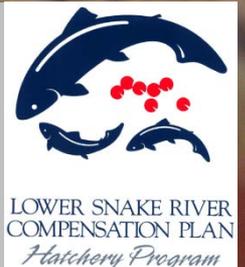


Evaluation of the Wallowa Stock Steelhead Fall Broodstock Experiment: Have We Accomplished Our Goals?

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

Oregon Department of Fish and Wildlife



Wallowa Stock Steelhead

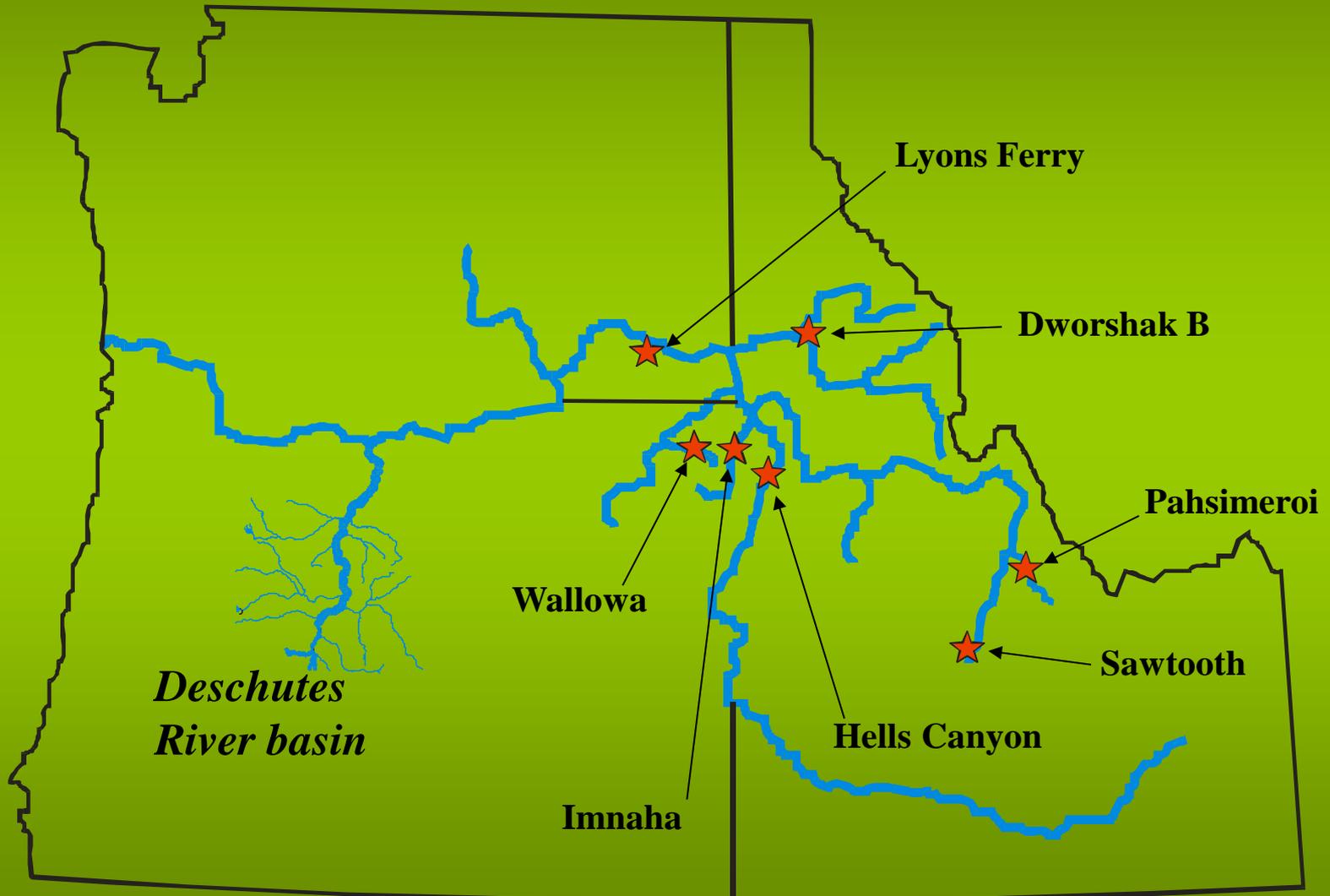


Wallowa Hatchery Broodstock

- 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

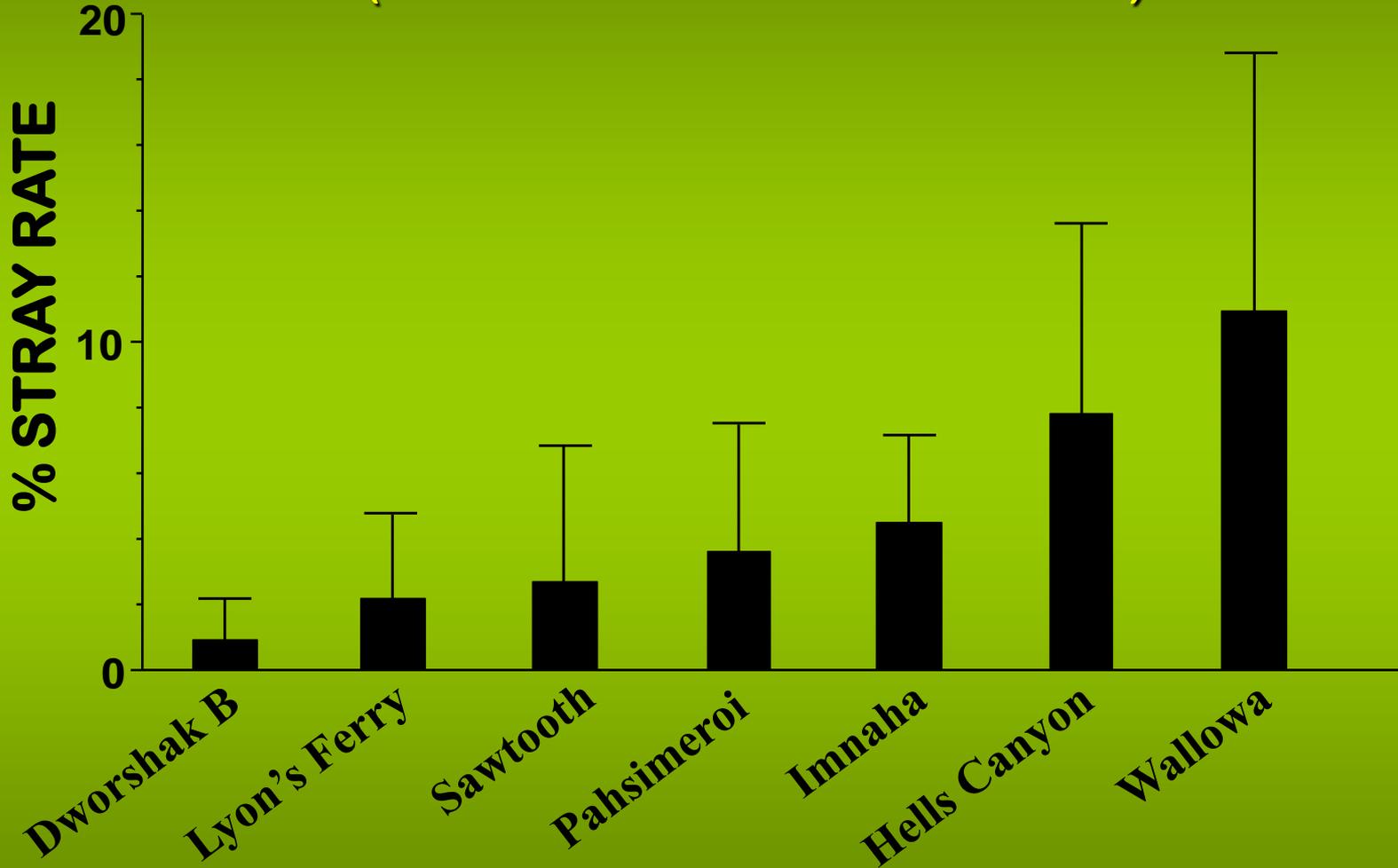


Snake River Hatchery Steelhead Stocks



Average Annual Deschutes River Straying By Snake River Hatchery Steelhead Stocks

(Based on 11-24 Years of Data)



