Lewis River Bull Trout: Synthesis of Known Information

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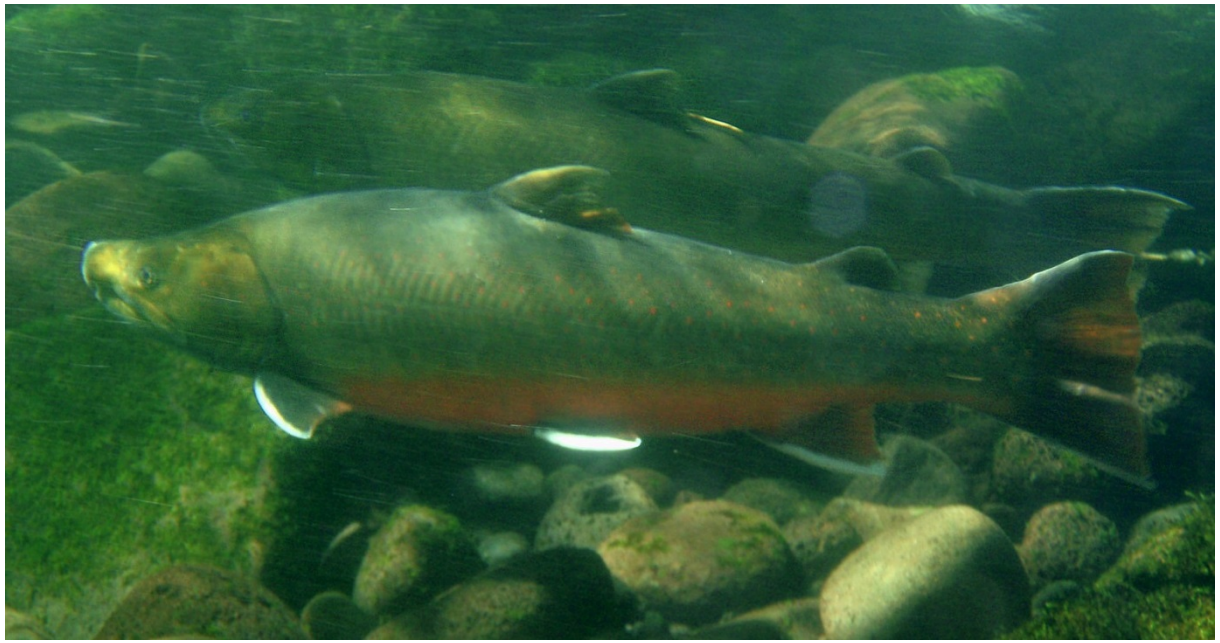


Background on LRBTRT

- Lewis River Bull Trout Recovery Team
- Subgroup of the Lewis River Aquatic Coordination Committee
- Analogous to bull trout core area working groups
- Regularly met for several years to identify and implement needed RME actions to benefit bull trout in the Lewis River subbasin

Background on need for synthesis document

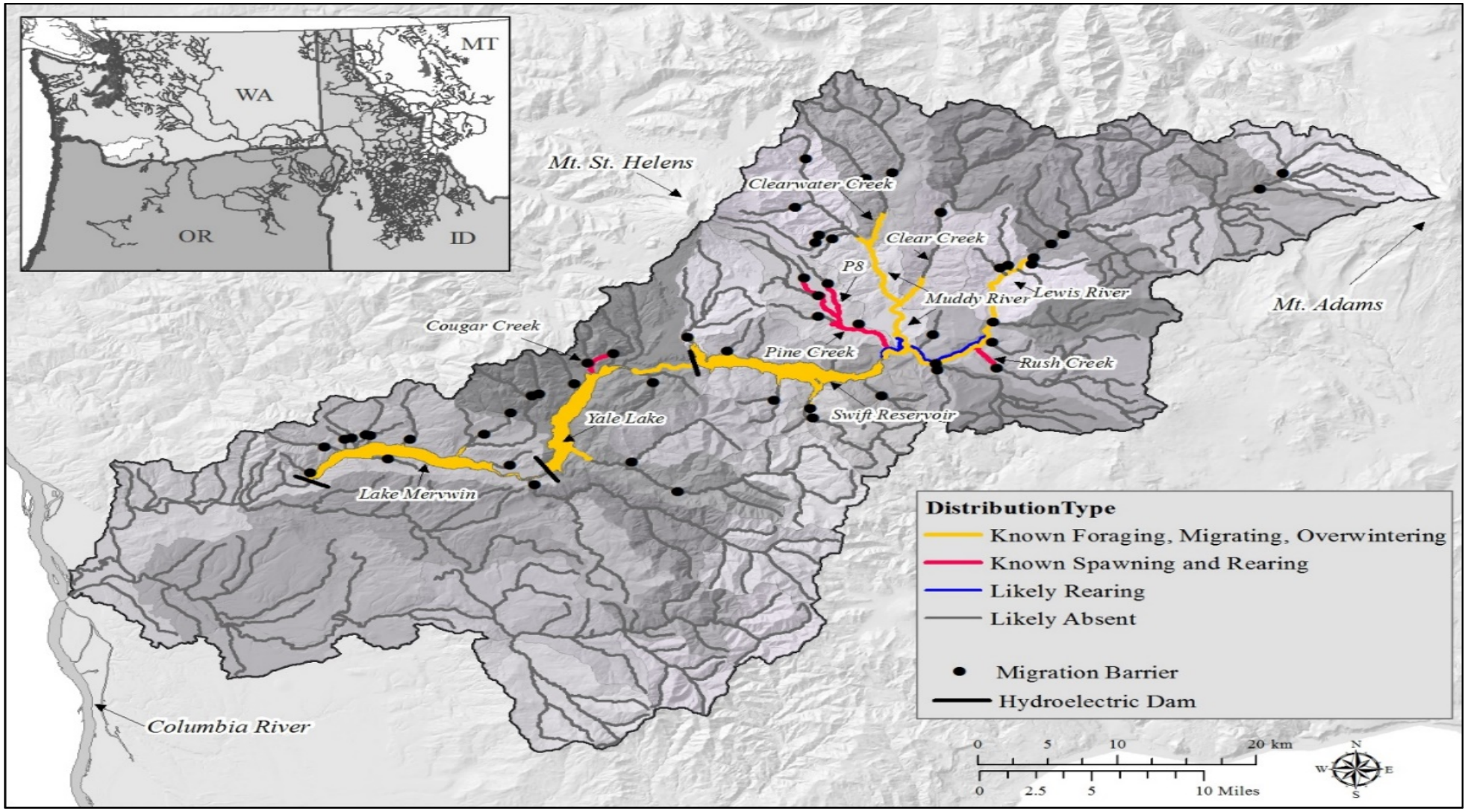
- Following completion of the bull trout recovery plan and RUIP (2015), the LRBTRT began work to develop a monitoring plan for bull trout in the Lewis River subbasin that addresses information needs of the recovery plan
- To fully develop this plan, the need was identified to synthesize known information for bull trout in the subbasin
- This document comprises a synthesis of bull trout information collected in the Lewis River for over two decades, and is the first such compilation of information in the subbasin since Graves (1982)

