

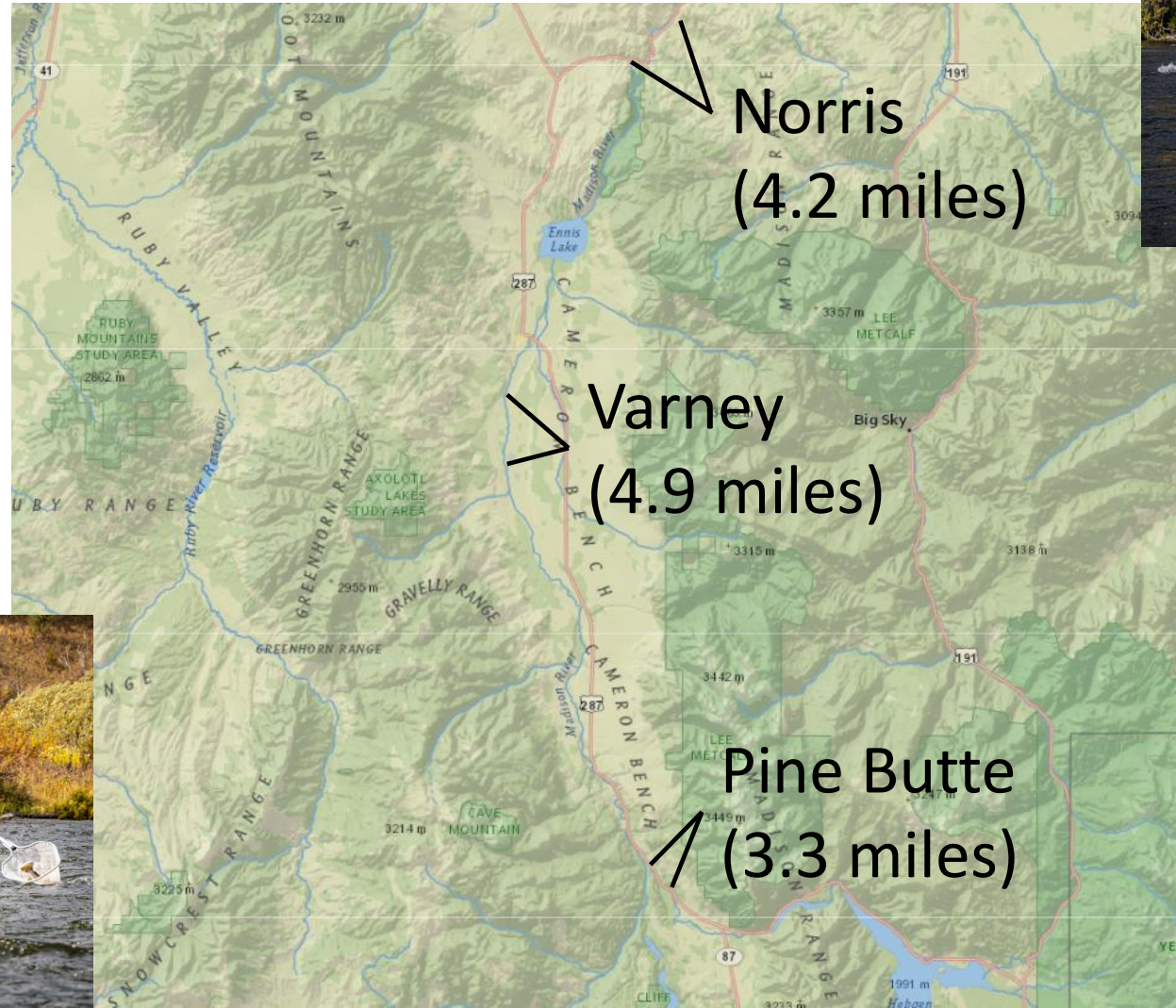


2022 State of the Madison River

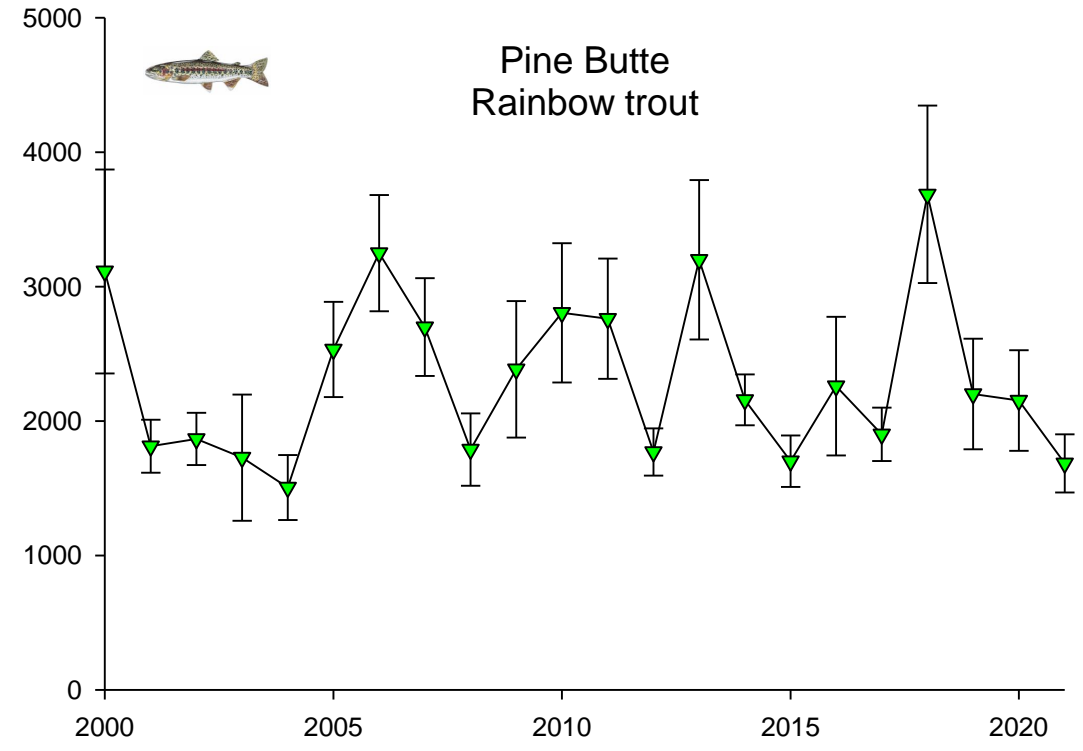
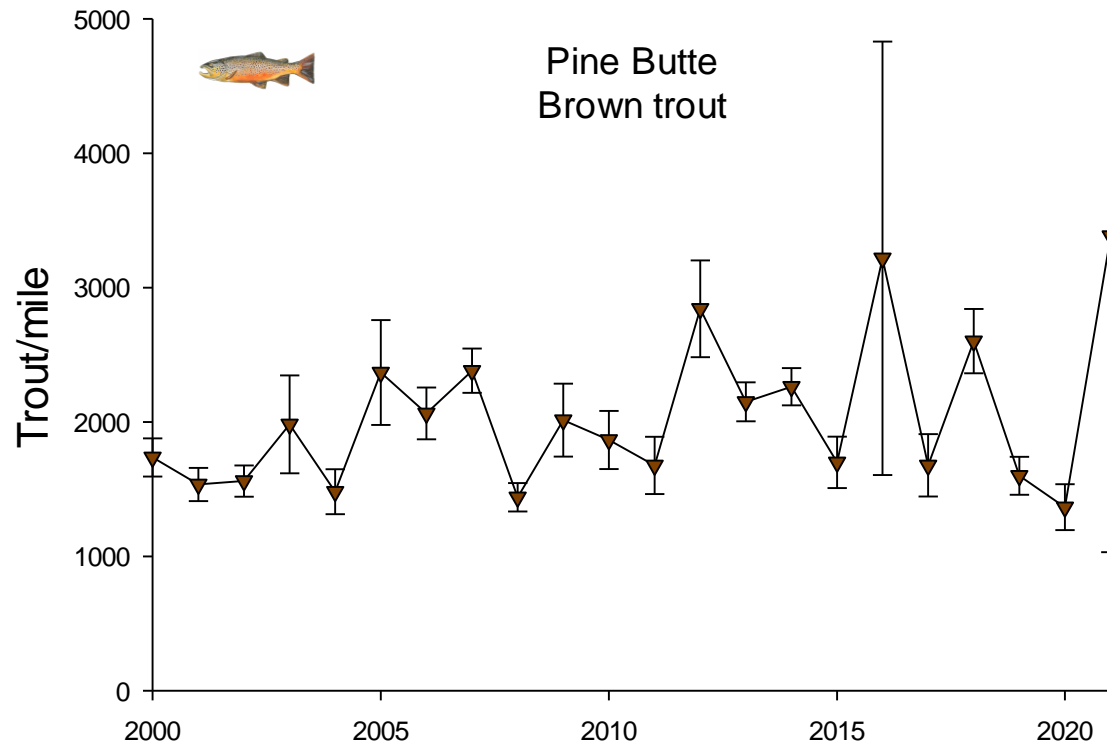
Mike Duncan
Madison-Gallatin Biologist
Mike.Duncan@mt.gov