HATCHERY PROGRAM

Error bars = 1 SE

Objectives

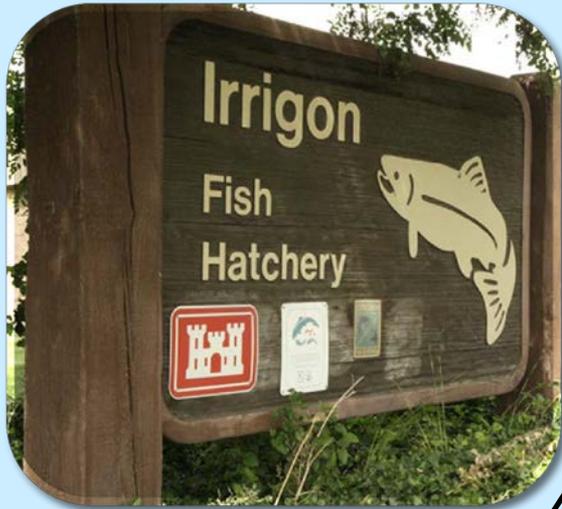
- **Create a new hatchery line from Wallowa stock returning to Grande Ronde in autumn.**
 - Autumn Line may stray less and improve the autumn fishery.
 - **Compare performance of Autumn Line with the standard Wallowa Stock.**
 - Is smolt outmigration survival similar?
 - Does the Autumn Line return earlier?
 - 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 standing in the water, holding a fishing rod. The background shows a forested bank with trees and some rocks in the water.

