



**NOAA
FISHERIES**

Adult spring/summer Chinook salmon estuarine and lower Columbia River survival and run timing

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The primary goal of this study is to provide estimates of survival and run timing for spring/summer Chinook salmon returning to the Middle & Upper Columbia & Snake Rivers

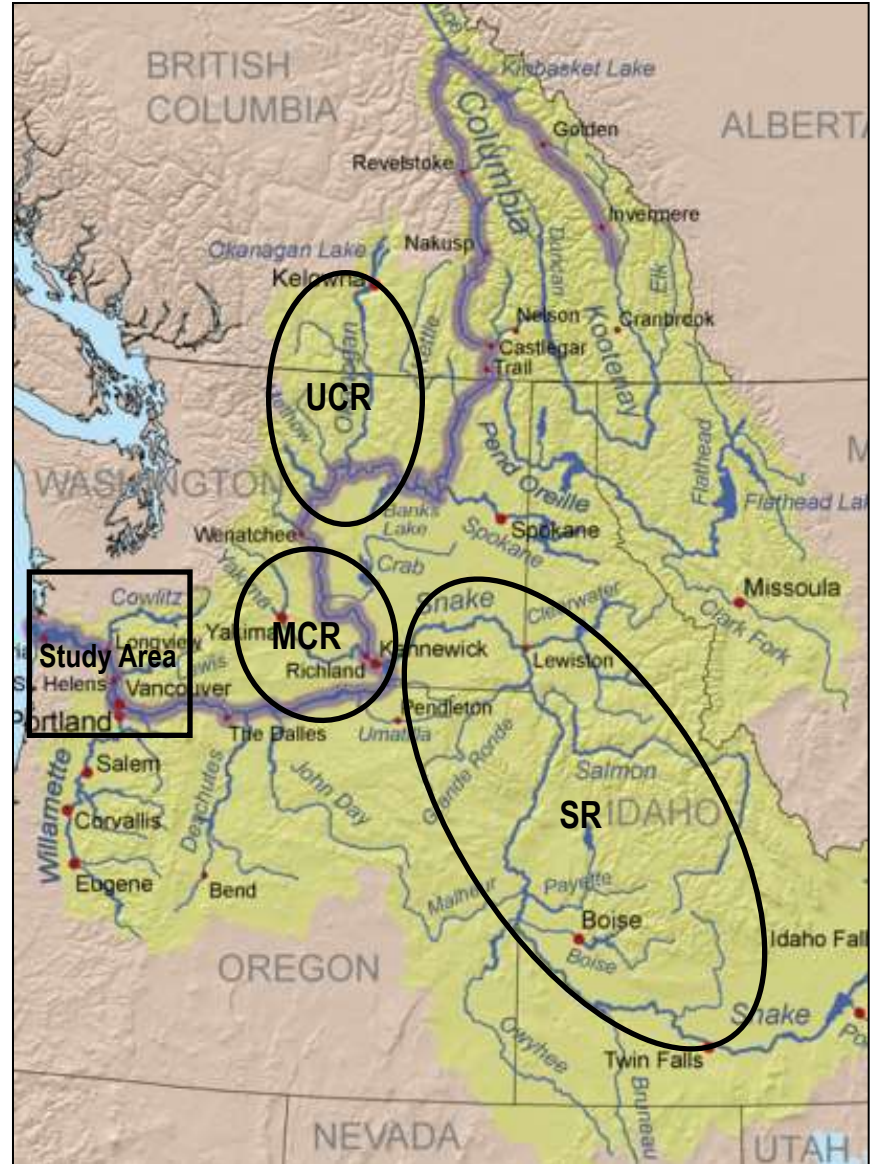


Photo by Darren Ogden, NOAA NWFS

Natural mortality in the CR estuary and lower river may be significant

Due to success of the Marine Mammal Protection Act of 1972 by the late 1980's Harbor seal and Stellar sea lion presence within the CR had been reestablished and California sea lions had been introduced



