Stantec

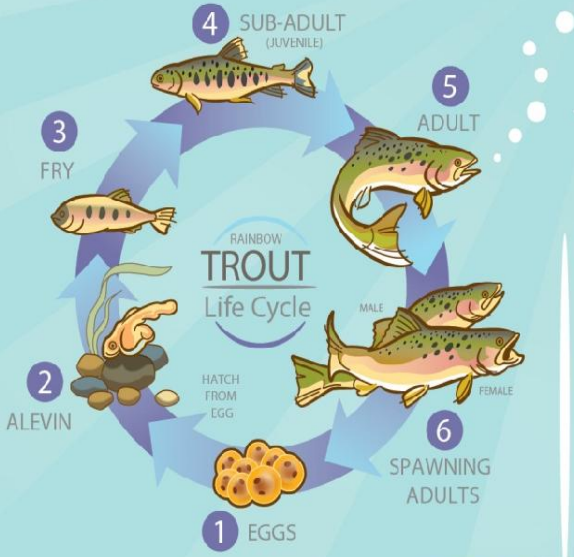
KDFWR
Hatchery Creek

Habitat Use Preference of Trout in Hatchery Creek

HATCHERY CREEK

DESIGN/BUILD STREAM PROJECT

KENTUCKY'S FIRST SUSTAINABLE TROUT STREAM



HERE'S WHAT WE'RE ACCOMPLISHING!

PROJECT TEAM

ecogro

RIDGEWATER RESTORATION & MANAGEMENT

Stantec

- Food Abundance
- Water Quality
- Water Temperature
- Habitat
- Holding Capacity