Madison River Sampling Sections

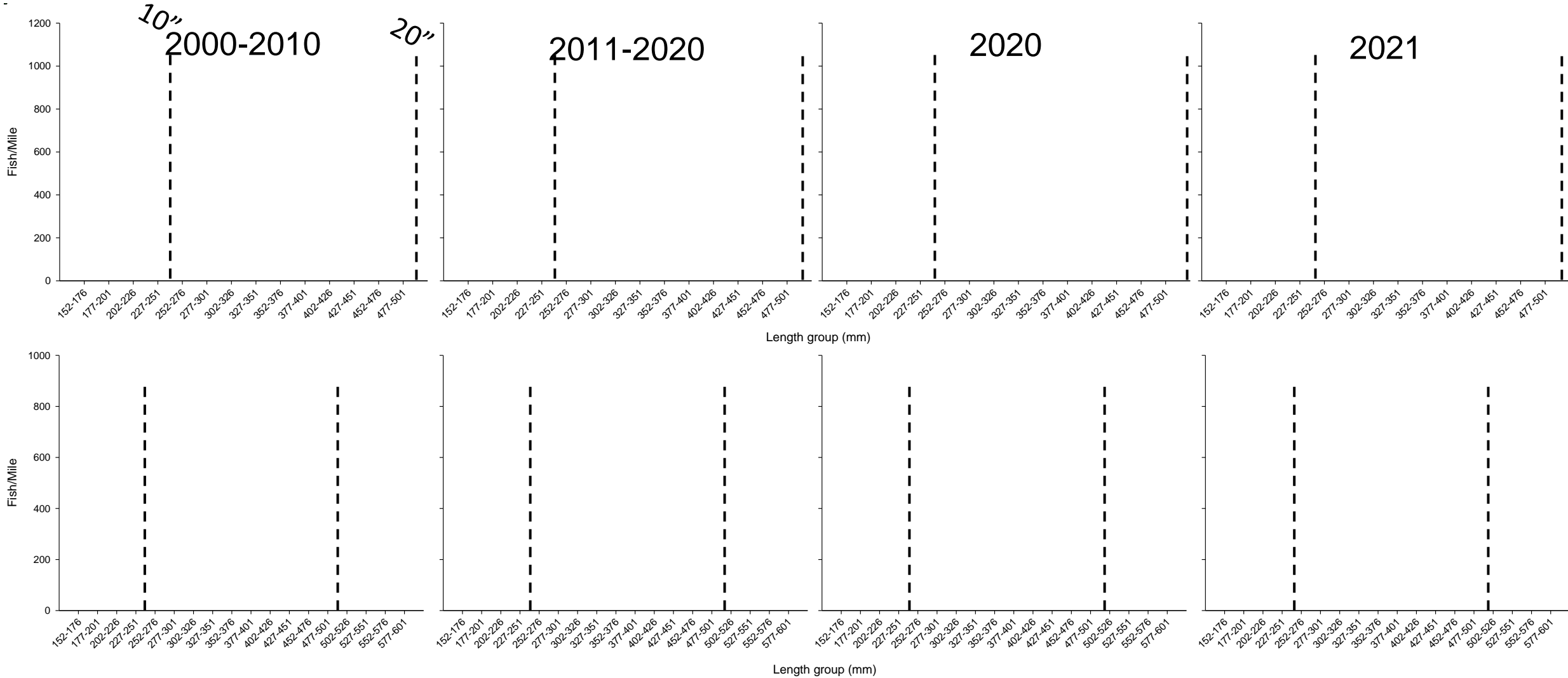


Pine Butte

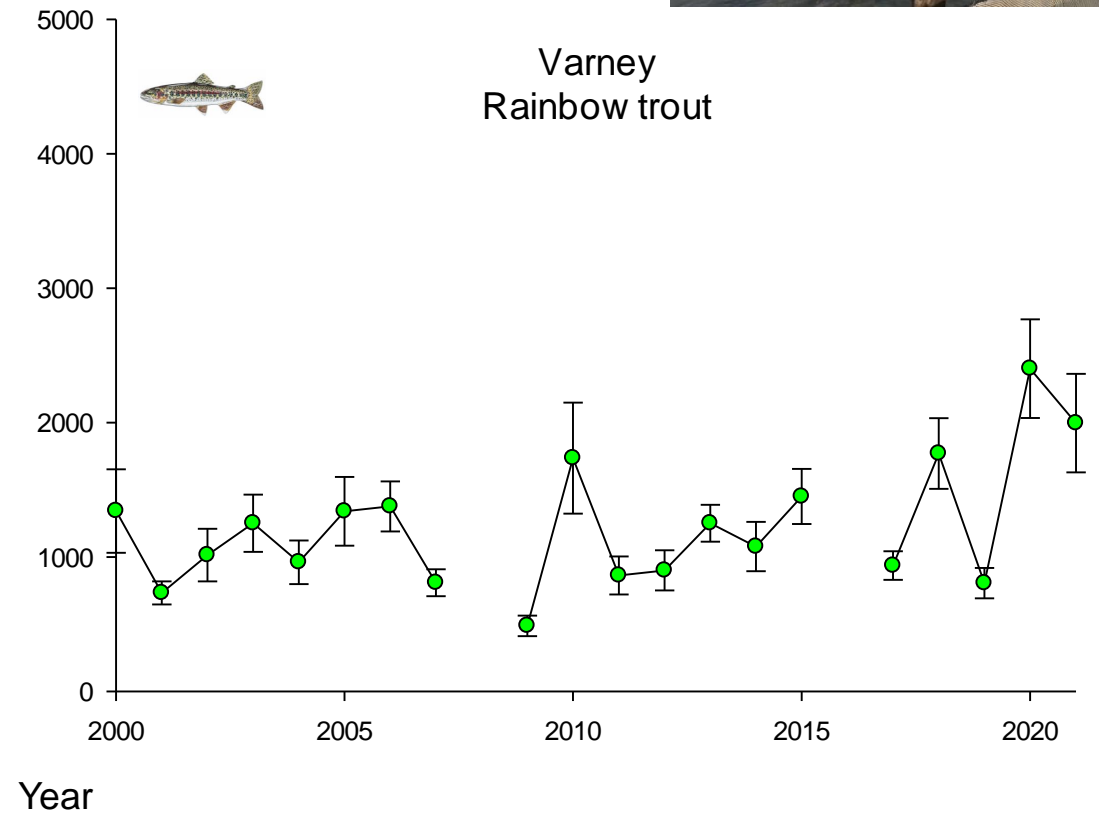
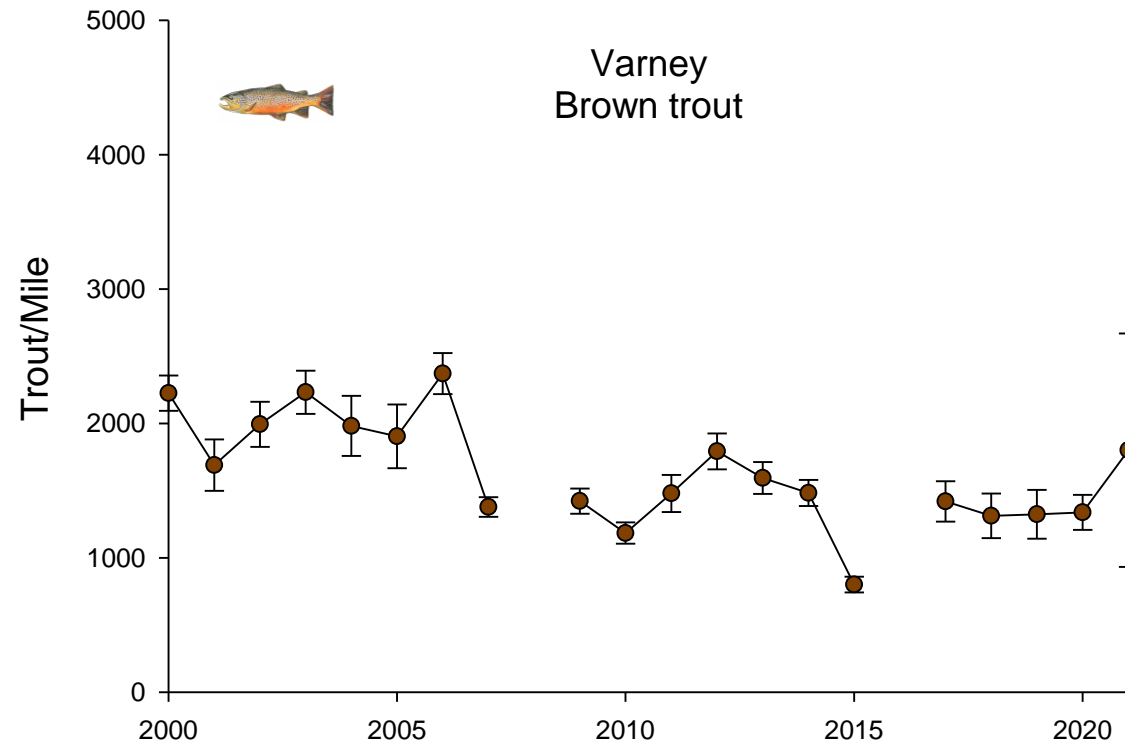


Year

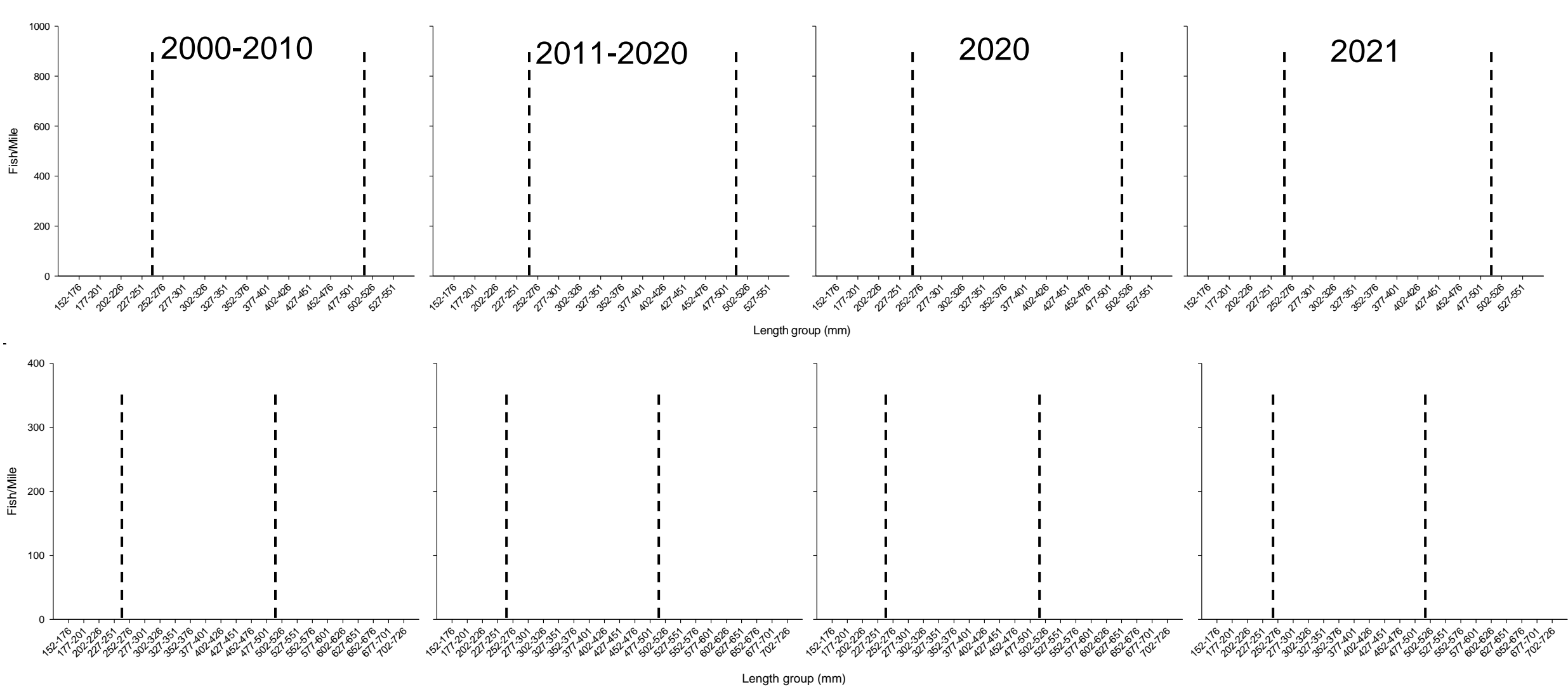
Pine Butte



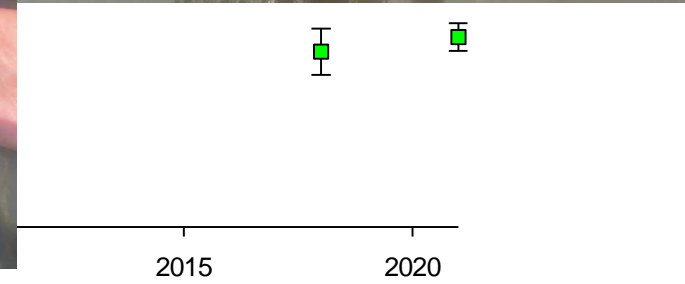
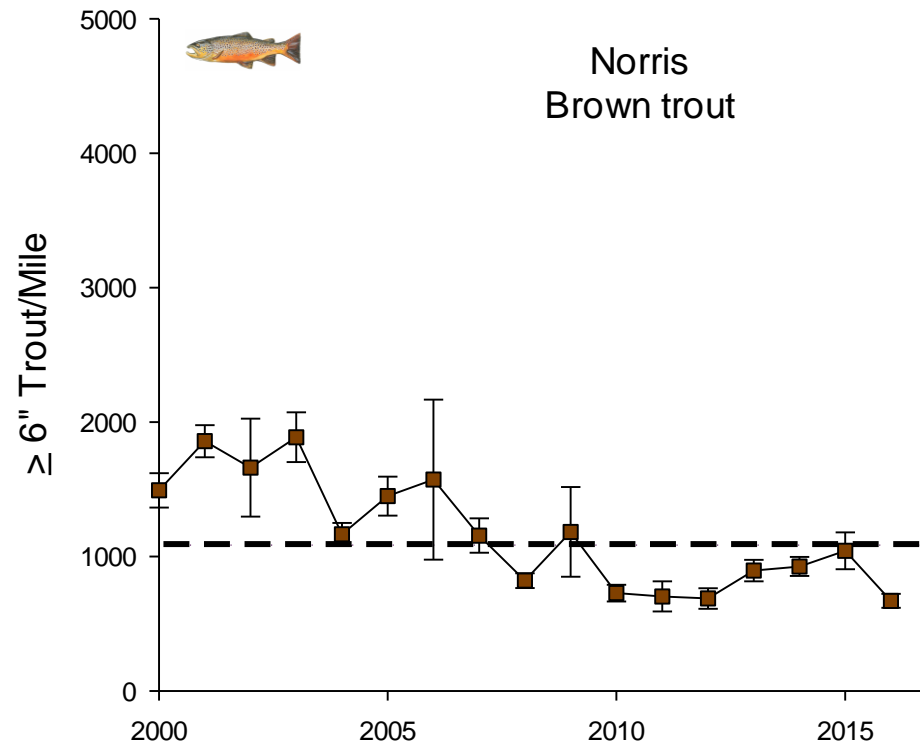
Varney



