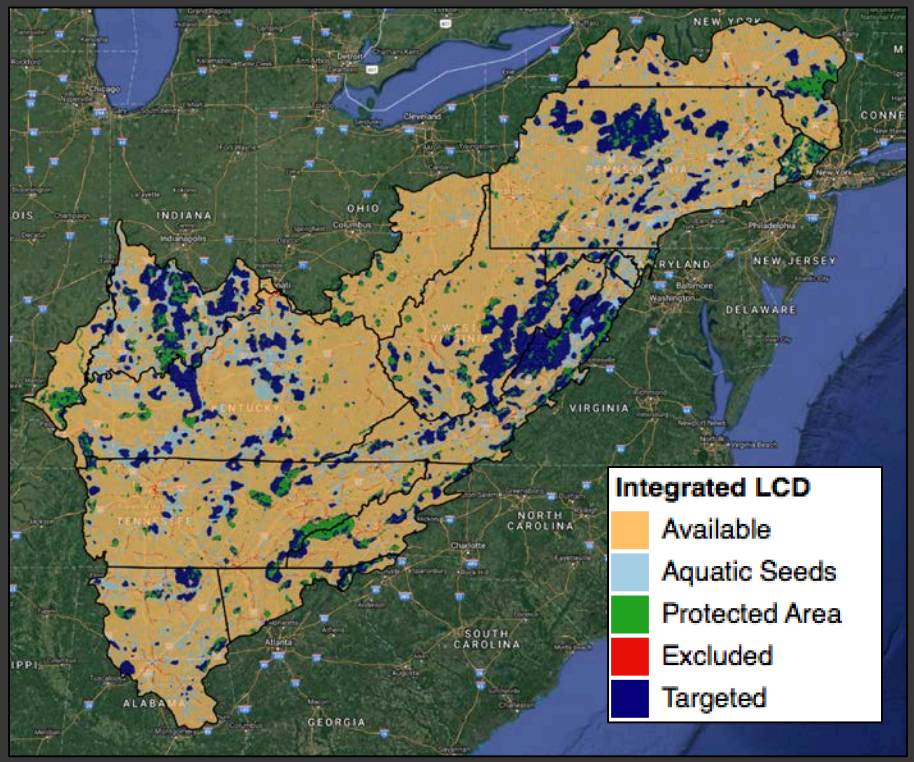


Target Richness / Catchment

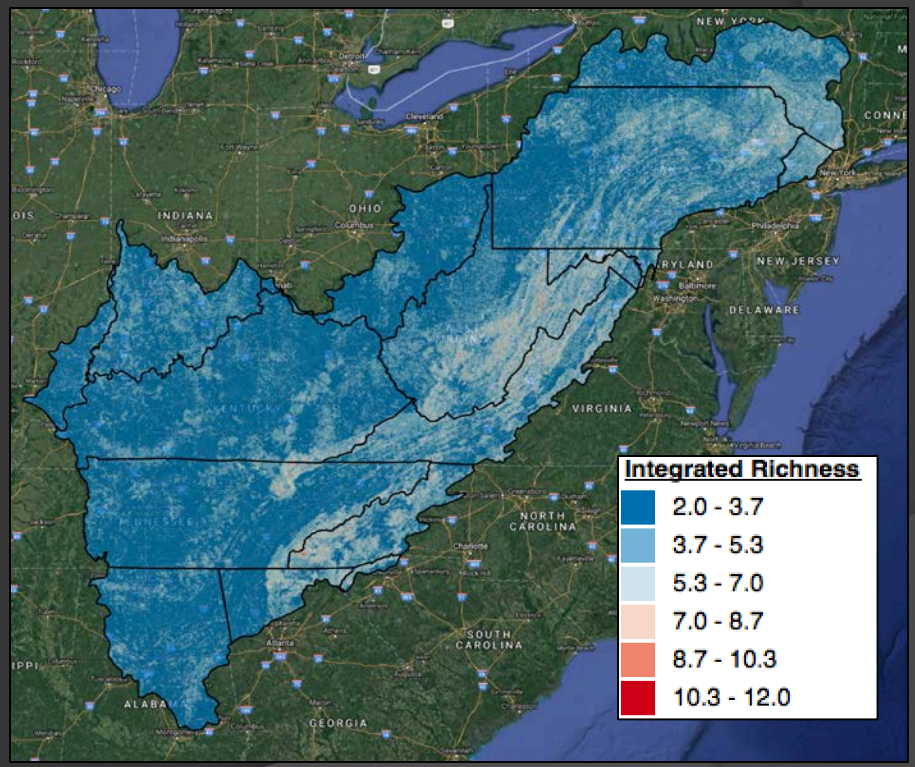


Integrated LCD 2

Overall Estate



Target Richness / Hexagon



Integrated LCD 2

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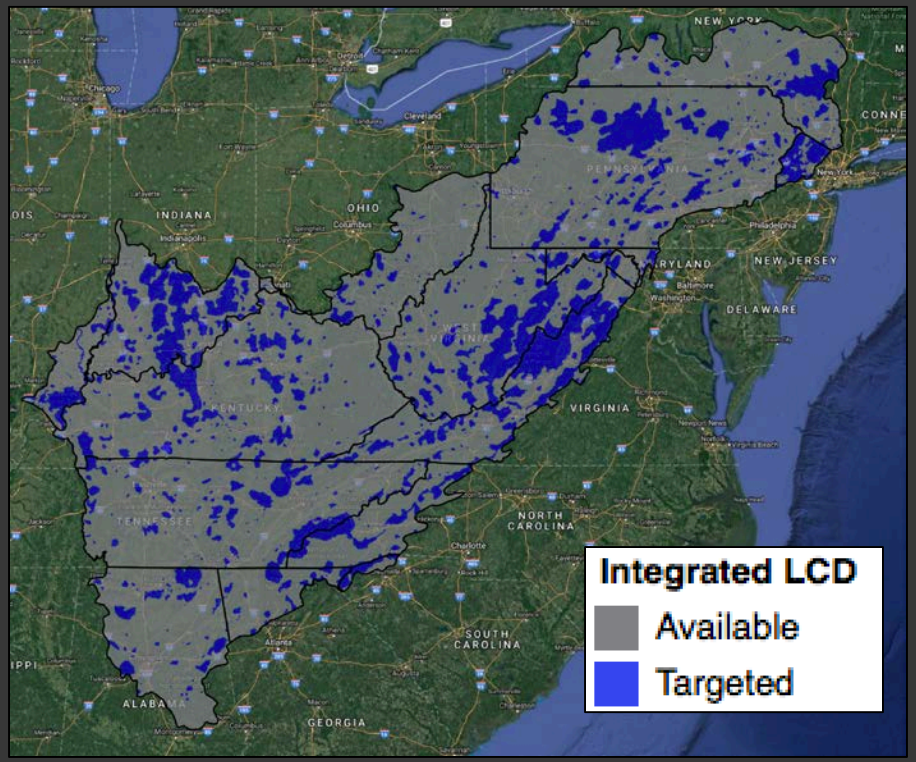

