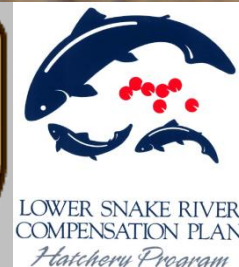


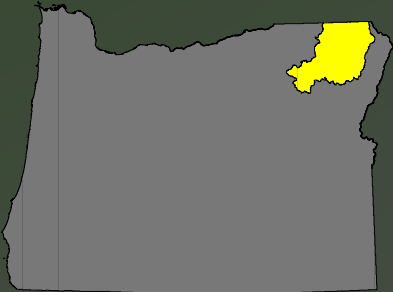
Harvest and Straying of Two Hatchery Steelhead Lines: One Derived from the Other by Temporally Selective Broodstock Collection

Lance Clarke, Michael Flesher, Shelby Warren, Bill Knox,
and Richard Carmichael

Oregon Department of Fish and Wildlife



Wallowa Stock Steelhead

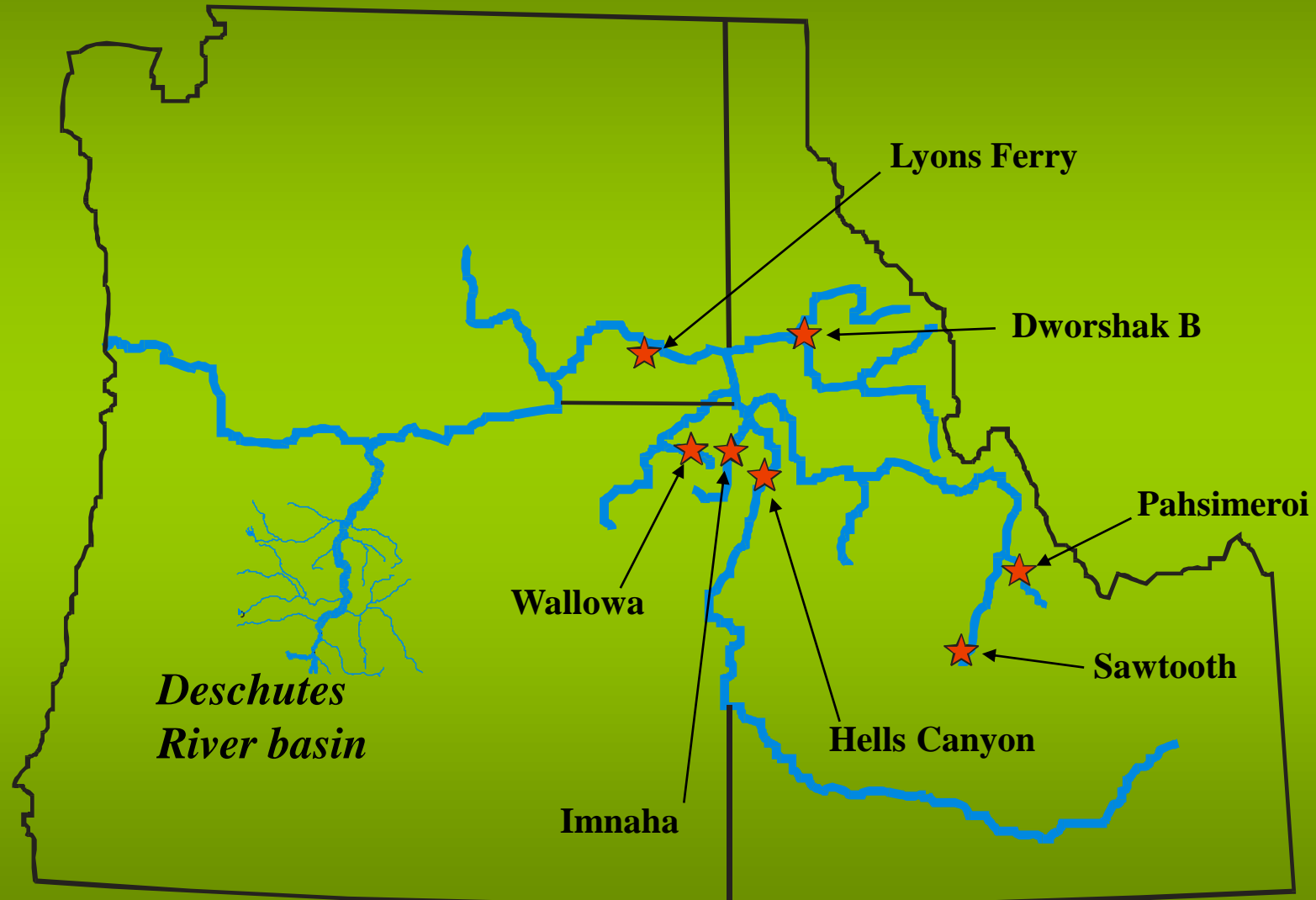


Wallowa Hatchery Broodstock

- Stock founded from adults collected in spring at Ice Harbor (1976) and Little Goose (1977 & 1978) dams
- Current broodstock sourced from spring returns to hatchery
- Substantial fishery in Grande Ronde basin from Sept.–April