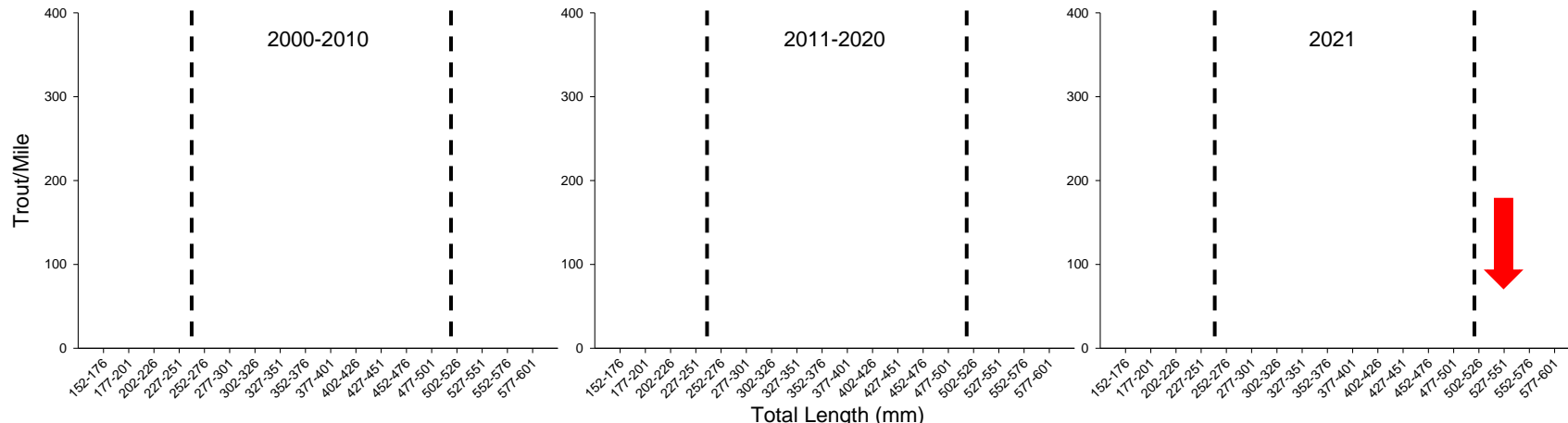
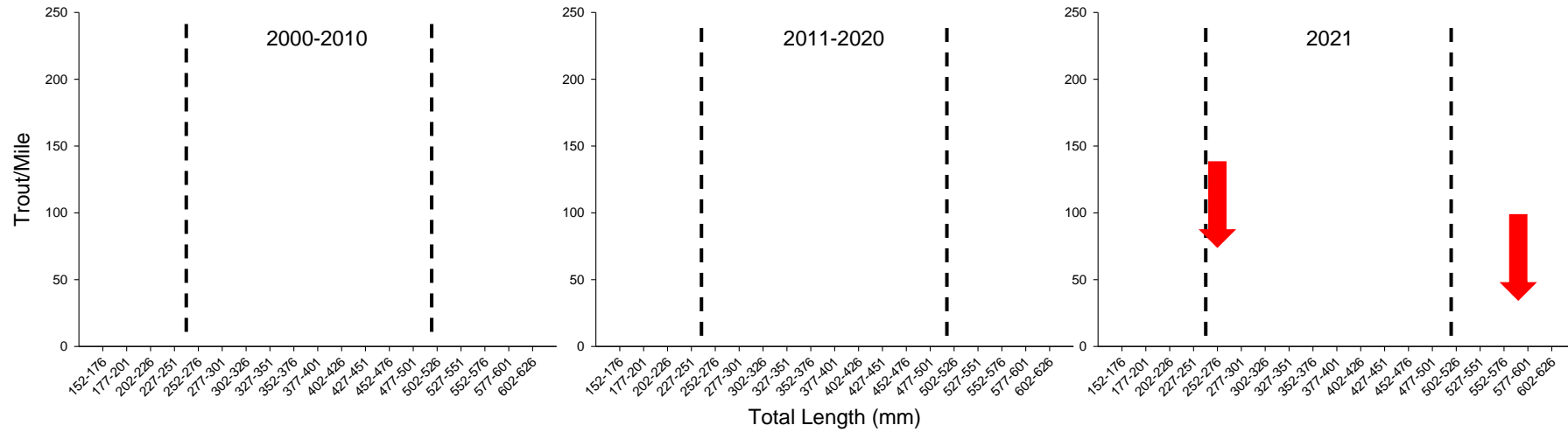
Varney