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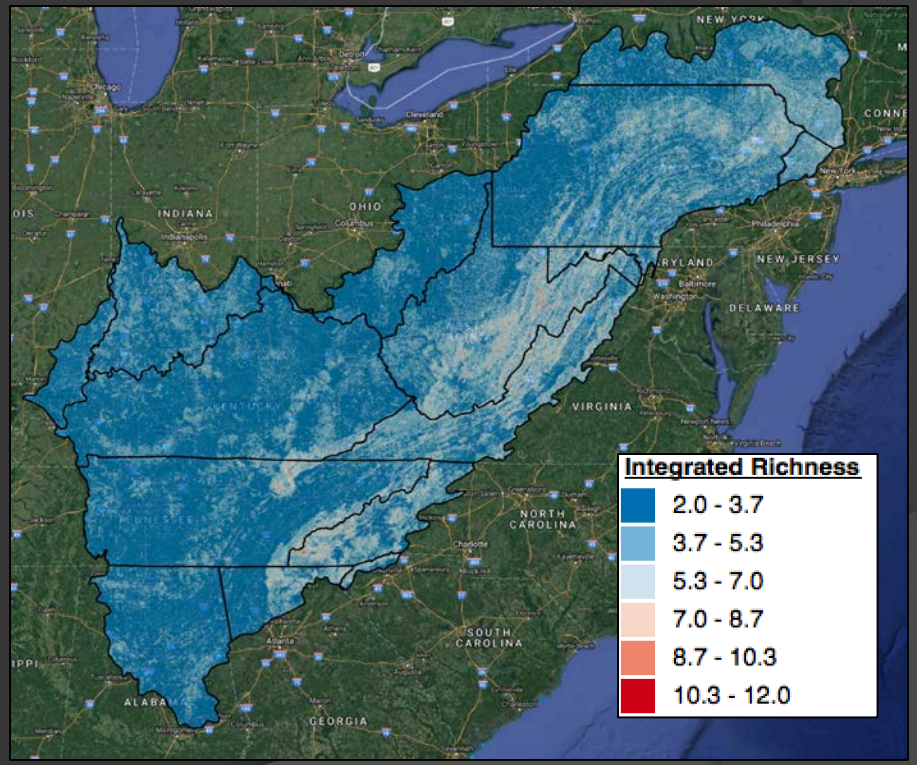