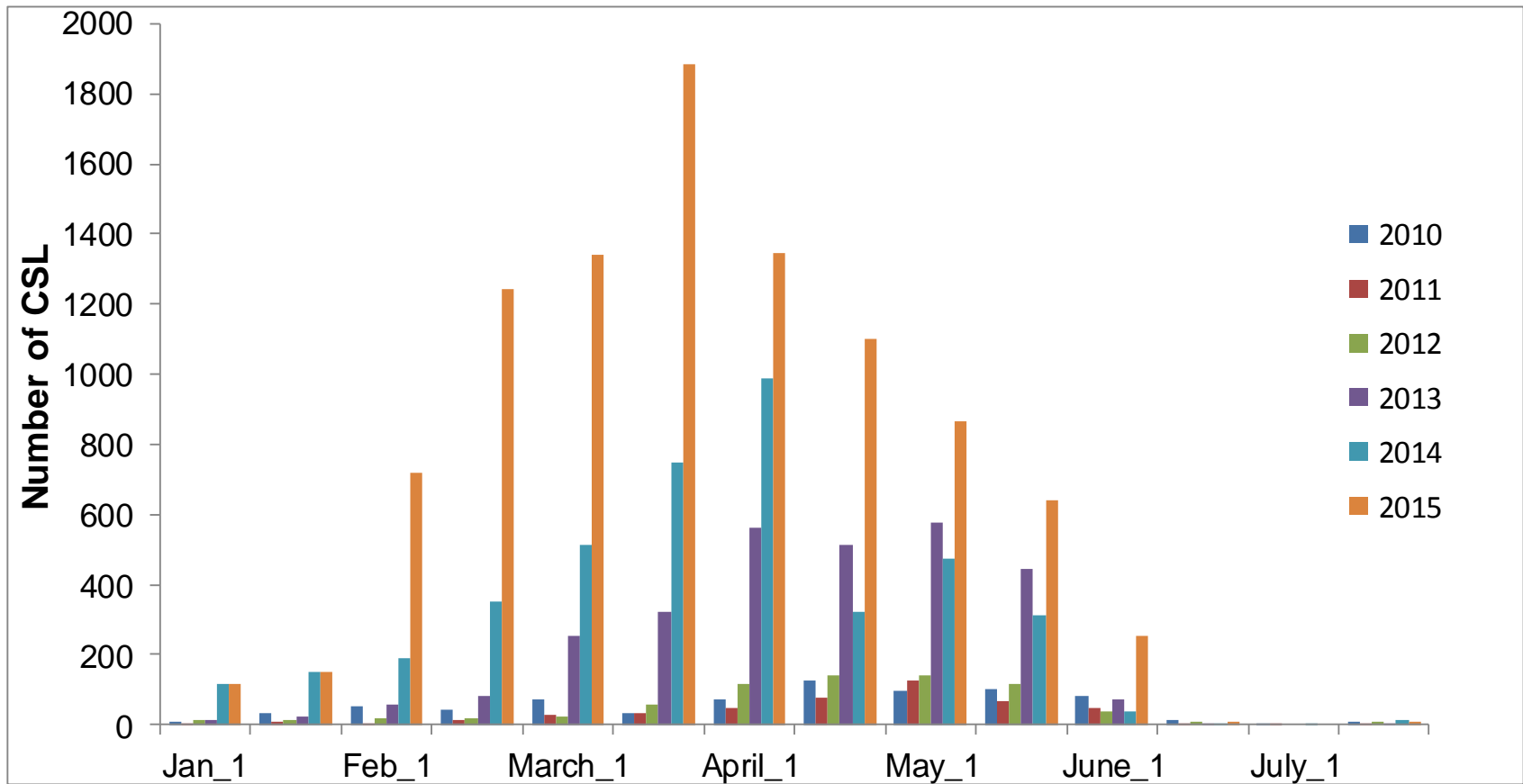
Photos by Ben Sandford, NOAA NWFSC







Average biweekly number of sea lions hauled out at the East End Mooring Basin near Astoria, OR



Data provided by Matt Tennis, ODFW



Commercial tangle-net crew
hauling in a Chinook salmon



Custom fabricated PVC tubes
Facilitated safe handling,
holding, and transfer of study
fish