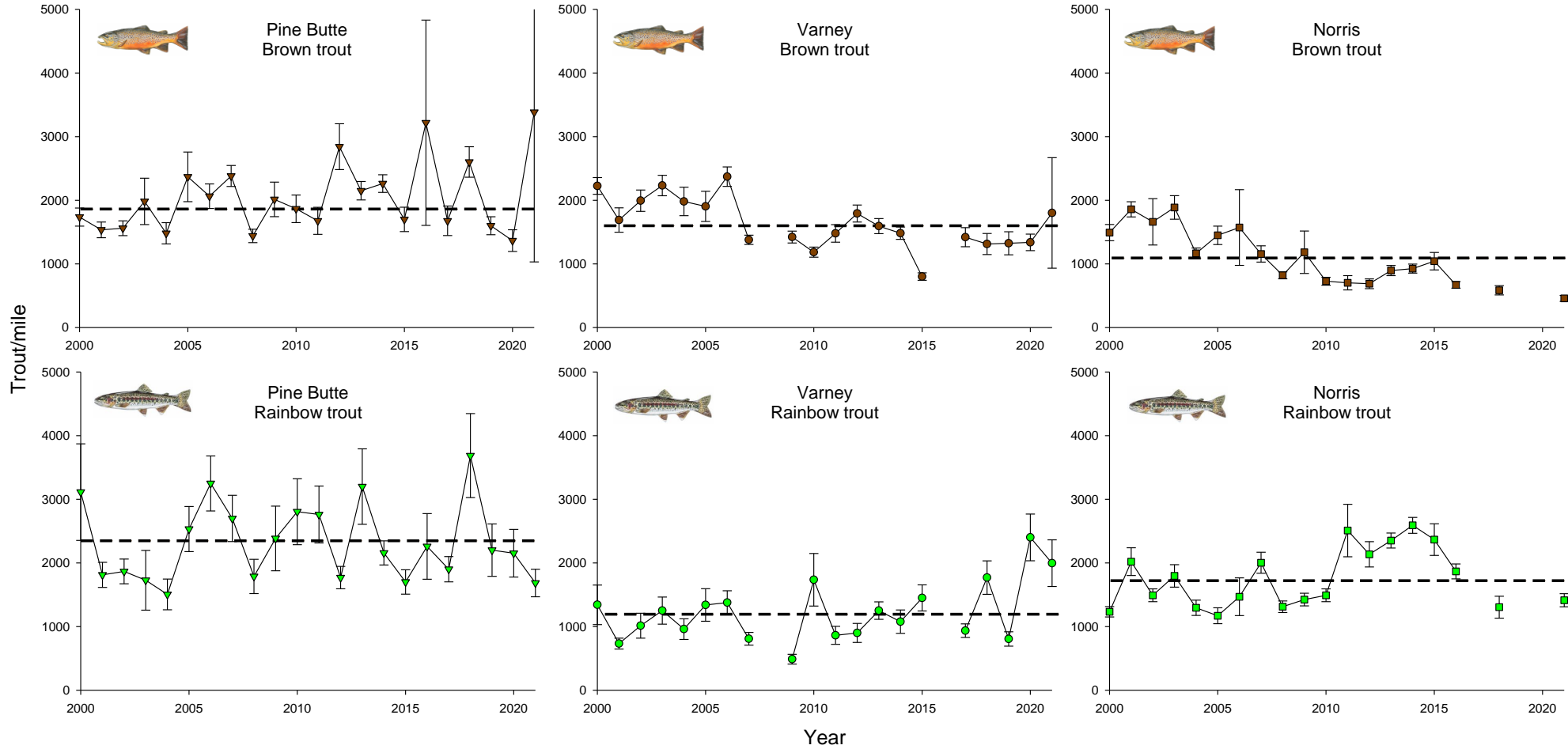
Norris



Norris

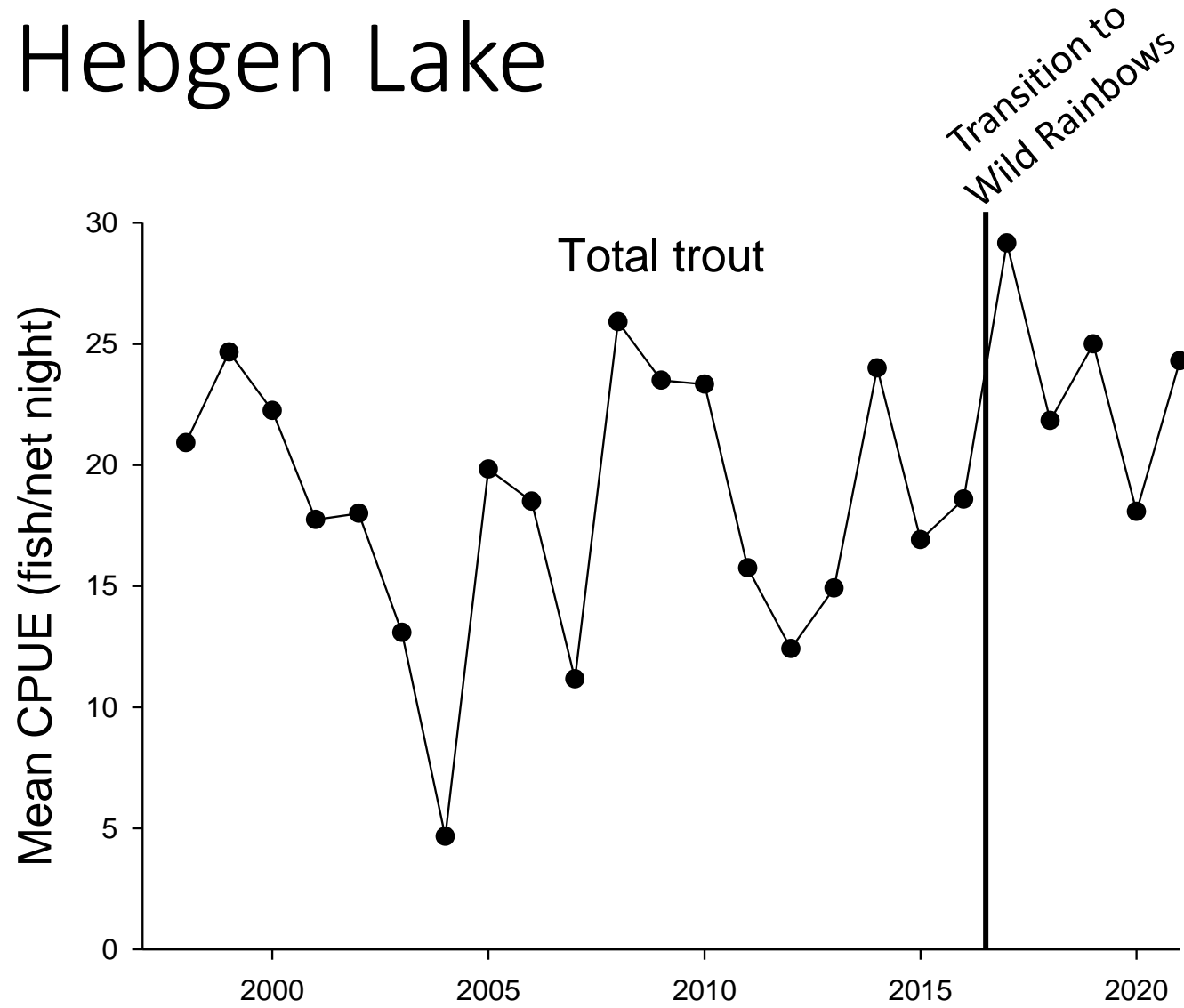


The Madison River

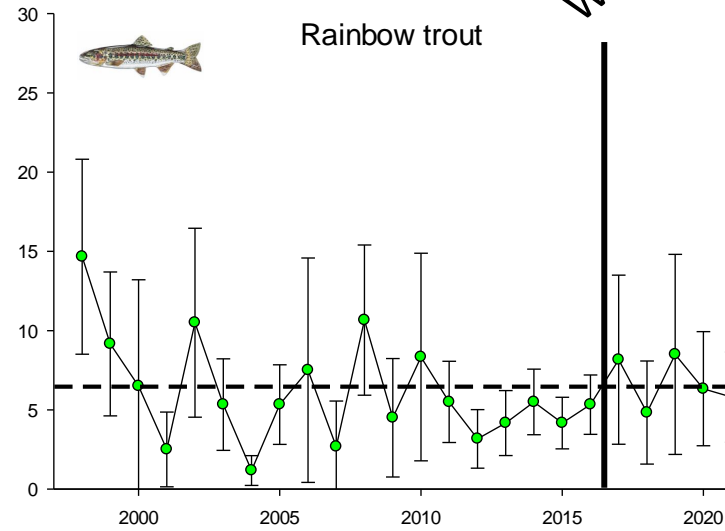
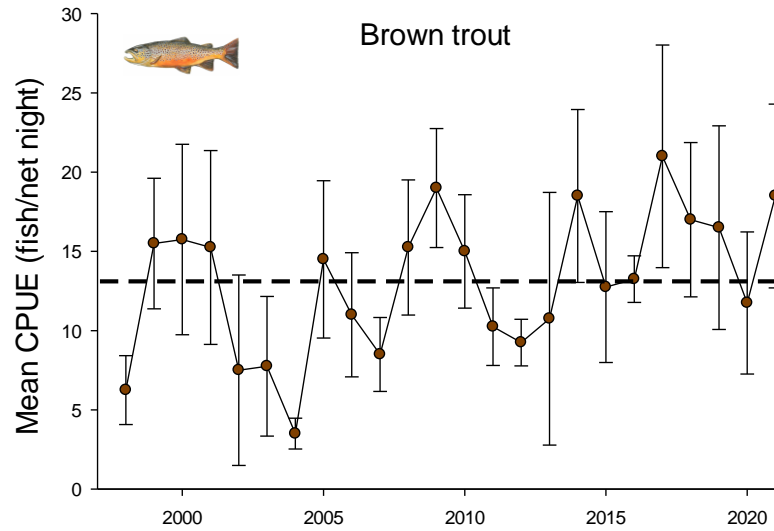


Illustrations: David Ritter

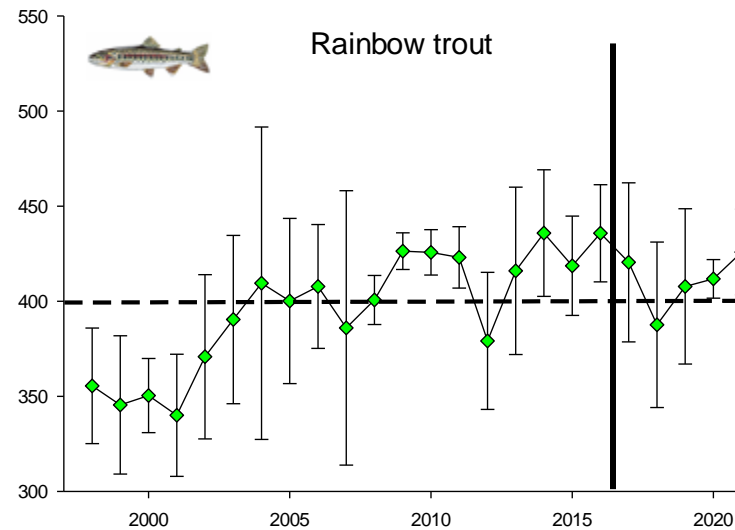
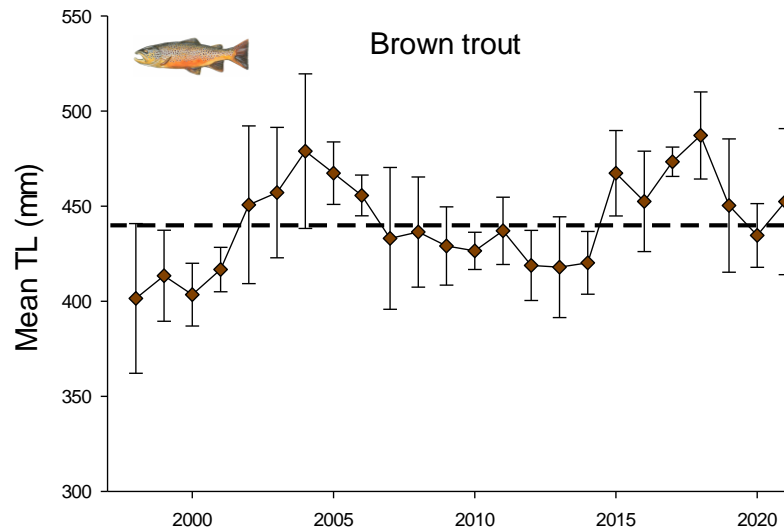
Hebgen Lake



Hebgen Lake

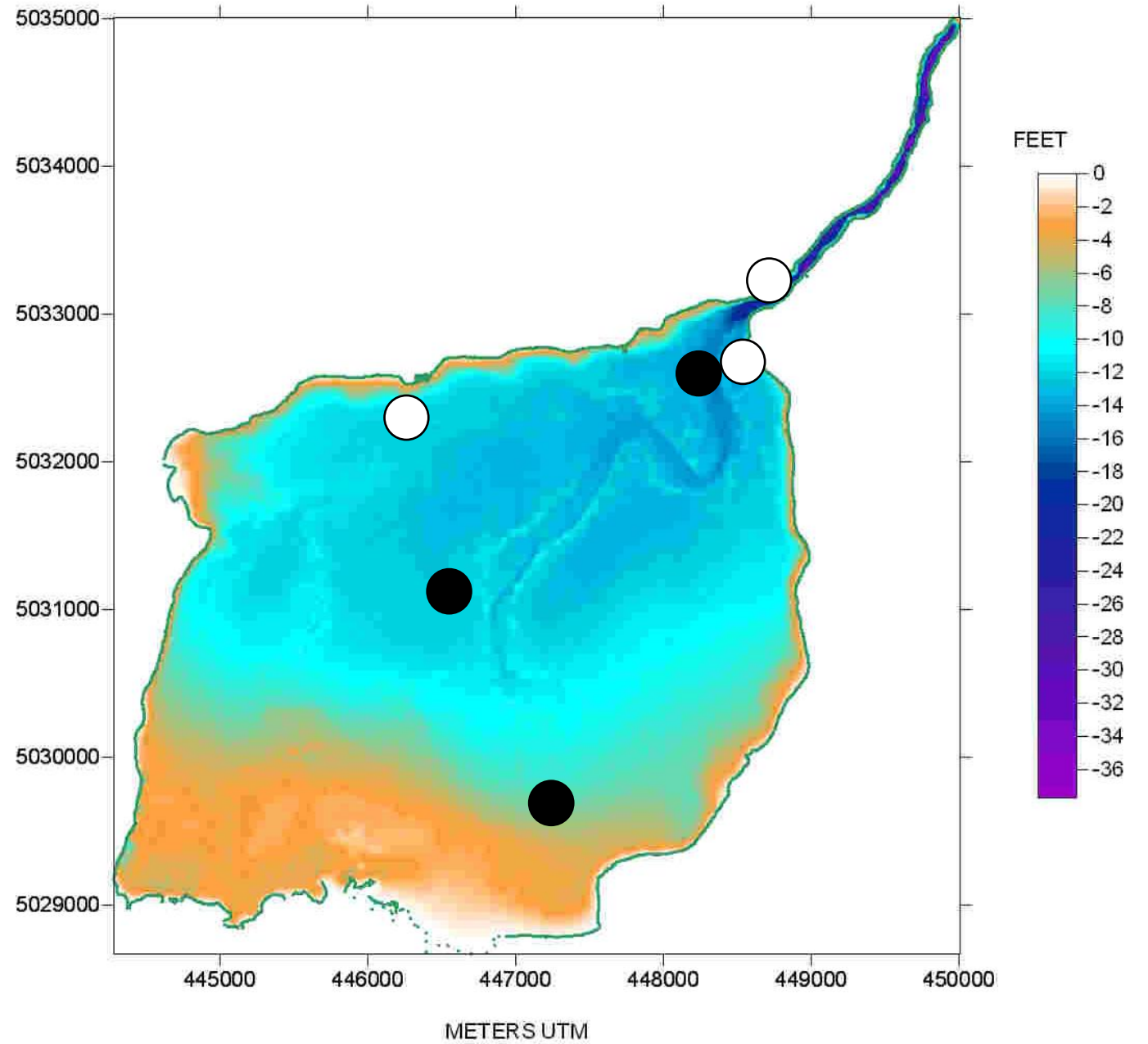


Transition to Wild Rainbows

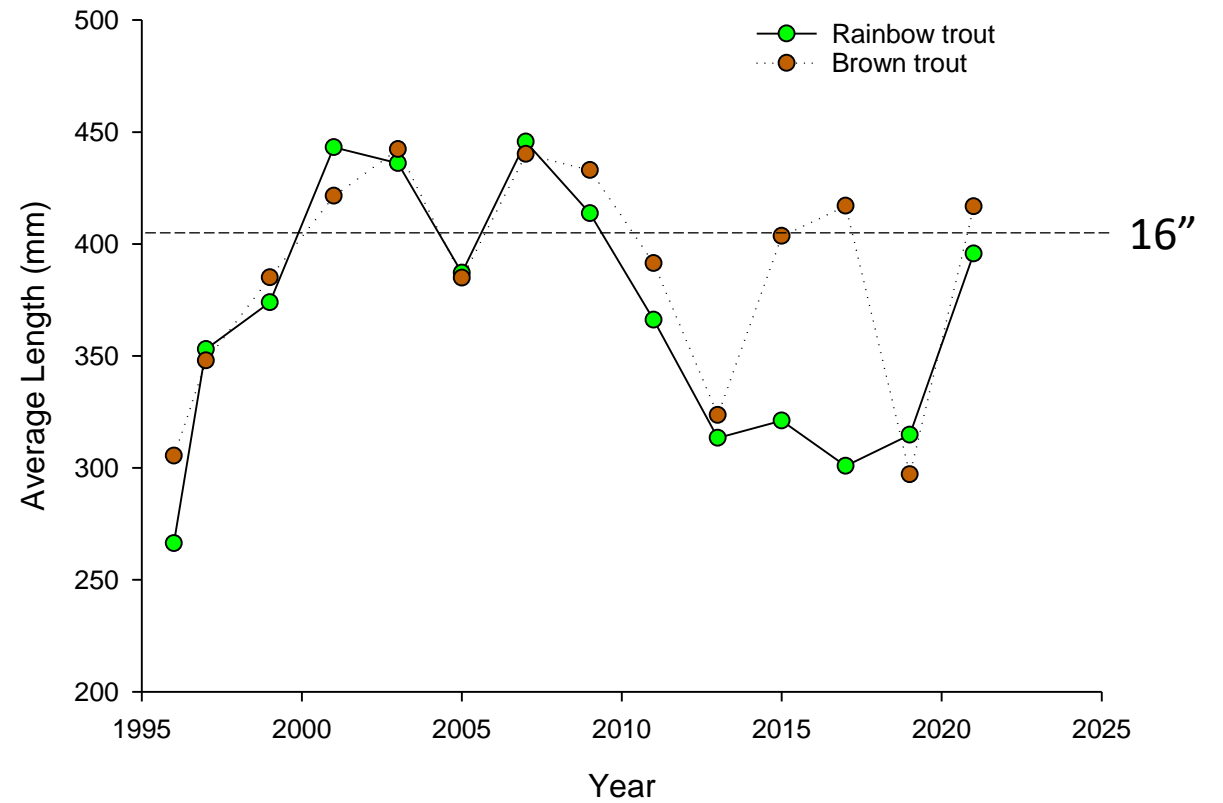
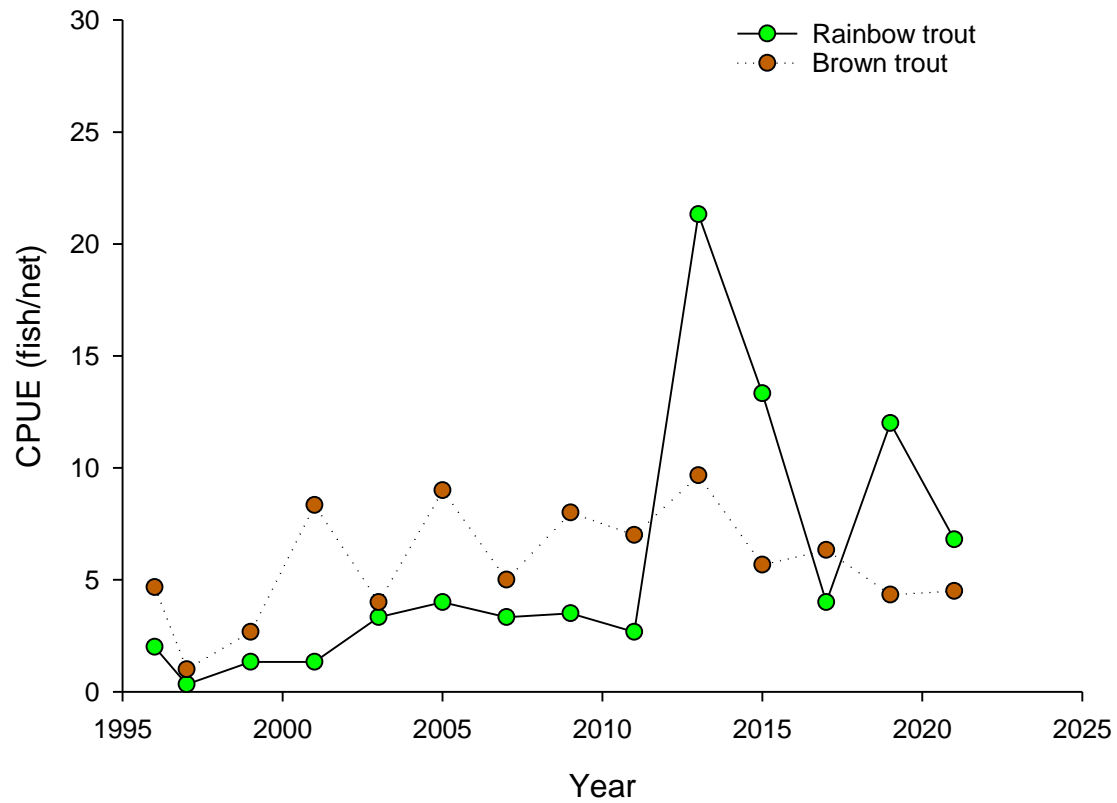


