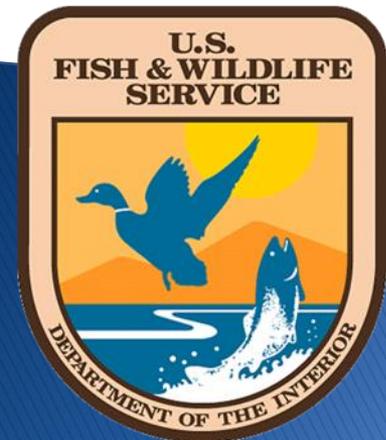


# Implications of Genetics on Wild Trout Management

Meredith L. Bartron  
USFWS-Northeast Fishery Center  
Lamar, PA



Pennsylvania Wild Trout Summit, August 26, 2017

# Why is genetic variation important?

- ▶ Provides the basis for adaptation

## Changes in seasonal climate outpace compensatory density-dependence in eastern brook trout

RONALD D. BASSAR<sup>1,2</sup>, BENJAMIN H. LETCHER<sup>1,2</sup>, KEITH H. NISLOW<sup>2,3</sup> and ANDREW R. WHITELEY<sup>2</sup>

<sup>1</sup>S.O. Conte Anadromous Fish Research Center, US Geological Survey, Leetown Science Center, Turners Falls, MA 01376, USA, research

## Flow regime, temperature, and biotic interactions drive differential declines of trout species under climate change

Seth J. Wenger<sup>a,1</sup>, Daniel J. Isaak<sup>b</sup>, Charles H. Luce<sup>b</sup>, Helen M. Neville<sup>a</sup>, Kurt D. Fausch<sup>c</sup>, Jason B. Dunham<sup>d</sup>, Daniel C. Dauwalter<sup>a</sup>, Michael K. Young<sup>e</sup>, Marketa M. Elsner<sup>f</sup>, Bruce E. Rieman<sup>g</sup>, Alan F. Hamlet<sup>f</sup>, and Jack E. Williams<sup>h</sup>

<sup>a</sup>Trout Unlimited, Boise, ID 83702; <sup>b</sup>US Forest Service Rocky Mountain Research Station, Boise, ID 83702; <sup>c</sup>Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO 80523-1474; <sup>d</sup>US Geological Survey Forest and Rangeland Ecosystem Science Center, Corvallis, OR 97331; <sup>e</sup>US Forest Service Rocky Mountain Research Station, Missoula, MT 59801; <sup>f</sup>Climate Impacts Group, Center for Science in the Earth System, University of Washington, Seattle, WA 98195-5672; <sup>g</sup>US Forest Service Rocky Mountain Research Station, Seeley Lake, MT 59868; and <sup>h</sup>Trout Unlimited, Medford, OR 97501

PNAS  
Transactions of the American Fisheries Society 144:373–382, 2015

© American Fisheries Society 2015  
ISSN: 0002-8487 print / 1548-8659 online  
DOI: 10.1080/00028487.2014.991446

### ARTICLE

## Environmental Factors Affecting Brook Trout Occurrence in Headwater Stream Segments

Yoichiro Kanno\*

Department of Forestry and Environmental Conservation, Clemson University, 261 Lehotsky Hall, Clemson, South Carolina 29634-0310, USA

Ecology of Freshwater Fish 2017: 26: 108–119

© 2015 John Wiley & Sons AS. Published by John Wiley & Sons Ltd

### ECOLOGY OF FRESHWATER FISH

## Effects of reduced summer flows on the brook trout population and temperatures of a groundwater-influenced stream

Andrew J. Nuhfer<sup>1</sup>, Troy G. Zorn<sup>2</sup>, Todd C. Wills<sup>3</sup>

rence of km<sup>2</sup>. A detection credit

## What impacts genetic diversity?

- ▶ Population size
- ▶ Migration (gene flow)
- ▶ Genetic drift (random change over time)
- ▶ Mutation



## Important components of brook trout biology

- ▶ Reside in small headwater streams
- ▶ Habitat can be fragmented due to barriers between streams