Background on need for synthesis document

- The synthesis document summarizes information on:
  - Habitat
  - Demographic characteristics
  - Vital rates
  - Spatial distribution
  - Movement patterns
  - Genetic diversity
  - Limiting factors

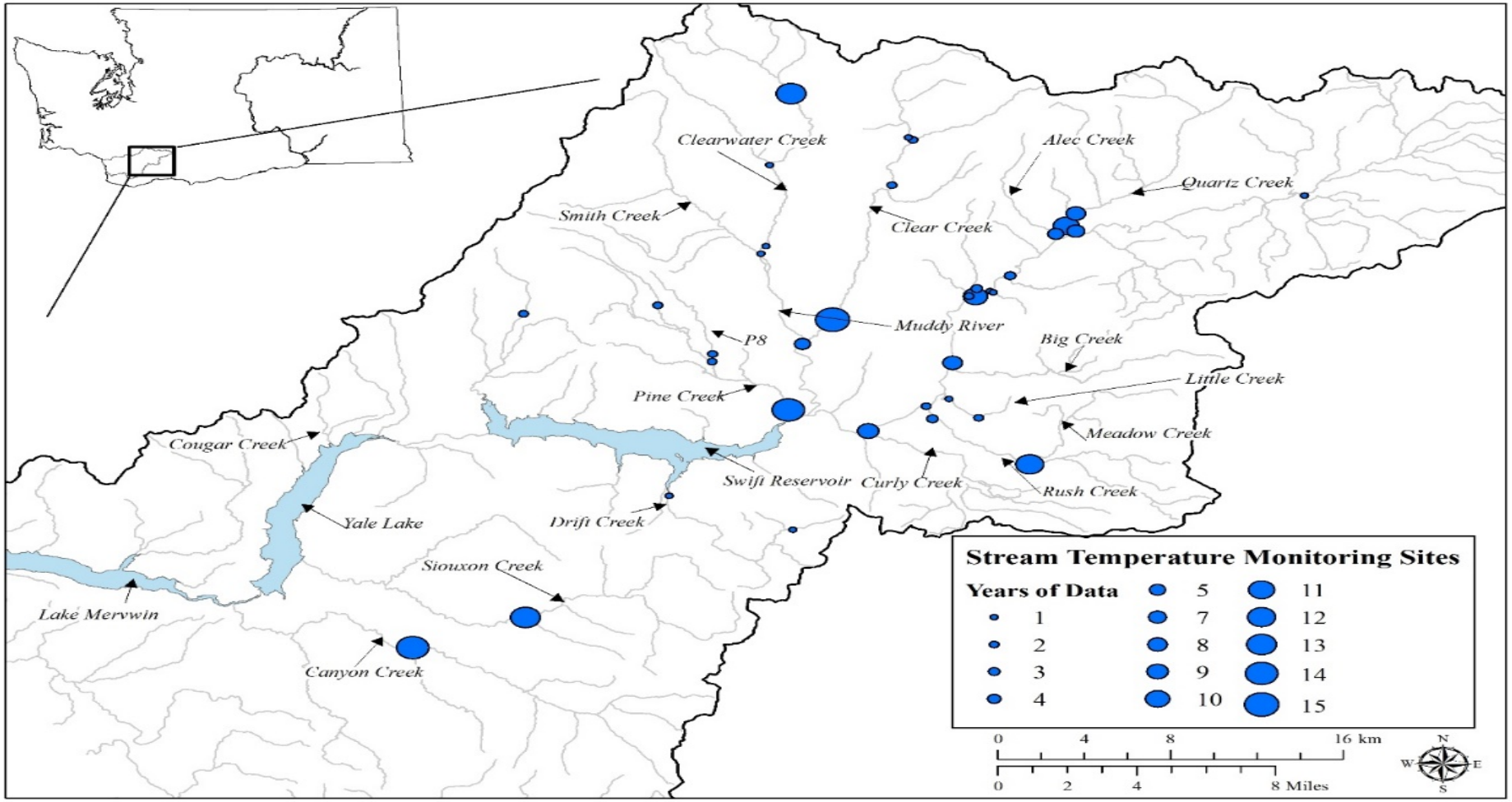
- Identifies data gaps and RME needs

Study area/subbasin description



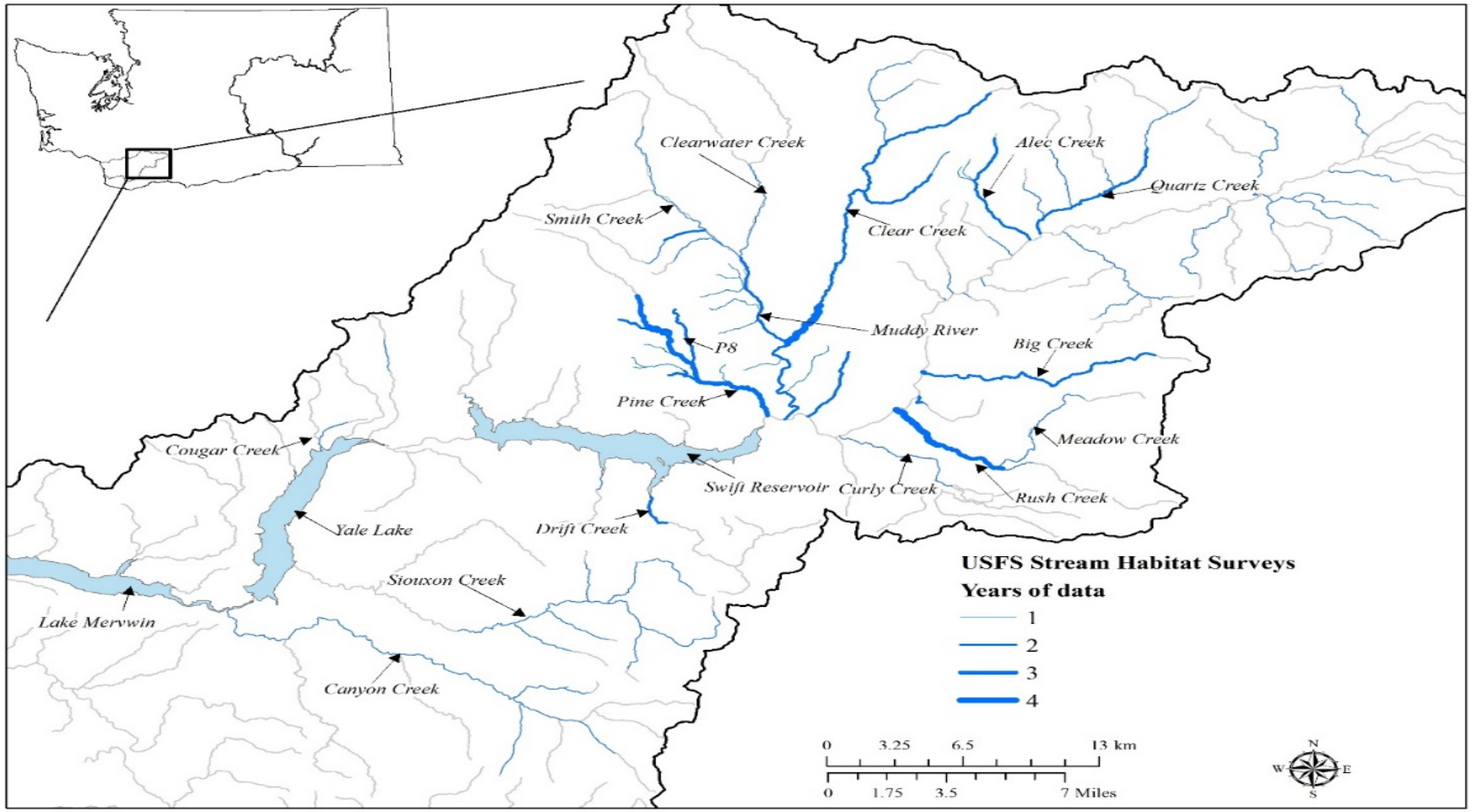
Habitat

Stream Temperature



Habitat

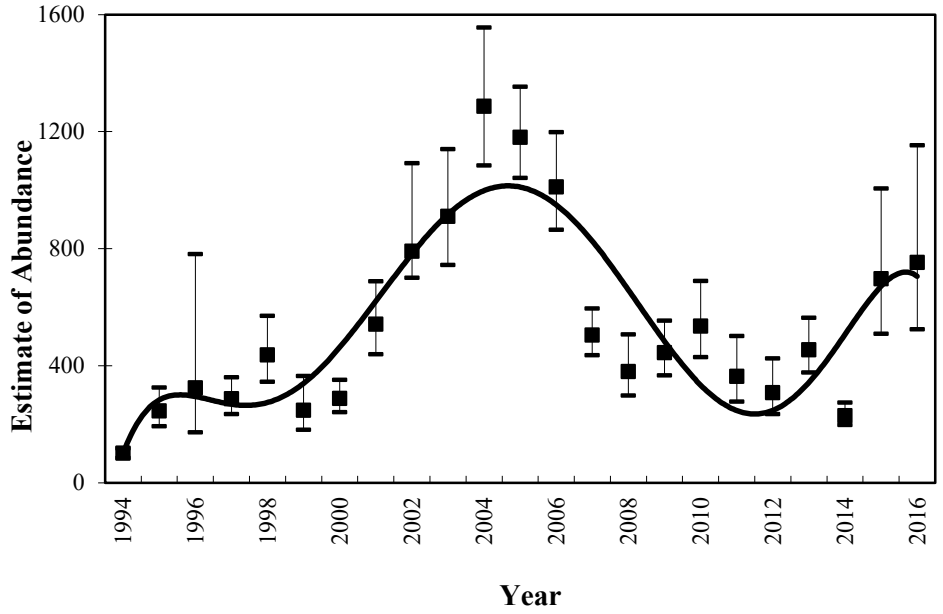
In-stream Habitat



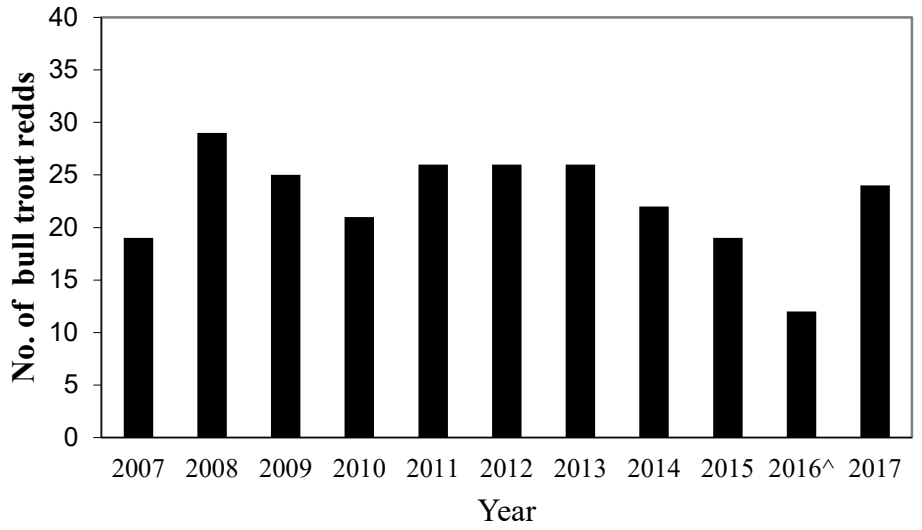
Demographic characteristics

Abundance

Swift populations



Cougar Creek (Yale)



Demographic characteristics