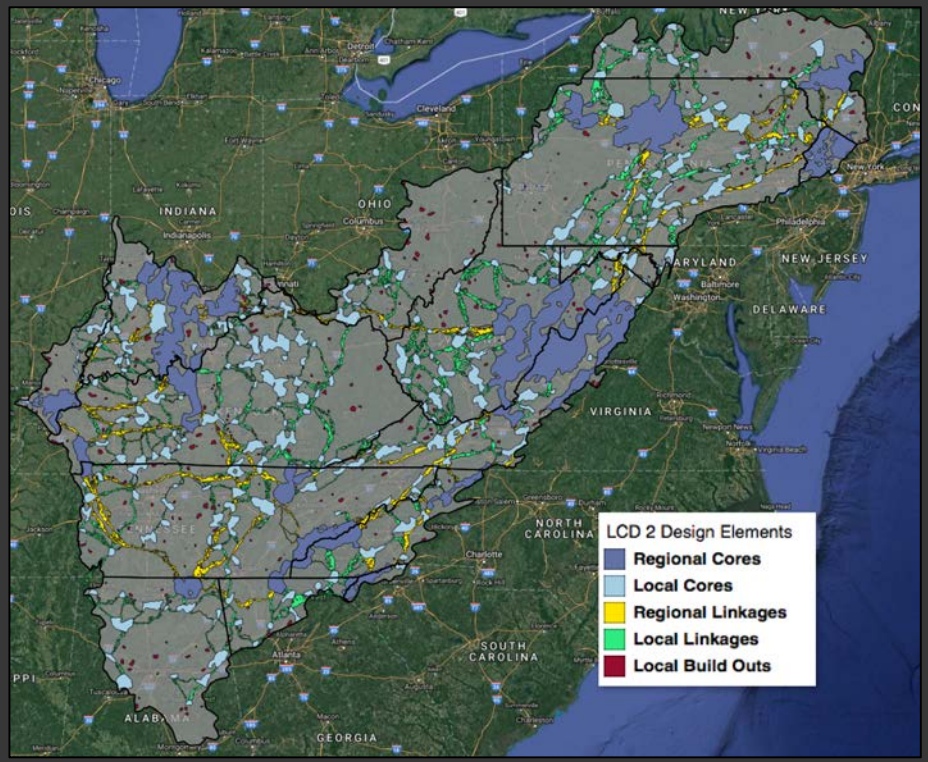
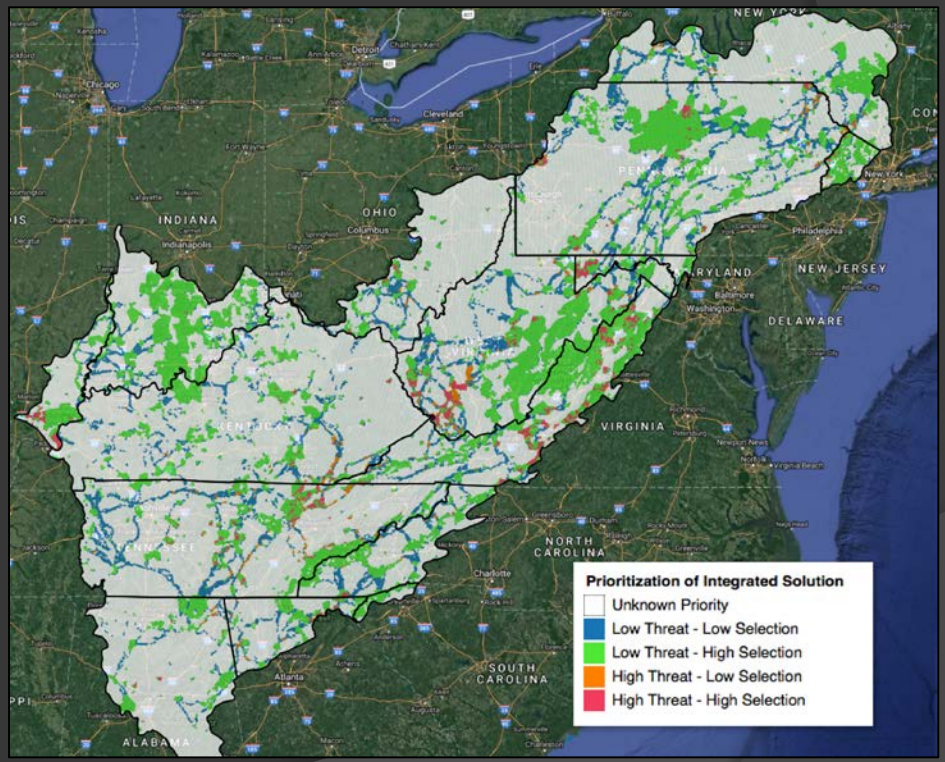