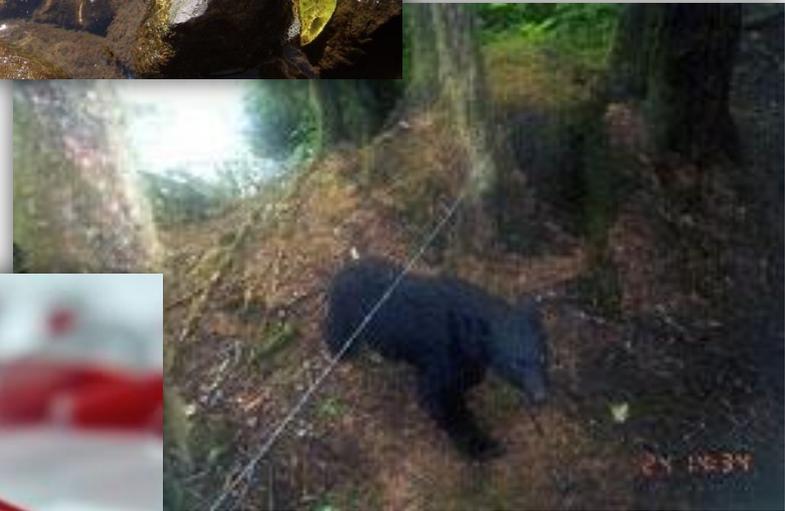


## What could this mean for wild trout?

- ▶ At greater risk for inbreeding & loss of genetic diversity
- ▶ Connected habitats are important to allow movement
- ▶ Loss of diversity can lead to reduced potential to persist & adapt