Effective population size – Nb (effective number of breeders)

	Spawn Year			
Tributary	2013	2014	2015	2016
Pine Creek	21.7 (16.4-29.2)	19.5 (15.2-25.1)	16.8 (13.2-21.6)	15.5 (12.7-18.8)
Rush Creek	18.4 (12.9-27.8)	23.0 (18-29.8)	7.4 (3.9-12.4)	12.8 (9.3-18.0)
Cougar Creek	na	18.7 (15.2-23.2)	18.2 (6.8-∞)	18.2 (14.0-23.7)

Demographic characteristics

Sex Ratio

Demographic characteristics

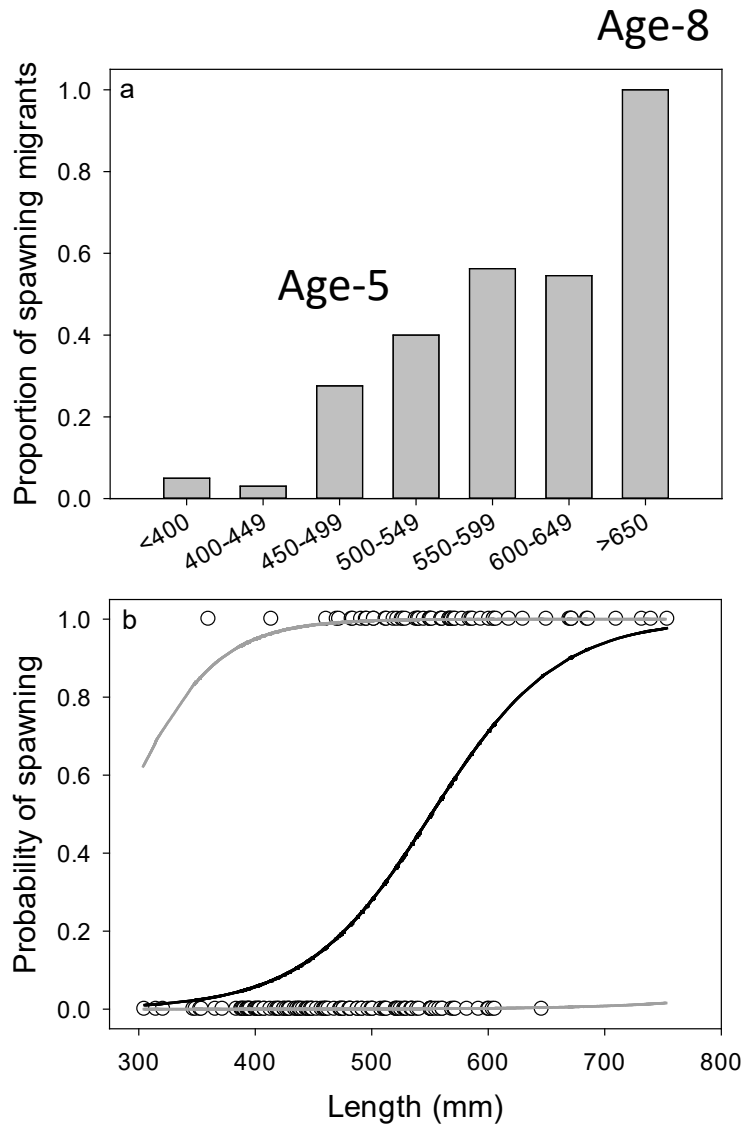
Age structure

- Age structure has been modeled and is available for incorporation into age or size structured population models
- According to the model, an 8-year old bull trout would be approximately 641 mm