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/m³

Wallowa Acclimation Ponds

Max. Density = 19.3 kg/m^3

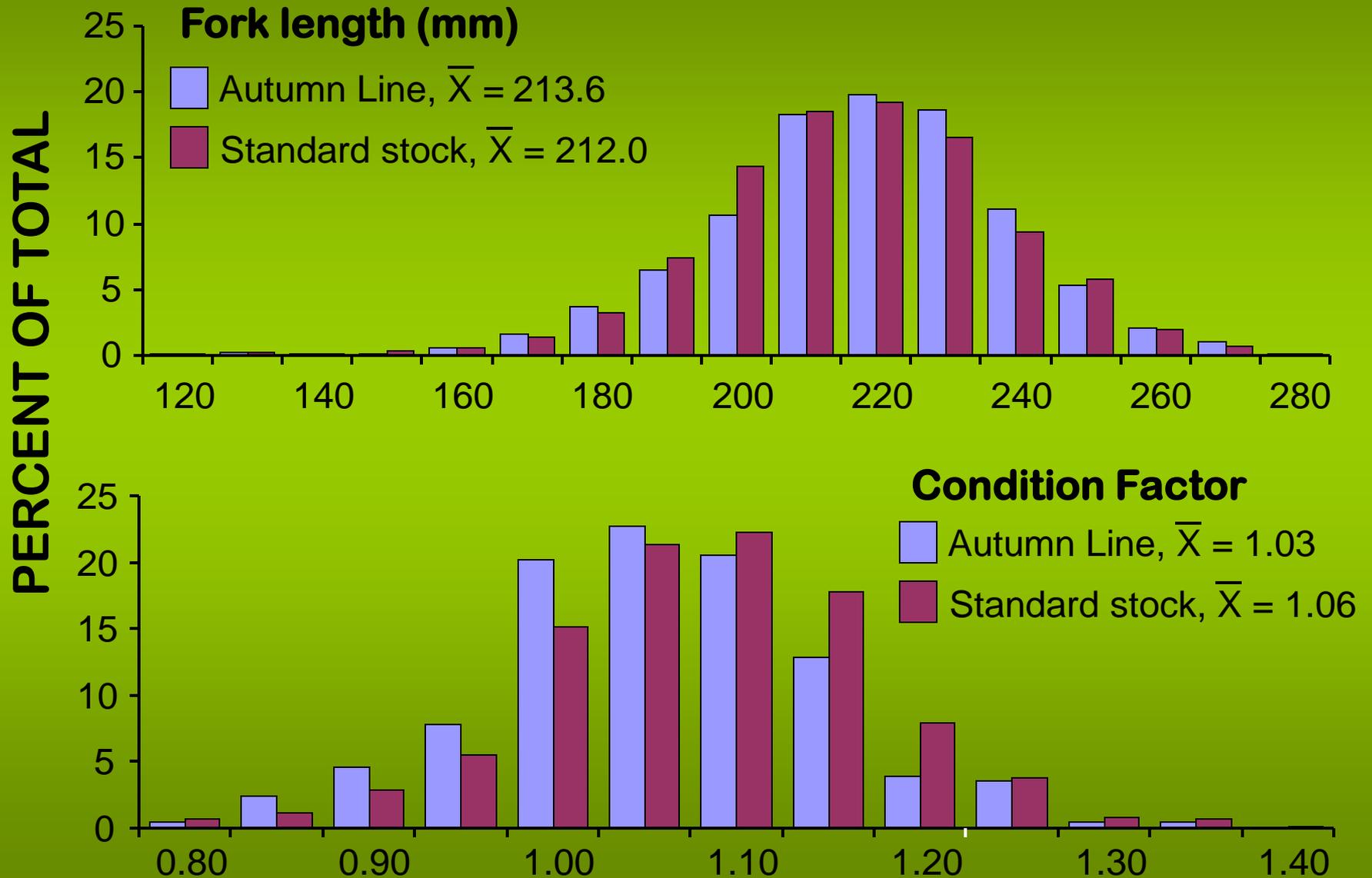


Juvenile Steelhead Releases

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

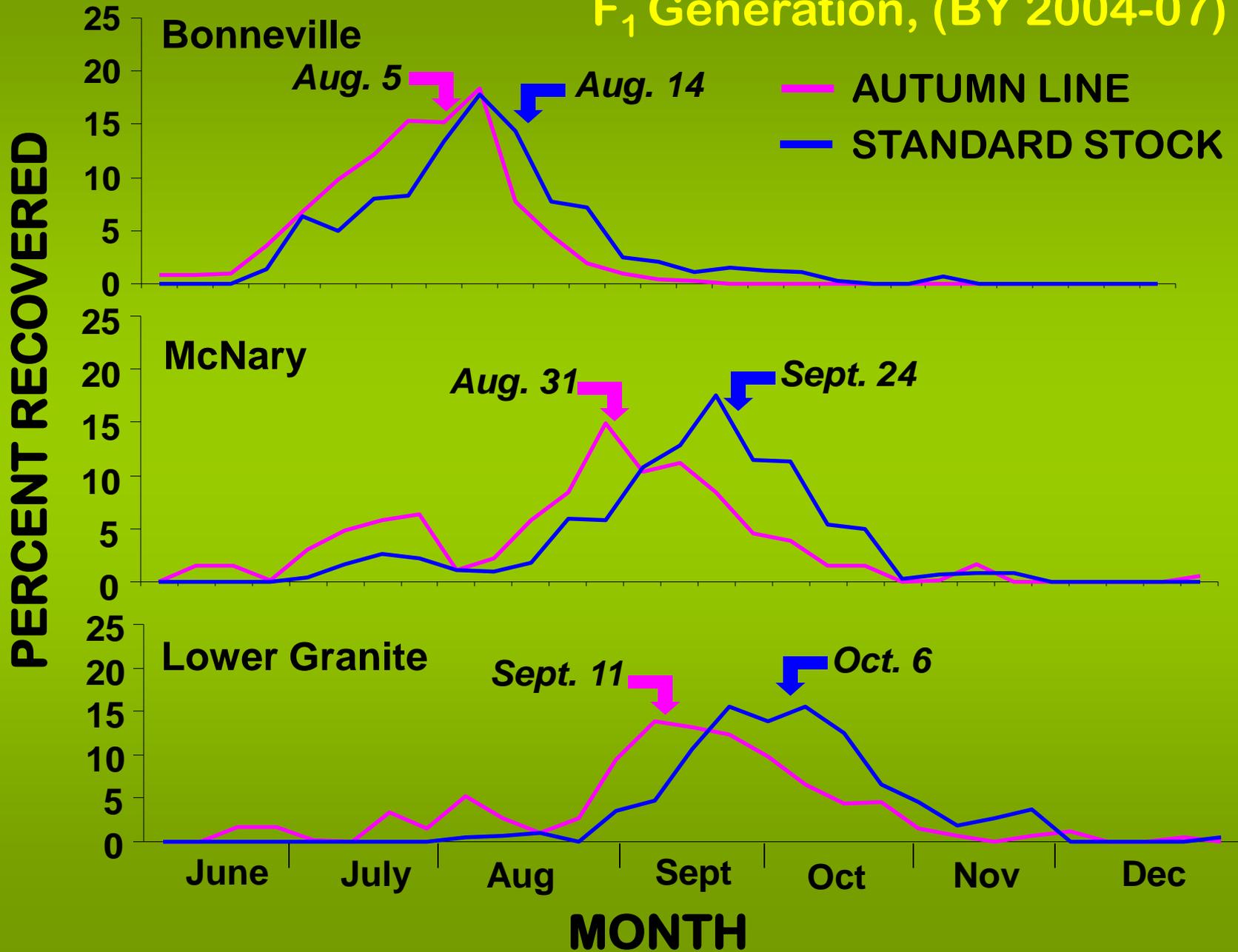


Juvenile Performance

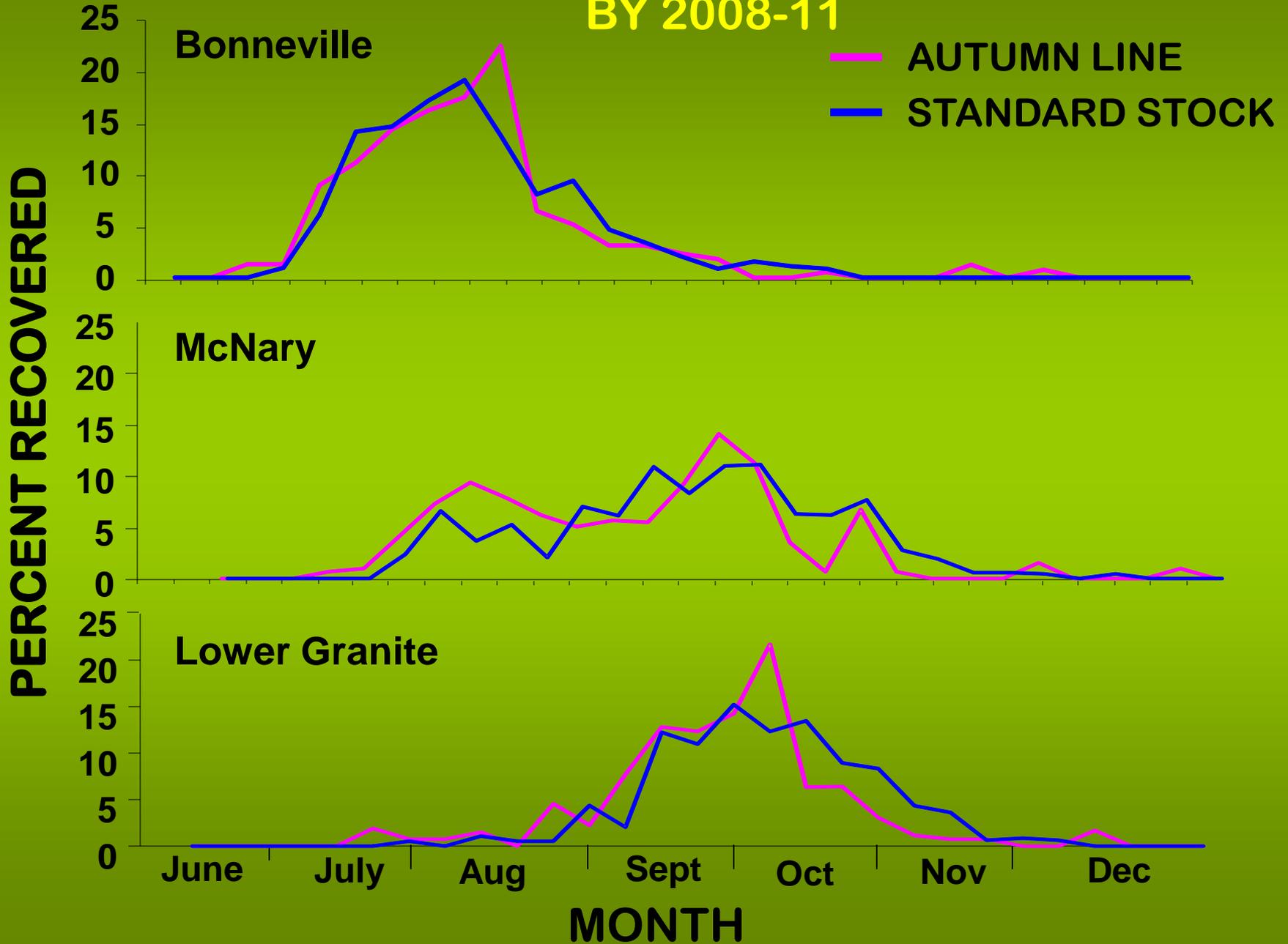
Brood Year	Travel Time (d; \pm SD)		% Outmigration Survival (\pm CI)	
	Autumn	Standard	Autumn	Standard
2004	23.5 (7.0)	23.8 (7.6)	77 (2.1)	77 (3.0)
2005	21.6 (11.5)	22.4 (10.8)	73 (6.6)	74 (5.3)
2006	30.8 (6.7)	30.1 (8.7)	71 (22.3)	78 (41.0)
2007	31.3 (11.3)	33.1 (12.9)	84 (19.3)	84 (13.5)
2008	18.3 (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 Steelhead Return Timing