Integrated LCD 2

Conservation Design Elements

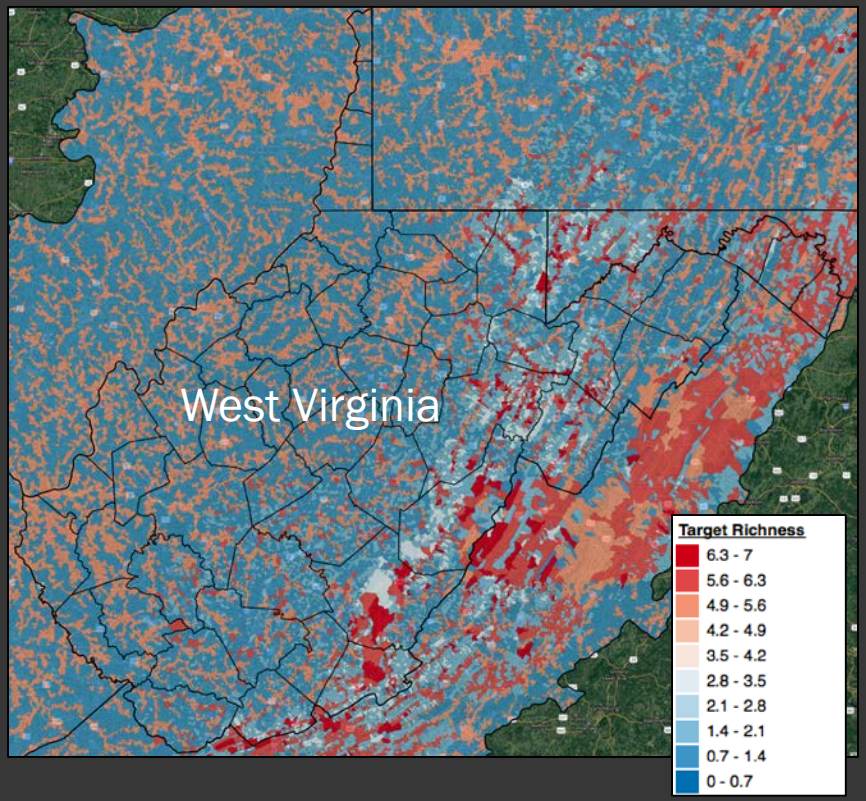


Prioritization by Element



Areas of Interest: State Planning

Aquatic Target Richness



