CONSERVATION PLANNING/DESIGN UPDATE

Paul Leonard

Rob Baldwin

Department of Forestry and Environmental Conservation
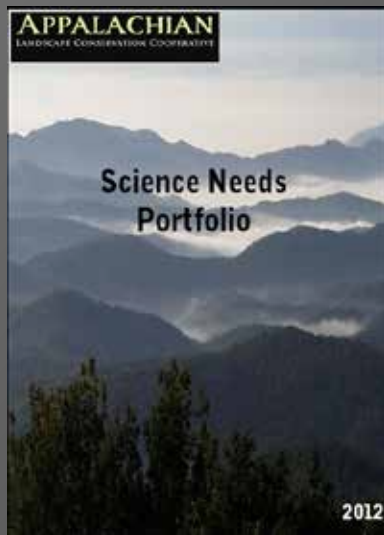
Webinar Outline

- Get everyone up to speed on status of Phase I conservation design process and output.

- Solicit feedback about conservation targets in design

- Identify gaps / weakness in target models

- Identify opportunities to strengthen representation of targets for Phase II design
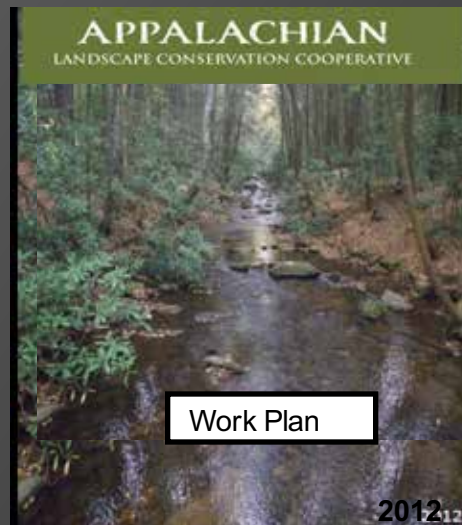
History of LCC: Building the Enterprise