# How can we obtain genetic information?



# Applications of genetic tools to wild trout management

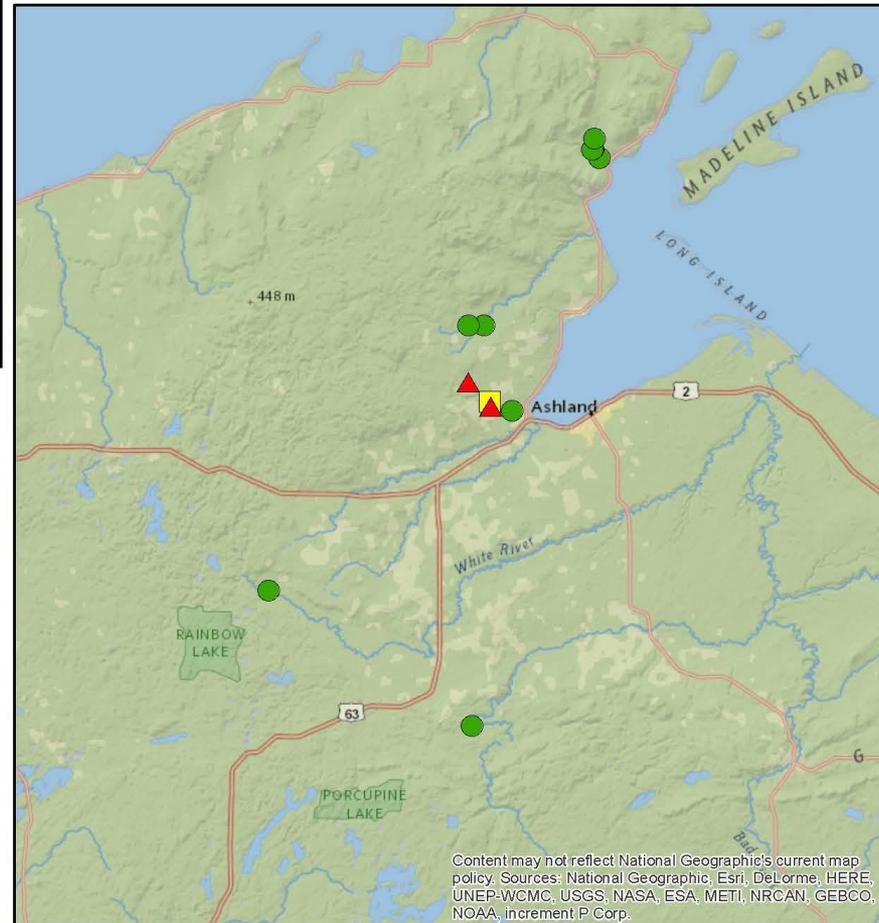


# Environmental DNA (eDNA)



## Brook Trout Detection

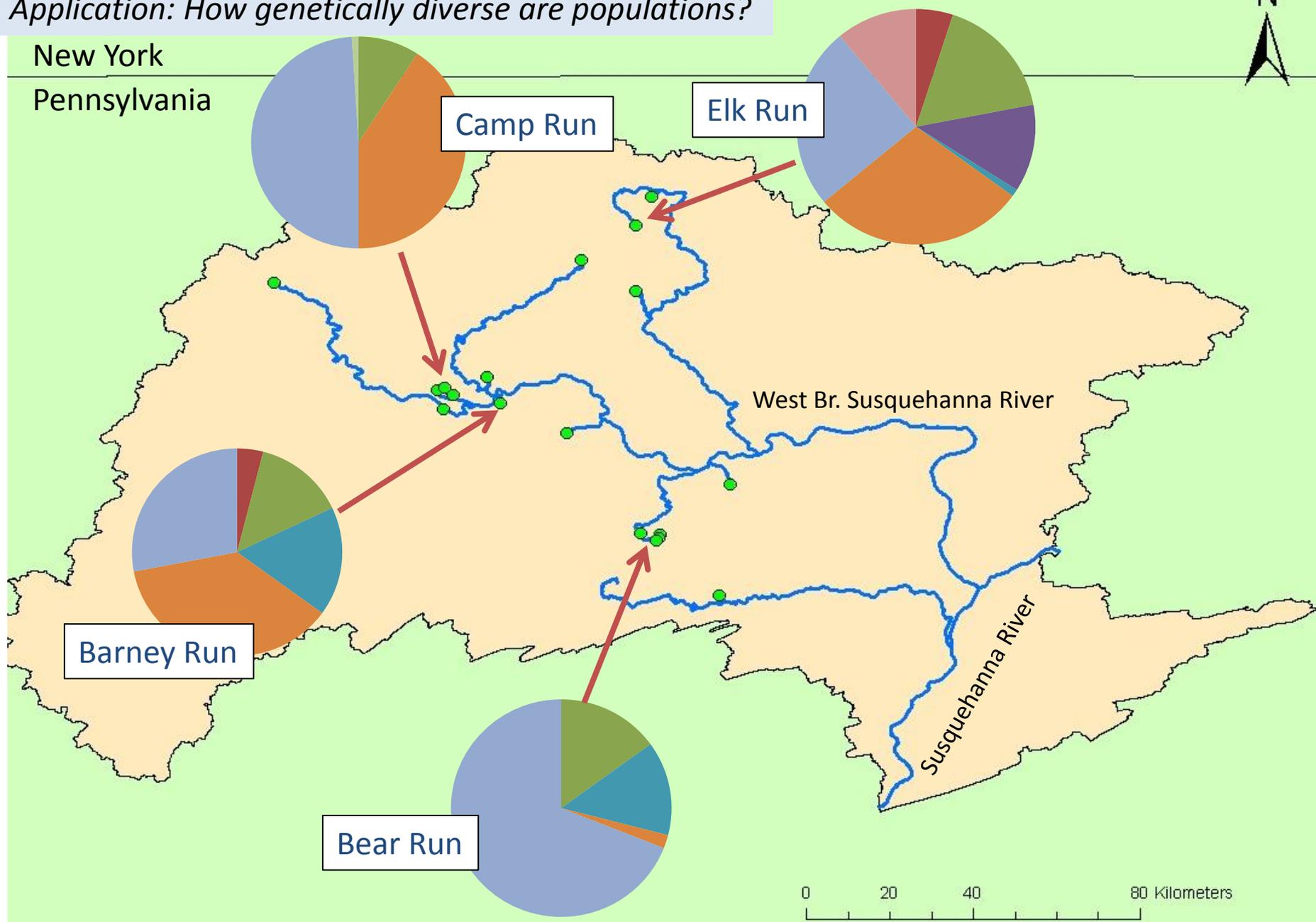
- ▲ No Detection
- Genetic Only
- Genetic and Electrofishing