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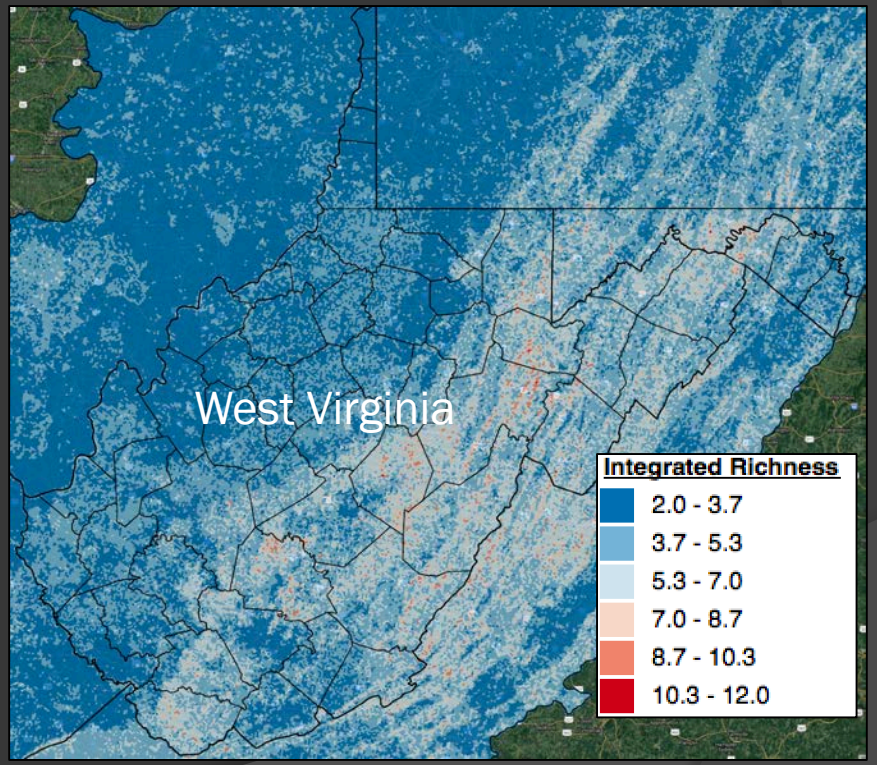
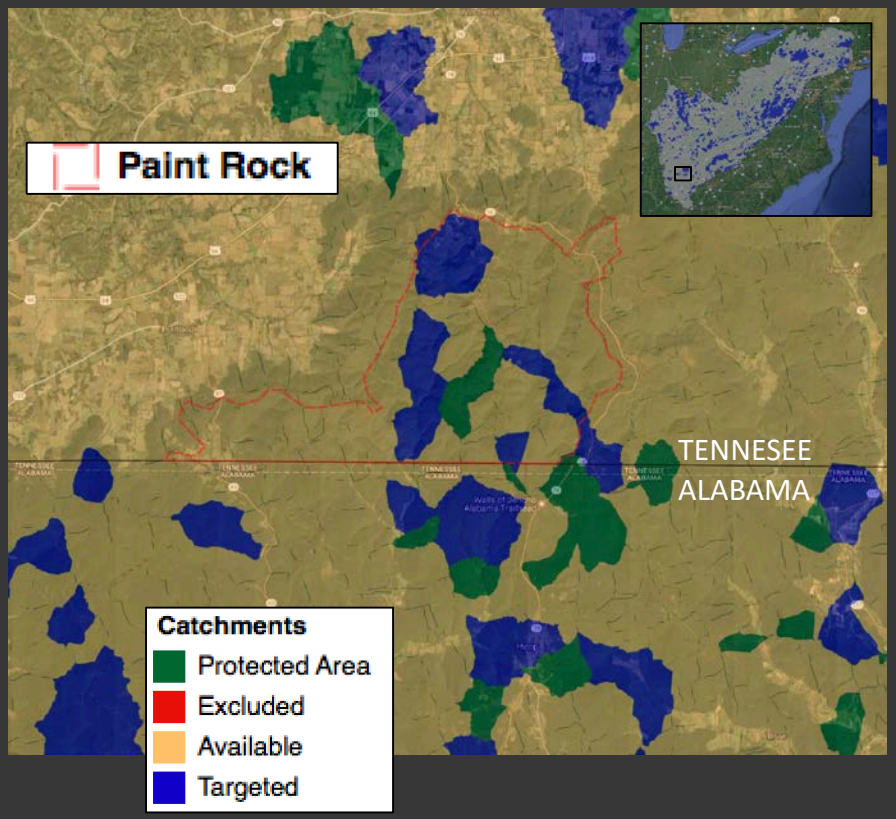
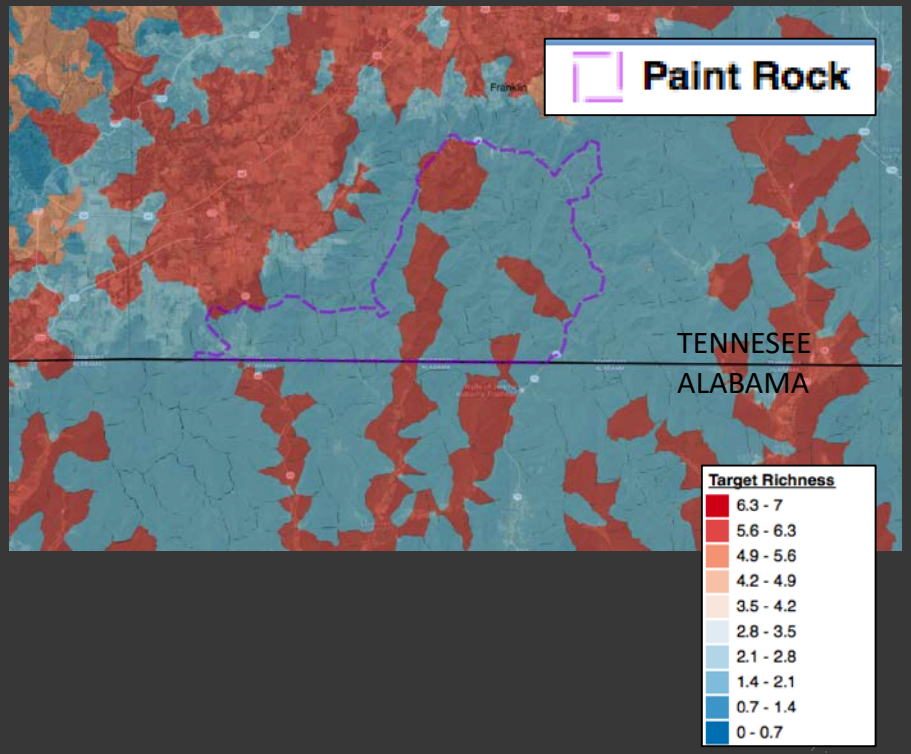