SCIENCE

identify the science needs

**Nov 2011
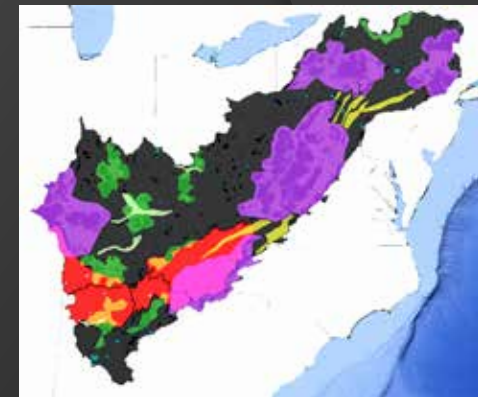SN Workshop Portfolio**

MANAGEMENT

Work Plan

build the institution

**July 2012
SC Workshop
5-Yr Work Plan**

PARTNERSHIP

network the conservation actions in conservation design

**July 2014
Propose Conservation Design**
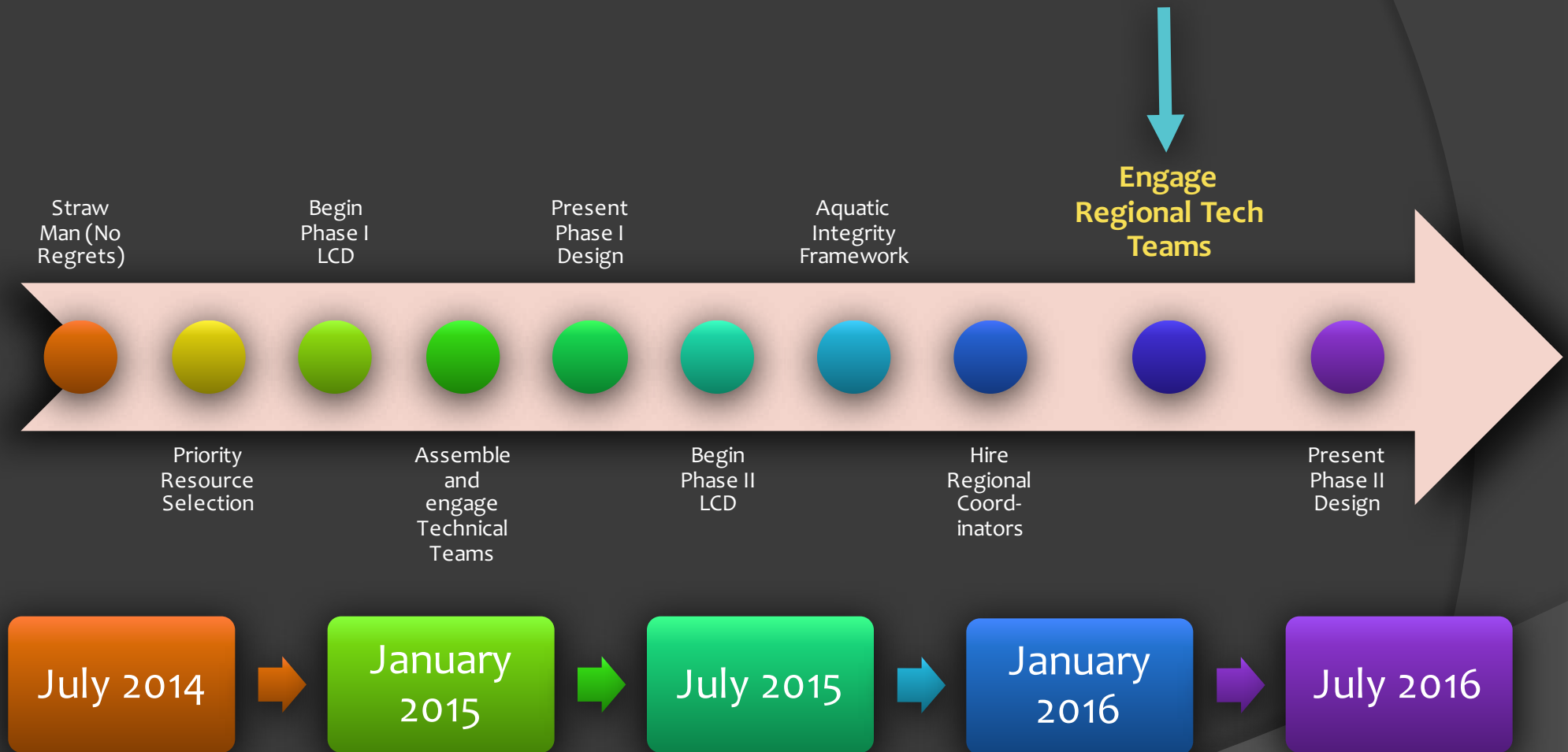
Overreaching Goal

- Represent the species, ecosystems, ecological processes, in a system of managed and protected areas, taking into account a dynamic and uncertain future.

Key Terminology

- Priority Resource / Seed Resource = Targets
  - Amount of any of these represented in a plan = Goals

- Design Elements = locations that contain multiple targets and are crucial for achieving goals.

Phase I Conservation Design Process
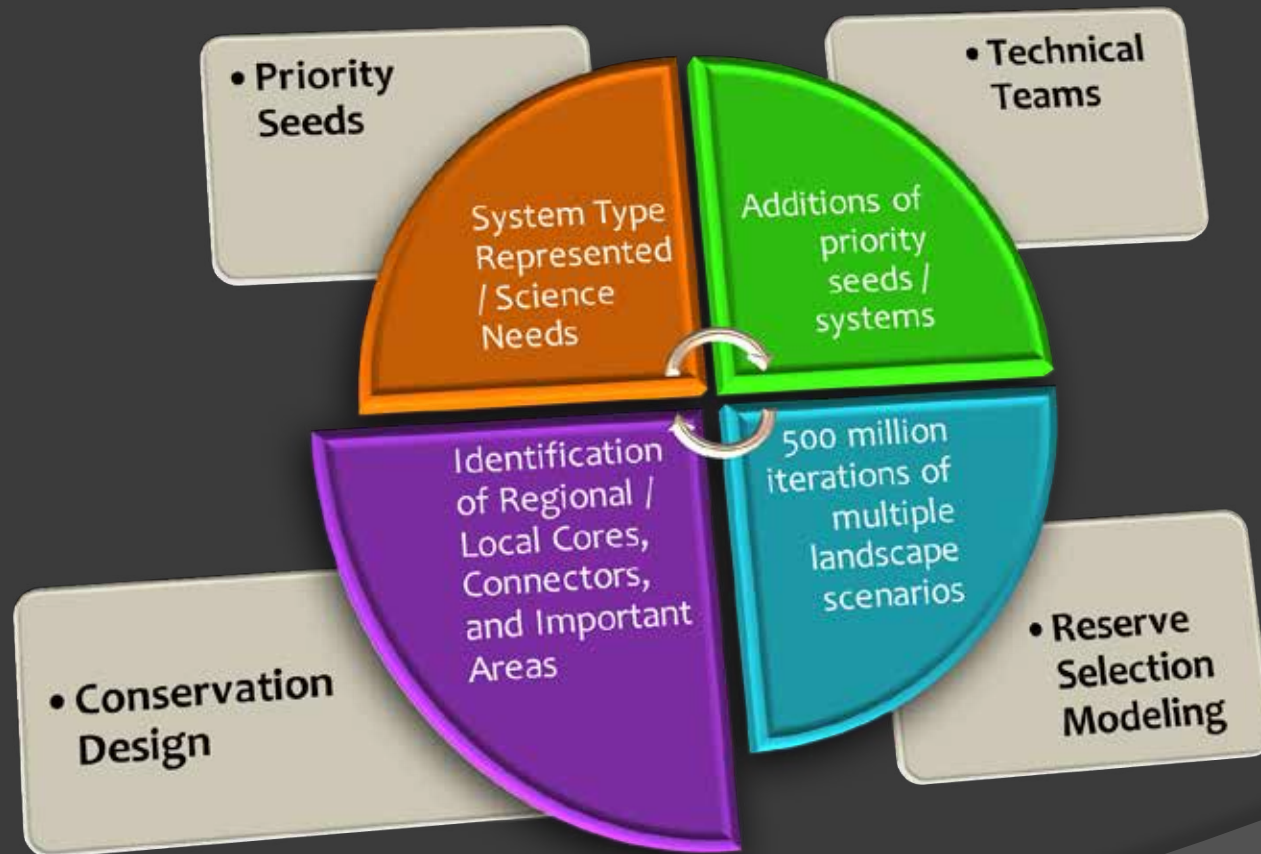
'Seed' Resources brought before Technical Teams