*Application: How genetically diverse are populations?*

New York

Pennsylvania



Camp Run

Elk Run

Barney Run

Bear Run

West Br. Susquehanna River

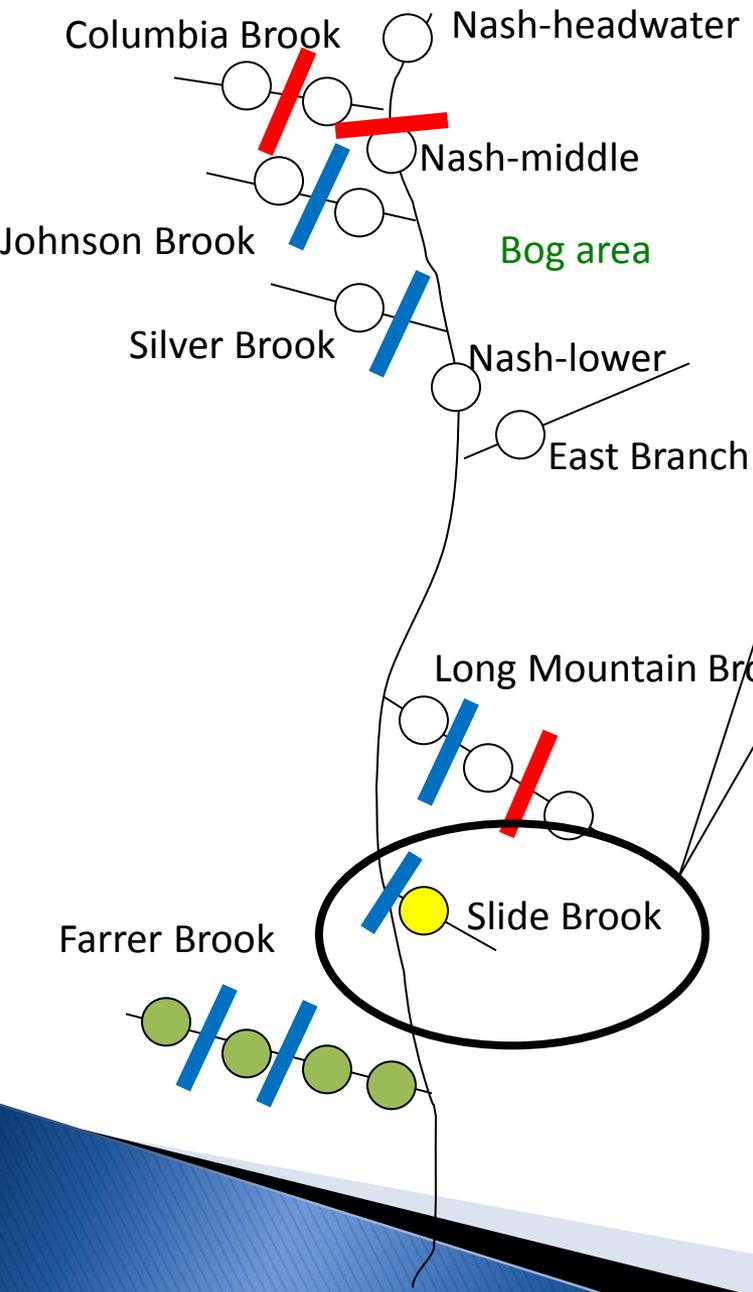
Susquehanna River

