Patch Metrics: A cost effective method for short and long term monitoring of Chesapeake Bay wild brook trout populations?

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Introduction

Case History: Eastern Brook Trout Joint Venture

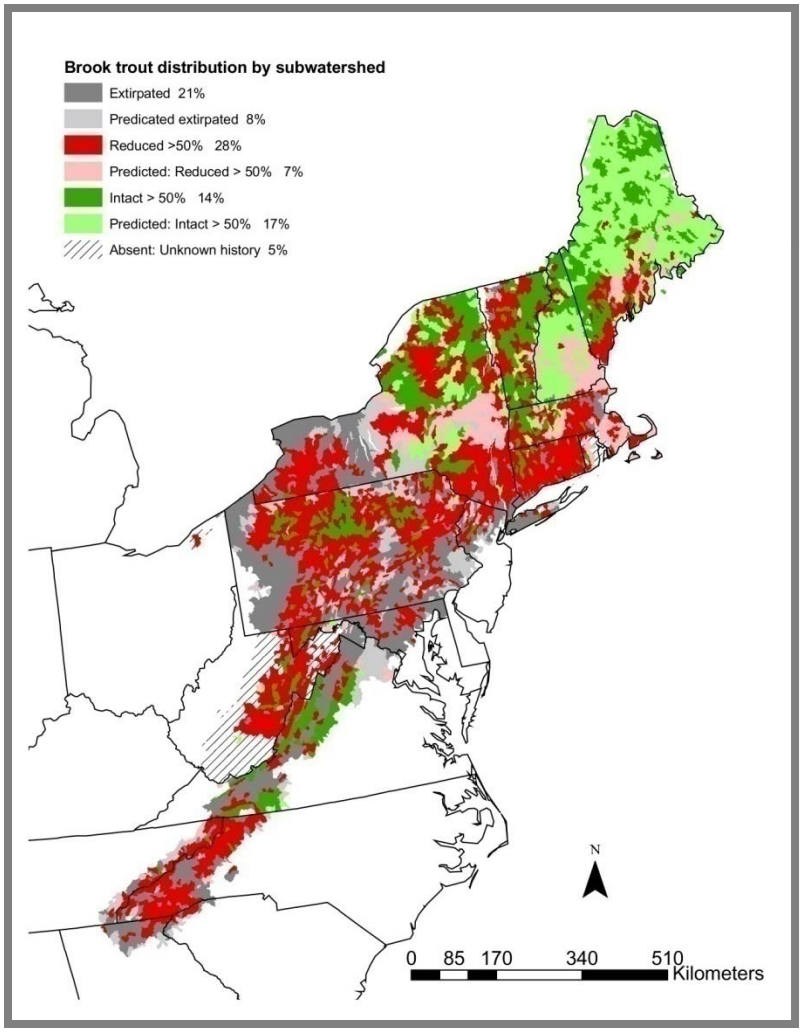
1. Evaluate the distribution of brook trout for the 2005 EBTJV assessment.