Design Approach

- REDD formation
- 15-35 mm
- Hyporheic Exchange
- Fine Sediment

Design Approach

- Low Velocity
- Warmer Temperature
- Cover

Design Approach

- Support Drift Feeding
- LWD Cover
- Less Holding Area


Design Approach
• Drift Feeding
• Cover
• Holding Capacity

- Stable Transition
- Allow Fish Passage

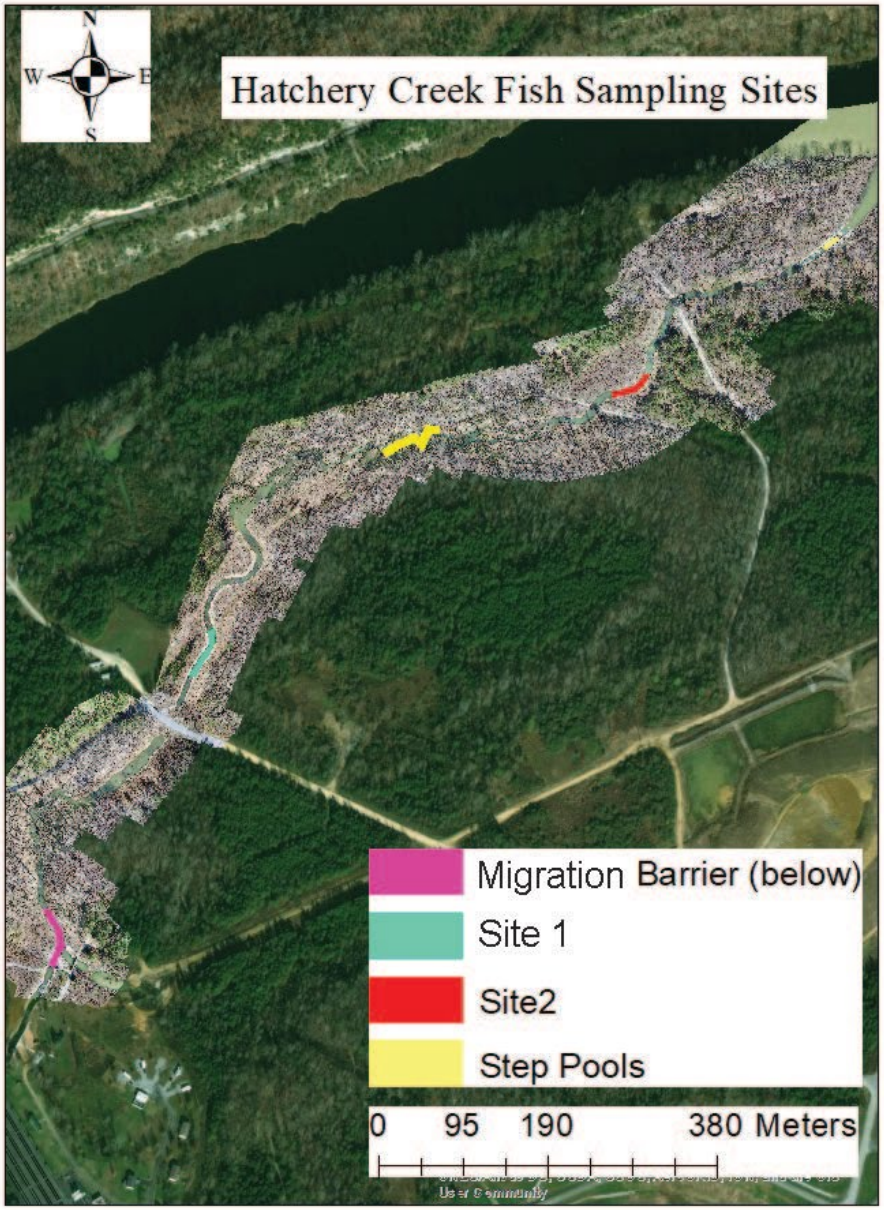
Design Approach

Study Purpose

- Attempt to explain variation of trout size within two apparently similar design reaches

Post Construction Data Collection

- Backpack Shocking conducted for 3 years by Murray State University
- Snorkle and habitat sampling conducted by Stantec
- Four sites shocked/sampled
- Drone recorded sampling to geolocate fish observations
- 2-D model development



Sitewide Comparison

- F-Test performed for comparison of reach means from snorkle observations
- Alpha criterion: 0.05
- Null Hypothesis $u1 = u2 = u3 = u4$
- Reject Null Hypothesis $u1 \neq u2$ ....

- Indicated difference in at least one reach mean
- Wide range of trout size and age
- Indicates reproduction
- Potential for preference due to available habitat

Site	Mean (mm)	Variance	Sample Size	P value
Site 1	165.7778	7397.677	45	2.85E-15
DA	78.57	1572.85	21	
Site 2	59.5	506.52	60	
Step Pool	98.18182	4576.364	11	

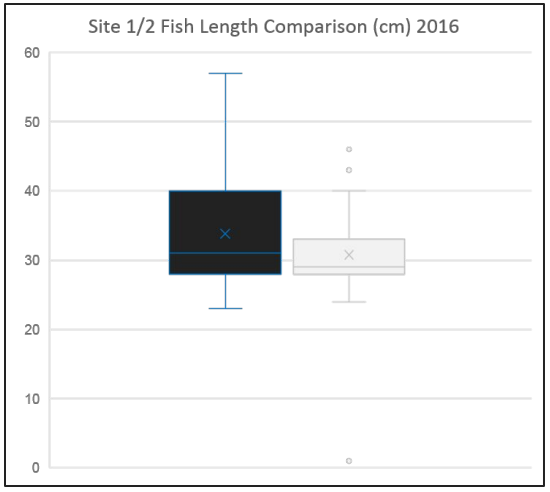
Reach Comparisons

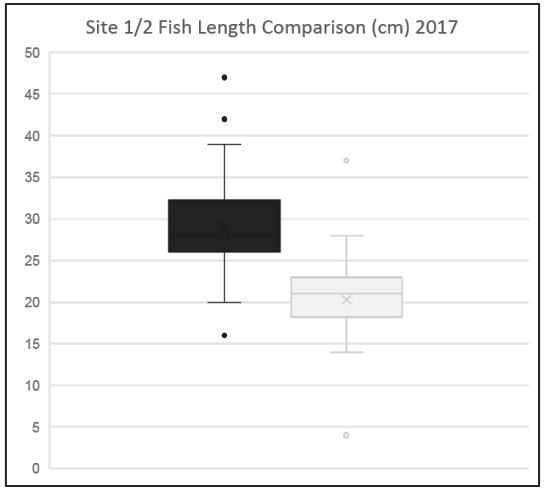
- T-Test performed for comparison of reach mean fish length from shocking data
- Welch's t-test
- Alpha criterion: 0.05
- Null Hypothesis *u1 = u2*

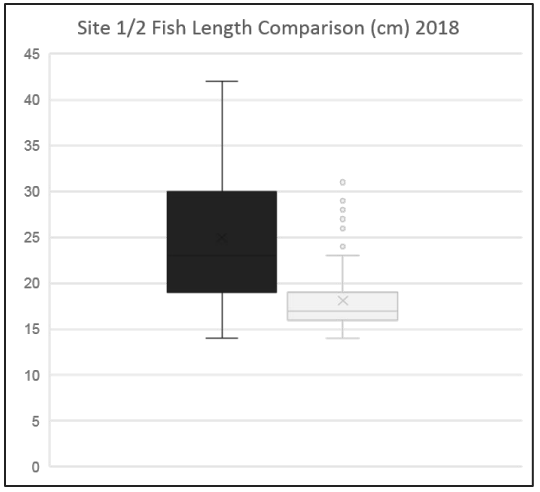
- Site 1 and Site 2 most heavily fished reaches
- Anglers say larger fish located in Site 1 but more catches in Site 2
- F Test also suggests preference
- Reject Null Hypothesis in 2017 and 2018