0 20 40 80 Kilometers

*Locus C129*

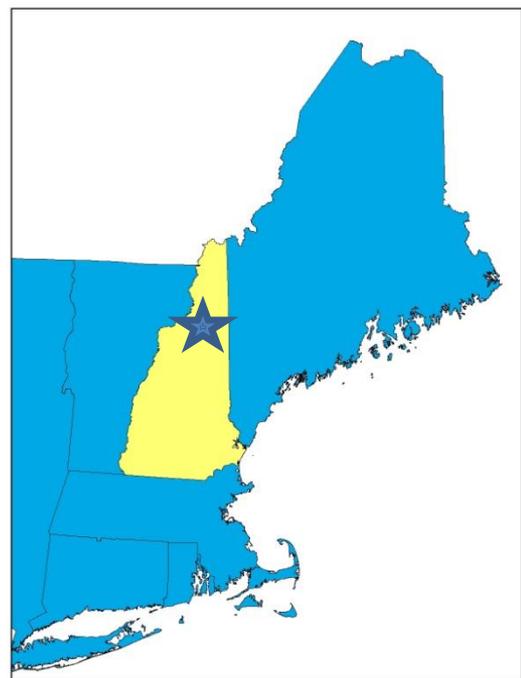
Application: Evaluate passage

# Slide Brook, Nash Stream, NH



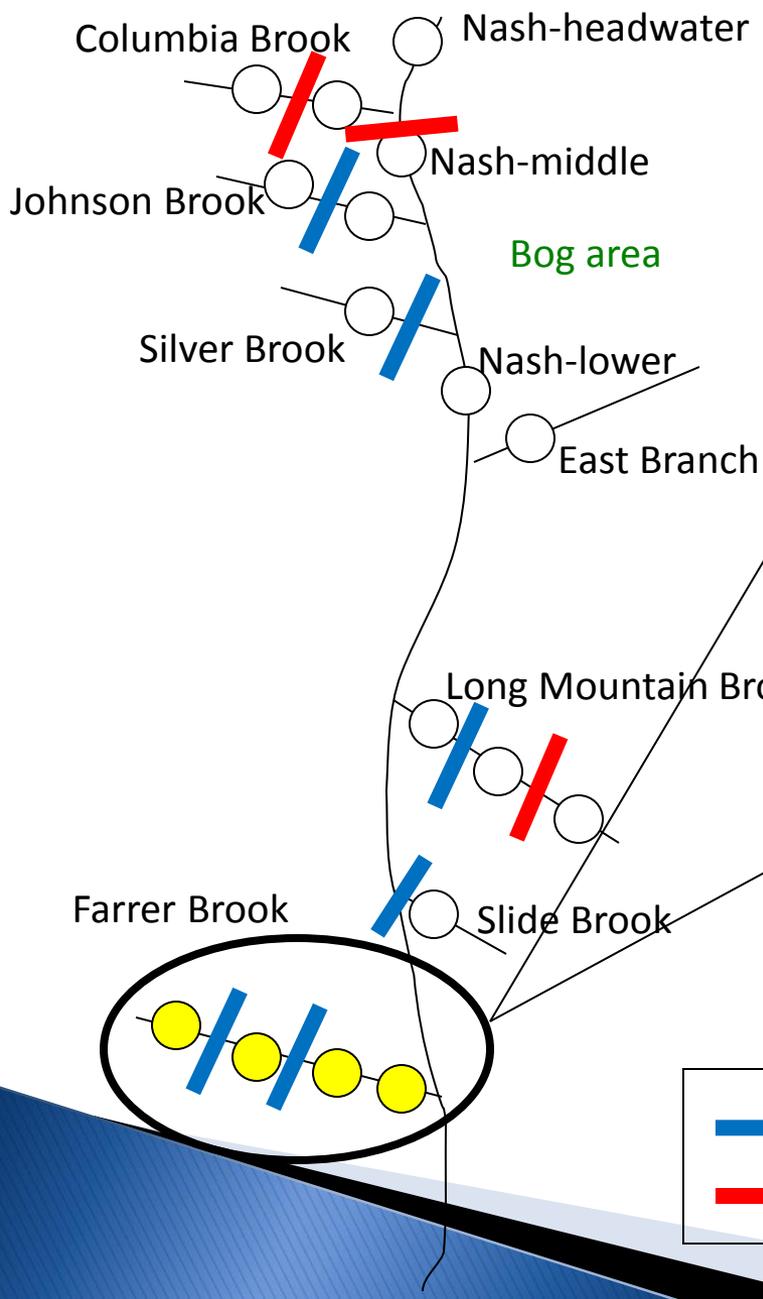
Slide Brook  
0.226  
Long Mountain Brook-lower