Demographic characteristics

Age at maturity

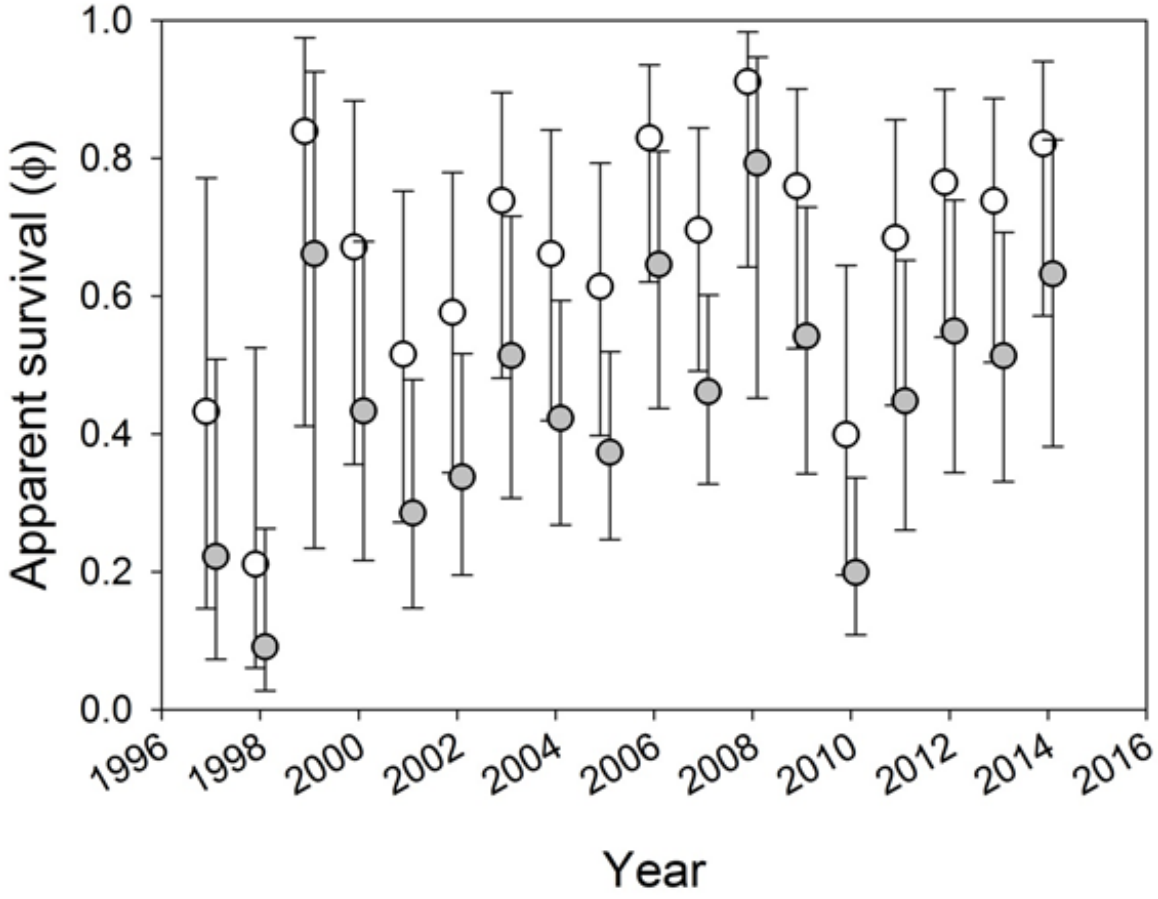
- Information suggests that bull trout 260-450 mm FL, while demonstrating spawning runs, are subadults
- Increasing trend in proportion of fish demonstrating spawning migrations with increasing body size
- All bull trout > 650 mm FL (at least age-8) are sexually mature



Vital rates

Survival

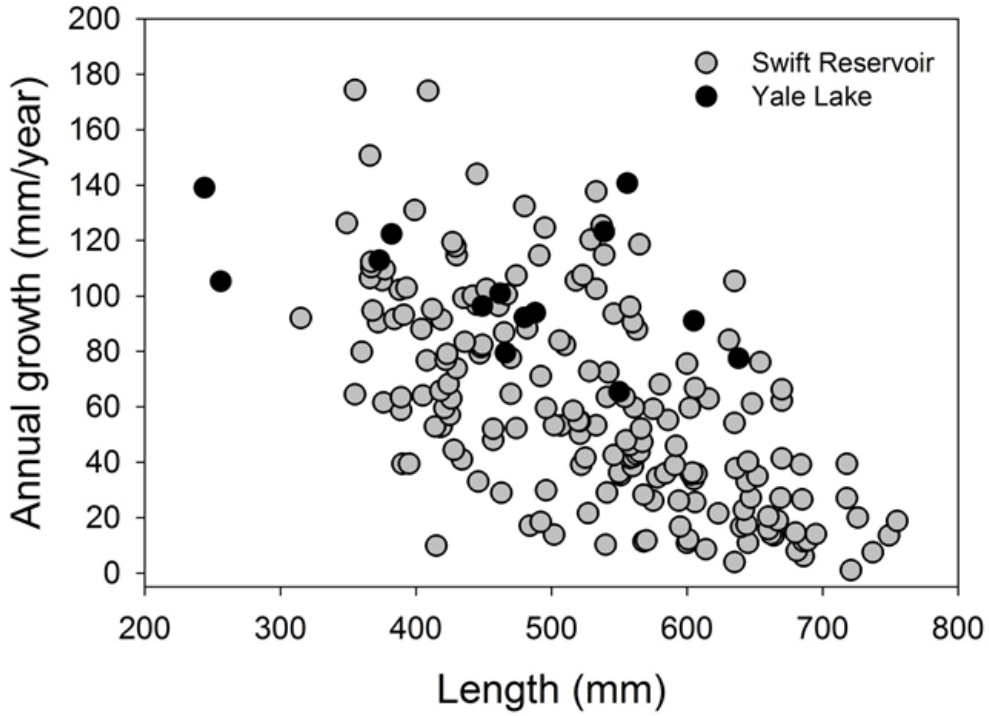
- Survival for the period of analysis was variable and indicated subadult survival was greater than adult survival
- Pronounced increase in apparent survival of both groups after 1998



Vital rates

Growth

- Little difference in growth patterns between bull trout in Yale Lake and Swift Reservoir
- Growth estimates are similar to adfluvial bull trout from elsewhere