Early Successional
- Golden-winged Warbler
- Spotted Skunk
- Wild Turkey

Mature Lowland Forest
- Wood Thrush

Upper Elevation Streams
- Brook Trout

Lower Elevation Streams
- Hellbender

Unfragmented Landscapes
- Black Bear

Priority Resources

Mature Lowland Forest
- Wood Thrush

High-elevation Forests
- GWW
- Red Spruce

Early Successional Habitats
- Facultative Generalist
  - Young Forests
    - Spotted Skunk
  - Prairie Warbler
- Shrub/Scrub
  - GWW

Cave / Karst
- Aquatic
  - Group Richness
- Terrestrial
  - Group Richness

Unfragmented Forests
- Black bear Connectivity

High-elevation Streams
- Mid
  - Head water streams > 3k ft.
- Highest
  - Brook Trout

Low-elevation Streams
- Mid
  - Hellbender
- Lowest
  - Moderate Gradient, Warm Headwaters

Forested Wetlands
- PFO / PSS - NWI

Phase I Targets to capture 'Priority Resources'

1. Hellbender SDM*
2. Forested Wetlands
3. Golden-winged warbler
4. Typic Foothills Cove Forests
5. Typic Montane Cove Forests
6. Shale Barrens
7. Rock Outcrops
8. Rich Montane Cove Forests
9. Least likely to depart from historical climate regimes
10. Cave Obligates (Aquatic) Species Richness
11. Cave Obligates (Terrestrial) Species Richness
12. Moderate gradient, warm headwaters*
13. Brook Trout SDM
14. Headwaters > 3k feet in elevation*
15. Spotted Skunk SDM
16. Top resilient sites
17. Red Spruce SDM
18. Roadless forest blocks > 75% canopy cover
19. Acidic Fens*
20. Prairie Warbler SDM

* In active revision

Incorporating resilience targets through 2030

- Resilient landscapes (TNC)
  - Incorporated top 10% of resilient scores

- Predicted yearly climate departure from historical baselines (1950-1979)
  - Mean Annual Temperature & Climate Moisture Deficit
    - Included top 25% of areas least likely to depart from baseline

Formulating and solving the conservation problem

- How do we minimize the landscape fragmentation between priority resources in the LCC geography while meeting specific conservation goals

- Use Conservation Planning Software to select near-optimal areas where targets occur (or could occur) to achieve stated goals