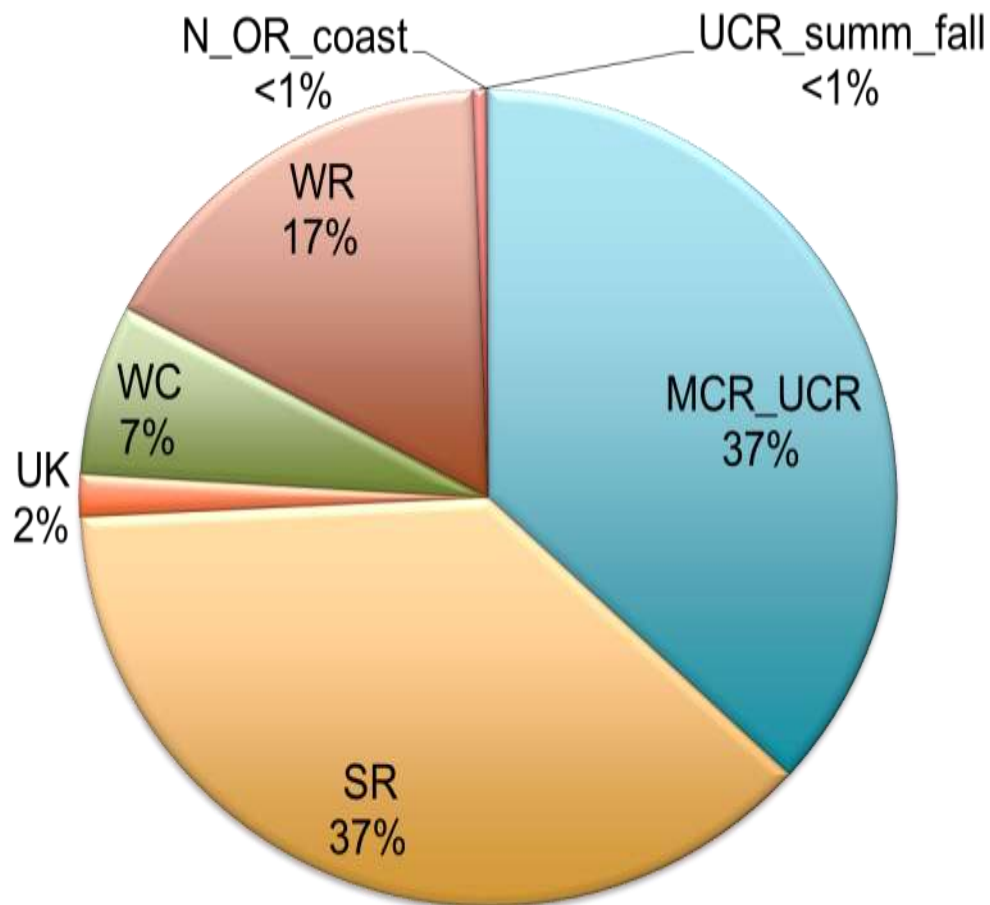
Adult Chinook salmon being transferred from the commercial fishing vessel to a research vessel using PVC tubes