Areas of Interest: Refuges

Near-optimal Aquatic Solution



Target Richness / Catchment



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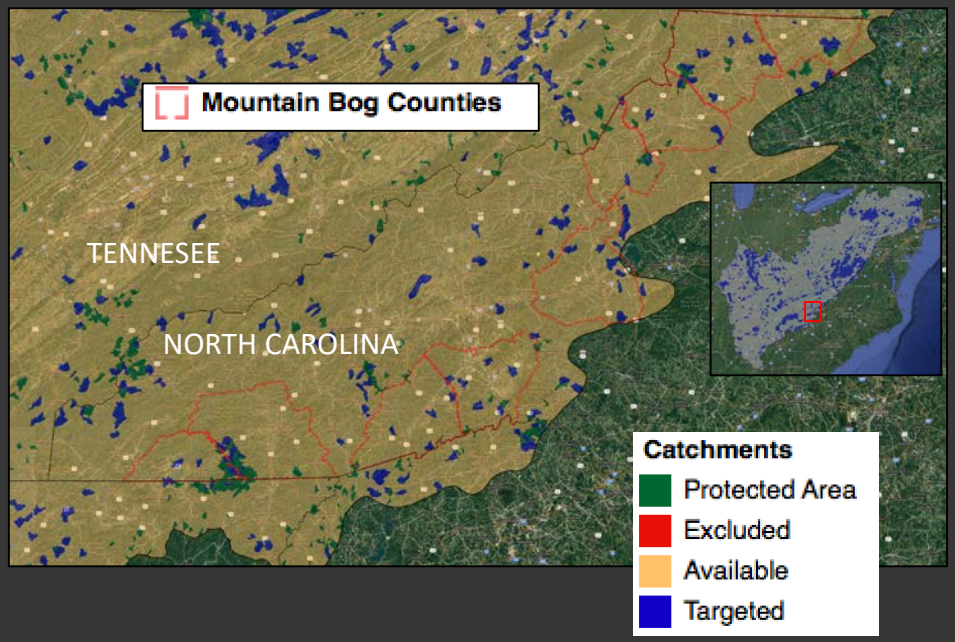