Model outputs of technical team irreplaceability scenario (500 million iterations)
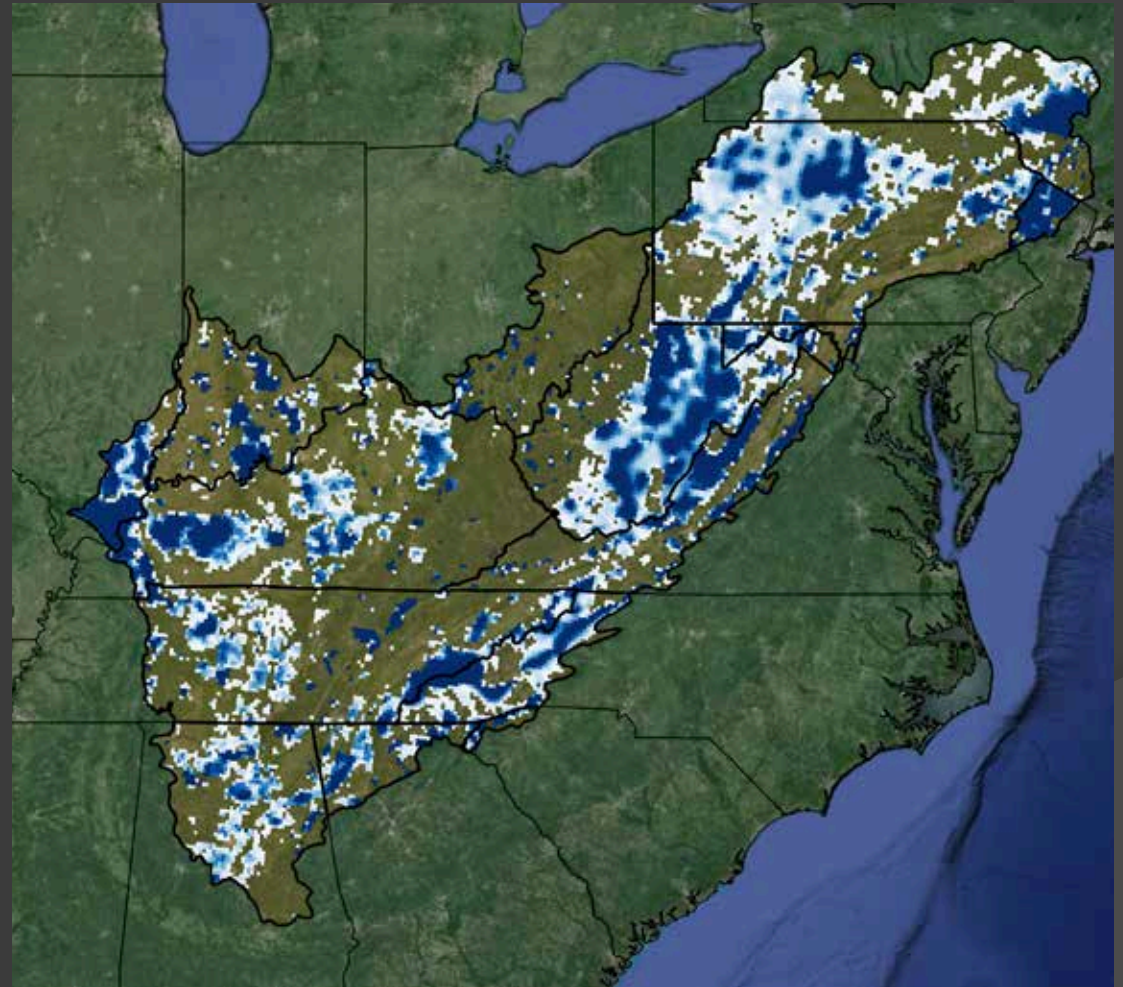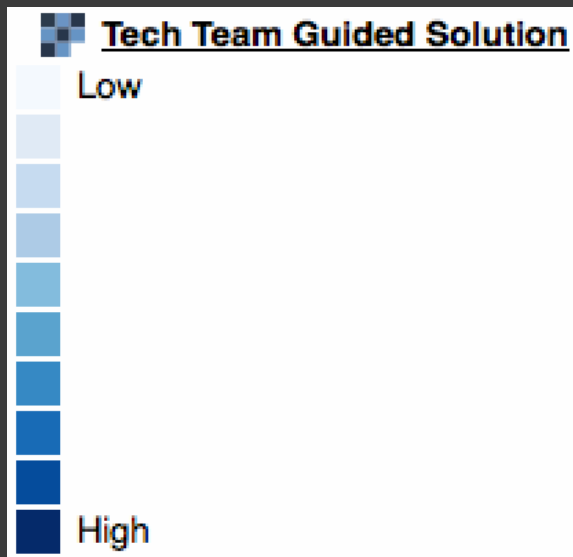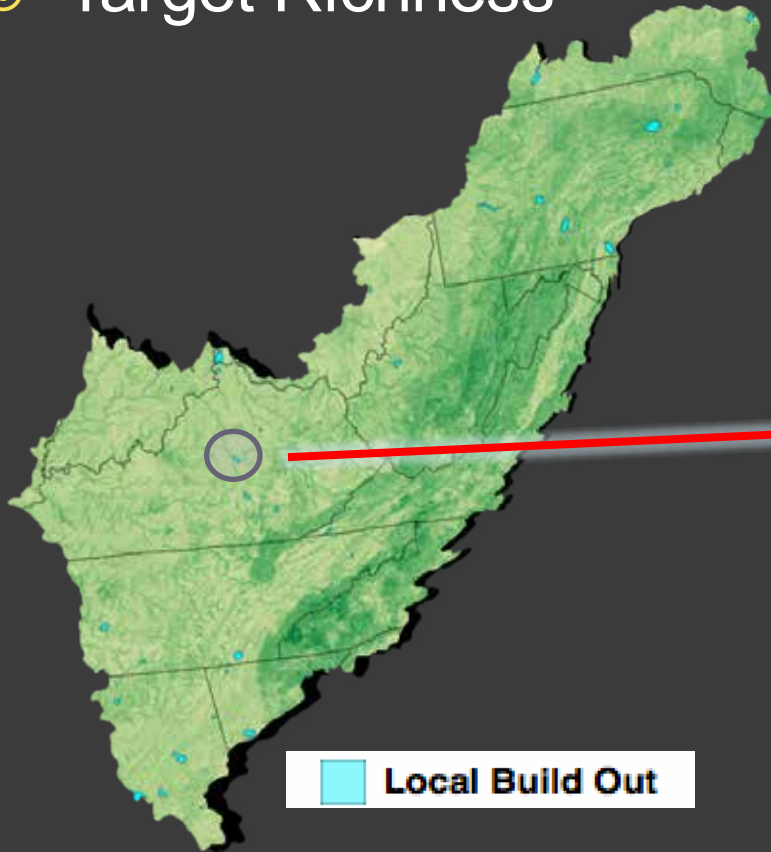
Scalable decision-making to 1km hexagons