Year

Ennis Lake

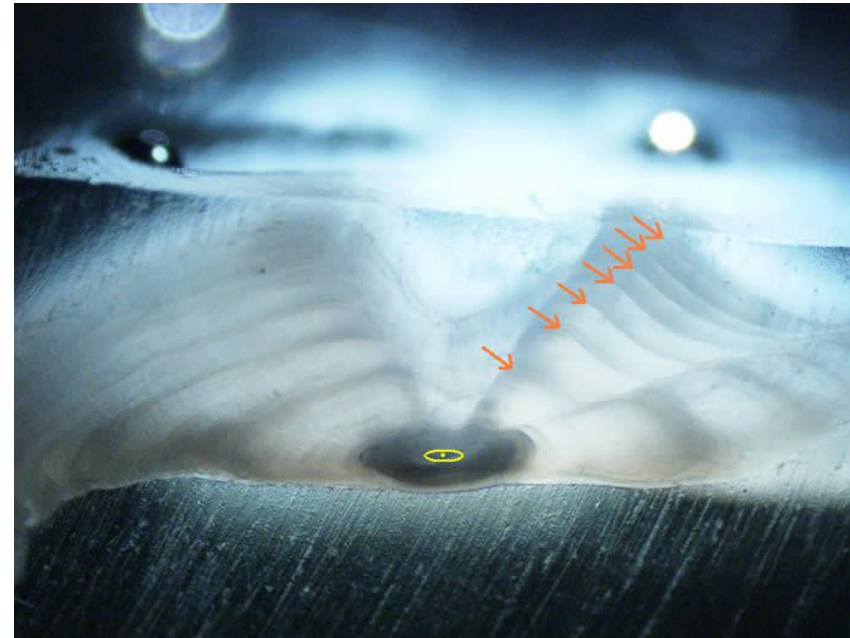


Ennis Lake

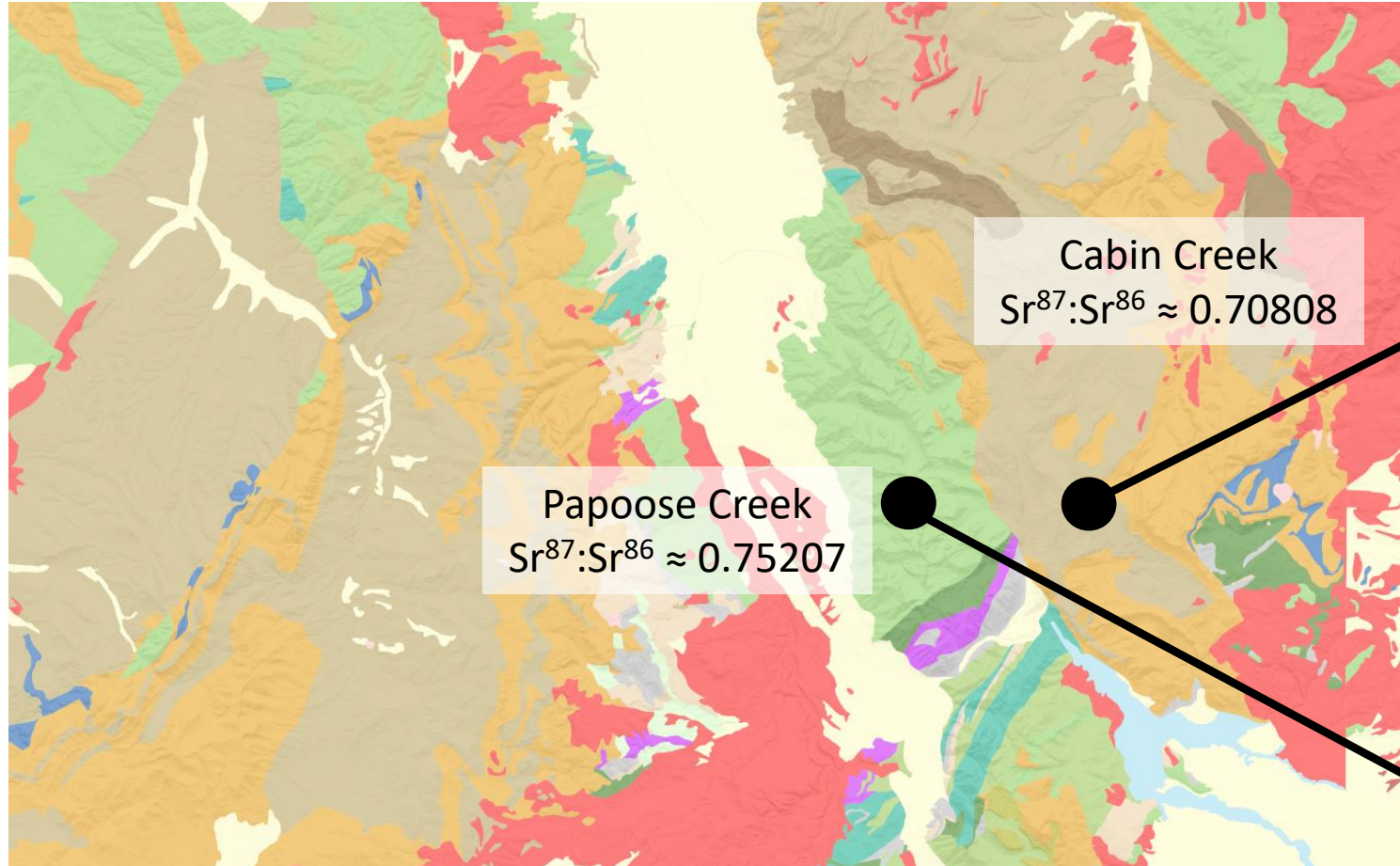


Otolith Microchemistry

- Water chemistry signatures incorporated into otolith and remain unchanged through time
- Characterize natal origins and movements of fish if sufficient variability in water chemistry exists



Upper Madison Geology

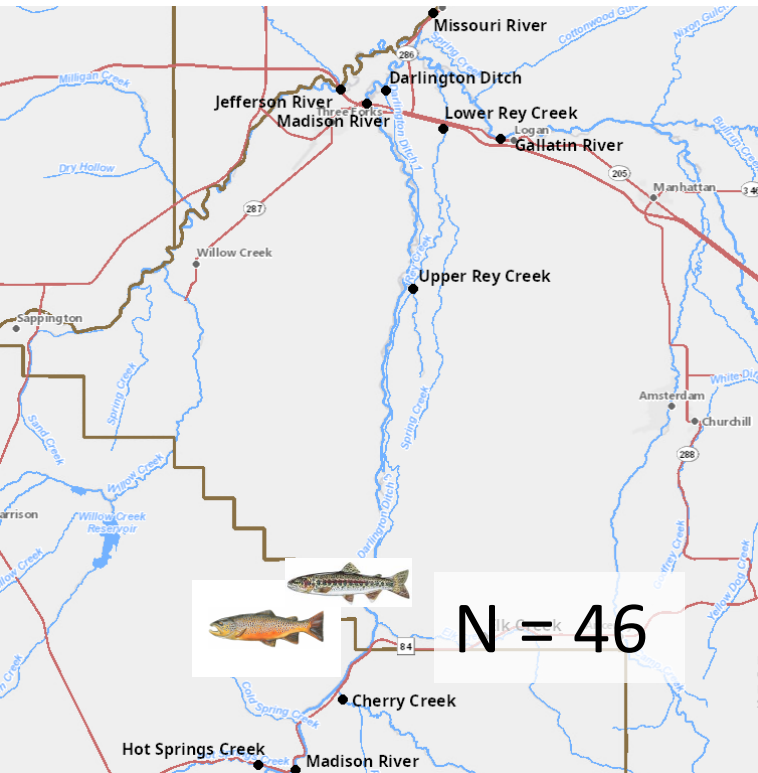


Geologic Time Scale

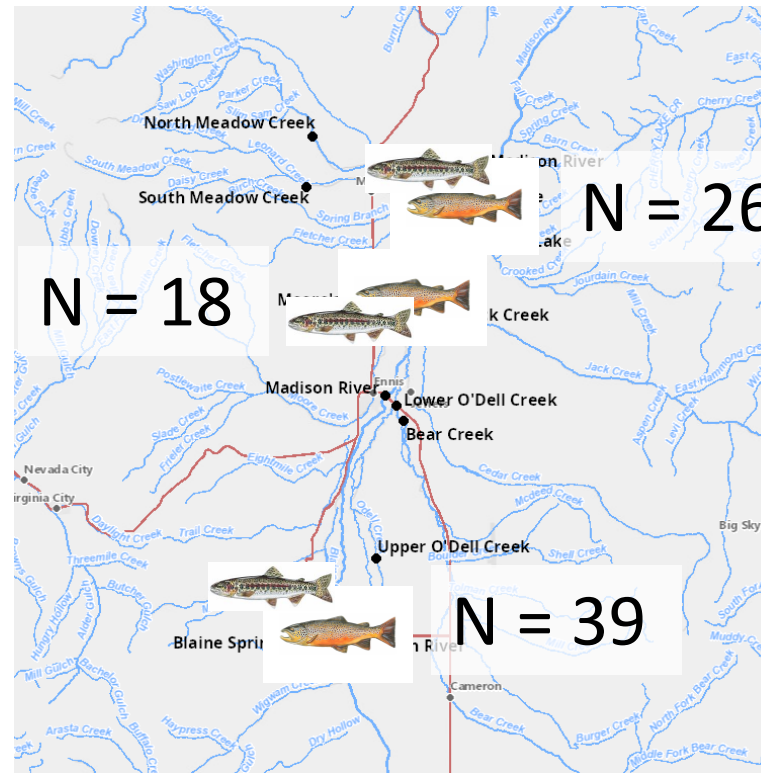
EON ERA	PERIOD	EPOCH	Present		
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	
			Pleistocene	2.6	
		Tertiary	Neogene	Pliocene	5.3
				Miocene	23.0
			Paleogene	Oligocene	33.9
				Eocene	55.8
	Paleozoic	Mesozoic	Paleocene	65.5	
			Cretaceous	145.5	
			Jurassic	199.6	
		Carboniferous	Permian	Triassic	251
Permian				299	
Pennsylvanian				318	
Mississippian			Mississippian	359.2	
			Devonian	416	
			Silurian	443.7	
			Ordovician	488.3	
Precambrian	Proterozoic	Cambrian	542		
		Archean	2500		
		Hadean	4000		