2. Context:

   -lots of states

   -inconsistent fine scale data

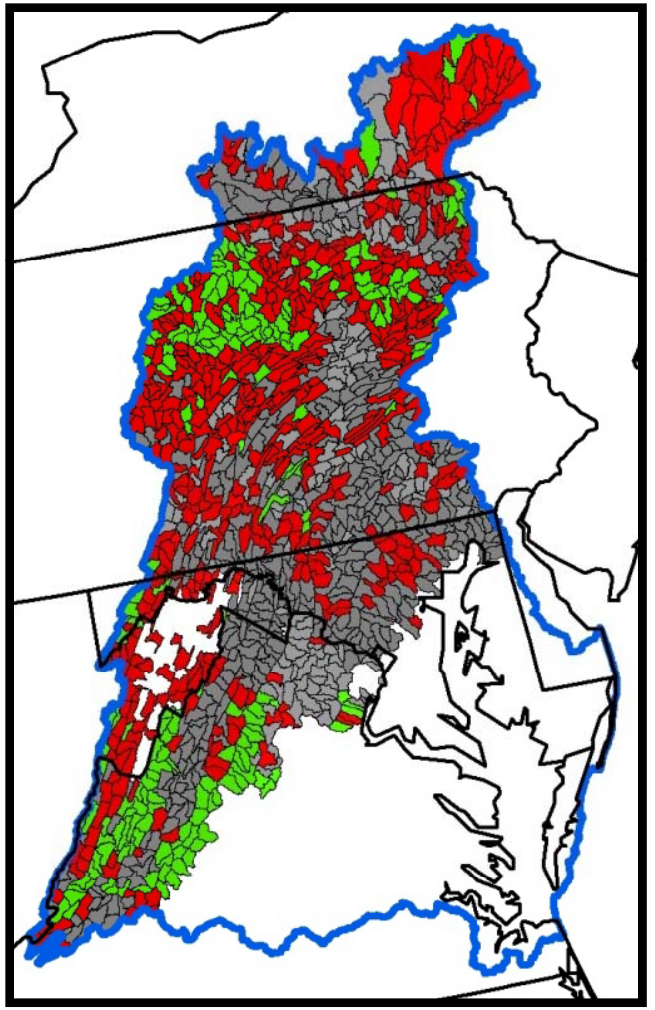
3. Hudy et al. 2008 NAJFM 28:1069-1085



Eastern Brook Trout
JOINT VENTURE

Brook Trout Range

- 1,433 subwatersheds
  - 226 intact (green)
  - 542 reduced (red)
  - 595 extirpated (gray)



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While many extirpations and losses occurred at the turn of the century, many documented losses have occurred in the last ten years.

Threats:

- Dams
- Roads
- People
- Exotics
- Land use
- Genetic integrity
- Climate Change

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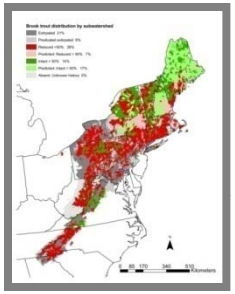
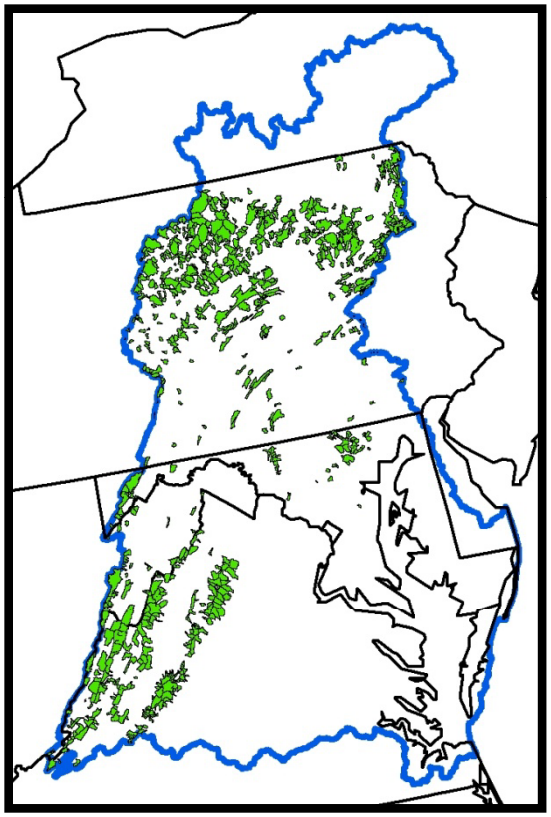
Objectives

Today's Objectives

1. Develop Metrics:
   a) correct scale
   b) cost effective
   c) detect meaningful change
2. Develop monitoring protocol for brook trout populations in the Chesapeake Bay watershed.