F₁ Generation, (BY 2004-07)

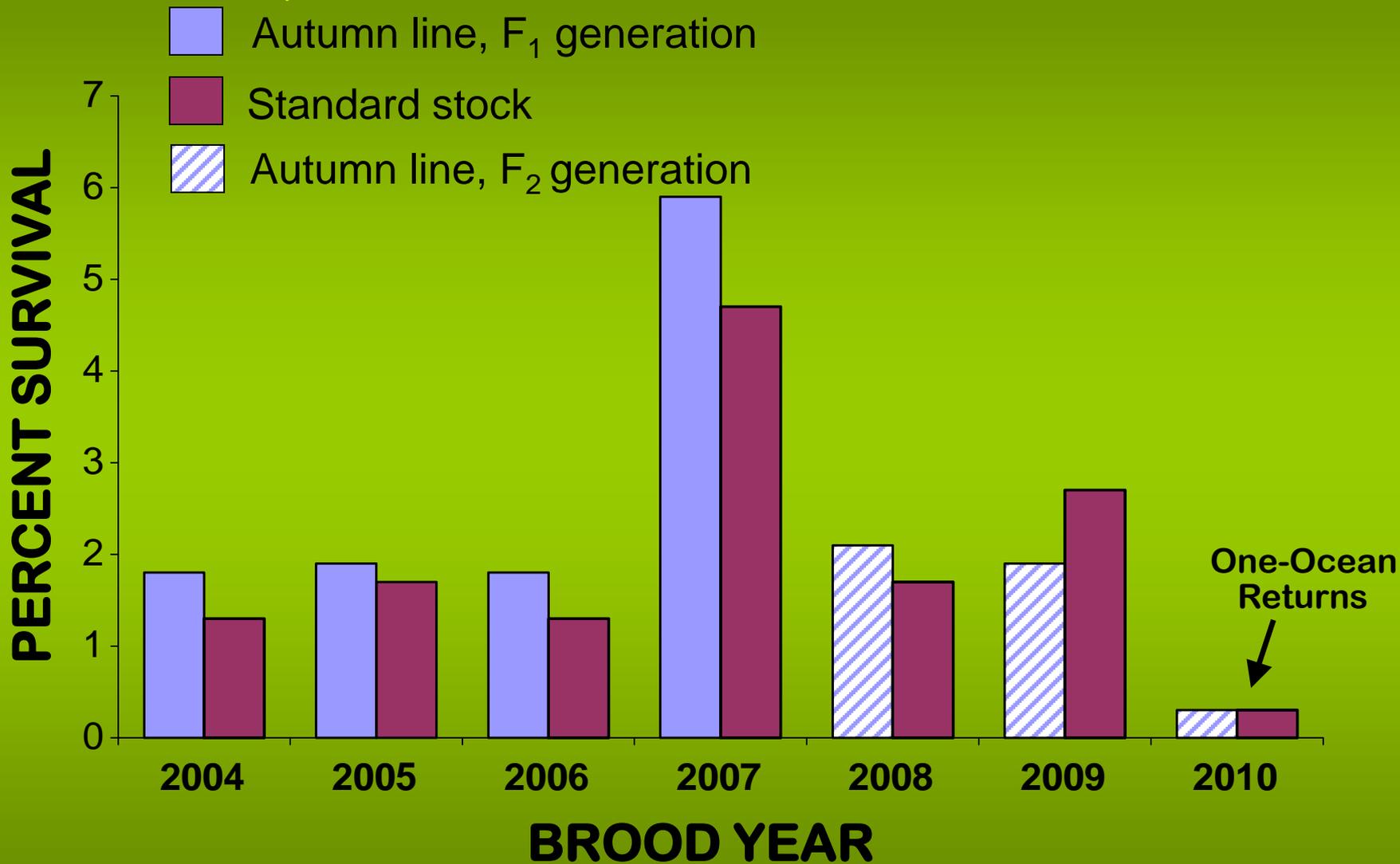


F₂ Generation Adult Return Timing BY 2008-11