Madison Otolith Microchemistry

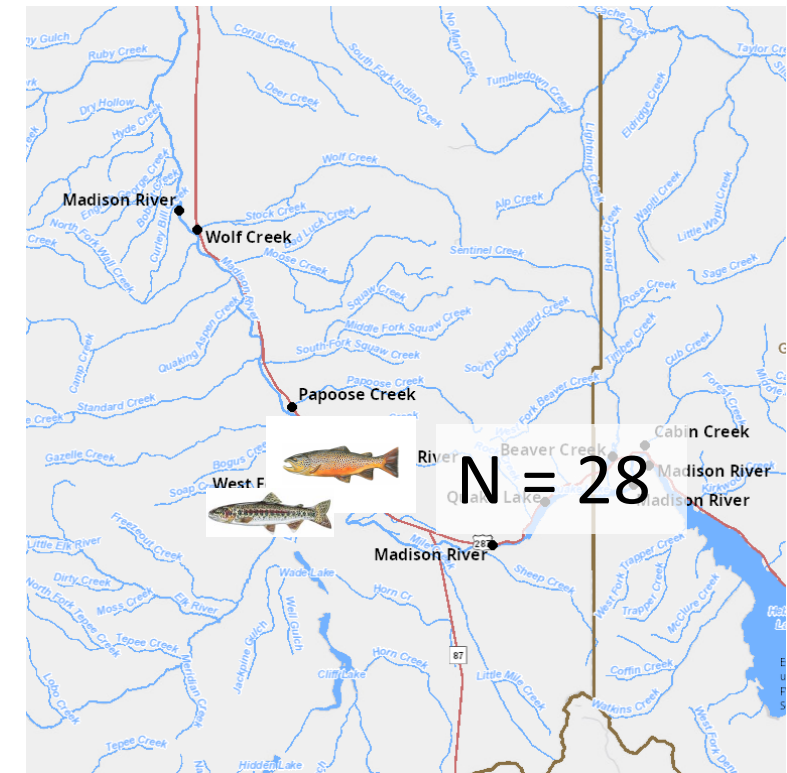
Lower Madison



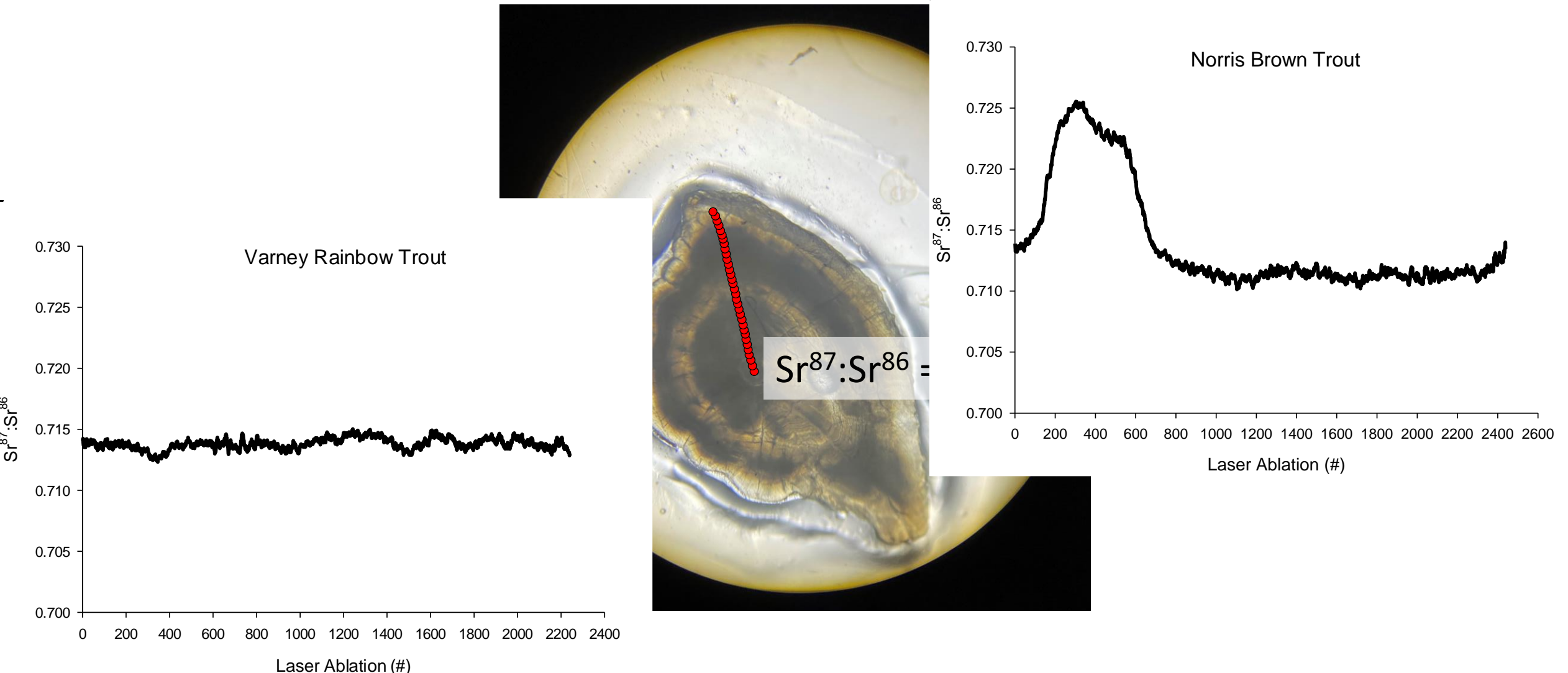
Ennis Area



Upper Madison

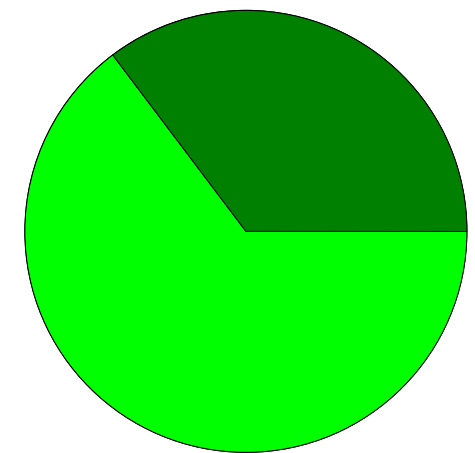
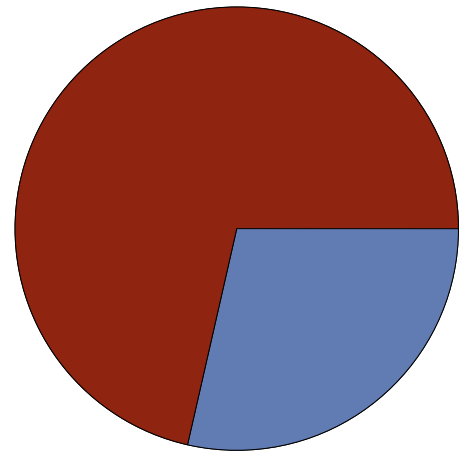


Otolith Microchemistry



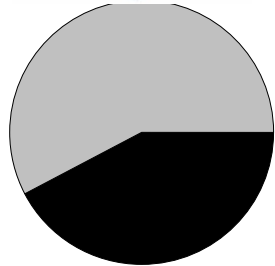
Lower Madison Natal Origins

Lower Madison

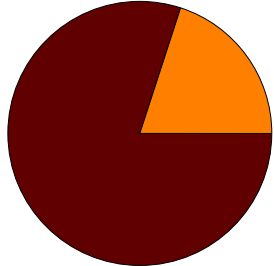


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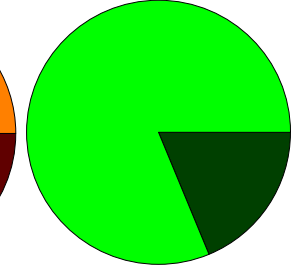
Ennis Area Natal Origins



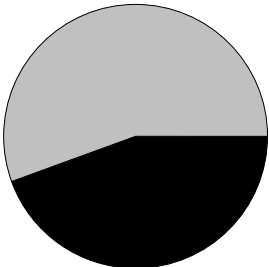
— Mainstem
— Tributary



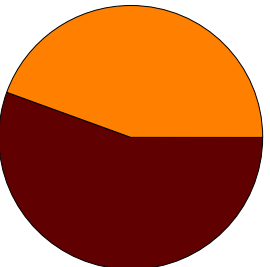
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— Tributary



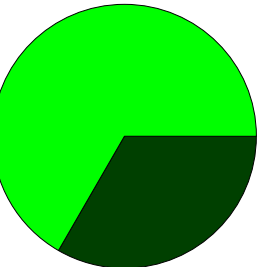
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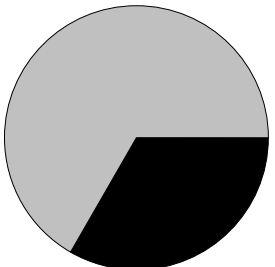
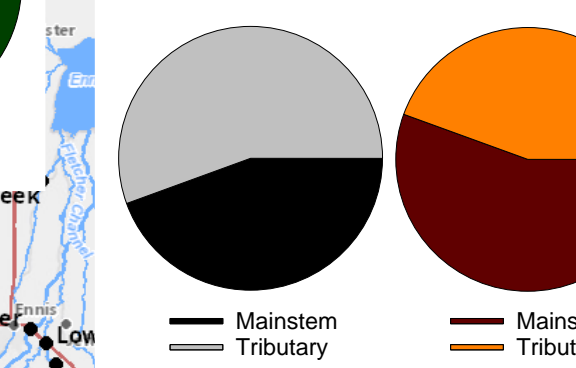
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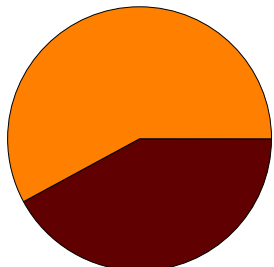
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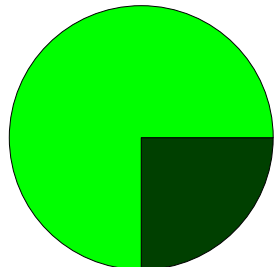
— Mainstem
— Tributary