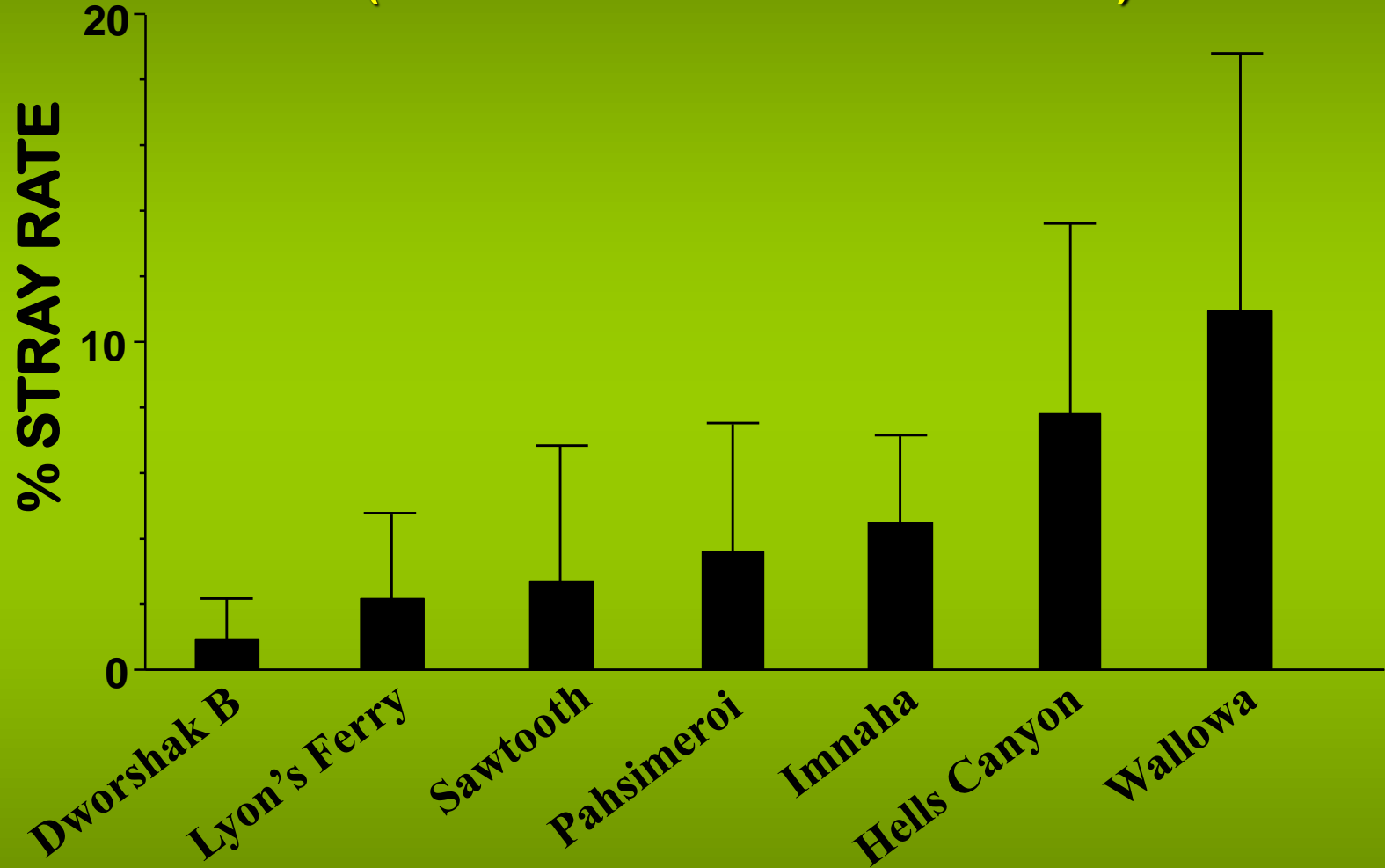


Snake River Hatchery Steelhead Stocks



Average Annual Deschutes River Straying By Snake River Hatchery Steelhead Stocks

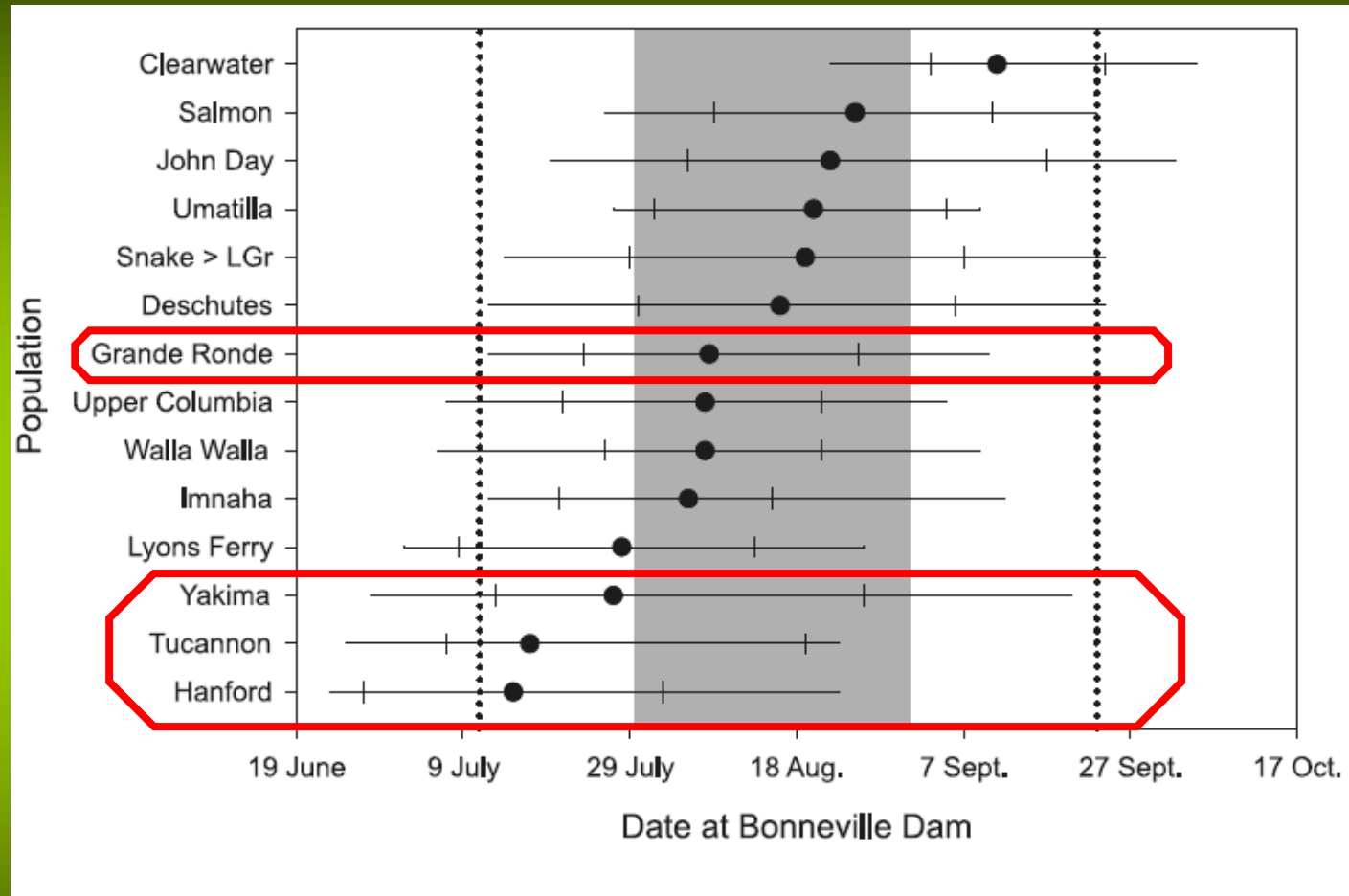
(Based on 11-24 Years of Data)



HATCHERY PROGRAM

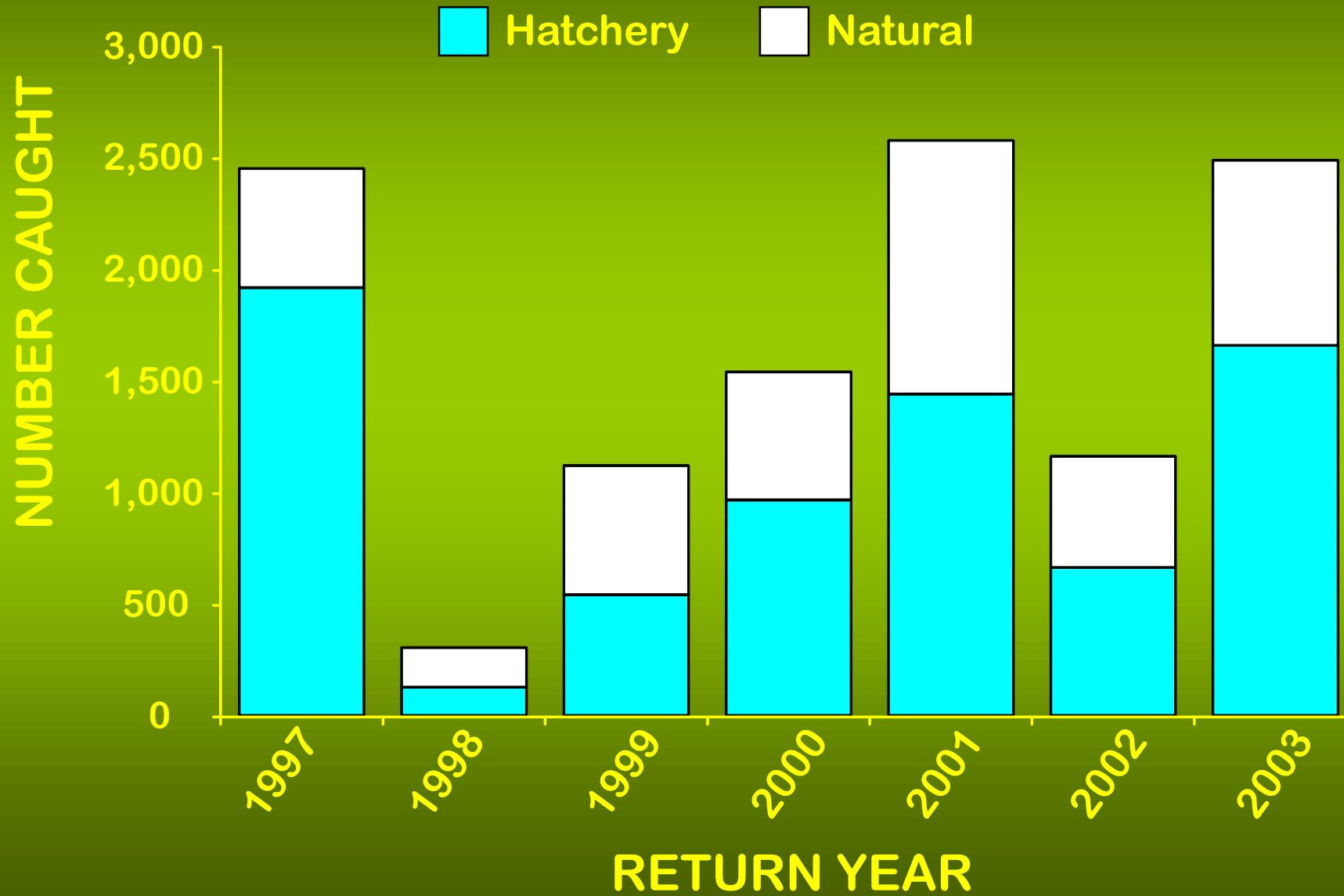
Error bars = 1 SE

Steelhead Migration Timing in the Columbia River (from Keefer et al. 2009, CJFAS)