- LCC broken up into 592,129 hexagons
  - **Each hexagon contains data for each conservation target and can be summarized by:**

    - Target Richness
    - Irreplaceability
    - Connectivity
    - Threat

Scalable decision-making to 1km hexagons

- Target Richness

- Target richness by hexagon

Feature count

■	10.8 - 12
■	9.6 - 10.8
■	8.4 - 9.6
■	7.2 - 8.4
■	6.0 - 7.2
■	4.8 - 6.0
■	3.6 - 4.8
■	2.4 - 3.6
■	1.2 - 2.4
■	0 - 1.2

Local Build Out
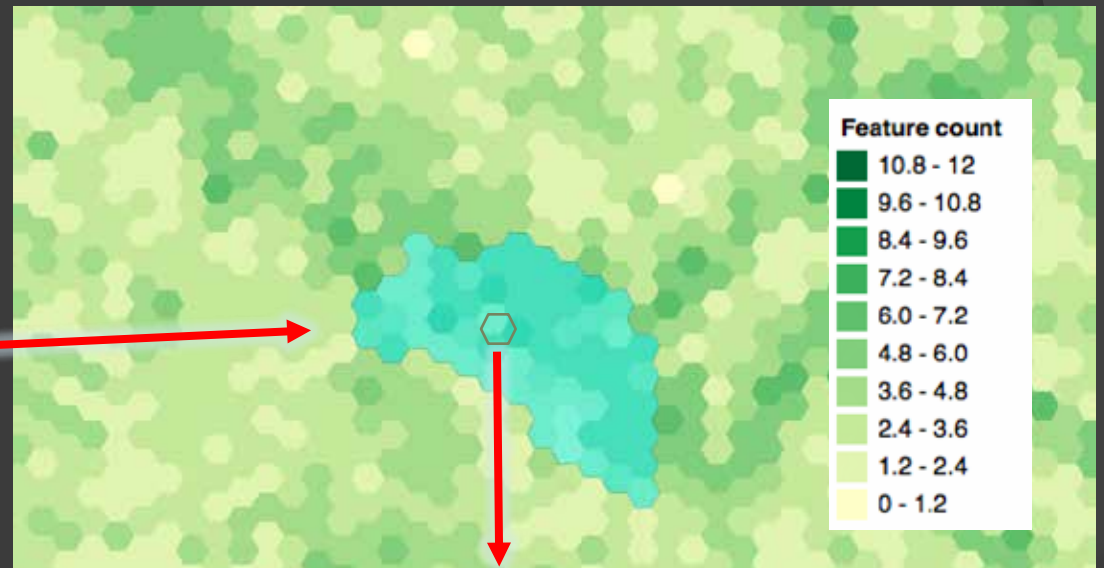
	ID	Name	Amount	As % of total	Target	As % of target	% of target currently met
1	6	Forested_Wetlands	2789.42125	0.0 %	1770022219.0	0.0 %	150.37 %
2	8	Hellbender	1004400.0	0.0 %	12322134720.0	0.01 %	107.37 %
3	11	Lowland_Streams	129600.0	0.0 %	5775735780.0	0.0 %	99.72 %
4	12	Prarie_Warbler	226800.0	0.0 %	14132483505.0	0.0 %	323.11 %
5	14	Resilience	729000.0	0.0 %	8929356975.0	0.01 %	107.21 %

Moving from model output maps to a conservation design

- Produce generalized regions with <u>specific conservation functions</u> related to multi-scale process relevant to decision making

- Move beyond complex model outputs to simplified representations that can be <u>more easily communicated</u>

- Provide <u>discrete areas</u> to assess by threat

- Provide names for areas that have <u>natural and cultural resonance</u> and give "sense of place"