Date	Sampling Site	Mean (cm)	Variance	T Stat	P Value	n
3/16/2016	Site 1	33.84	67.83	1.96	0.052	67
	Site 2	30.74	57.19			39
4/17/2017	Site 1	28.94	36.42	6.25	3.58E-08	34
	Site 2	20.33	30			36
3/6/2018	Site 1	24.98	59.14	6.46	1.23E-08	58

Reach Comparisons





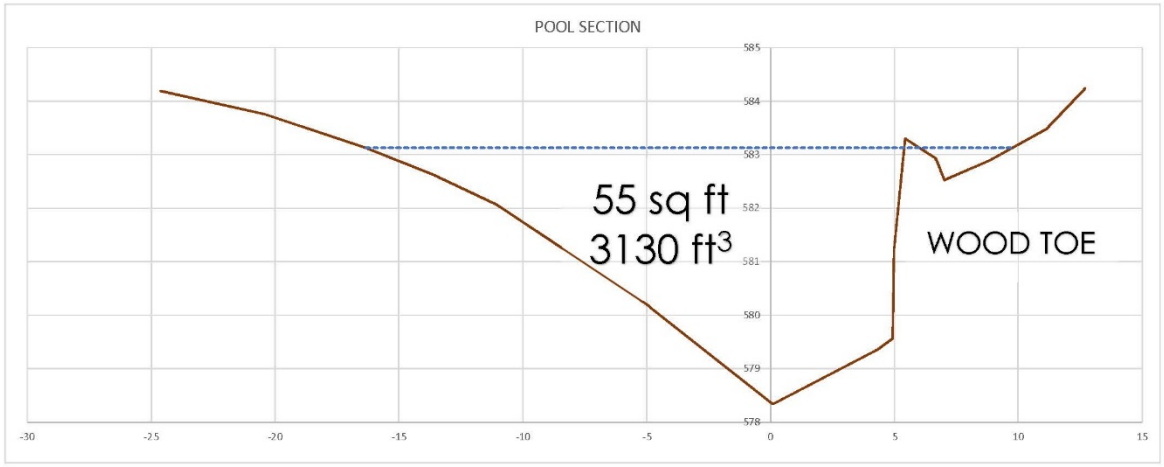


Two-dimensional model

- Collected detailed topo data to produce surface
- 0.5’ grid mesh
- HEC-RAS 5
- Modeled min and max flows from hatchery discharge
- Used drone aerial photography surface water extents and as-built water surface profile data to calibrate for sampling day discharge
- 33cfs most closely correlated with observed discharge

Site 1

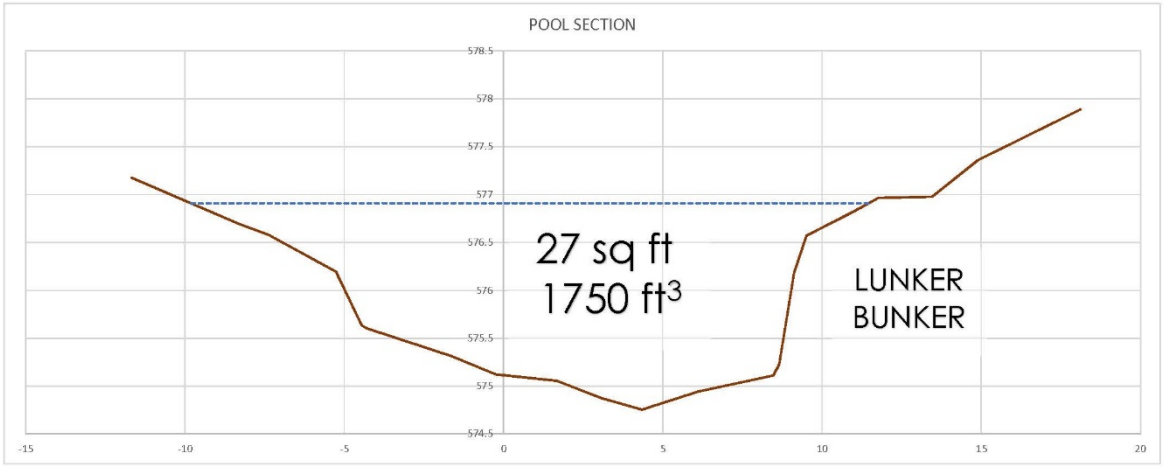
- Depth
- Velocity
- Area
- Blockage Ratio
  - 0.16
- Wood Volume
  - 630 ft^3
- Slope
  - (0.56%)



Fish location data and drone imagery provided by Patrick Vrablik and Dr. Flinn of Murray State University