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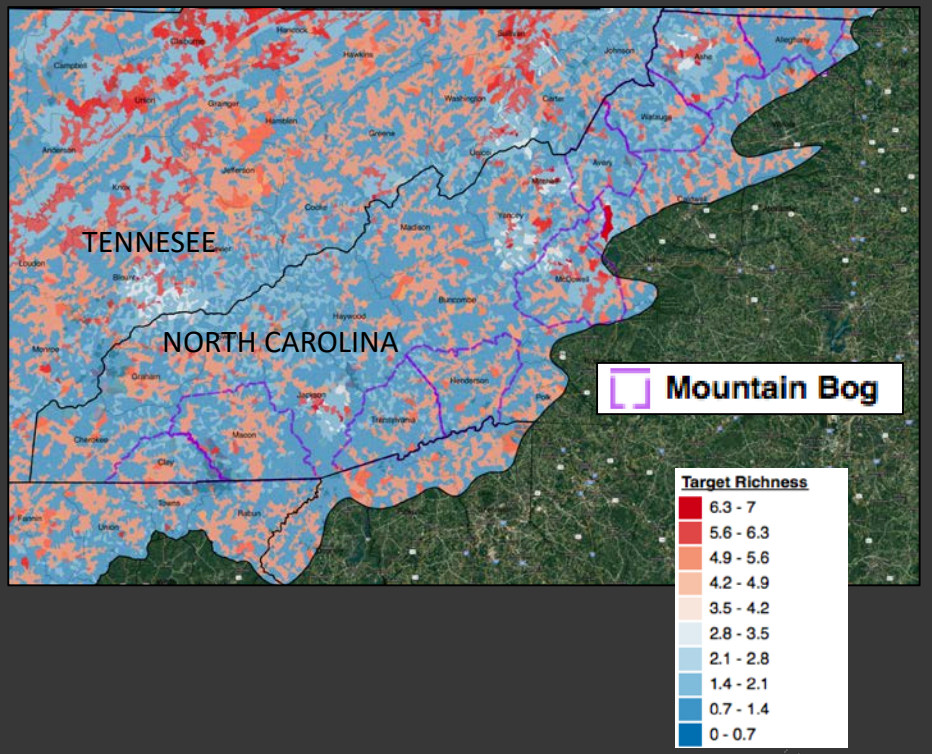
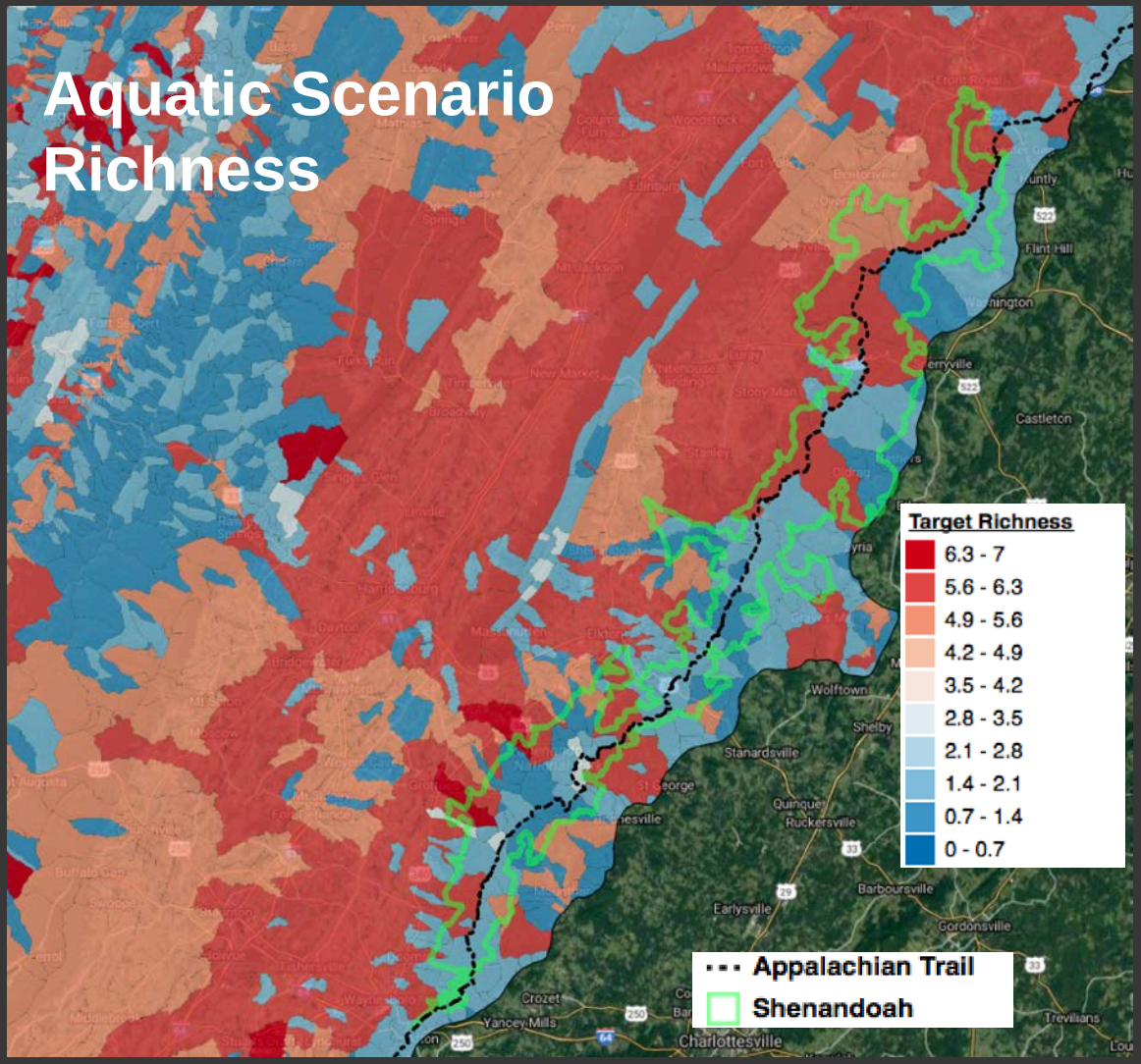
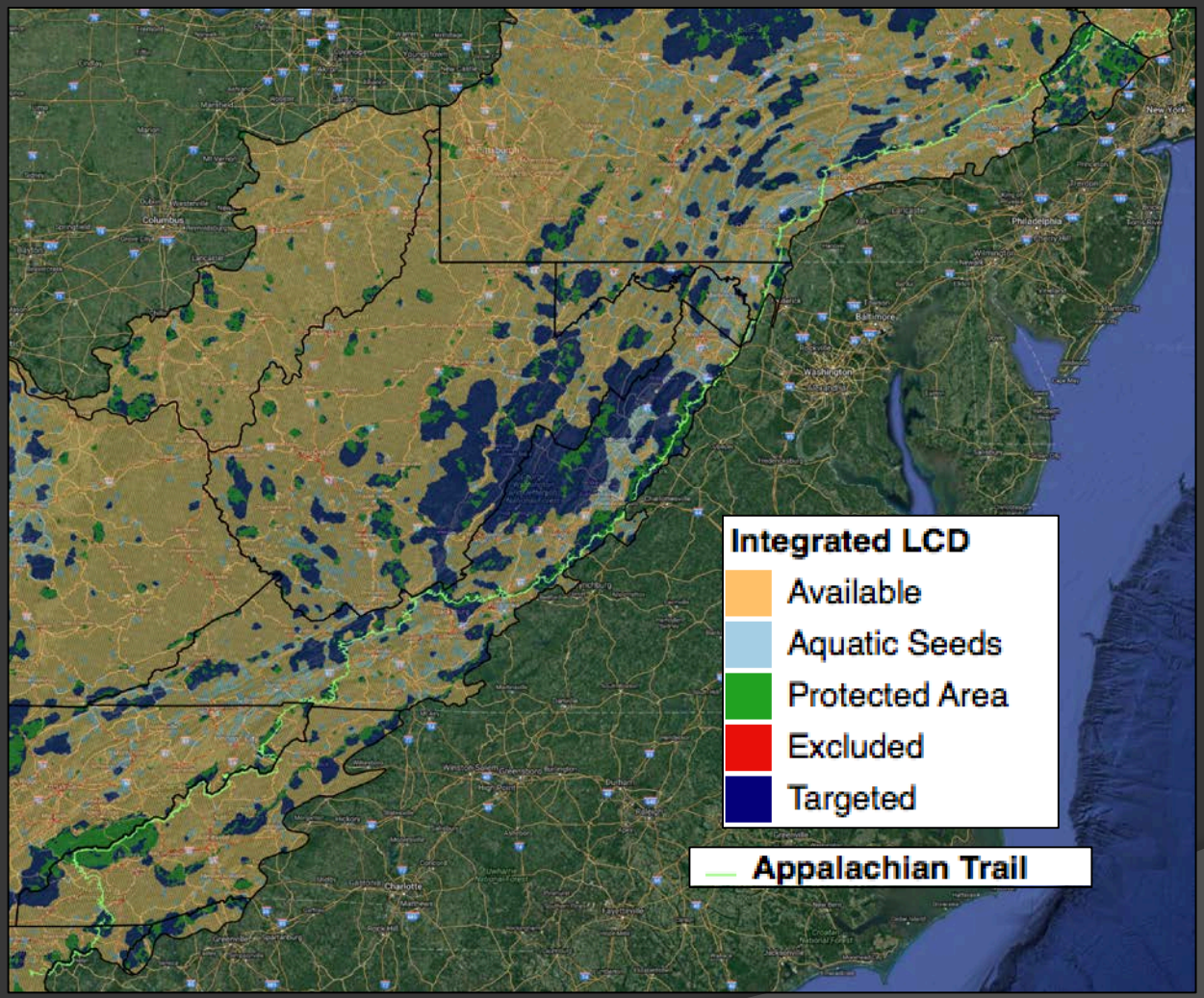


Areas of Interest: Parks



Areas of Interest: NGOs



Online Tool For Partners

- Allow partners to examine multi-scaled aspect of design inputs and outputs
- Ask questions about why a place is important in the plan
- Either by uploading shapefiles or by drawing shapes to identify