Centennial Valley Arctic Grayling Adaptive Management Project 2016 Spring Update

29 August, 2018

- The Centennial Valley Arctic Grayling Adaptive Management Plan (AMP) is being implemented to identify limiting factor(s) for Arctic grayling in the upper Centennial Valley (CV) of southwestern Montana. Non-native hybrid Yellowstone cutthroat trout, spawning habitat, and overwinter habitat have been identified as the three most likely factors that could limit long-term viability of grayling in the upper CV. Long-term viability is expected to be maintained by 1) conserving genetic diversity, 2) establishing spawning and/or refugia in at least two tributaries, and 3) maintaining a spawning population of $\geq$ 1,000 fish. The latter is based on the Species Status Assessment Workshop for Arctic grayling conducted in 2014.
- The AMP focus is on identifying factors that cause the spawning population to decline below 1,000 fish and, if that occurs, management actions that will most effectively return the population to objective. An emphasis on learning through 'management as experiment' during the first phase of the AMP is being accomplished via two experiments that 1) reduced non-native hybrid Yellowstone cutthroat trout population (2013–2016) and 2) will maximize availability of spawning habitat (2017–2020). Experiments are being developed for altering winter habitat. To date, natural variability has provided opportunity to explore the hypothesized relationship between grayling spawning population and area of suitable winter habitat in Upper Red Rock Lake (Upper Lake).
- The estimated number of Arctic grayling in the 2016 Red Rock Creek spawning population was **214 (95% CI = 161–321**), which was significantly lower than the previous year ($\hat{N}$ = 1131, 95% CI = 1069–1210; Figure 1), likely due to a winter mortality event.
- Suitable winter habitat within Upper Lake (i.e., water depth below the ice $\geq$ 1 m and dissolved oxygen $\geq$ 4 ppm) reached a minimum during February sampling at an estimated 8 ha. Grayling spawning population was reduced to $\leq$ 214 fish in all years when <10 ha of suitable winter habitat was available in Upper Lake (Figure 2).

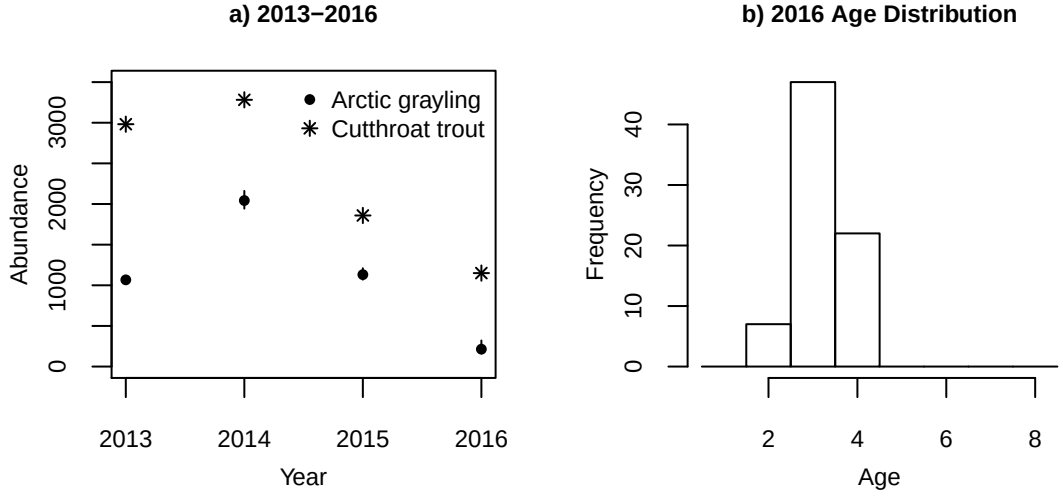

Figure 1. a) Arctic grayling and non-native hybrid Yellowstone cutthroat trout abundance estimates and 95% confidence intervals (grayling only) from Red Rock Creek, 2013–2016, and b) age distribution of the 2016 grayling spawning population.

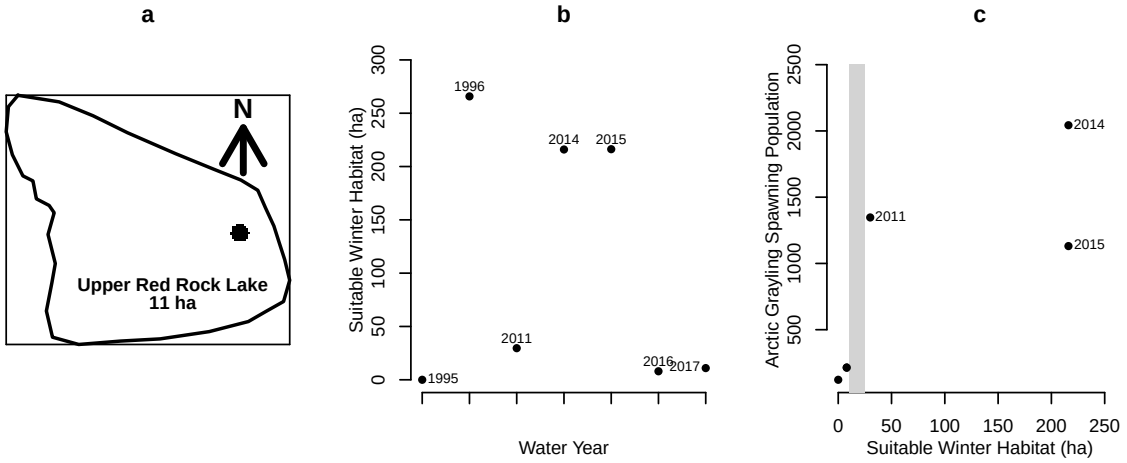

Figure 2. a) Extent of minimum area of suitable Arctic grayling winter habitat in Upper Red Rock Lake, 2016, b) annual estimate of minimum area of suitable habitat for water years 1995–2017, and c) grayling spawning population as a function of minimum area of suitable winter habitat for years when both were estimated (1995 [0 ha] and 2016 [8 ha] points are plotted but not labelled). The shaded polygon represents an hypothesized threshold (10–25 ha) of suitable winter habitat where 1) enough winter habitat is available to sustain grayling population at objective ($N \geq$ 1,000 fish, $>$ 25 ha suitable habitat), and 2) winter habitat presumably reduces grayling survival, resulting in grayling population below objective ($\hat{N} \leq 214$, <10 ha suitable habitat).

- The estimated number of Yellowstone cutthroat trout in the Red Rock Creek spawning population was **1150**, an approximate reduction of **65%** from the highest estimated population in 2014 ($\hat{N} = 3282$; Figure 1).
- We will continue to learn how grayling respond to Yellowstone cutthroat trout population reductions, the first management experiment undertaken as part of the AMP, as 1) grayling cohorts spawned during low trout abundances recruit, and 2) Yellowstone cutthroat trout spawning population recovers.
- Suitable spawning habitat was most recently quantified in 2015, with an estimated total area of suitable spawning habitat (A_{ts}) of 1.7 ha, and weighted area of suitable habitat (A_{tw}) of 4.1 ha, in Red Rock and Elk Springs creeks. Surveys to estimate area of suitable spawning habitat will be completed again in 2017.

LITERATURE CITED

Boyd, J. 2008. Effects of water temperature and angling on mortality of salmonids in Montana streams. Thesis. Montana State University, Bozeman, Montana. 56 pgs.

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