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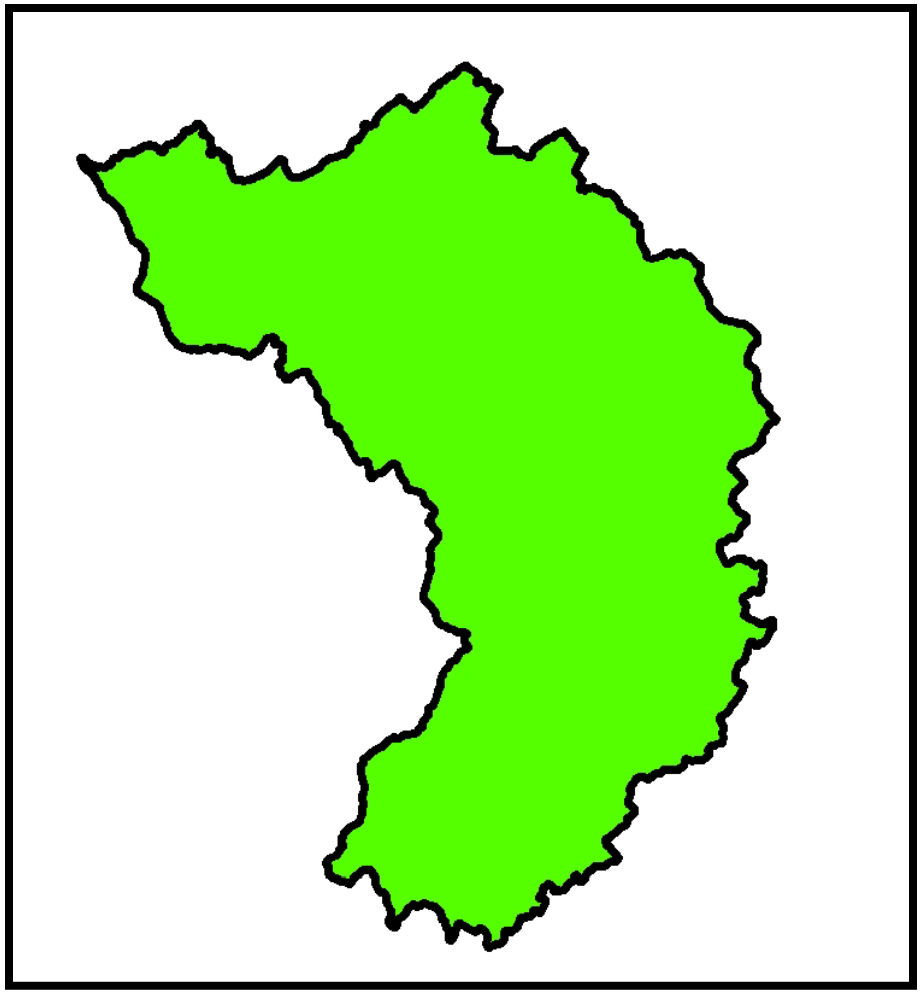
Scale

Sub-basins (4th HUC)
100%



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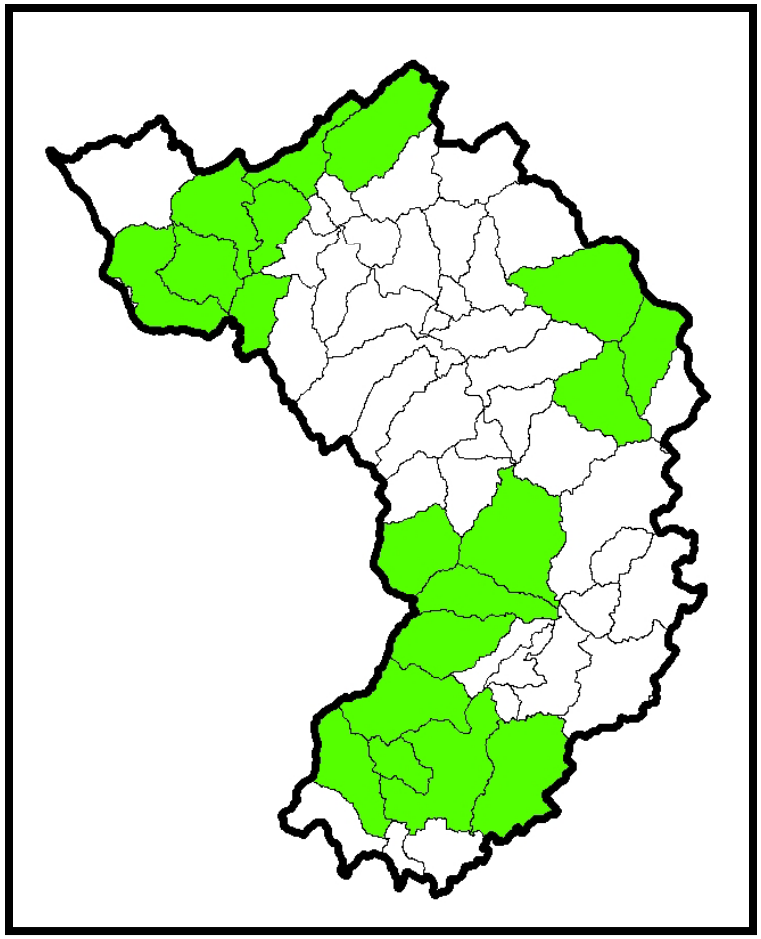
Subwatersheds (6th HUC)
33%