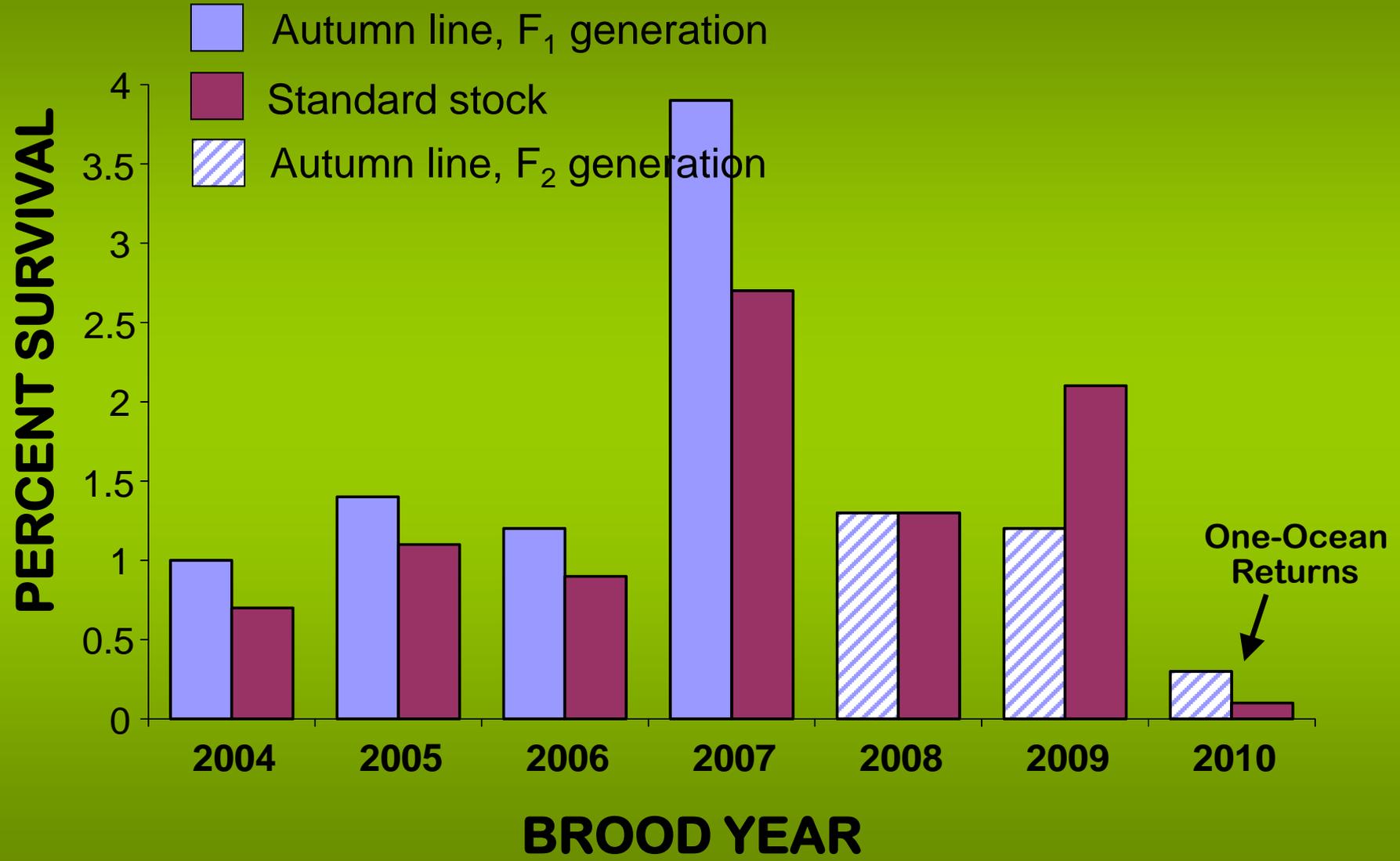
Smolt-to-Adult Survival to Bonneville Dam

(F_1 28% difference, significant, $P = 0.004$)



