Influence of climate variability on Cutthroat Trout and Coastal Giant Salamander in headwater streams

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BACKGROUND

In response to climate change, the Pacific Northwest (PNW) ecoregion is expected to experience increased frequency and duration of droughts.

Studies have demonstrated initial negative impacts of a drought on stream biota, but our understanding of how these populations recover is more limited.

The PNW experienced a severe drought in 2015, which provided a unique opportunity to study how stream biota respond during and after a year with reduced streamflow and high temperatures that is likely reflective of future conditions across the region (**fig.1**).

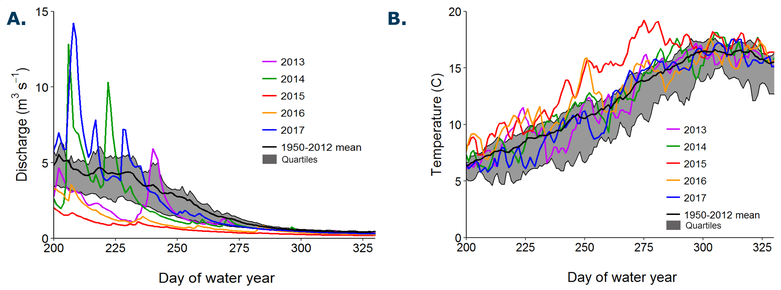


Figure 1: Hydrograph (**A**) and temp (**B**) signals at HJ Andrews Lookout Creek Gauge

STUDY QUESTIONS

How do trout and salamander populations in headwater ecosystems repond to severe drought conditions?

Do the impacts of a severe drought on trout and salamanders persist beyond the initial drought year?

METHODS

- Annual backpack electroshocking surveys in five headwater streams with sympatric populations of cutthroat trout (*Oncorhynchus clarkii*) and coastal giant salamander (*Dicamptodon tenebrosus*) from 2013 to 2017 (**fig.2,3**).
- Study reaches were 80-100 m in length on streams that ranged from 4 to 8 m bankfull width in the Mckenzie Basin.
- Determined abundance, biomass, and mean condition factor estimates for cutthroat trout and coastal giant salamander populations in each stream.

Study Site: McKenzie Basin, OR

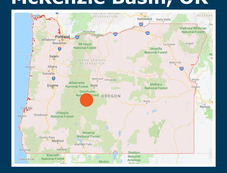
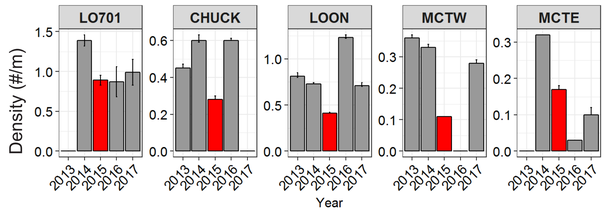


Figure 2: Electroshocking stream survey crew - 2017

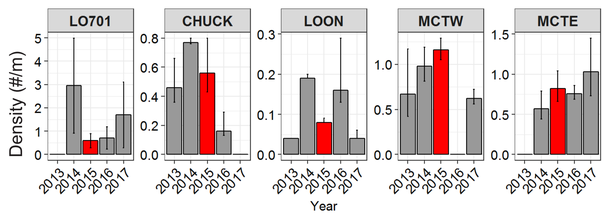
Figure 3: Cutthroat trout (top), and coastal giant salamander (bottom)

RESULTS - Abundance

Cutthroat Trout

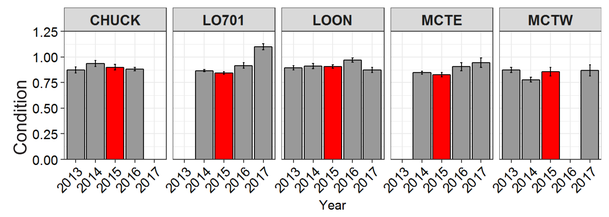


Coastal Salamander

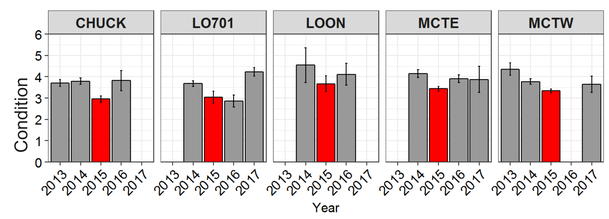


RESULTS - Condition

Cutthroat Trout

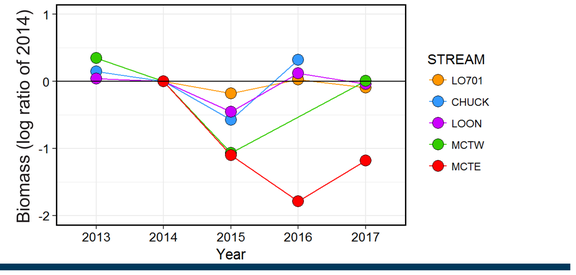


Coastal Salamander

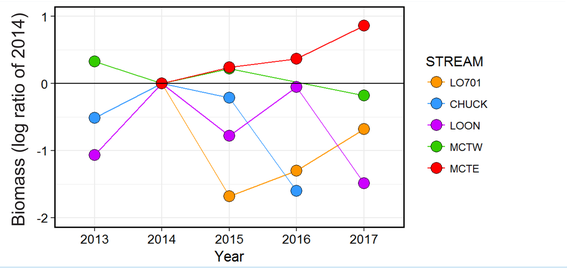


RESULTS - Biomass

Cutthroat Trout



Coastal Salamander



CONCLUSIONS

- Cutthroat trout abundance and total biomass declined during 2015 (drought year), but in four of the five streams, populations recovered within a year or two.
- In the largest stream (LO701), declines in fish biomass per meter were muted but the salamander decline was larger. In contrast, in the smallest stream (MCTE) fish declines were large while salamander abundance increased.
- In mid-sized streams, responses were more moderate, warranting further exploration into stream size influence on relative response and recovery of stream biota following severe drought conditions.
- Fish biomass declined in all sites in response to the drought while salamander biomass responses were more variable. In contrast, fish condition response were variable while salamander condition declined across all sites. This suggests the potential for different life-history strategies in dealing with drought that warrants further exploration in future work.

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