

Afognak Lake Sockeye Salmon Stock Monitoring, 2010

The Afognak Lake sockeye salmon *Oncorhynchus nerka* run severely declined in 2001. Concerns expressed by local subsistence users to the Alaska Department of Fish and Game and the US Fish and Wildlife Service Office of Subsistence Management prompted an investigation of the lake's rearing environment in 2003 followed by subsequent annual studies. This report provides 2010 project results.

Using mark-recapture techniques, an estimated 309,130 sockeye salmon smolt (95% CI 267,874–350,387) emigrated from Afognak Lake in 2010. The emigrating sockeye salmon smolt population was composed of 237,716 age-1. and 71,415 age-2. smolt. Age-1. smolt had a mean weight of 2.6 g, a mean length of 70 mm, and a mean condition factor of 0.76. Age-2. smolt had a mean weight of 3.9 g, a mean length of 82 mm, and a mean condition factor of 0.69. The total sockeye salmon escapement into Afognak Lake was 52,255 of which 80.6% were age 1.3.

Lake limnology data were collected during 5 monthly sampling events from May to September. In 2010, chlorophyll-*a* concentrations increased, seasonal total phosphorus concentrations declined, seasonal zooplankton densities were low, condition factors of emigrating smolts were low compared to historical data, and there was a positive association ($R^2=.83$, $p<0.00017$) between temperature and the condition of emigrating smolt.

Further assessment of photosynthetically active radiation, nutrient availability, phytoplankton population, available forage species vs. actual forage species, and the bioenergetic responses of juvenile salmon will occur over the next 3 years (2011–2013) of this project. This additional information, coupled with annual smolt health and abundance estimates, will provide greater insight into Afognak Lake's freshwater environment and factors affecting smolt production.

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