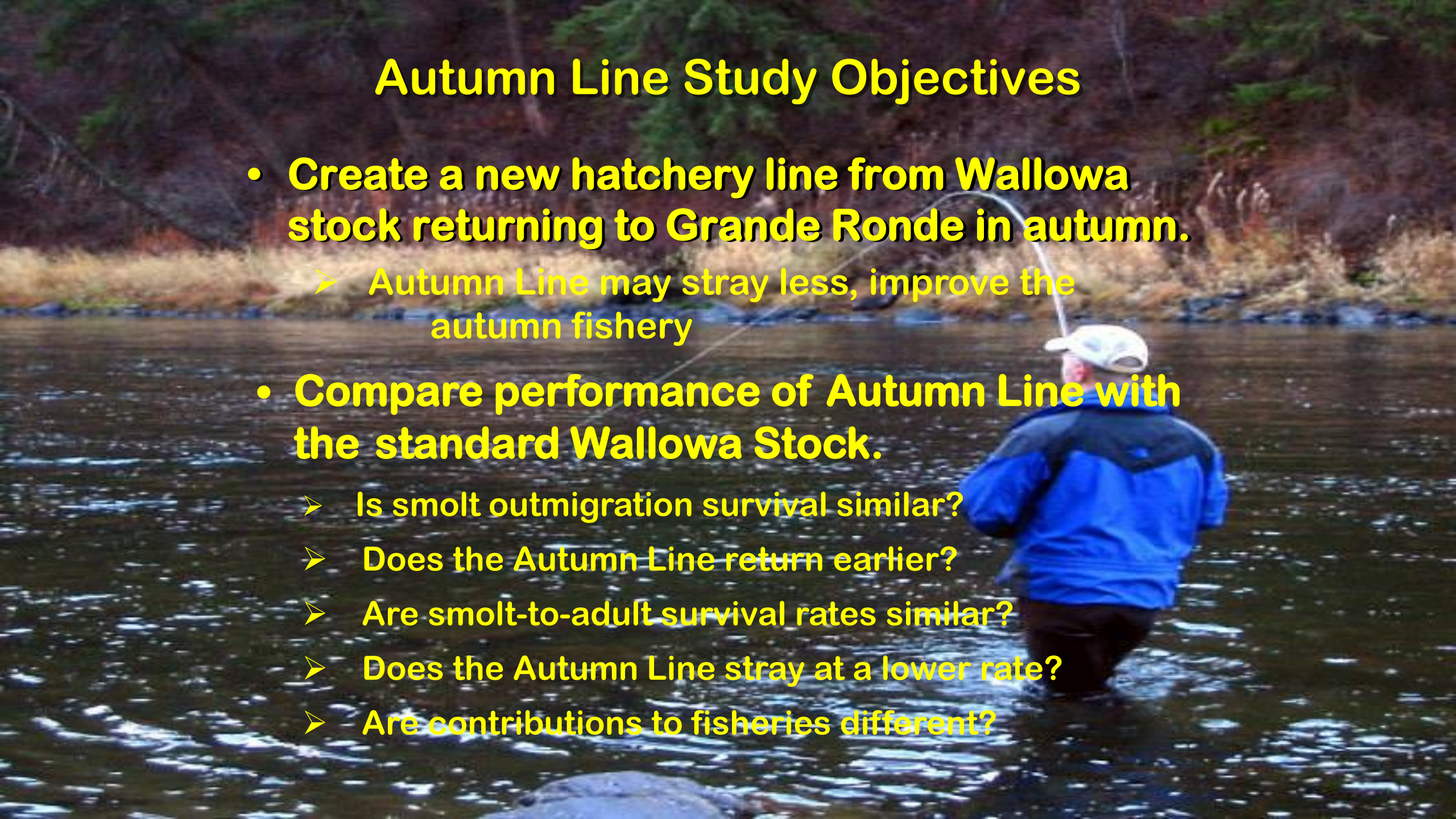


“On average, stocks migrating earliest (Tucannon, Hanford Reach, and Lyon’s Ferry) encountered the lowest daily temperatures in the Bonneville reservoir, were least likely to use refugia, and passed through the Bonneville to John Day reach fastest”

Total Autumn Steelhead Catch on the Lower Grande Ronde (1997-2003)



Autumn Line Study Objectives

- **Create a new hatchery line from Wallowa stock returning to Grande Ronde in autumn.**
 - Autumn Line may stray less, improve the autumn fishery
 - **Compare performance of Autumn Line with the standard Wallowa Stock.**
 - Is smolt outmigration survival similar?
 - Does the Autumn Line return earlier?
 - Are smolt-to-adult survival rates similar?
 - Does the Autumn Line stray at a lower rate?
 - Are contributions to fisheries different?
- 
- A person wearing a blue jacket and a white cap is fishing in a river. The person is seen from the back, holding a fishing rod that is arched over the water. The river is dark with some white foam from the current. The background shows a forested bank with some dry grass and rocks.

Autumn Broodstock Collection and Handling

(Brood Years 2004–2007)

- Upon landing, anglers placed hatchery fish in a tube
 - Oriented fish into flow, held up to 24 h
 - Fish PIT-tagged, transferred to Wallowa Hatchery, held for spawning





Max. Density = 19.5 kg/m^3

Wallaqua Acclimation Ponds

Max. Density = 19.3 kg/m^3

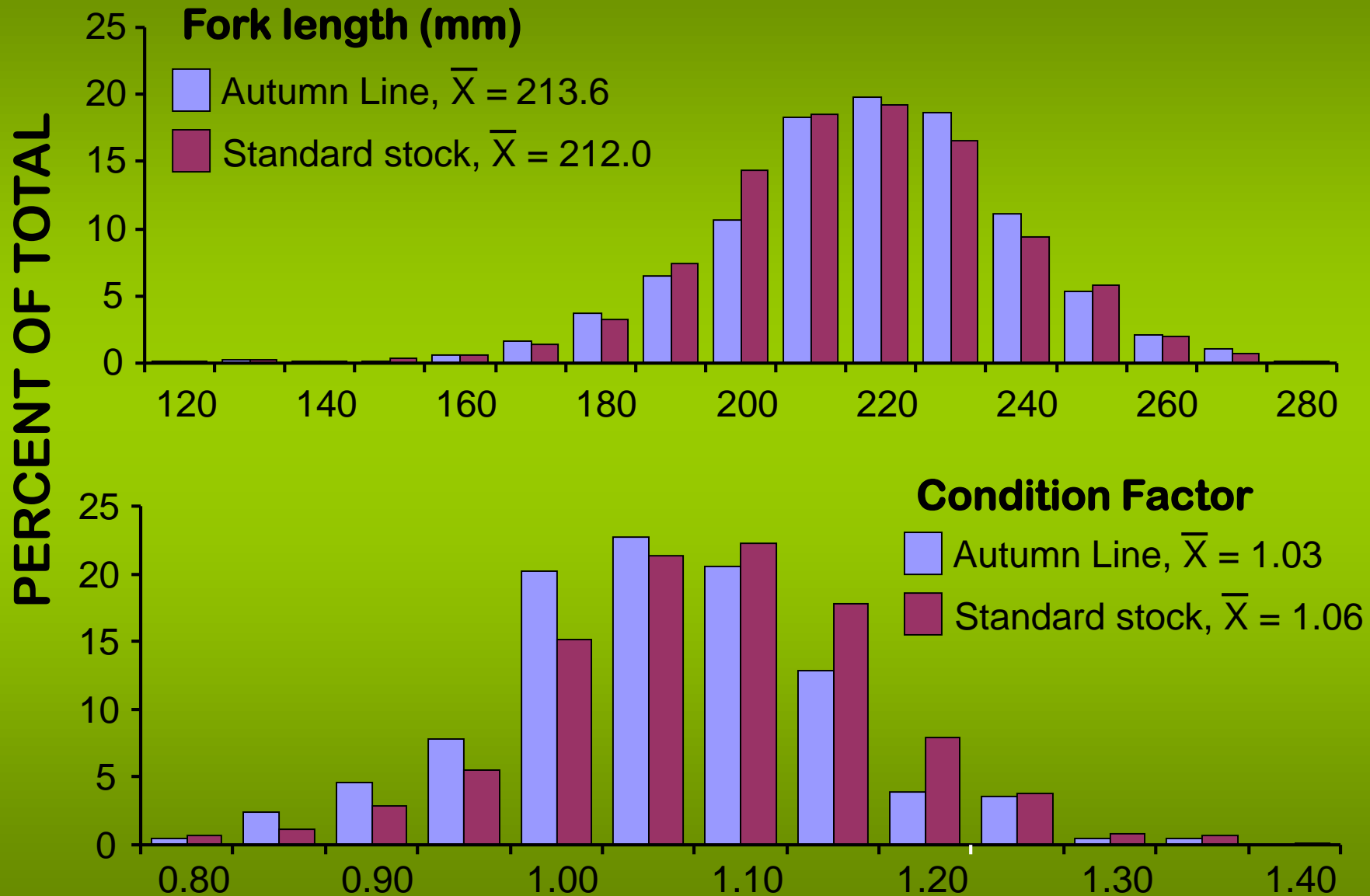


Juvenile Steelhead Releases

Brood Year	Gen-eration	Number Released		Number PIT tagged	
		Autumn	Standard	Autumn	Standard
2004	F ₁	170K	373K	3,777	3,769
2005	F ₁	277K	308K	3,567	3,566
2006	F ₁	221K	258K	3,567	3,586
2007	F ₁	140K	345K	3,558	6,914
2008	F ₂	129K	241K	3,599	5,203

* Coded wire tags were implanted into 100K of Autumn Line and Standard Line juveniles for estimating stray rates.