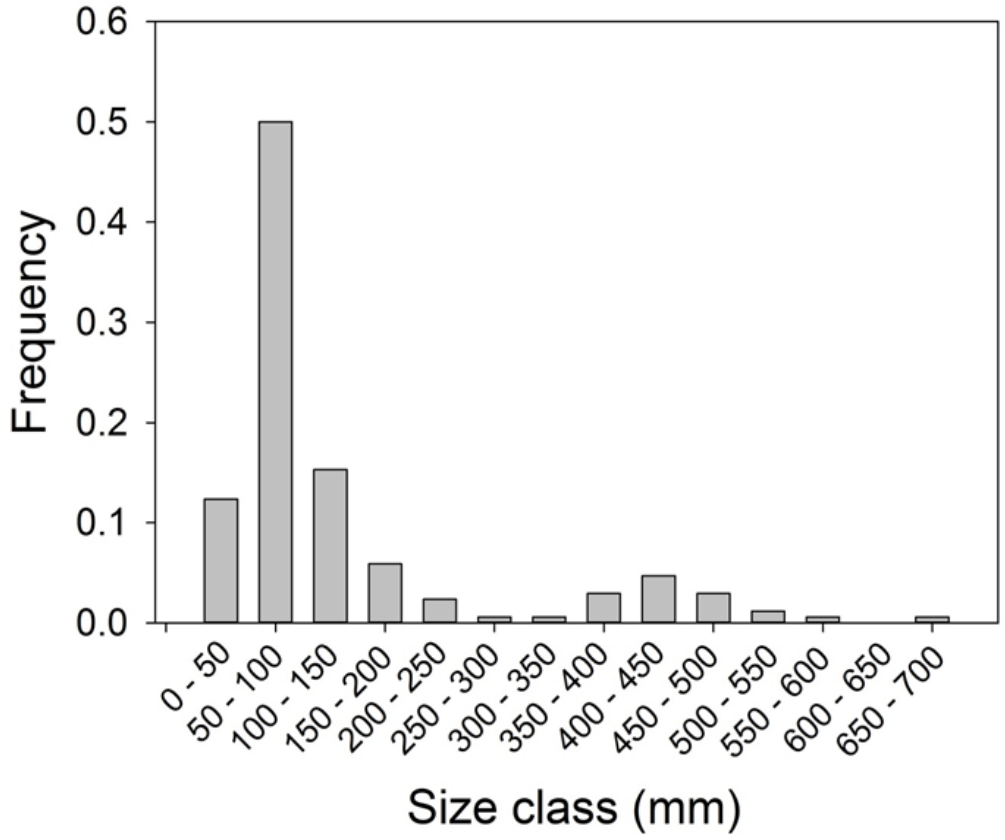
Vital rates

Fecundity

Spatial distribution

Length-frequency of bull trout in tributaries

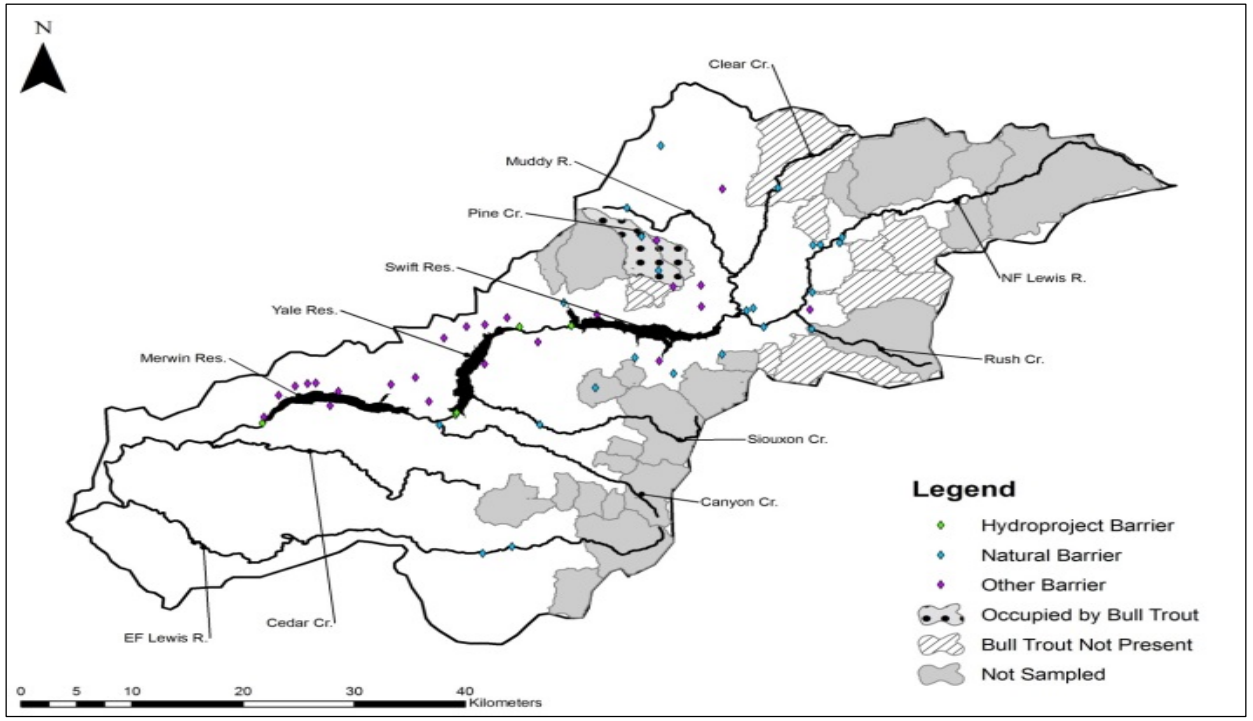
- Majority of bull trout within tributaries are age-1 to age-3 individuals
- A number of adult bull trout utilize tributaries during the late summer, prior to onset of spawning