We mapped five conservation design elements

1. Regionally Connected Cores
2. Locally Connected Cores
3. East-West Linkages
4. Regional Linkages
5. Local Build Outs
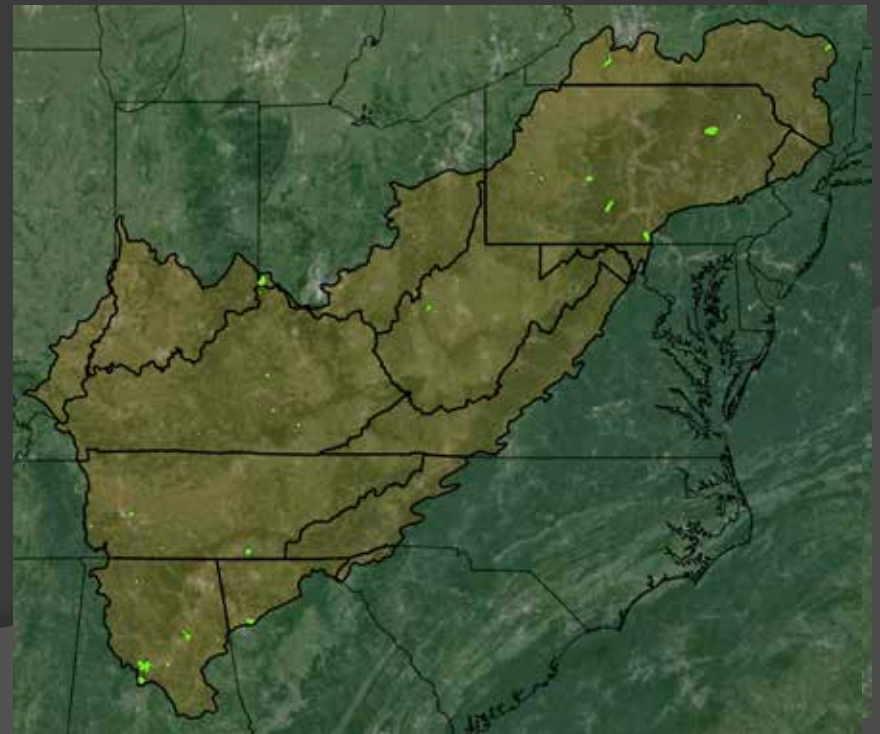
Map of all conservation elements

Legend:
- Regional Core
- Local Build Out
- Regional Linkage
- East-West Linkage
- Local Core
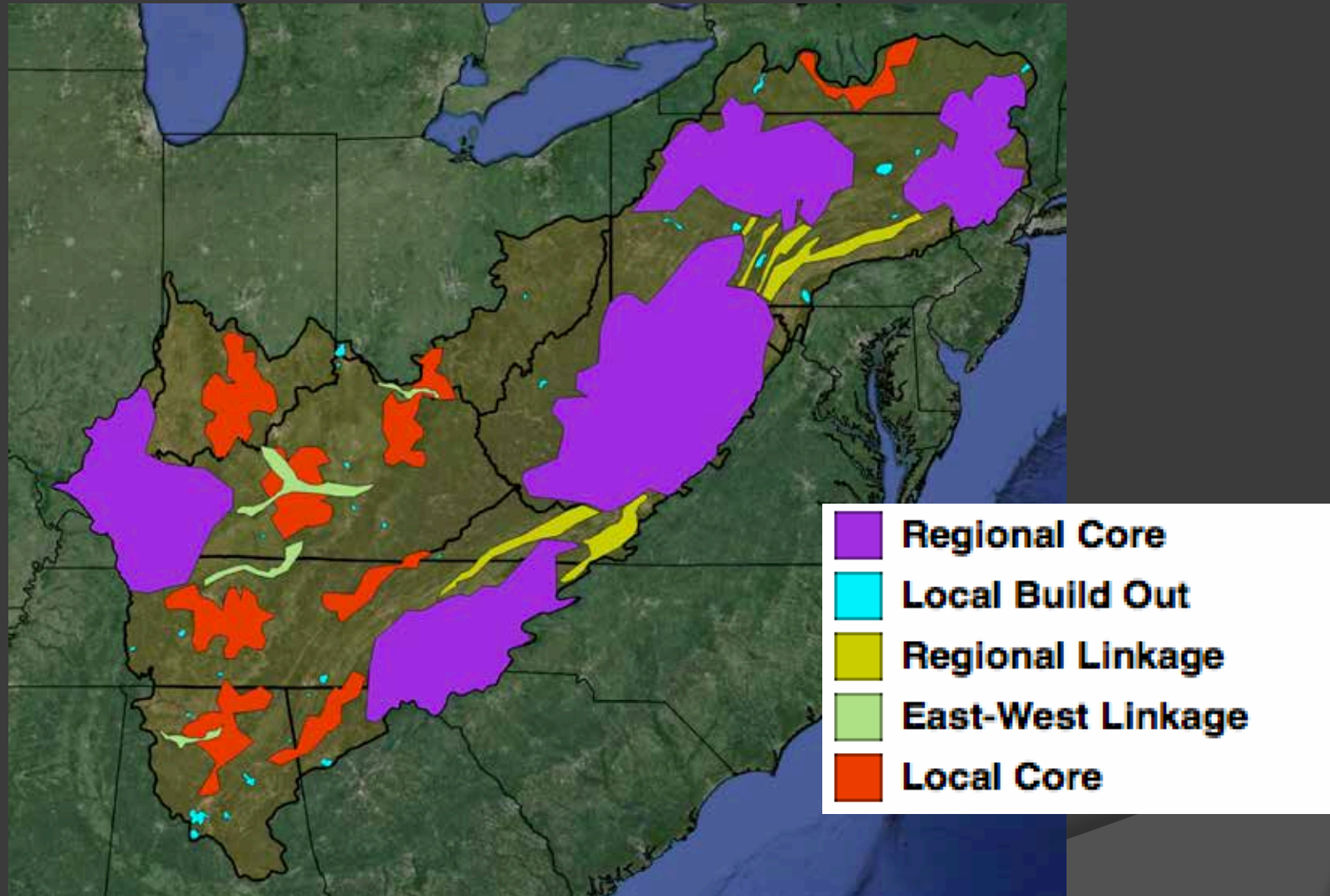
Multi-scaled Design and Target Integration (Phase I)