Average Smolt Length and Condition Factor, Brood Years 2004-07

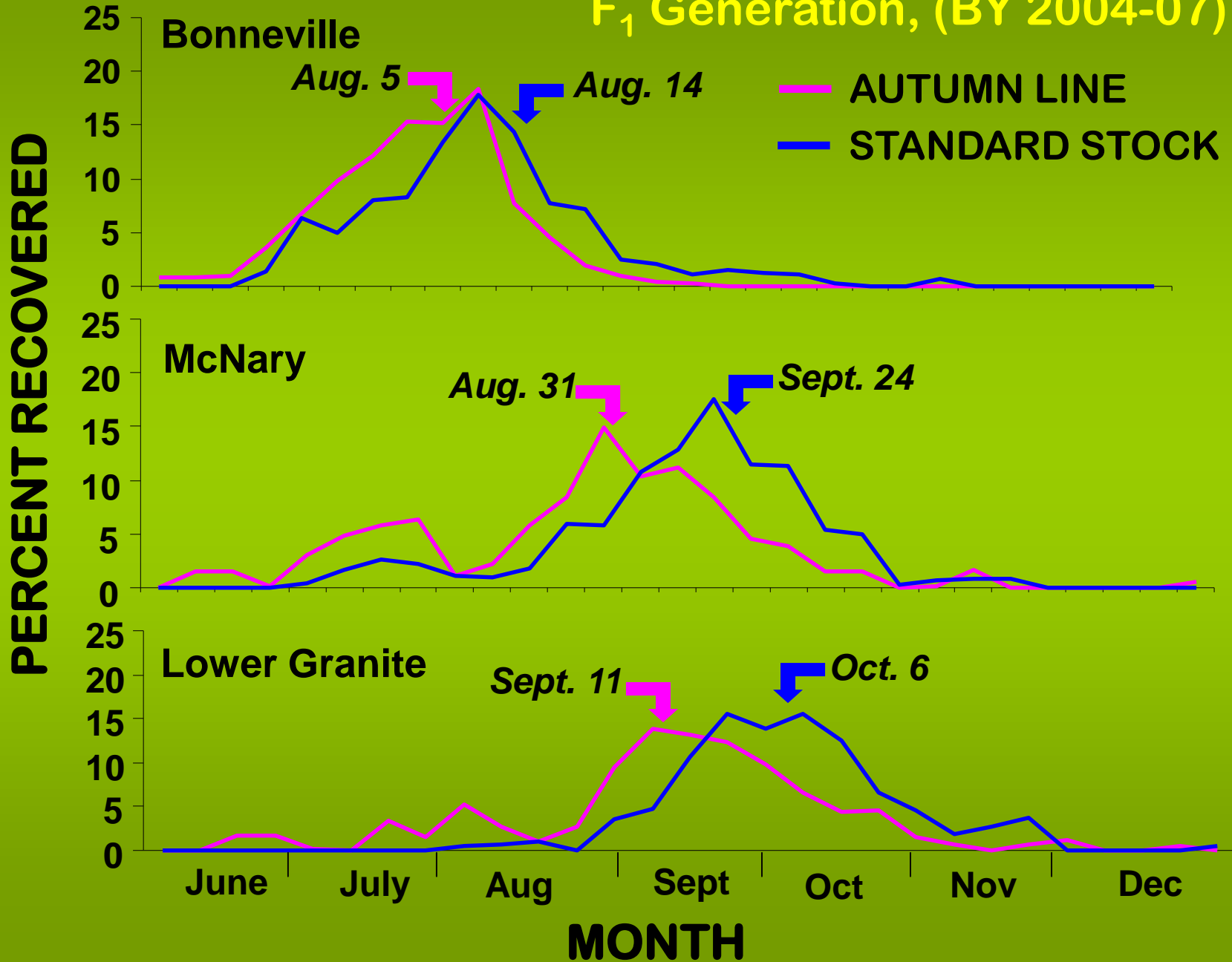


Juvenile Performance

Brood Year	Travel Time (d; \pm SD)		% Outmigration Survival (\pm CI)	
	Autumn	Standard	Autumn	Standard
2004	23.5 (7.0)	23.8 (7.6)	77 (2.1)	77 (3.0)
2005	21.6 (11.5)	22.4 (10.8)	73 (6.6)	74 (5.3)
2006	30.8 (6.7)	30.1 (8.7)	71 (22.3)	78 (41.0)
2007	31.3 (11.3)	33.1 (12.9)	84 (19.3)	84 (13.5)
2008	18.3 (9.7)	17.3 (11.2)	82 (4.8)	80 (3.9)
<i>Averages</i>	<i>25.1</i>	<i>25.3</i>	<i>77%</i>	<i>79%</i>

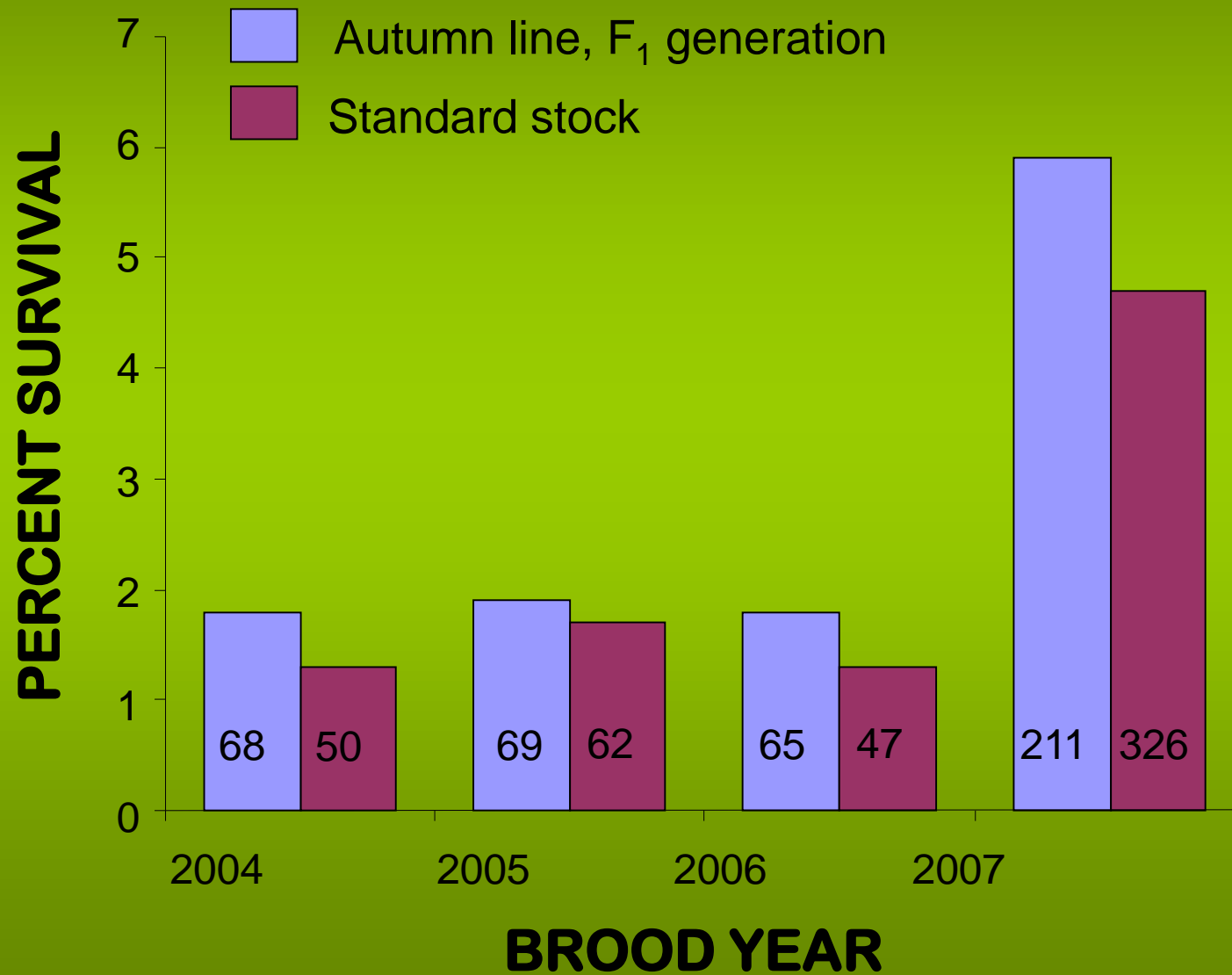
Average Adult Return Timing

F₁ Generation, (BY 2004-07)



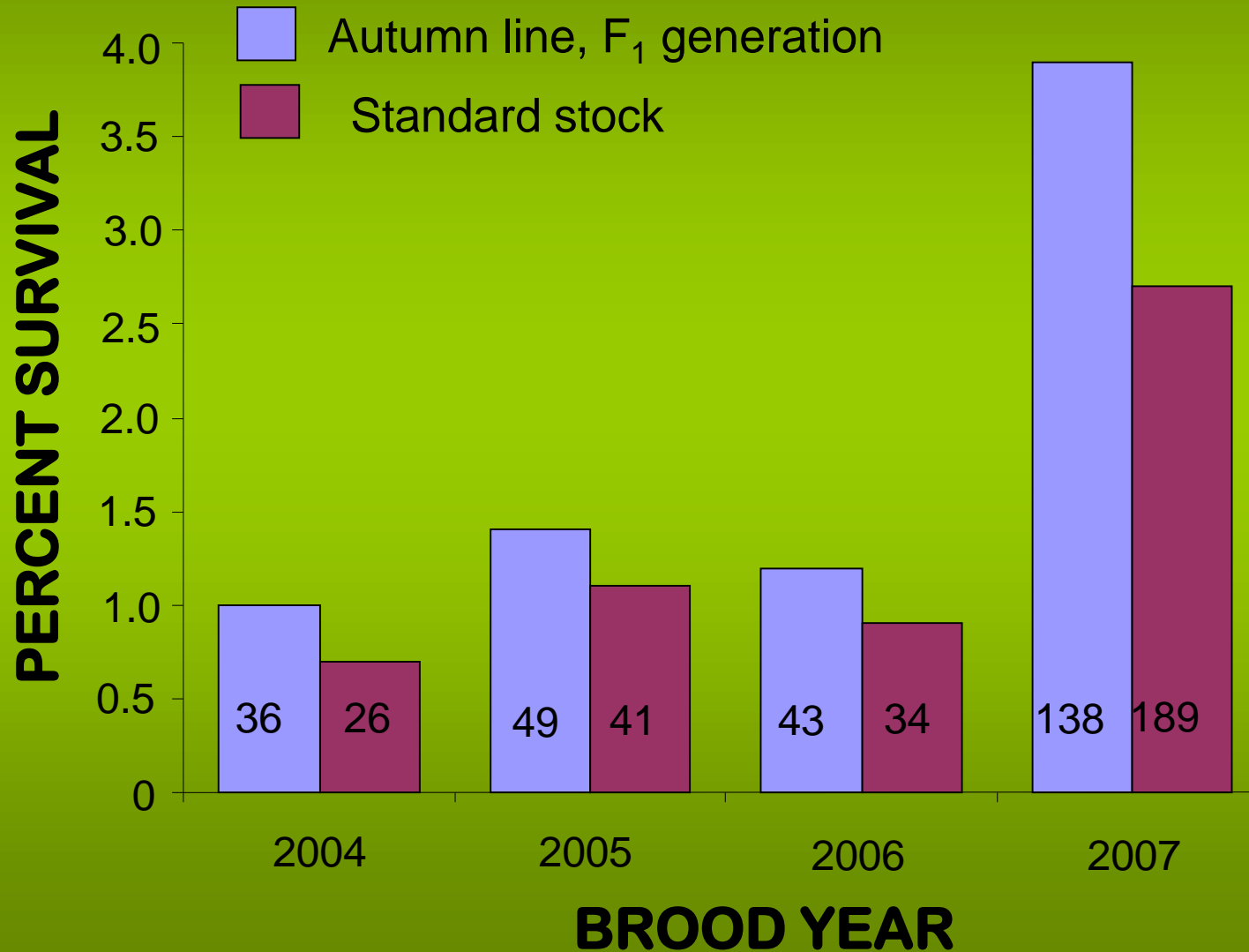
Smolt-to-Adult Survival to Bonneville Dam