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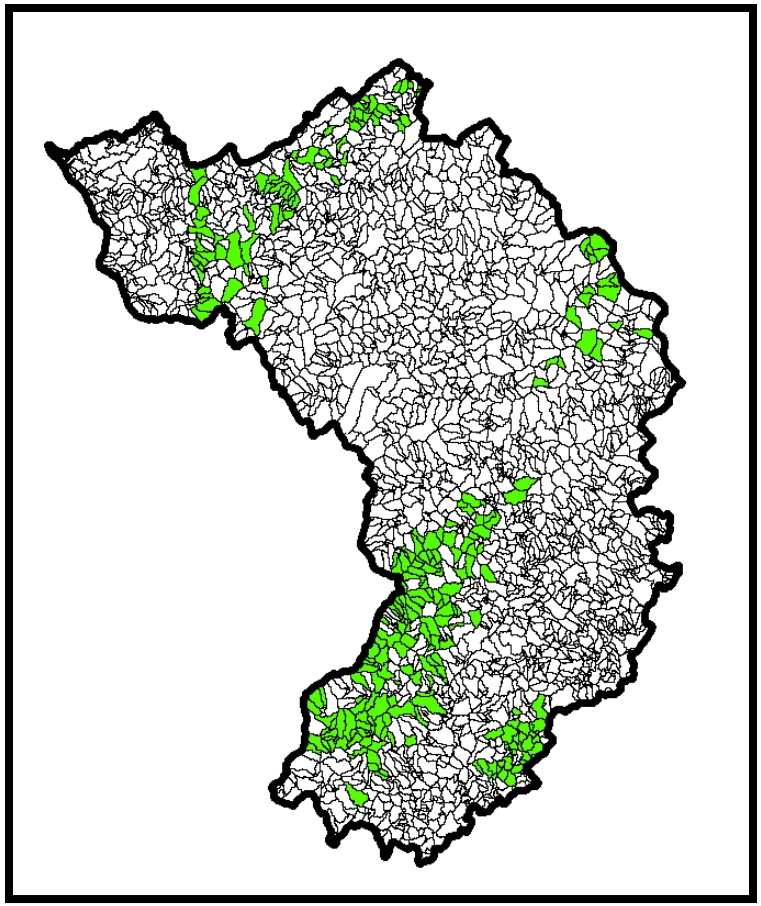
Catchments
11%



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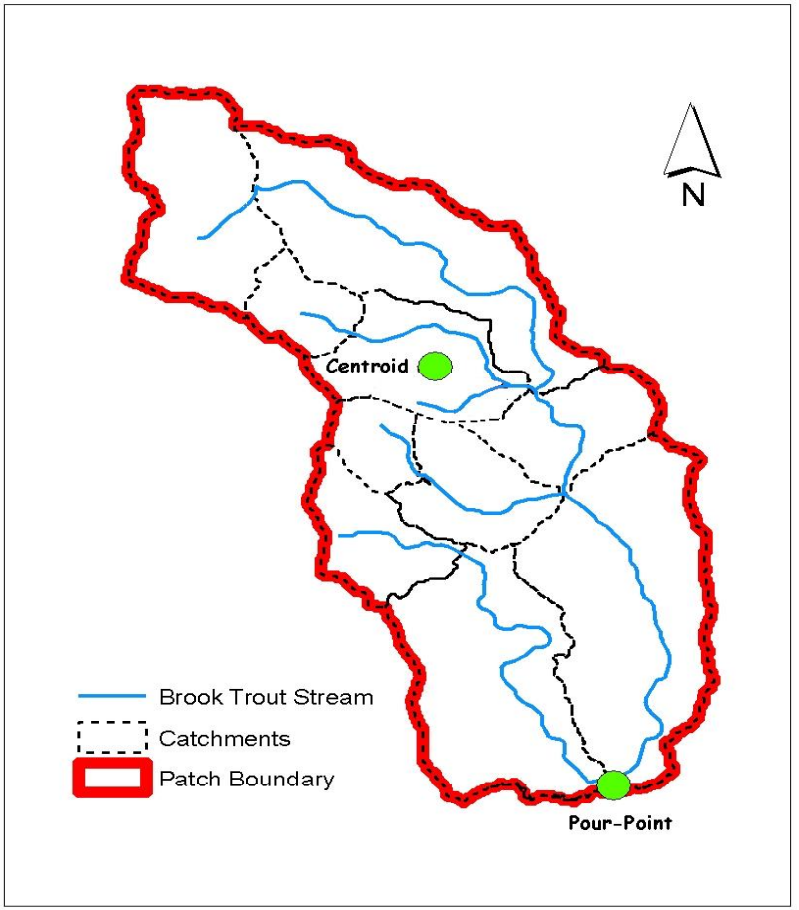
Fine Scale Occupancy Assessment