Smolt-to-Adult Survival to Lower Granite Dam

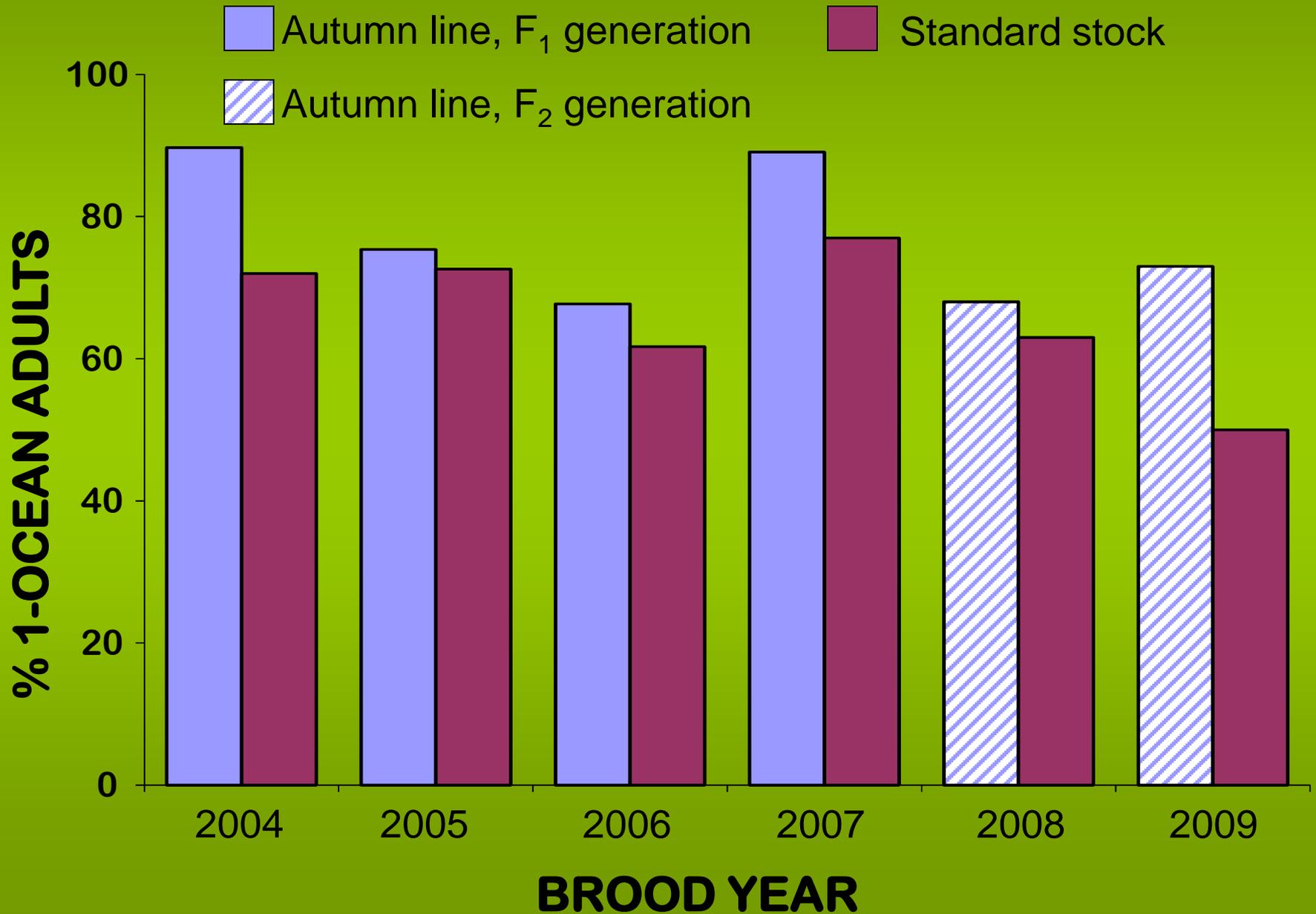
(F_1 significantly different, $P < 0.001$)