(significantly different, $P = 0.004$)

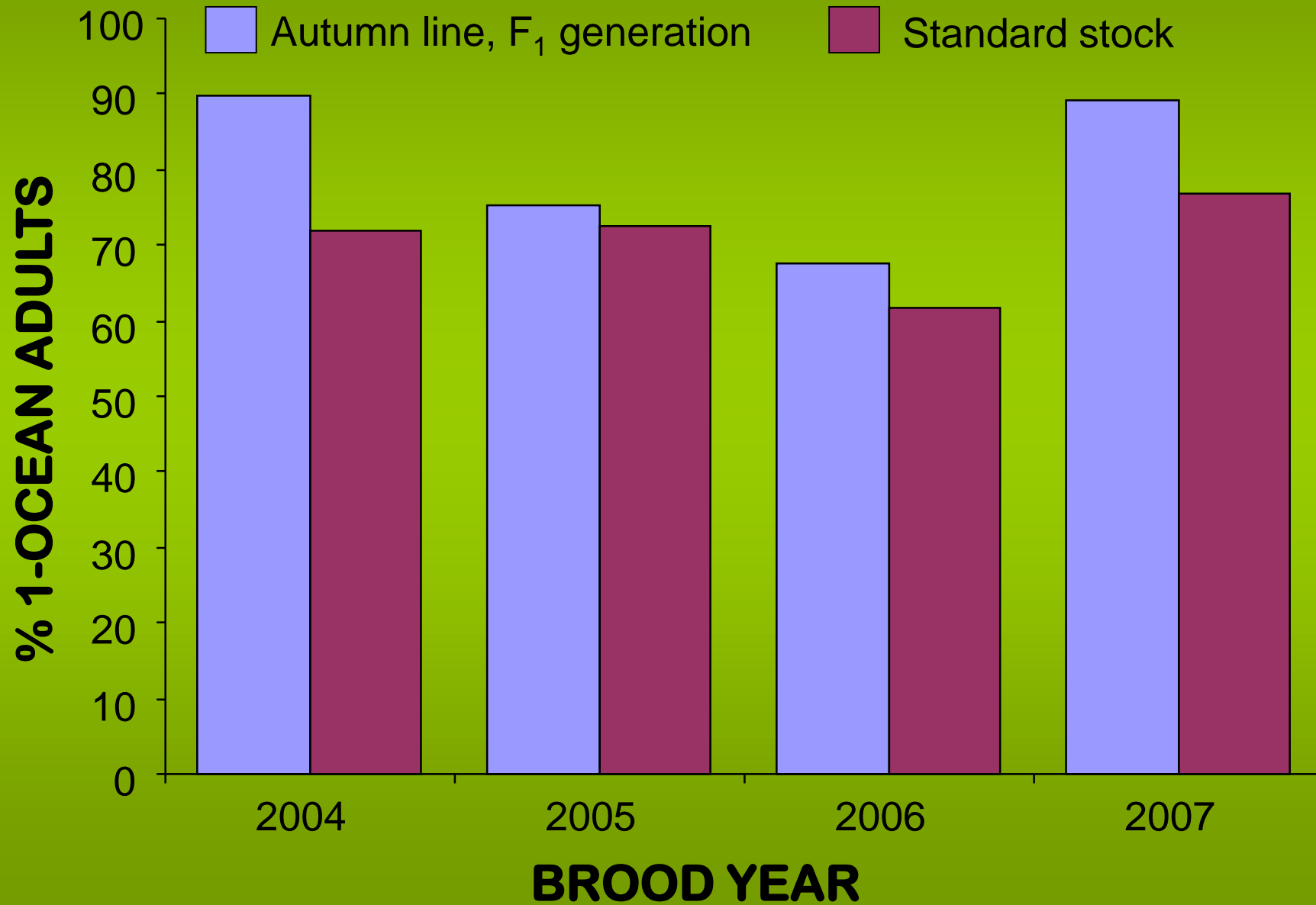


Smolt-to-Adult Return to Lower Granite Dam

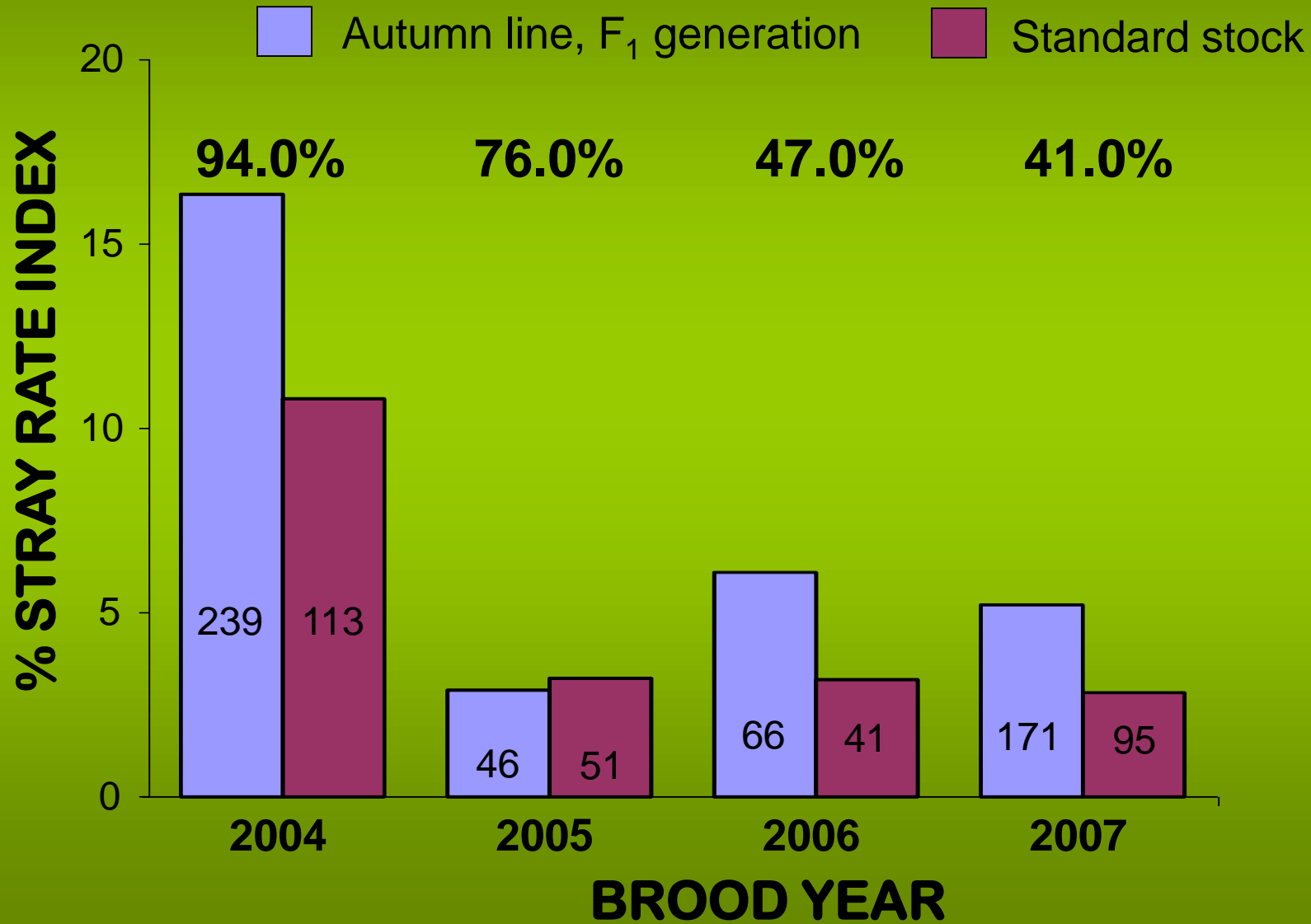
(significantly different, $P < 0.001$)