1 Acre Circle: Smallest Targeted Forested Wetland

20 km resolution: Cave / Karst Spp. Richness

Locally Connected Core (8)

Local Build-out (many)

1 km² Hexagons

(592,129)

Regionally Connected Core (5)

1 km² Circle: Unfragmented Forests

30 m resolution: Topographic Variables

90 m resolution: Species Distributions, Resilience, Headwaters

270 m resolution: Landscape Connectivity, Climate Vulnerability

* Hexagons, pixel sizes, and elements are not to scale.

Final step in geographic prioritization – assessing threat

- We assessed level of threat to each element of the conservation design, mapped those levels of threats, and assigned the areas to a threat vs. irreplaceability matrix

Assessing each design element by level of threat

- We made a cumulative threat index comprised of

  - **Climate Vulnerability** (Departure from Baseline: 2030)
  - **Housing Density** (Projected to 2030)
  - **Energy Development** (Projected to 2030)
    - Natural Gas, Wind, Coal

Relative Irreplaceability (accounting for connectivity) vs. Threats

HIGHEST IRREPLACEABILITY / HIGH THREAT
HIGHEST IRREPLACEABILITY / LOW THREAT
HIGH IRREPLACEABILITY / HIGH THREAT
HIGH IRREPLACEABILITY / LOW THREAT
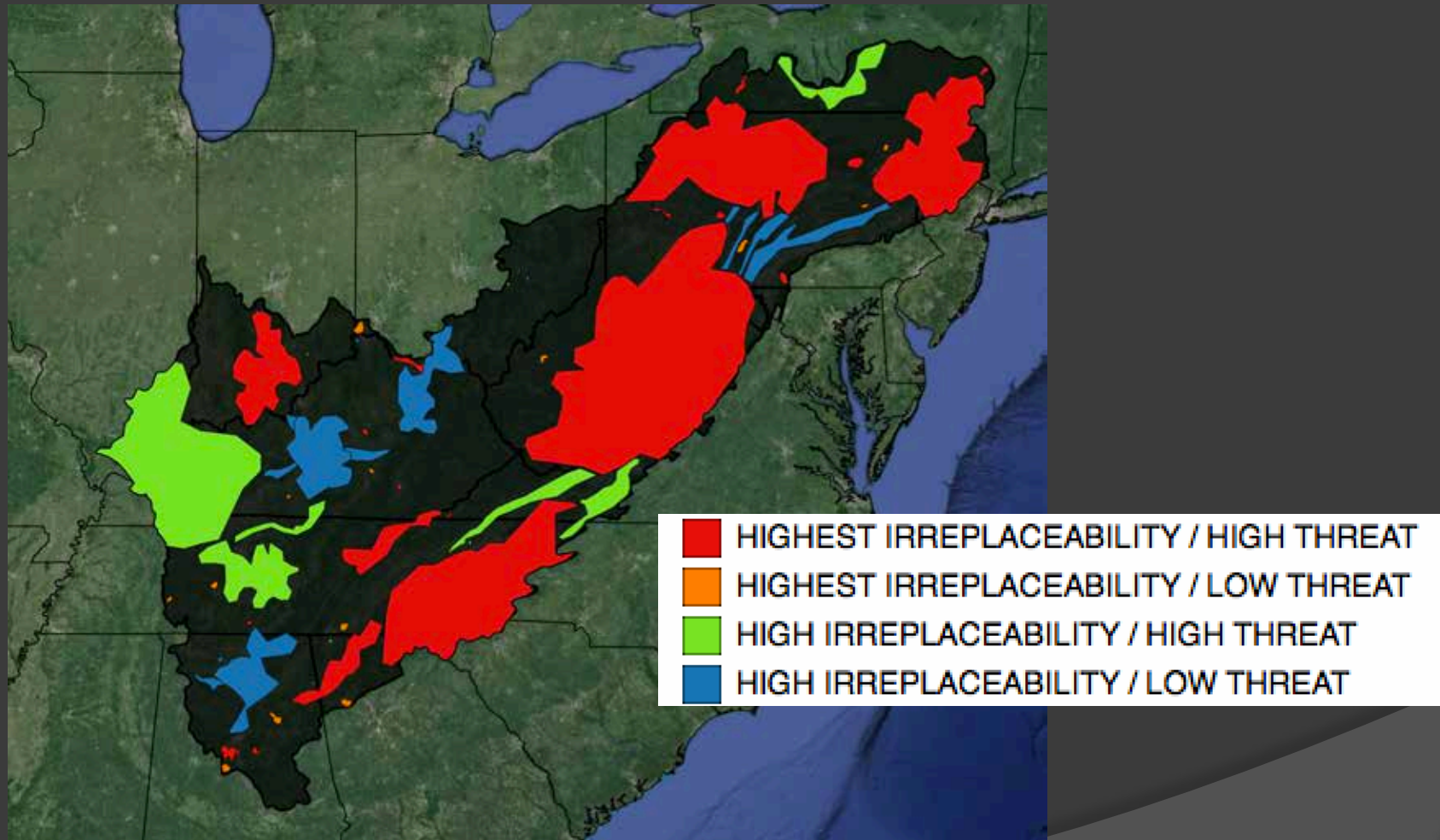
Questions ??