— Mainstem
— Tributary



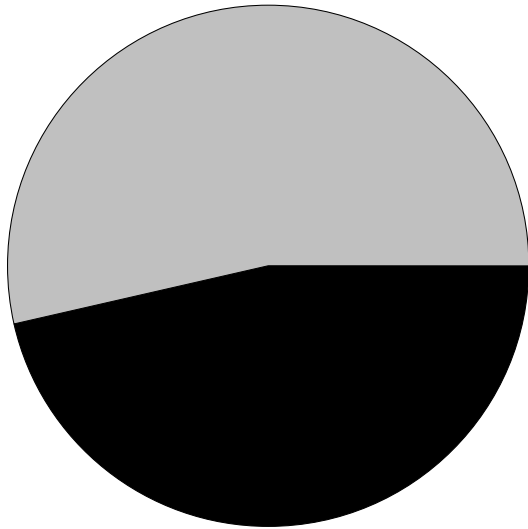
— Mainstem
— Tributary



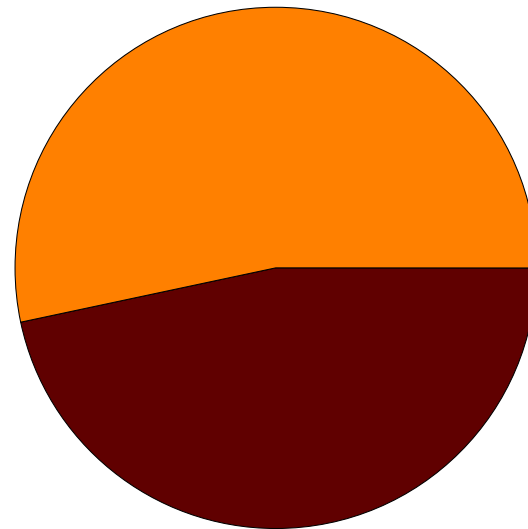
— Mainstem
— Tributary

Upper Madison Natal Origins

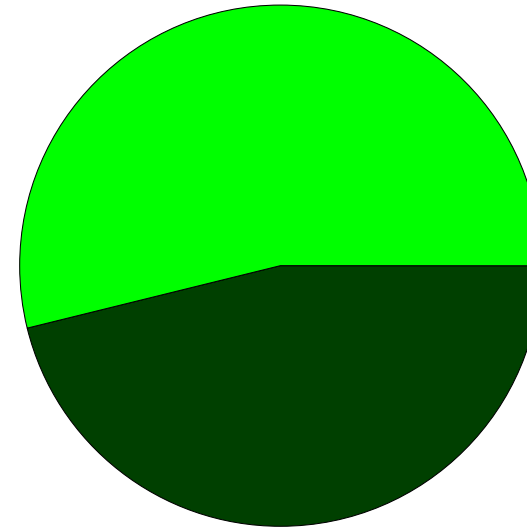
Pine Butte



— Mainstem
— Tributary



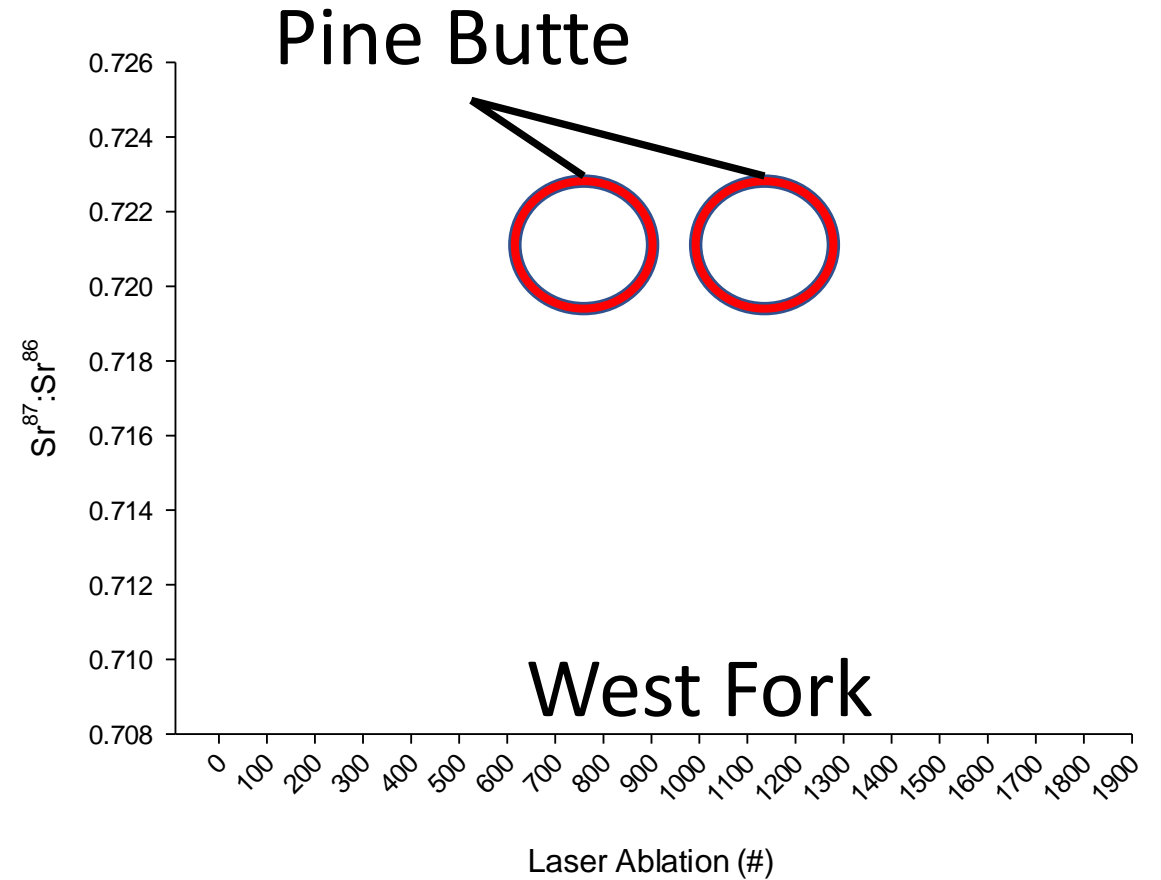
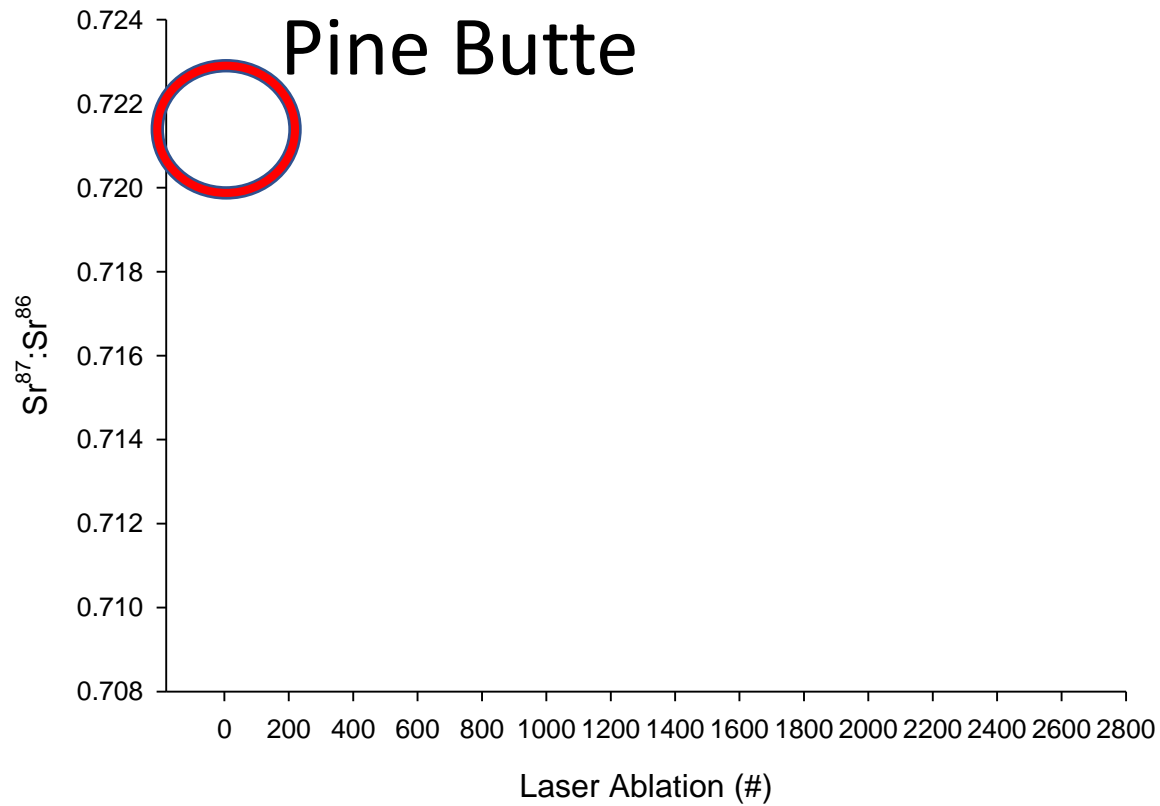
— Mainstem
— Tributary



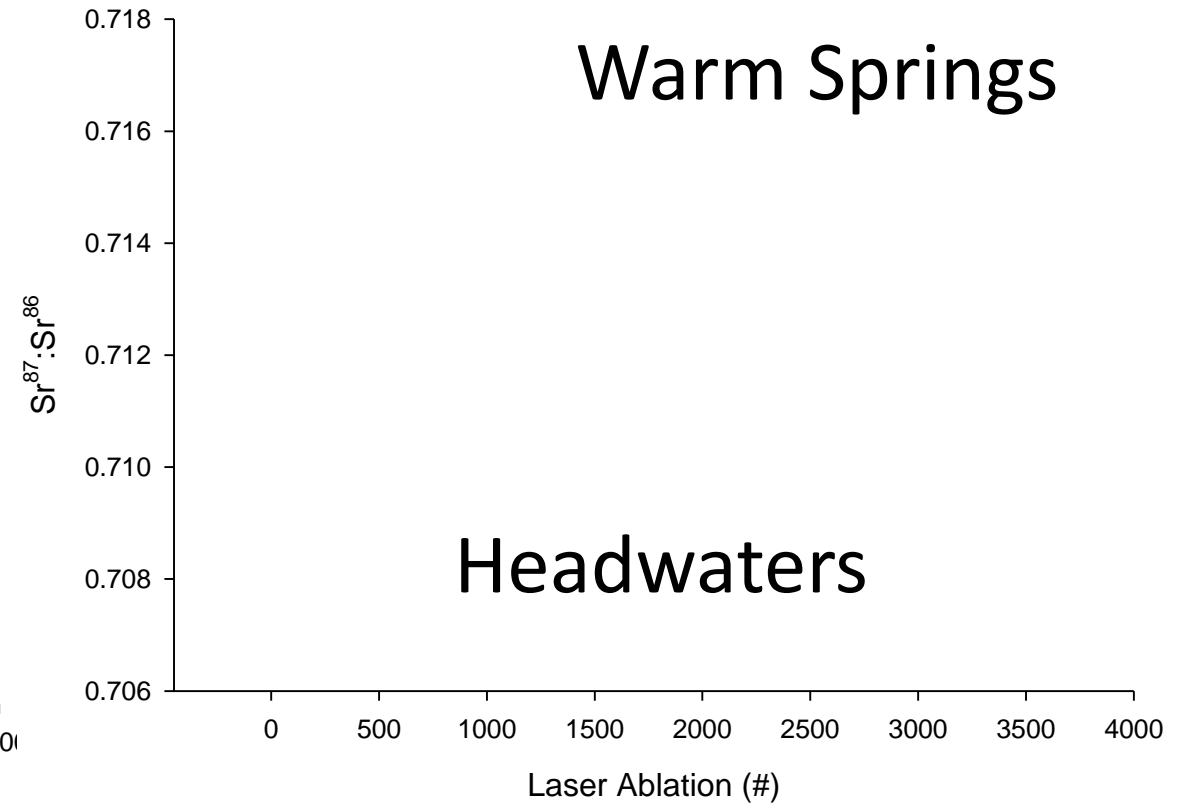
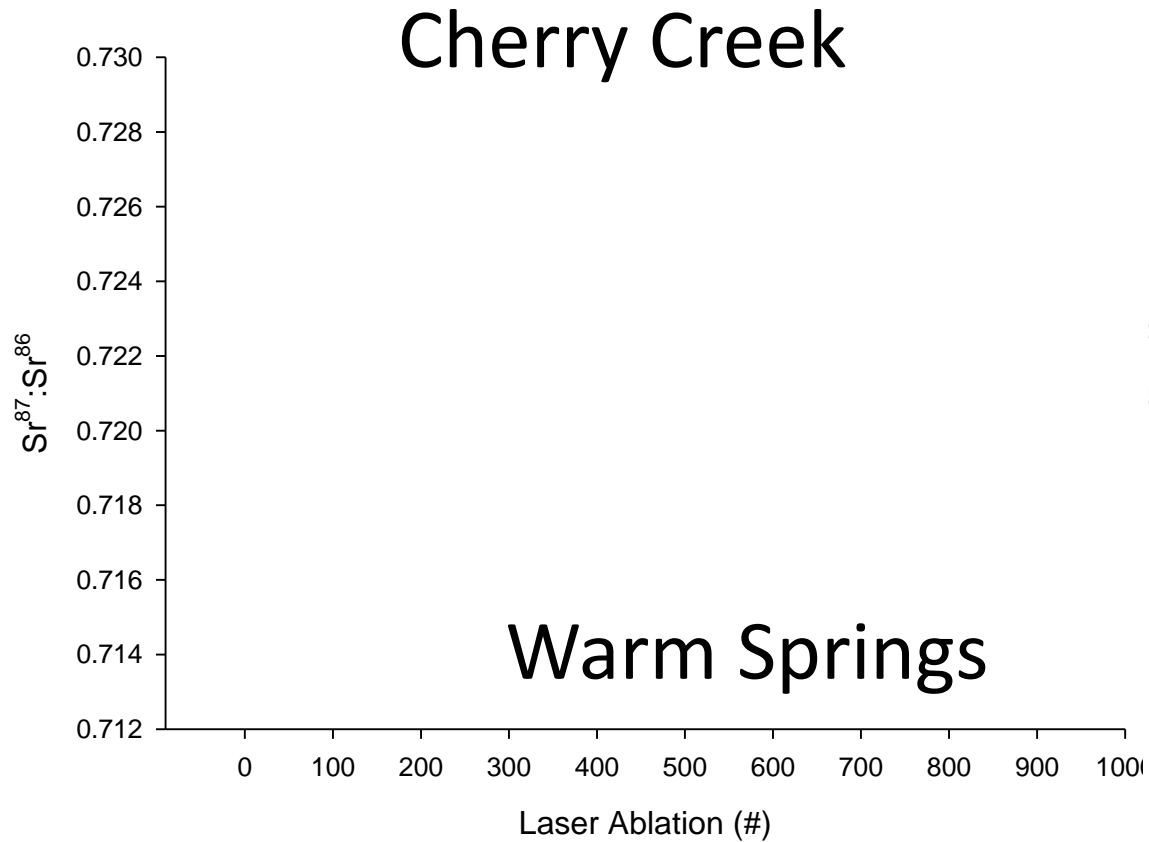
— Mainstem
— Tributary