Age At Return

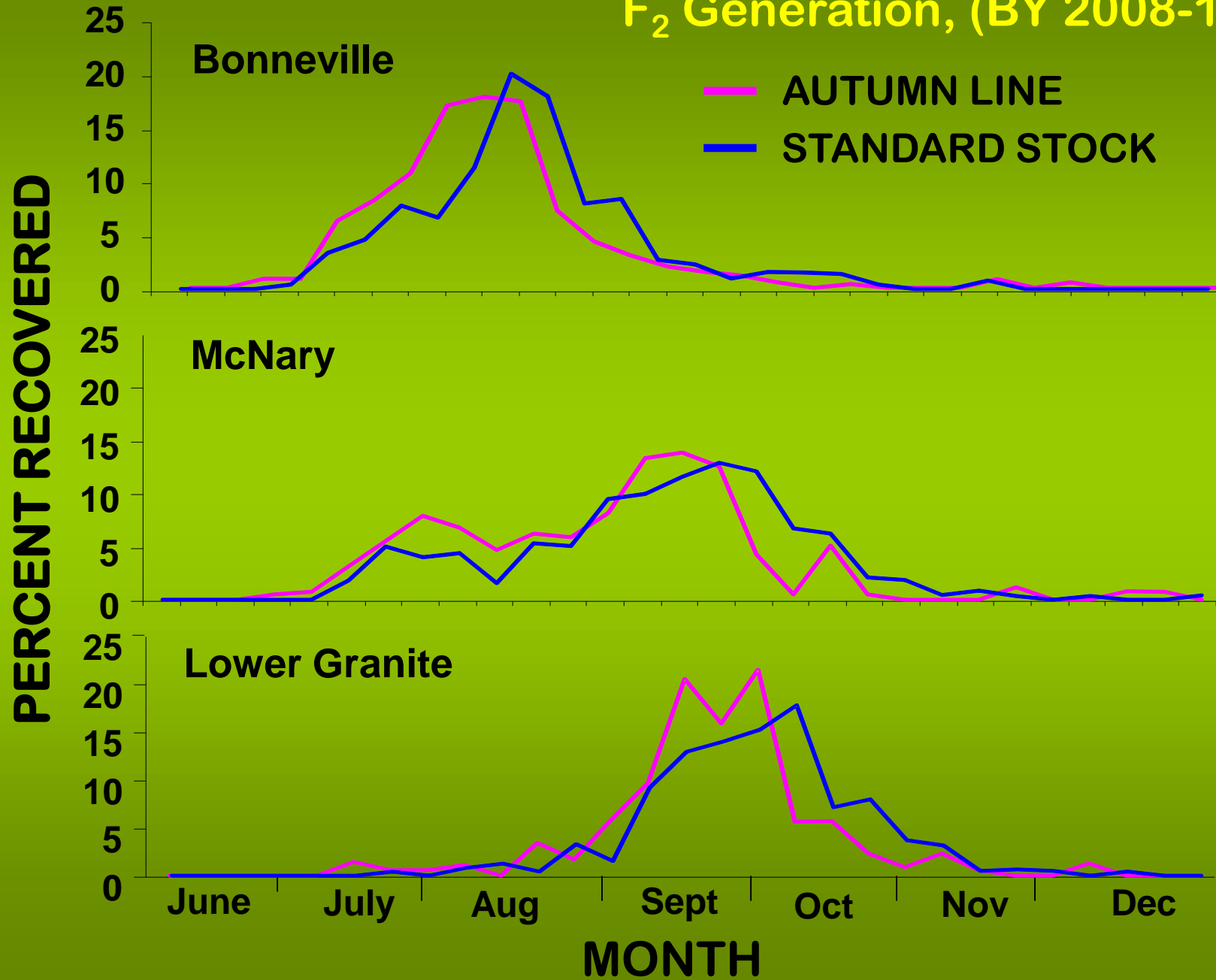


Percent of Steelhead that Strayed And the Percent of Barged Fish

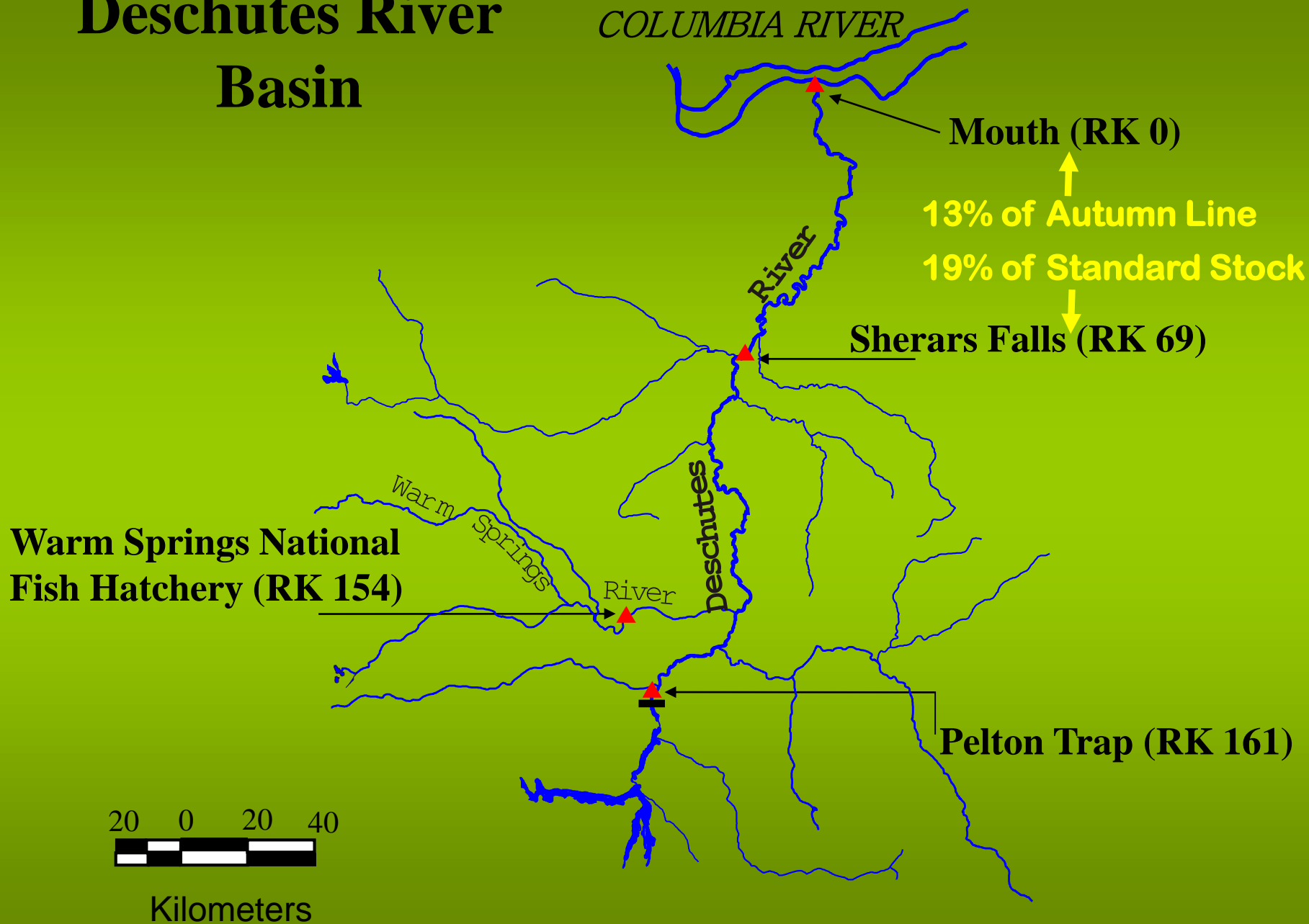


Average Adult Return Timing

F₂ Generation, (BY 2008-11)