Spatial distribution

Occupancy and distribution

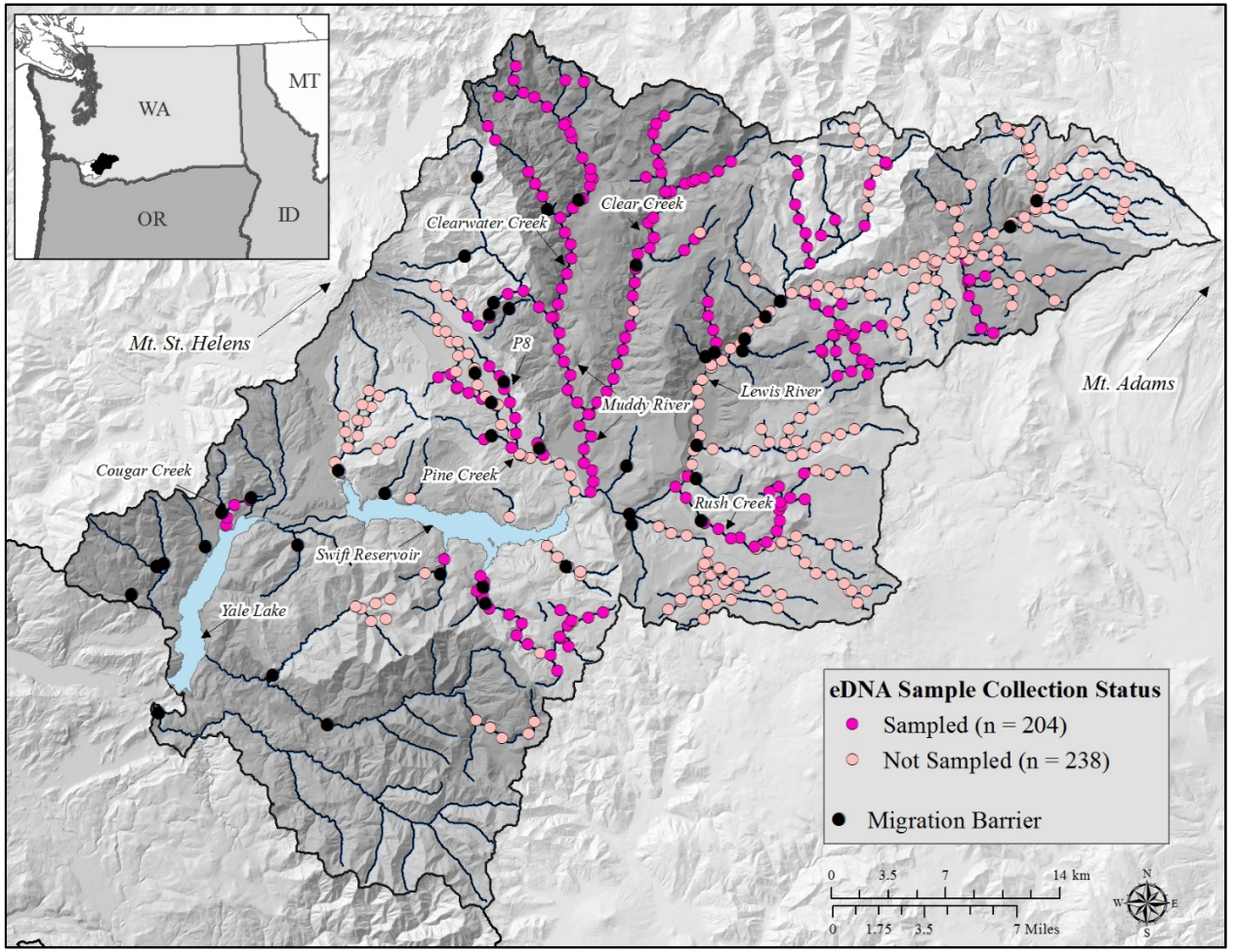
- Bull trout occupy patches known to currently support spawning and early life rearing



Spatial distribution

eDNA

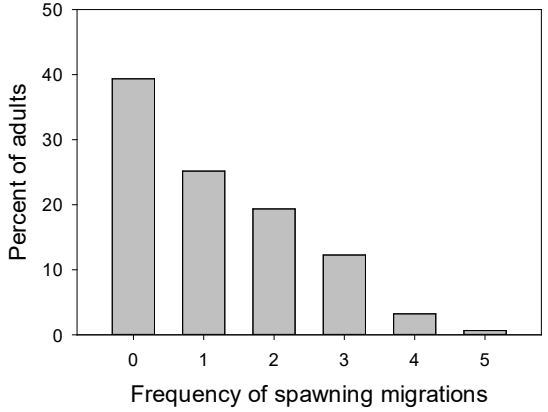
- eDNA analysis supports results from occupancy surveys and currently known areas of spawning and early life rearing