- In Chesapeake Bay Watershed*:
  - 3,003 catchments: Allopatric Brook Trout Populations
  - 1,716 catchments: Sympatric Populations (with Brown or Rainbow Trout)
  - 1,966 catchments: Only Exotic Trout Species

* excluding NY

Identification of Brook Trout "Patches"

- "Patch"= a group of contiguous catchments occupied by wild brook trout.
- Patches not connected physically
  - Dams, warm water habitat, downstream invasive species
- Assumed to be genetically isolated populations



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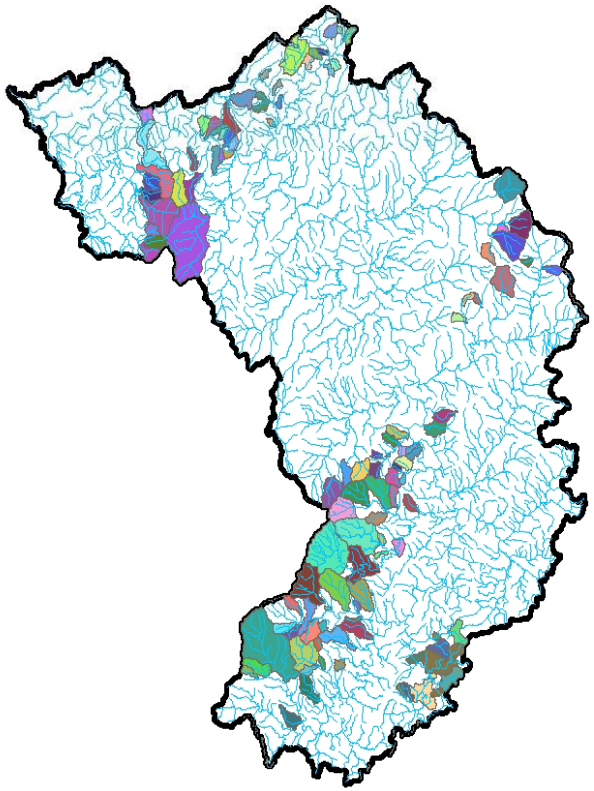
Patches