Deschutes River Basin

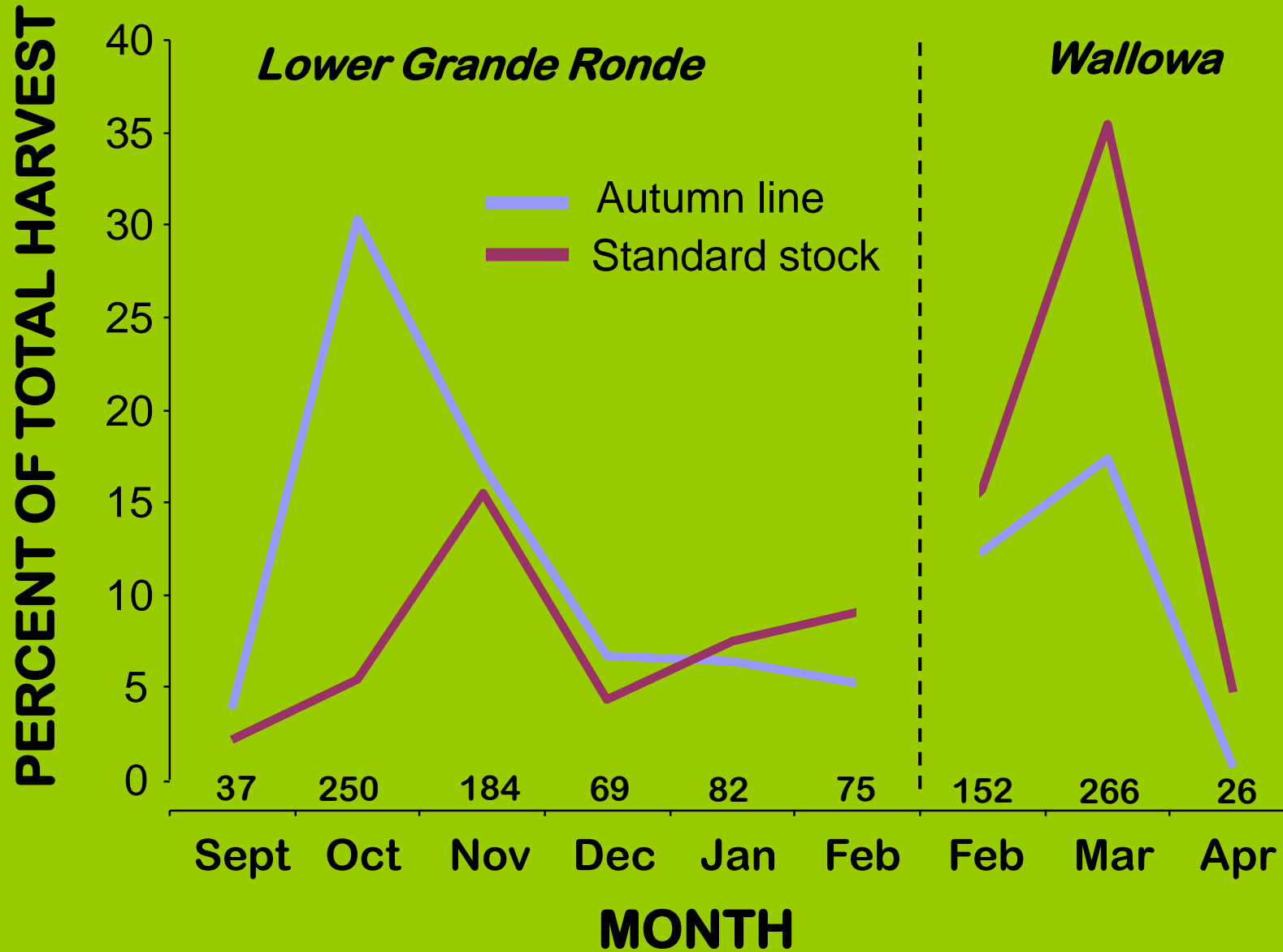


Grande Ronde River Fisheries

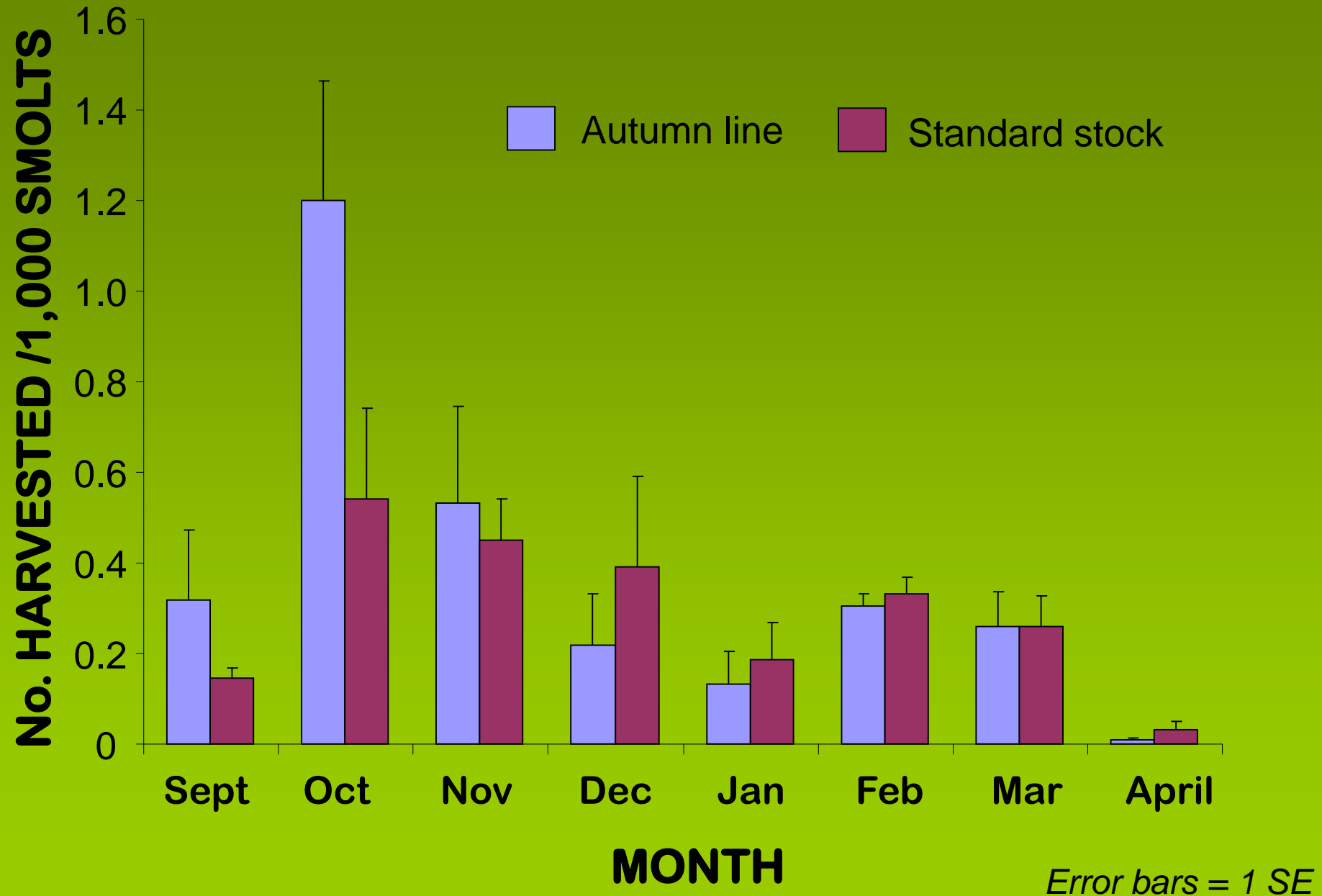


Harvest Timing in the Grande Ronde Basin

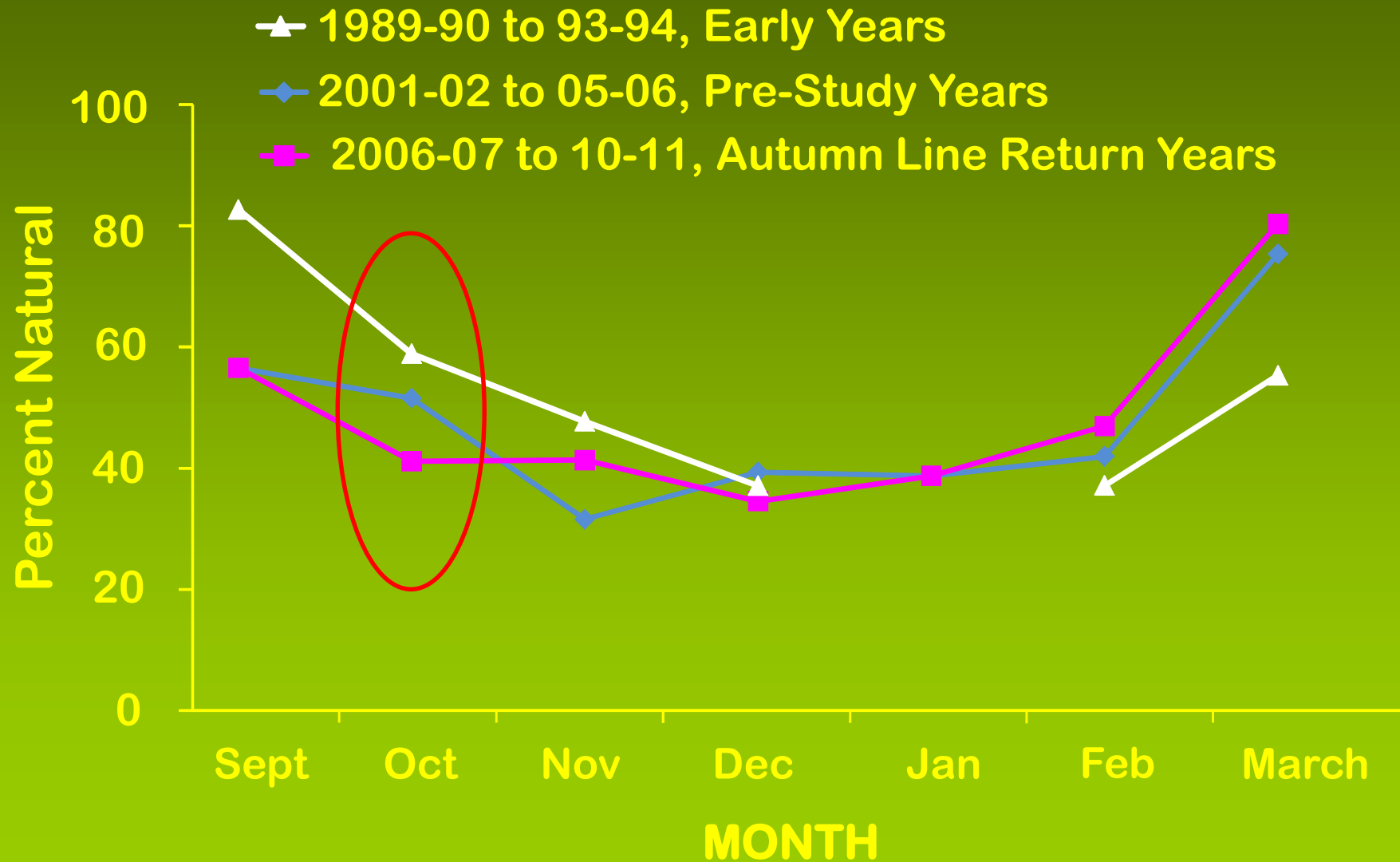
(run years 2006-07 to 2008-09)



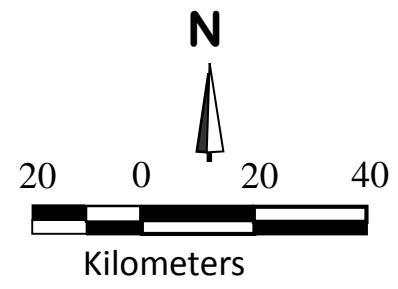
Number Harvested in the Lower Grande Ronde