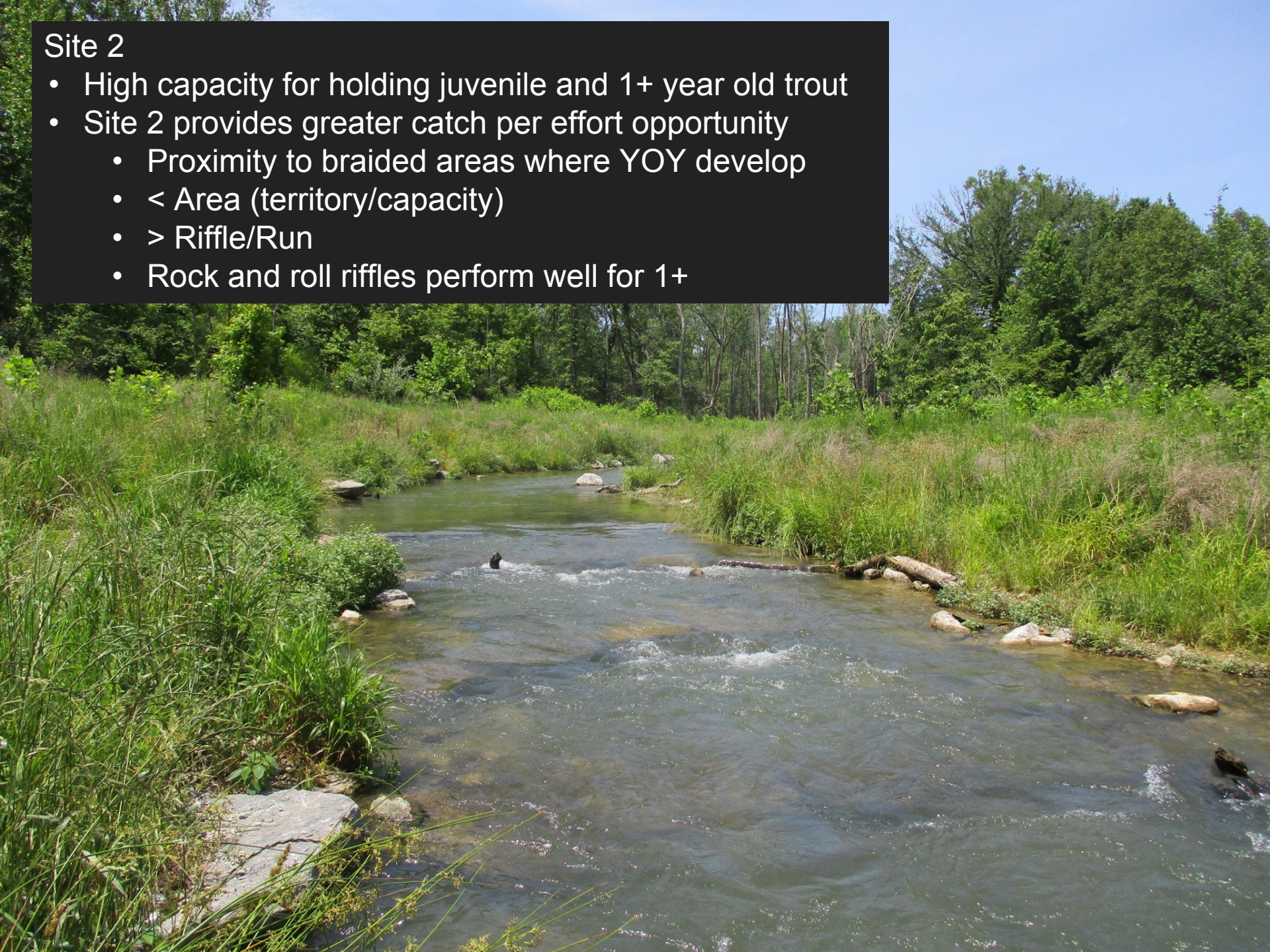
Site 2

- Depth
- Velocity
- Area
- Blockage Ratio
  - 0.09
- Wood Volume
  - 130 ft^3
- Slope
  - (0.67%)



Fish location data and drone imagery provided by Patrick Vrablik and Dr. Flinn of Murray State University

- Study Results
- Site 1 holding larger trout
  - > Area (territory/capacity)
  - > Pool habitat
  - > Cover/Diversity
  - Proximity to optimal spawning habitat



Site 2

- High capacity for holding juvenile and 1+ year old trout
- Site 2 provides greater catch per effort opportunity
  - Proximity to braided areas where YOY develop
  - < Area (territory/capacity)
  - > Riffle/Run
  - Rock and roll riffles perform well for 1+

Reflections

- Differences in design parameters and habitat can play a large role in the success of a fishery
- Wide range of fish age classes suggests reproduction is occurring
- Will age class distributions change in Hatchery Creek over time?
- Great resource for the public
- May be more susceptible to disease
- Dynamic watersheds
  - Sediment transport, stability, in addition to habitat