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Eastern Brook Trout
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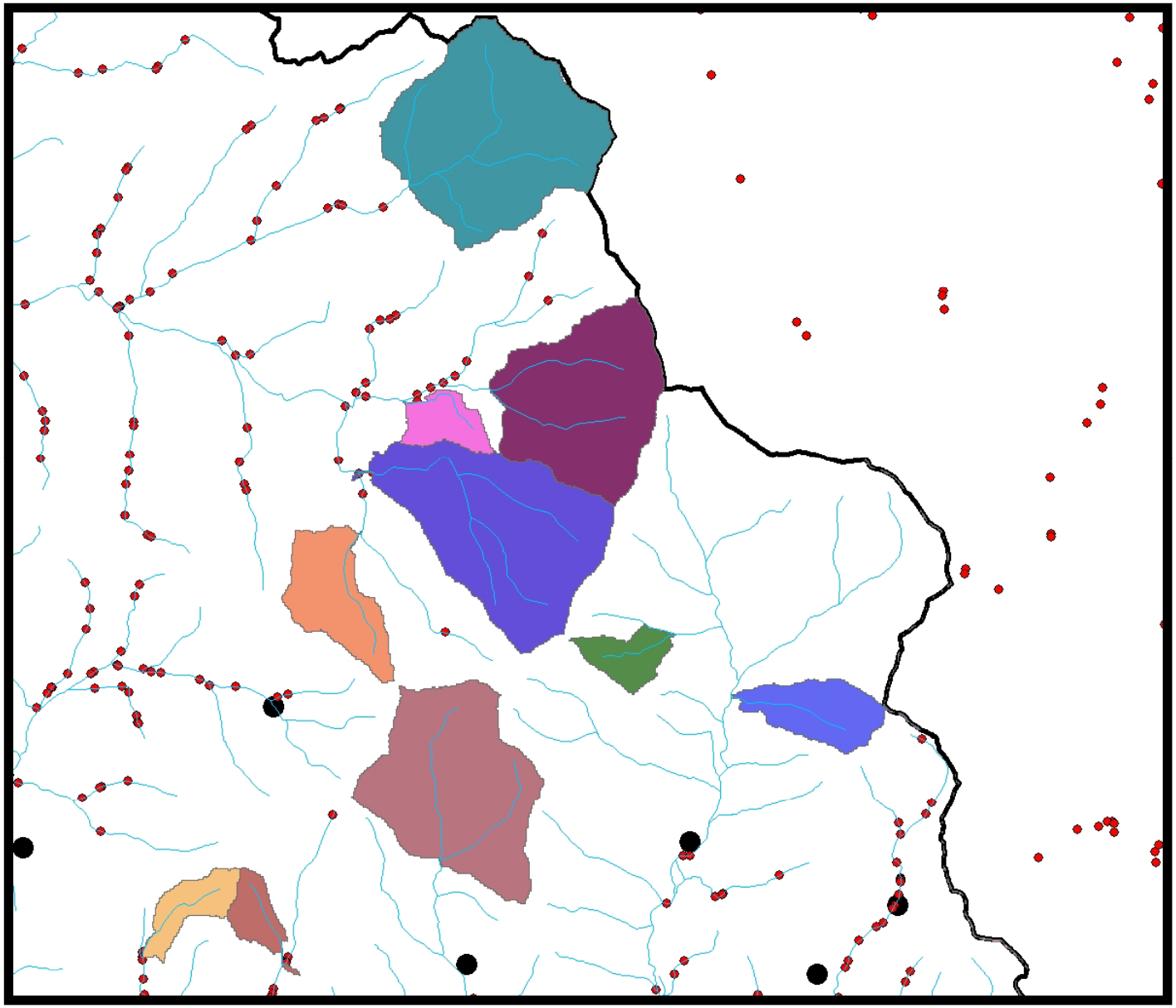

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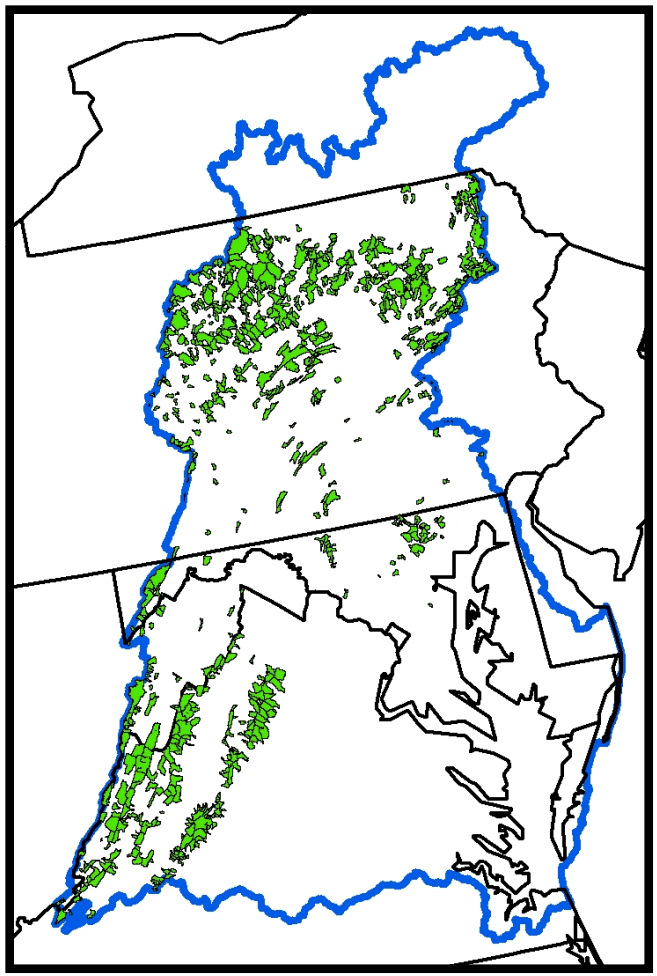
Chesapeake Bay Brook trout Patches (n=868)