Percent of Natural Steelhead Caught in the Lower Grande Ronde Fishery (for three return year periods)

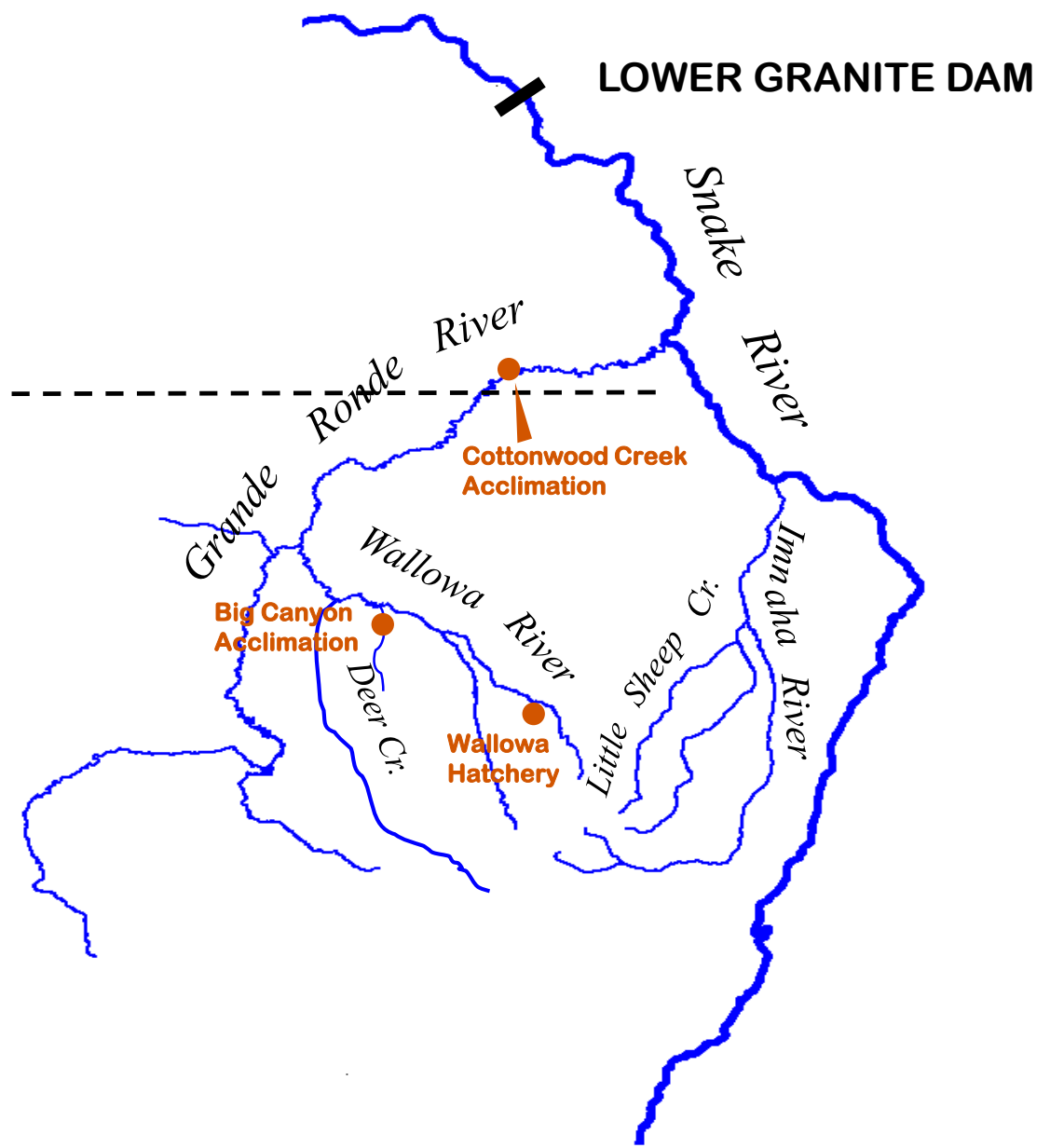


Grande Ronde and Imnaha River Basins Steelhead Hatchery Facilities

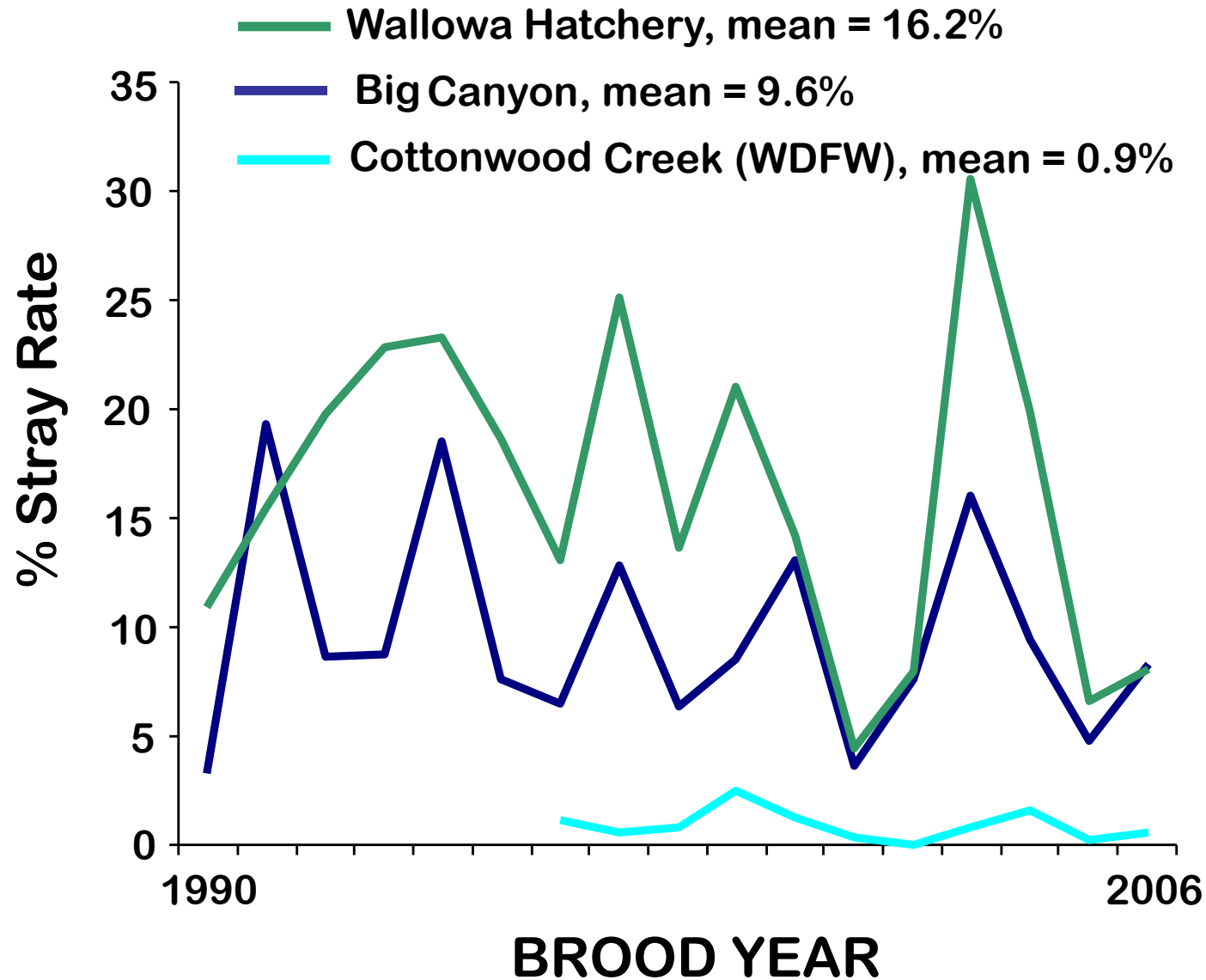


Washington

Oregon



Comparison of Wallowa Stock Straying from Grande Ronde River Release Sites



Wallowa Acclimation Pond Syndrome (WAPS): 1989

W. J. Groberg, Jr. and E. Spangler
ODFW Fish Pathology Lab
Badgley Hall
Eastern Oregon State College
La Grande, OR 97850

A concerted effort was made during February through April of 1989 to more definitively assess water quality and associated fish health problems at Wallowa Hatchery. This was primarily in response to losses of summer steelhead smolts during acclimation in the previous two years with no specific etiology determined (see Wallowa Acclimation Pond Syndrome (WAPS): 1988 by Groberg). With the cooperation and resources of the Oregon Dept. of Environmental Quality (DEQ) a systematic and intensive water quality evaluation was made (see attached DEQ Project Summary and Data Results). This included sampling of not only Spring Creek, but of certain other sites in the Wallowa River basin. Fish health and pond parameters were systematically evaluated by the Oregon Dept. of Fish and Wildlife.

WDFW's LYONS FERRY HATCHERY

Max. Density = 0.98 kg/m^3



WDFW's Acclimation Pond on the Lower Grande Ronde River

Max. Density = 2.0 kg/m^3



Conclusions

- **Autumn Line F_1 adults pass Lower Granite Dam earlier, provide increased autumn fishing opportunities.**
 - **Will F_2 and subsequent generations continue to return earlier?**
 - **Will catch of natural fish be affected?**
- **Greater Autumn Line survival to adulthood.**
 - **Will the trend continue?**
- **No apparent straying benefit to Autumn Line.**
 - **Are there other broodstock, rearing, or release strategies that can be used to reduce straying?**
- **Multiple factors associated with straying of Wallowa stock.**