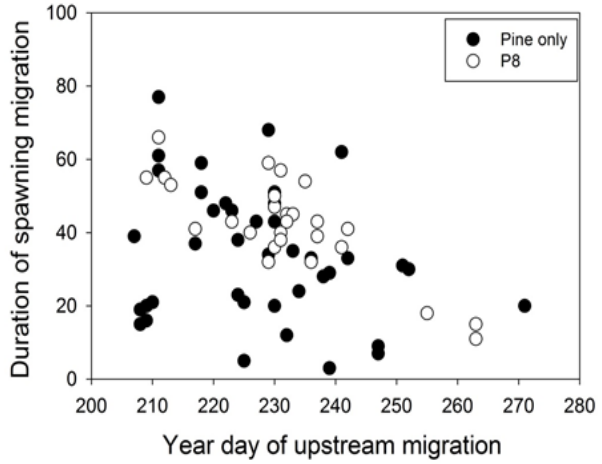
Movement patterns

PIT monitoring

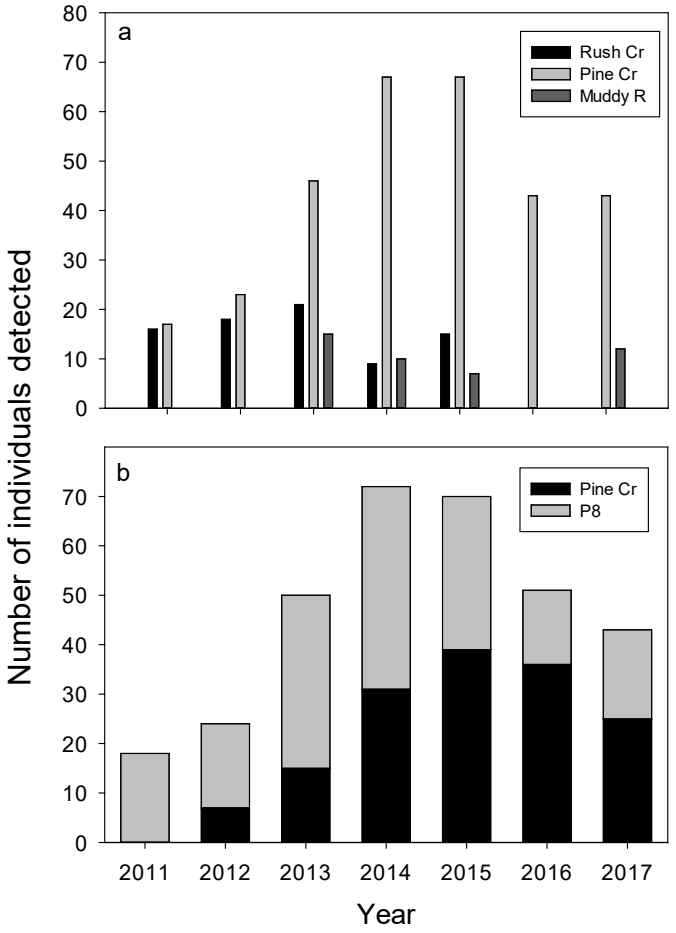
Frequency of Spawning Migrations



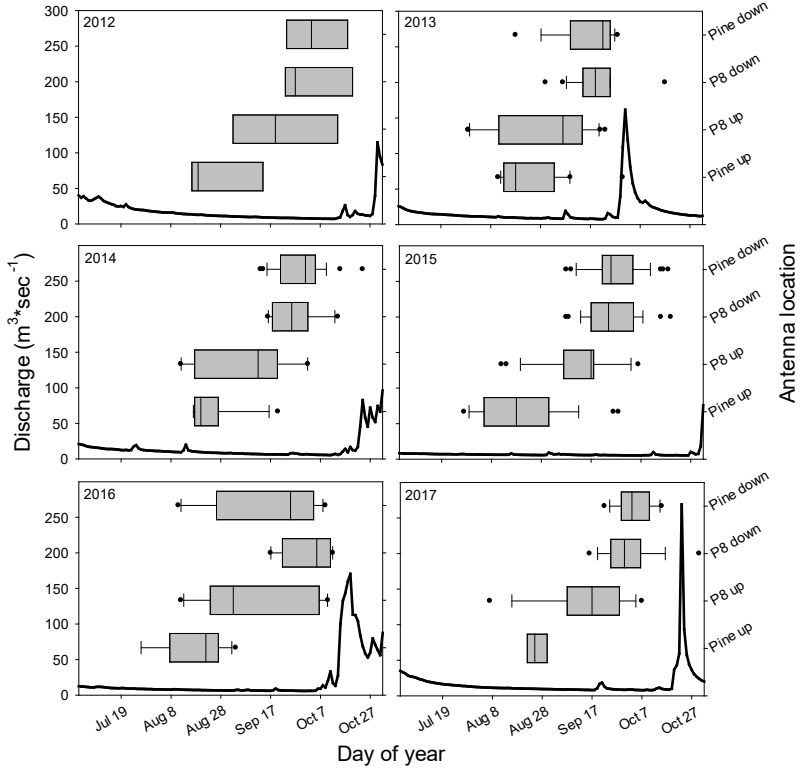
Duration of Spawning Migrations



Tributaries Used During Spawning Season



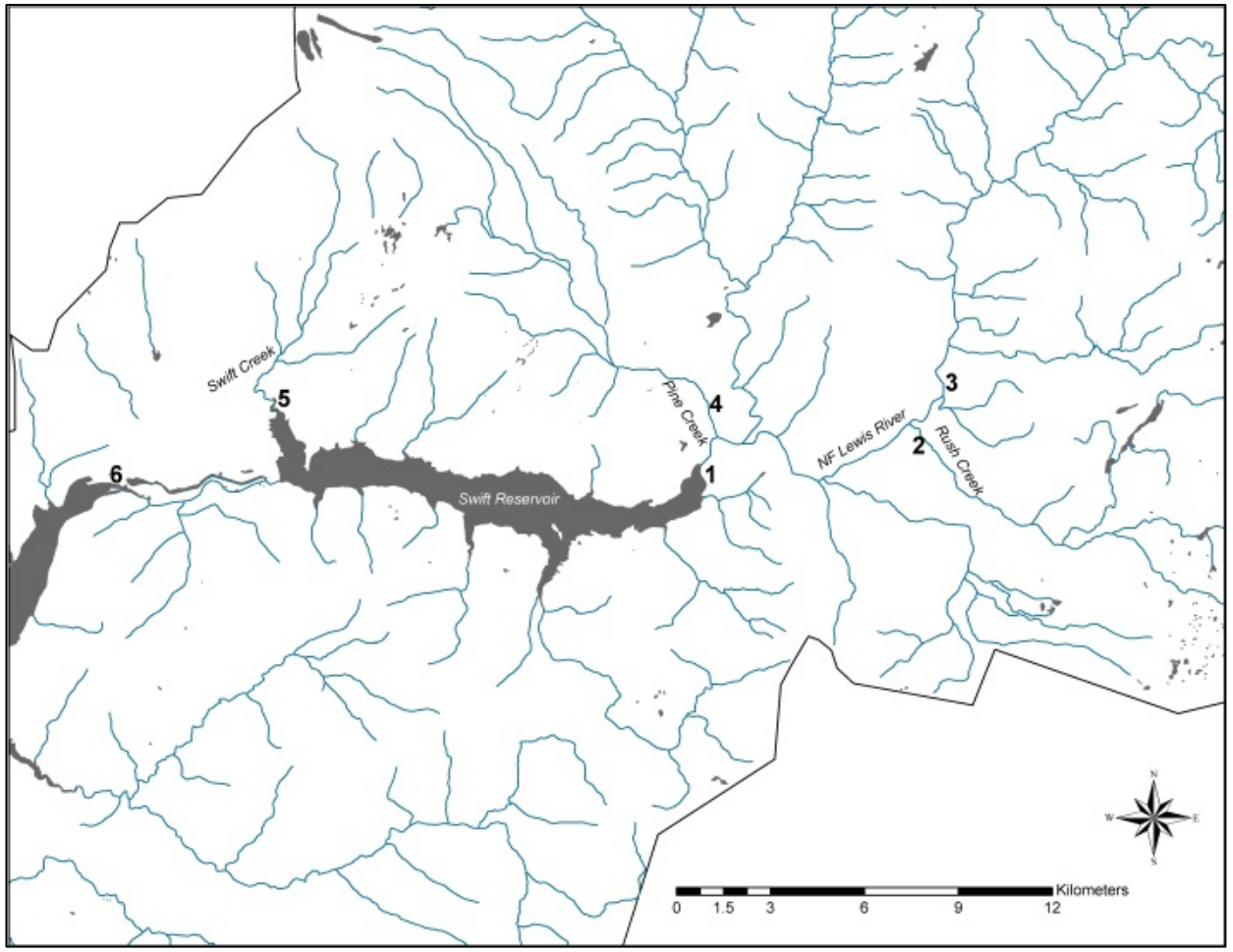
Duration in Tributary v. Discharge



Movement patterns

Radiotelemetry

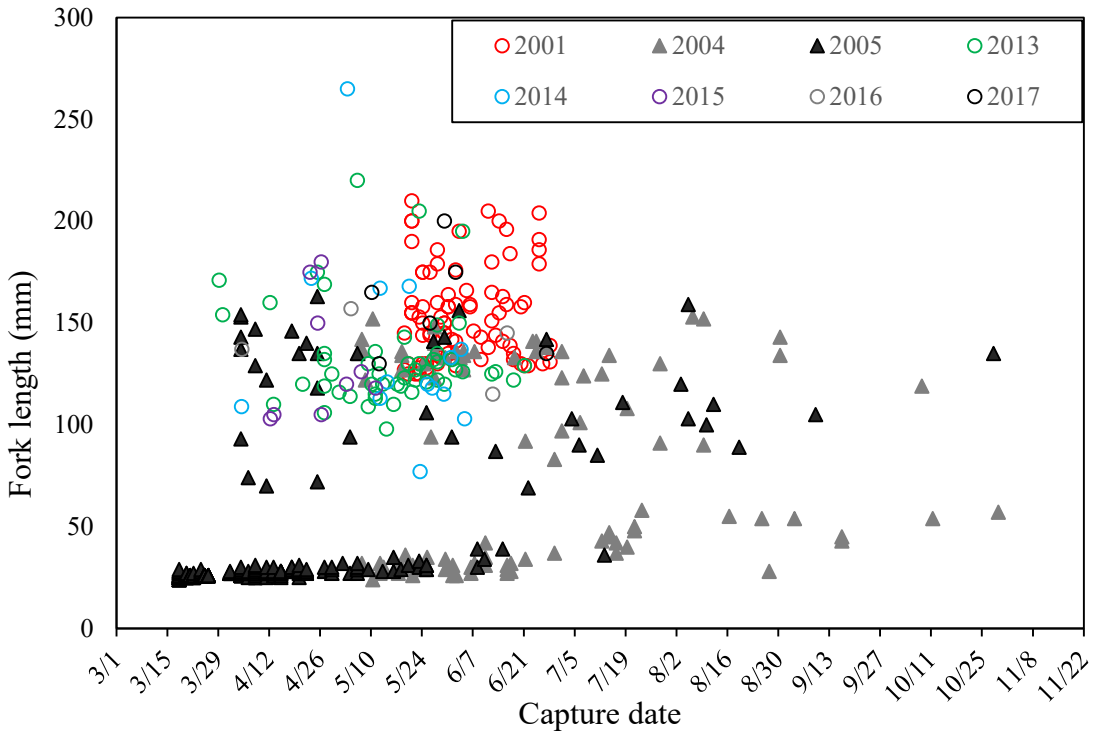
- Adult staging at Eagle Cliff in late spring
- Use of the mouth of Swift Creek
- Began movement upstream in July
- Movement in and out of tributaries prior to spawning
- Use of multiple tributaries during spawning season
- Migration back to reservoir by November