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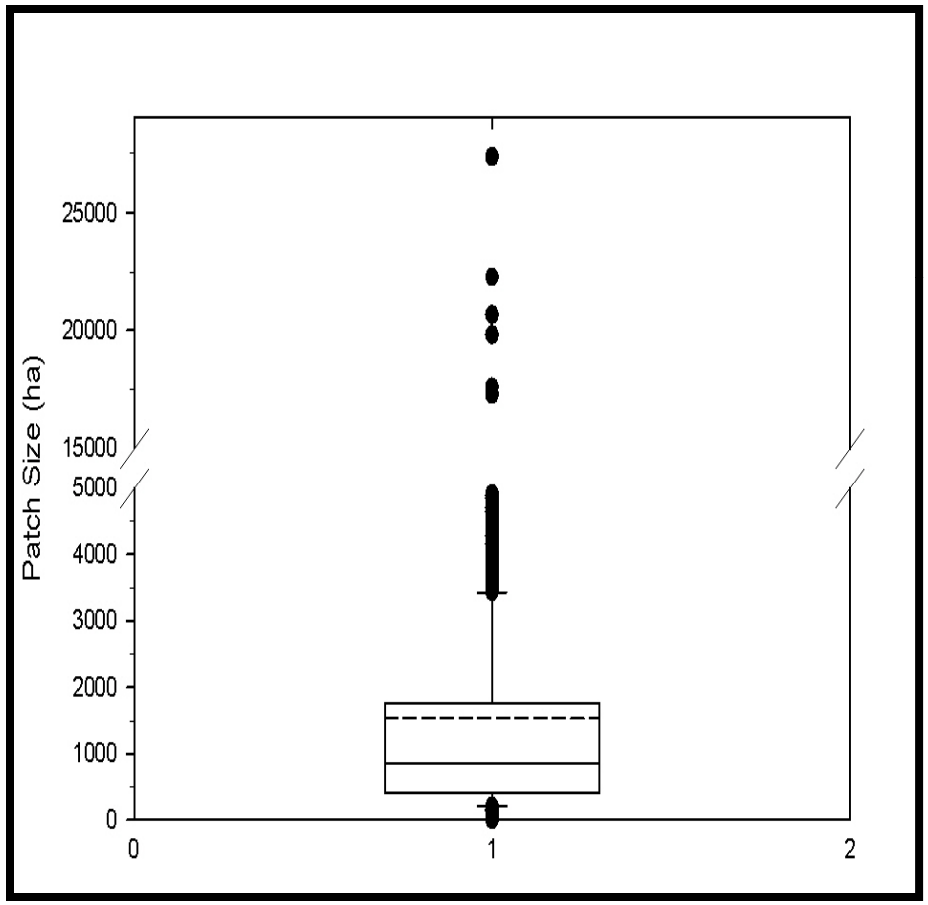
Patch - "Populations"

- Number of patches
  868
- Average size
  1,541 ha
- Median size
  855 ha



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Current Population Estimates

- Mark-Recapture
- Depletion Removal
- Problems:
  - Not viable for large scale monitoring
  - Expense
  - Inability to detect trend (i.e. large coefficient of variation % 50 adults; % 121 YOY)
  - Expansion to entire stream

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Patch
Metrics

Patch Metrics

Spatial Metrics

A. # of patches
B. # of patches with increasing size/connectivity(additional upstream and downstream catchments with brook trout)
C. # of patches decreasing in size/connectivity(loss of catchments)
D. Average patch size of the entire resource
E. # of patches with allopatric or sympatric(with brown or rainbow) populations