— Culvert  
— Waterfall

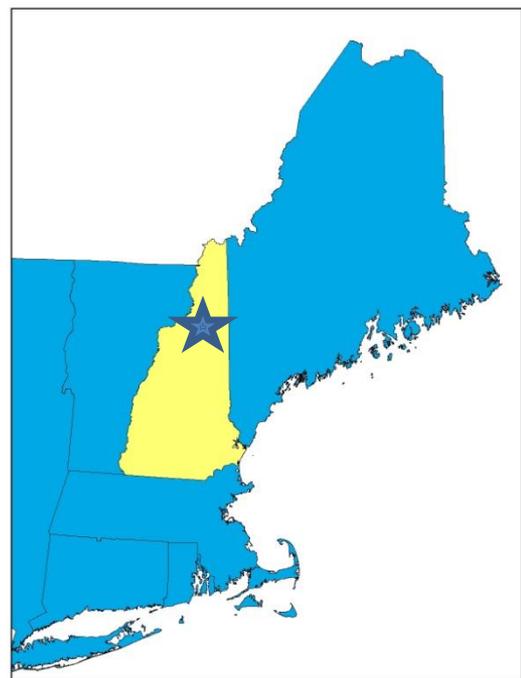


Application: Evaluate passage

# Farrer Brook, Nash Stream, NH



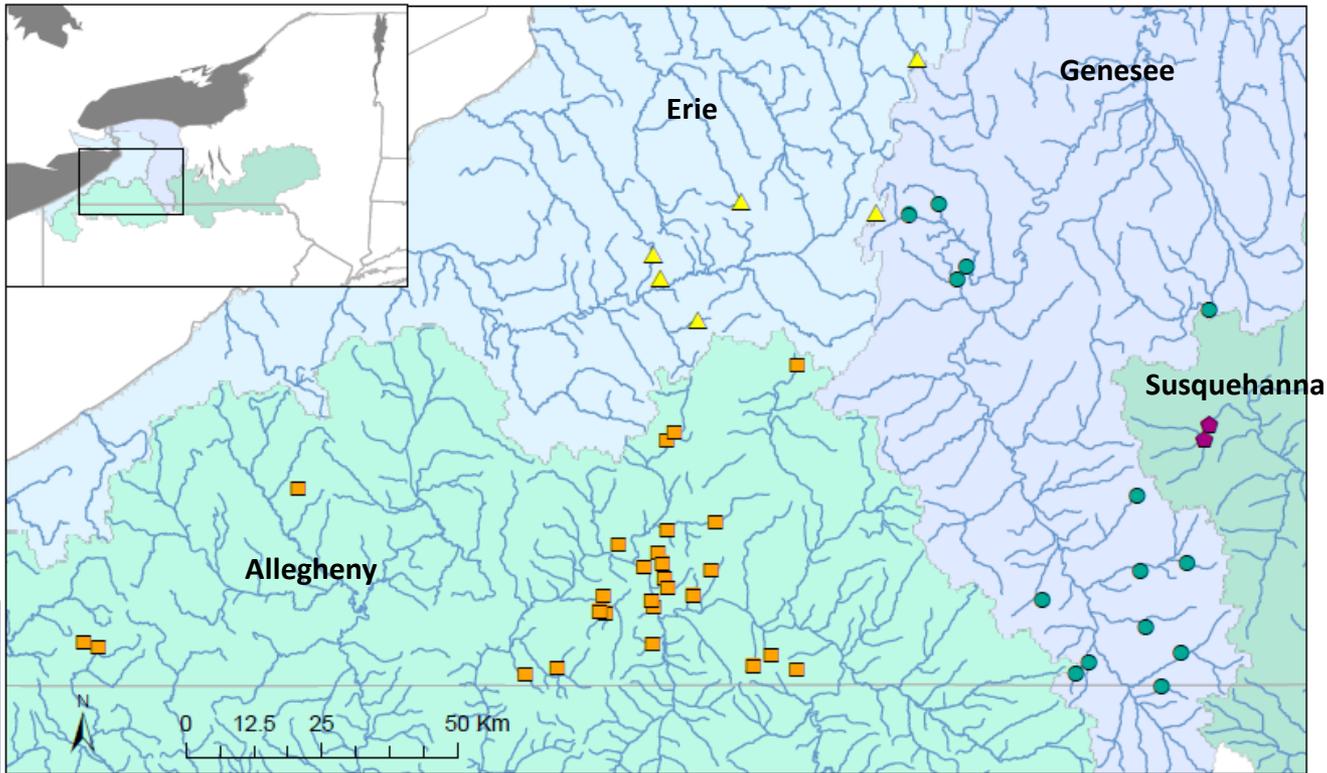
Upstream site	0.002
Upper Middle site	0.010
Lower Middle site	0.005
Downstream site	