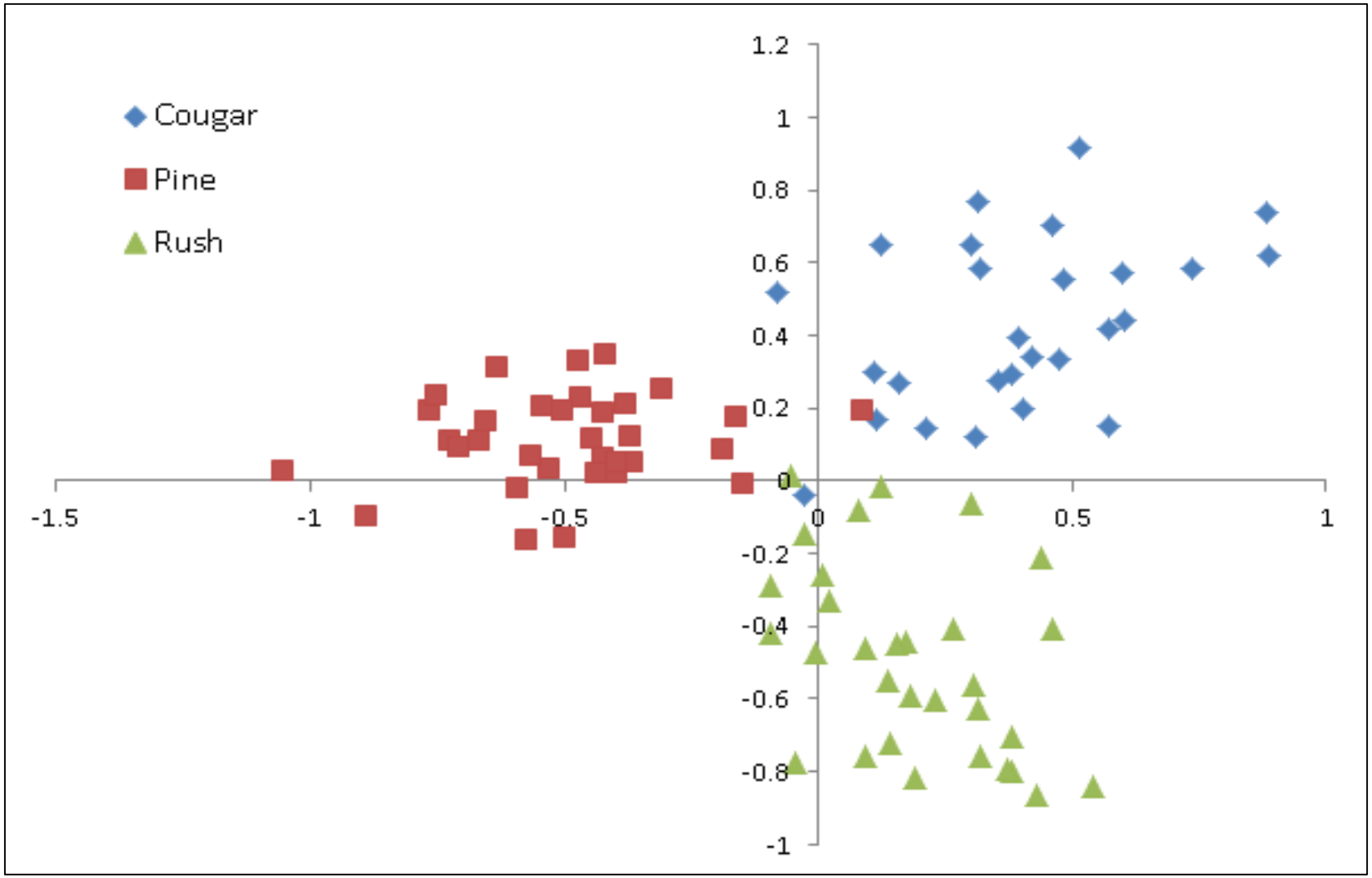
Movement patterns

Screw traps

					Length (mm)				
Year	Location	Trap operation dates	Range of capture dates	Number captured	Mean	SD	Median	Min	Max
2001	Eagle Cliff	5/18 - 6/28	5/19 - 6/28	83	154.9	23.0	151.0	125	210
2013	Eagle Cliff	3/28 - 6/30	3/29 - 6/21	52	132.8	24.4	126.0	98	220
2014	Eagle Cliff	3/18 - 7/2	3/26 - 6/4	16	137.0	45.6	120.5	77	265
2015	Eagle Cliff	3/25 – 6/1	4/12 - 5/11	9	131.3	29.9	120.0	103	180
2016	Eagle Cliff	3/24 - 6/30	4/4 - 6/16	4	138.5	17.7	141.0	115	157
2017	Eagle Cliff	4/20 – 7/30	5/10 - 6/27	6	159.2	26.3	157.5	130	200
2004	Rush Creek	5/5 - 11/2	5/6 - 10/29	97	77.5	48.0	54.0	24	153
2005	Rush Creek	3/16 - 10/31	3/18 - 10/28	277	40.0	33.4	27.0	24	163



Genetic diversity



Limiting factors

Pratt (2003), Meridian Environmental (2007), Lamperth et al. (2017)

- Temperature
- Barriers
- Low discharge
- Frequent scour events
- Lack of channel complexity
- Lack of optimal stream depth

Data gaps and RME needs

Habitat
- Temperature analyses
- Role of reservoirs
- Effectiveness/ biological response

Demographics
- Adult abundance/survival
- Juvenile abundance/survival
- Life history strategies
- Demographic thresholds – MVPs
- Population dynamics

Vital Rates
- Sex ratio
- Fecundity
- Age structure

Spatial Distribution
- Connectivity
- Recolonization
- eDNA monitoring

Movement Patterns
- Juvenile movement patterns

Limiting Factors
- Expand on current work to better understand limits to expansion
- Identify actions to address limiting factors

Genetic Diversity
- Effective population size

Fish Management
- Effects of anadromous fish reintroduction
- Fisheries related impacts

Climate Change
- Vulnerability Assessment
- Adaptation Actions

Development of Monitoring Plan