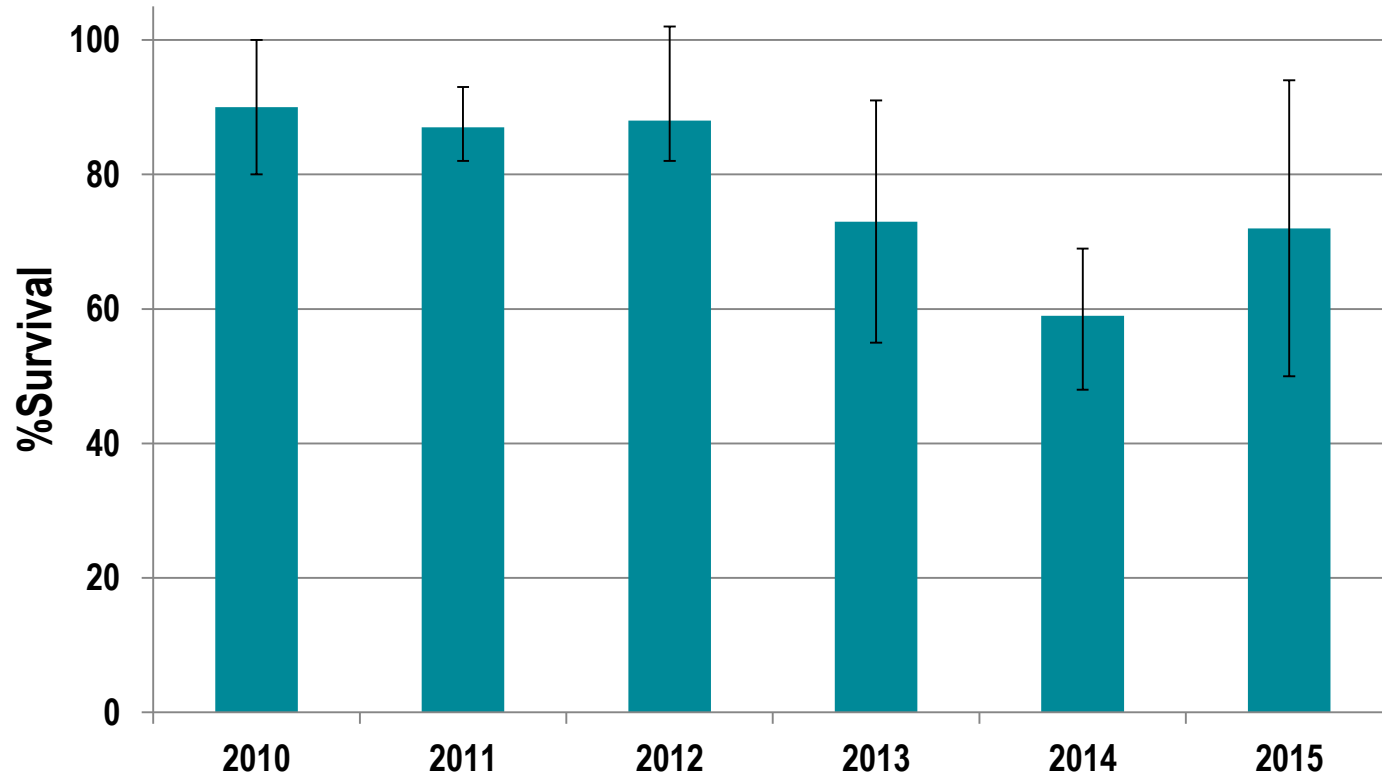
Study fish were physically restrained in dorsal recumbency for tissue collection and tagging

> 2200 returning spring/summer Chinook salmon have been tagged for this study since 2010

- Willamette River spring Chinook (17%)
- West Cascade tributary spring Chinook (7%)
- Middle and Upper Columbia River spring Chinook (37%)
- Snake River spring/summer Chinook (37%)
- Upper Columbia River summer/fall Chinook (<1%)
- North Oregon Coast Chinook (<1%)
- Unknown origin (2%)