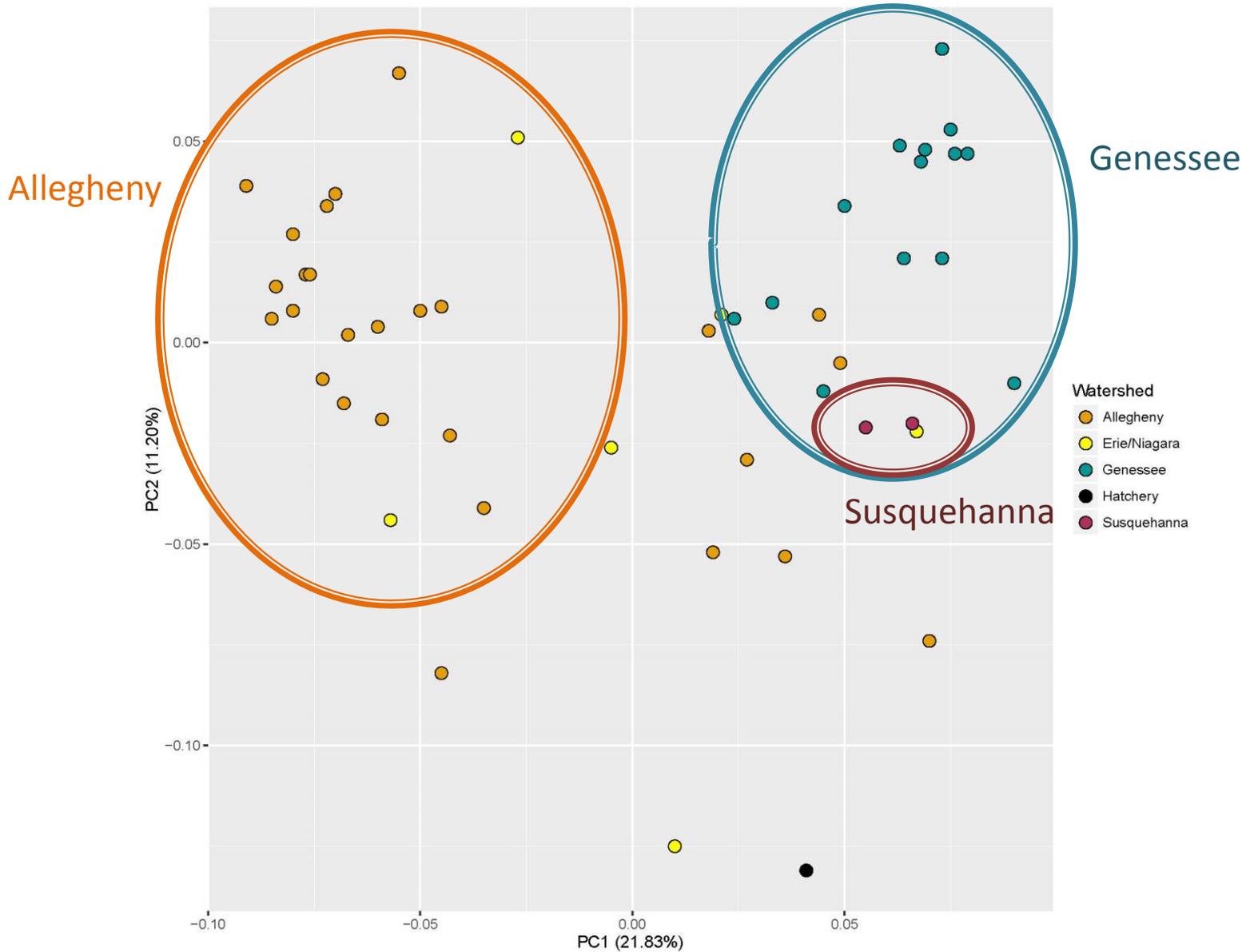
*Application: Compare populations*

## ***Western New York***

Basin	Collection Sites	<i>N</i> (Collected)
Allegheny	27	1,207
Genesee	14	649
Erie	6	300
Susquehanna	2	88
Randolph Fish Hatchery	1	50
<b>Total</b>	<b>50</b>	<b>2,294</b>



# How are populations related?



# Summary

- ▶ Genetic tools can be useful to:
  - Determine where brook trout are present
  - Assess the amount of genetic diversity within populations
  - Evaluate if barriers may impact migration
  - Learn how populations may be interacting with each other through gene flow
  - & many more...



Thank you!



Meredith\_Bartron@fws.gov