- Structural questions / feedback about process

- Conceptual questions / feedback about optimization, priority resources, scale, use cases

Discussion: Revisit Priority Resources

1. Hellbender SDM *
2. Forested Wetlands
3. Golden-winged warbler
4. Typic Foothills Cove Forests
5. Typic Montane Cove Forests
6. Shale Barrens
7. Rock Outcrops
8. Rich Montane Cove Forests
9. Least likely to depart from historical climate regimes
10. Cave Obligates (Aquatic) Species Richness
11. Cave Obligates (Terrestrial) Species Richness
12. Moderate gradient, warm headwaters *
13. Brook Trout SDM
14. Headwaters > 3k feet in elevation *
15. Spotted Skunk SDM
16. Top resilient sites
17. Red Spruce SDM
18. Roadless forest blocks > 75% canopy cover
19. Acidic Fens
20. Prairie Warbler SDM

* In active revision

Additional Species to Investigate

- Northern Bobwhite (shrub / grassland)
- Field Sparrow (early successional generalist)
- Wood Turtle (Low-elevation Streams)
- Flying Squirrel (high-elevation forests)
- Wood Rat (rock outcrops)
- Green Salamander (rock outcrops)
- Blacknose Dace (high-elevation Streams)

Discussion

- Setting Goals for Targets

    - Account for confidence in data?
        - Develop a weighted ruleset
    - Assess threats at individual target level?
    - Adjust goals based on abundance of target?

Discussion of Goals

Type	Priority Resource (Target)	ID	Tech Goal (%)	Aichi	High
Points					
Lines					
Polygons					
	Early Successional Habitat				
	Spotted Skunk	100	0.05	0.17	0.5
	Golden-winged Warbler	200	0.05	0.17	0.5
	Prairie Warbler	300	0.05	0.17	0.5
	Marture Lowland Forest				
	Roadless Forest Blocks > 75% Canopy Cover	2	0.2	0.17	0.5
	High-elevation Streams				
	Headwaters > 1,000 m	900	0.3	0.17	0.5
	Brook Trout	400	0.4	0.17	0.5
	Low-elevation Streams				
	Moderate Gradient, Warm Headwaters	1000	0.3	0.17	0.5
	Hellbender	500	0.2	0.17	0.5
	High Elevation Forests				
	Red Spruce	600	0.2	0.17	0.5
	Cave / Karst				
	Aquatic Group Richness	700	0.3	0.17	0.5
	Terrestrial Group Richness	800	0.4	0.17	0.5
	Forested Wetlands				
	PSS and PFO NWI	1	0.2	0.17	0.5
	Special 'Places' (Ecosystems)				
	Cove Forests				
	Rich Montane	1100	0.35	0.17	0.5
	Typic Montane	1200	0.35	0.17	0.5
	Typic Foothills	1300	0.35	0.17	0.5
	Shale Barrens	1400	0.05	0.17	0.5
	Rocky Outcrops	1500	0.25	0.17	0.5
	Acidic Fen	1600	0.1	0.17	0.5
	Refugia				
	Least departure from historical (temp and moisure)		0.35	0.17	0.5
	Top Resilient areas (TNC)		0.35	0.17	0.5
Area Required			24.97%	19%	55.92%
Locked	GAP 1 & 2 Protected Areas		1		
Cost	Inverse of Connectivity (Fragmentation)				

Next Week

- Focus on Conservation Design Elements
- Move around the map and examine conservation design elements
- Identify gaps not covered by existing elements
- Discussion about threats to elements