Movements

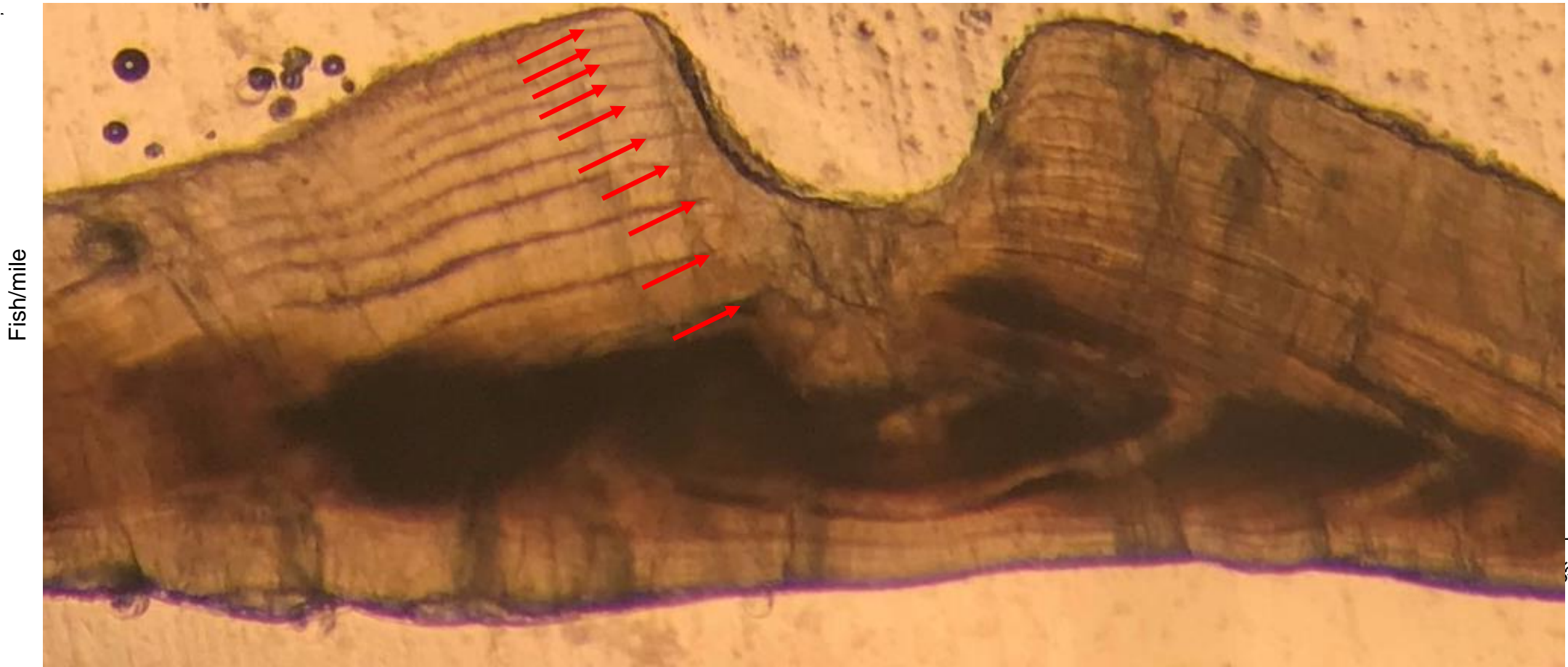


Movements

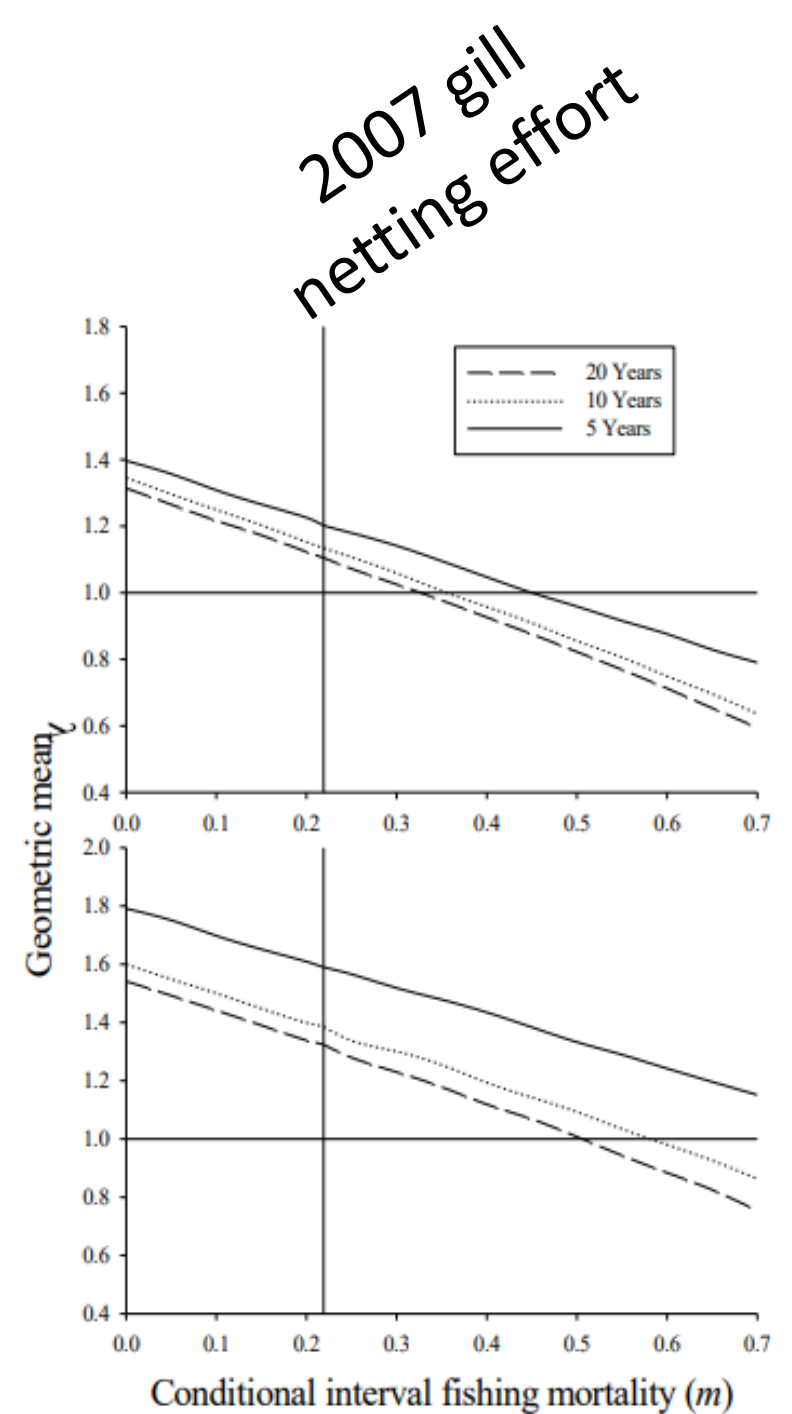


Madison Age and Growth Study

- Collected five otoliths from each inch group in long-term sampling sections

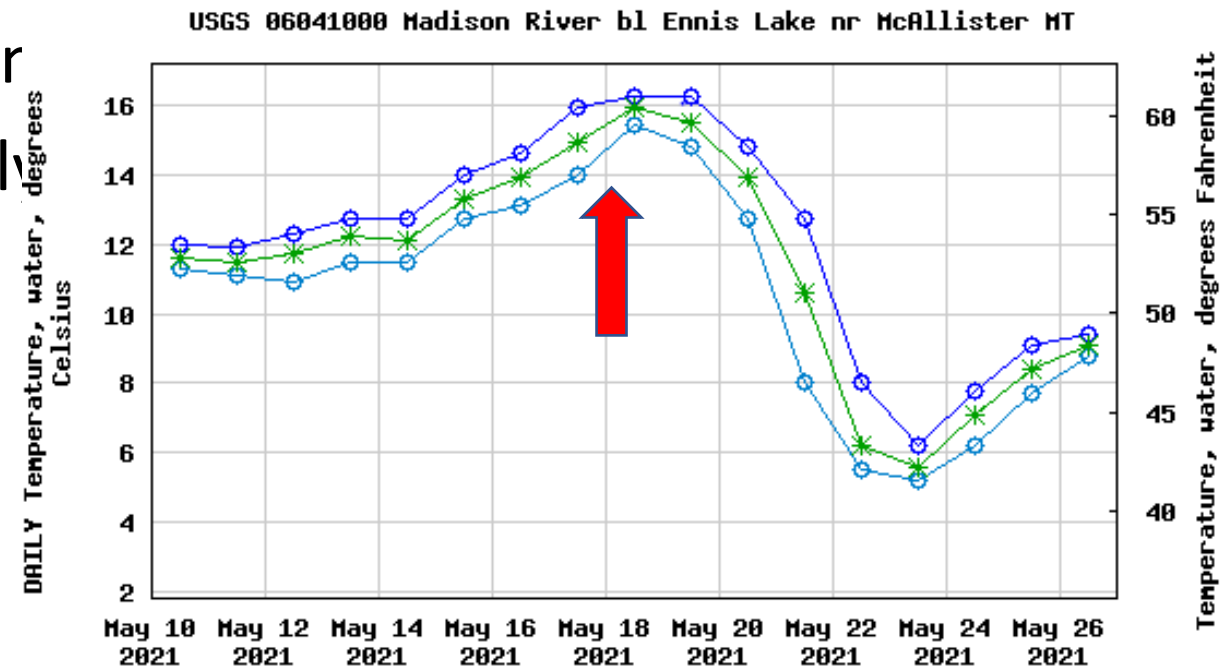


Madison Age and Growth Study



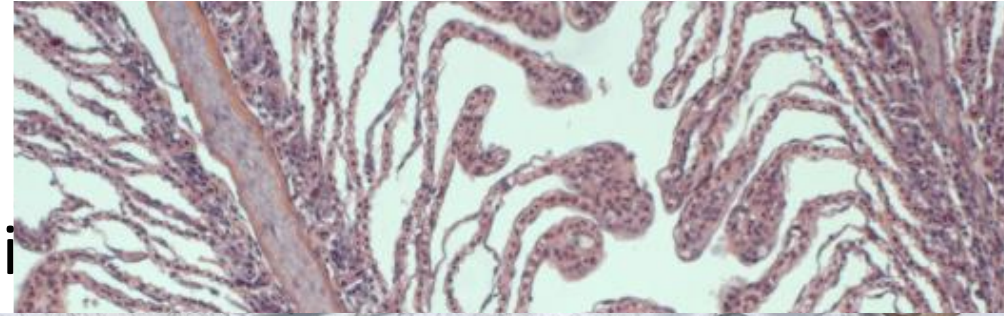
2021 Bear Trap Fish Kill

- Appeared to be single day event
 - Primarily between powerhouse and Warm Springs FAS
- Over 1,000 dead mountain whitefish
 - Only a handful of age-1 whitefish
- Several dozen adult trout found prior
- Several dead fish found immediately



2021 Bear Trap Fish Kill

- NWE staff coincidentally collected water quality data on May 18th
- Histology indicative of toxicant
- \approx 50% whitefish positive for PKD
- Saprolegnia observed in brown trout following



Questions?



Photo Credit: Morgan Jacobsen

Size Structure