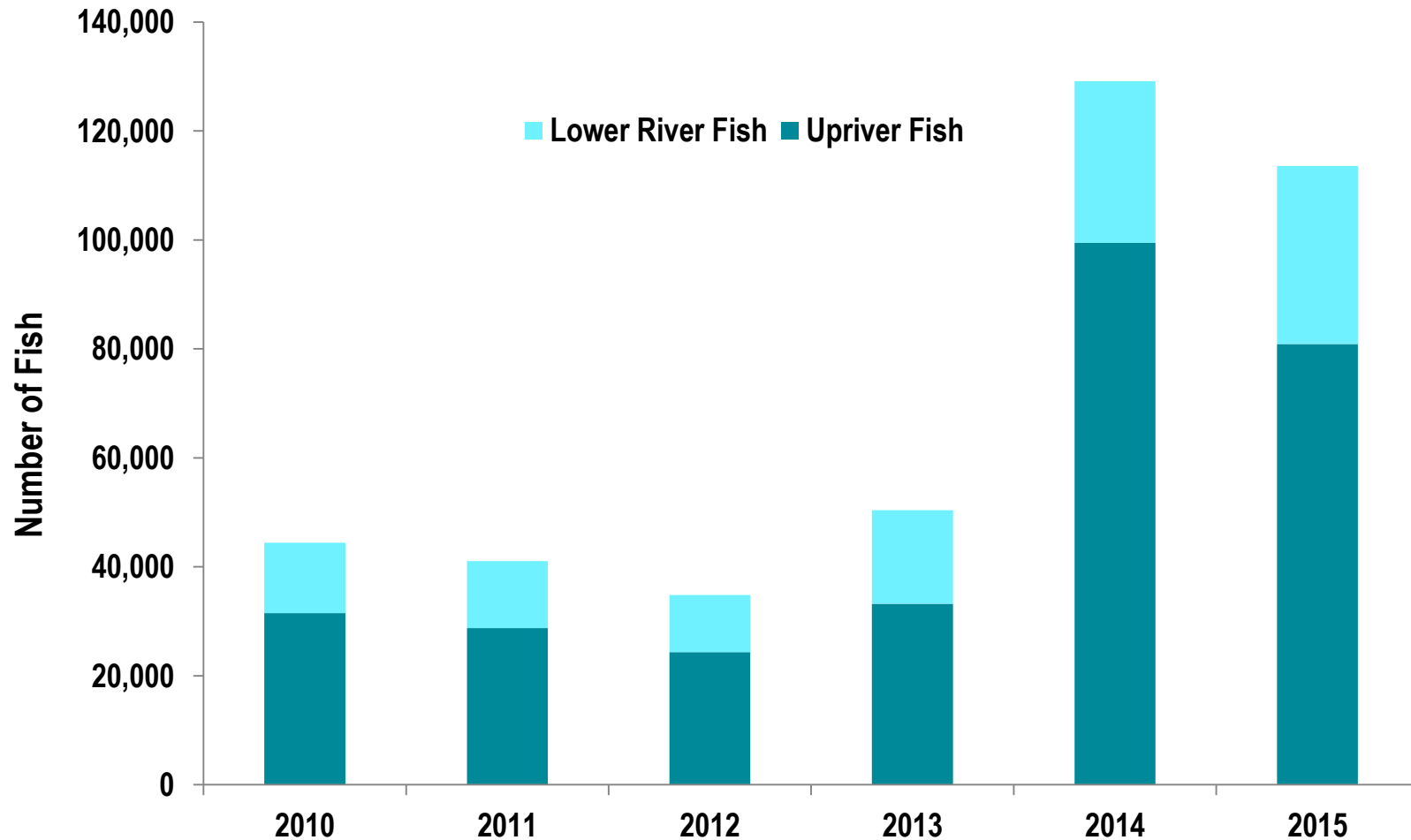
Weighted Mean Adjusted Survival for Interior CR adults (FL \geq 56 cm)



*Preliminary estimate & assumes harvest of 7%

**Survival estimates have been adjusted for mortality due to handling & tagging, detection efficiency at Bonneville Dam, and harvest

What do these estimates imply?



Estimates of Chinook salmon returns are from the 2016 WDFW Joint Staff Report and exclude Select Area spring/summer Chinook salmon returning to the CR estuary.

Potential sources of mortality (or error)

- **Pinniped depredation**
- **Permanent straying below Bonneville Dam for upriver fish**
- **Disease**
- **Under-estimation of sampling & handling mortality**
- **Under-estimation of harvest**
- **Artifact of learned behavior by predators**



Summary:

- >2200 fish tagged since 2010
- Average annual survival ranged from 55-90%
- Average annual survival decreased as the number of sea lions hauled out near Astoria, OR increased through 2014 but not beyond
- Higher seasonal mortality also coincides with peak sea lion presence
- Radio-telemetry has been incorporated into the study this spring to identify reach level behavior and survival and to obtain direct predation evidence

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www.nwfsc.noaa.gov/research/divisions/fe/estuarine/adult-est-survival.cfm