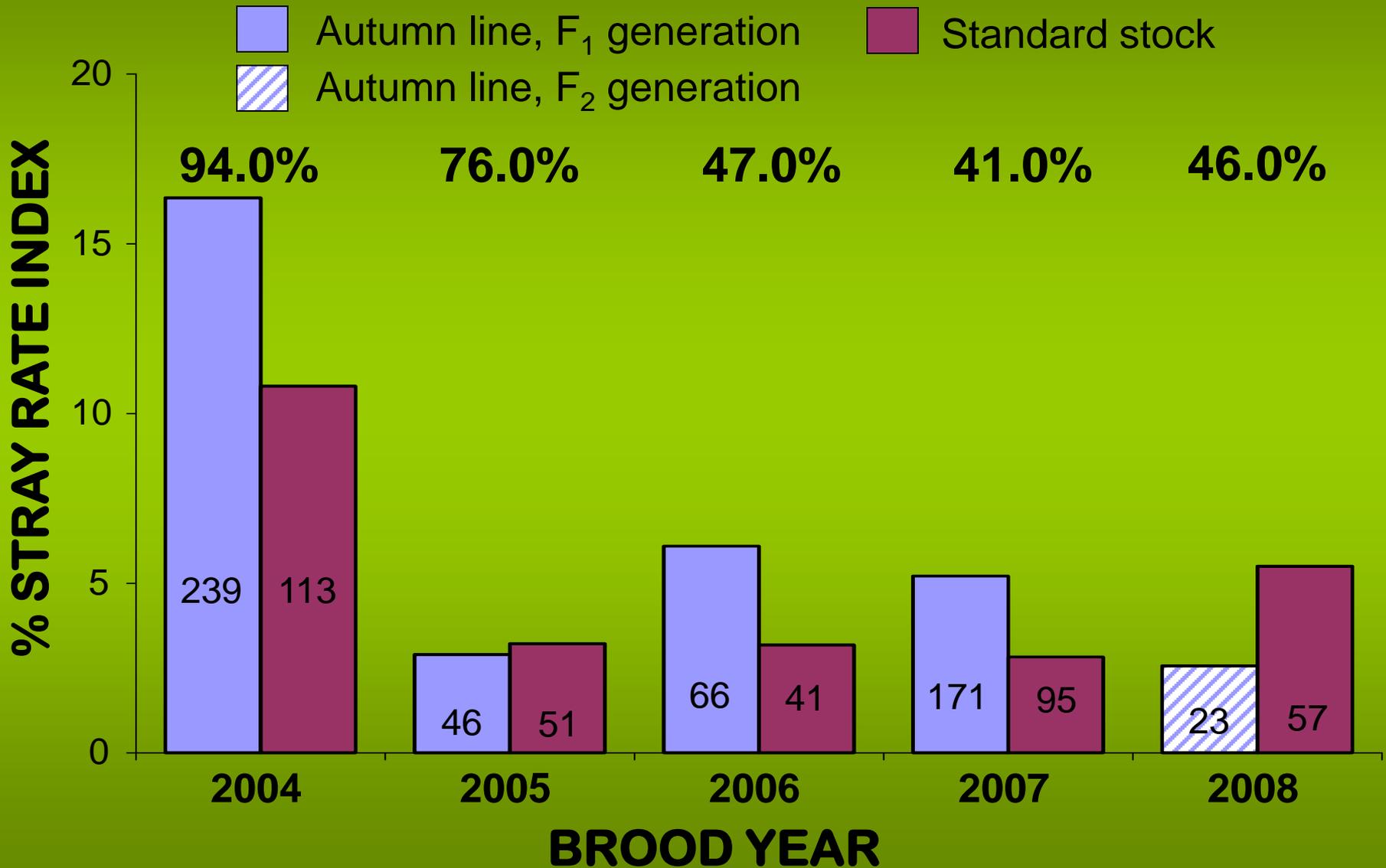
Smolt-to-Adult Survival Comparison

	<u>PIT TAG DERIVED</u>		<u>CWT DERIVED</u>	
Brood Year	Autumn Line	Standard Stock	Autumn Line	Standard Stock
2004	1.8	1.3	1.4	1.1
2005	1.9	1.7	3.7	1.6
2006	1.8	1.3	1.2	1.0
2007	5.9	4.7	3.4	3.3
<i>Mean =</i>	<i>2.9</i>	<i>2.3</i>	<i>2.4</i>	<i>1.8</i>

Age At Return



Percent of Steelhead that Strayed And the Percent of Barged Fish



Deschutes River Basin

COLUMBIA RIVER

>90% of Wallowa stock strays are in Deschutes
~85% of stray from above Sherars Falls

**Warm Springs National
Fish Hatchery (RK 154)**

Mouth (RK 0)

Sherars Falls (RK 69)

Pelton Trap (RK 161)

20 0 20 40



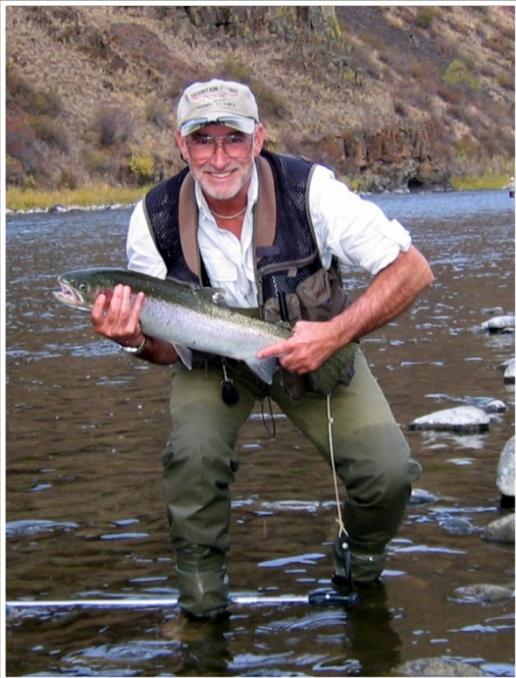
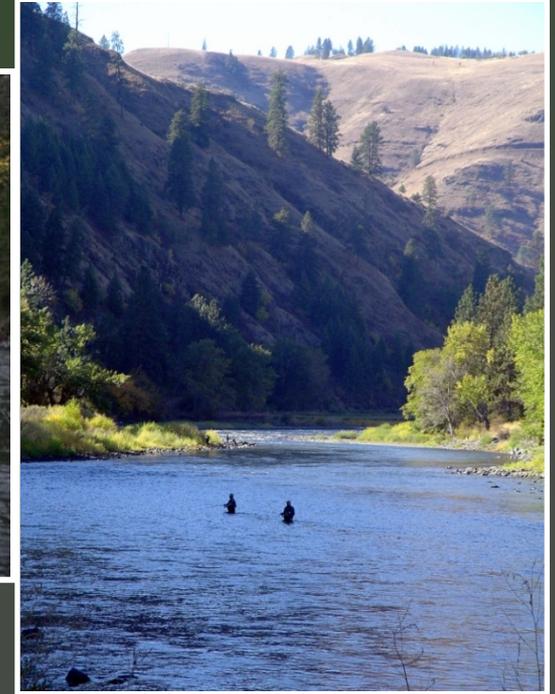
Kilometers



PIT Tag Detections in Deschutes and at McNary

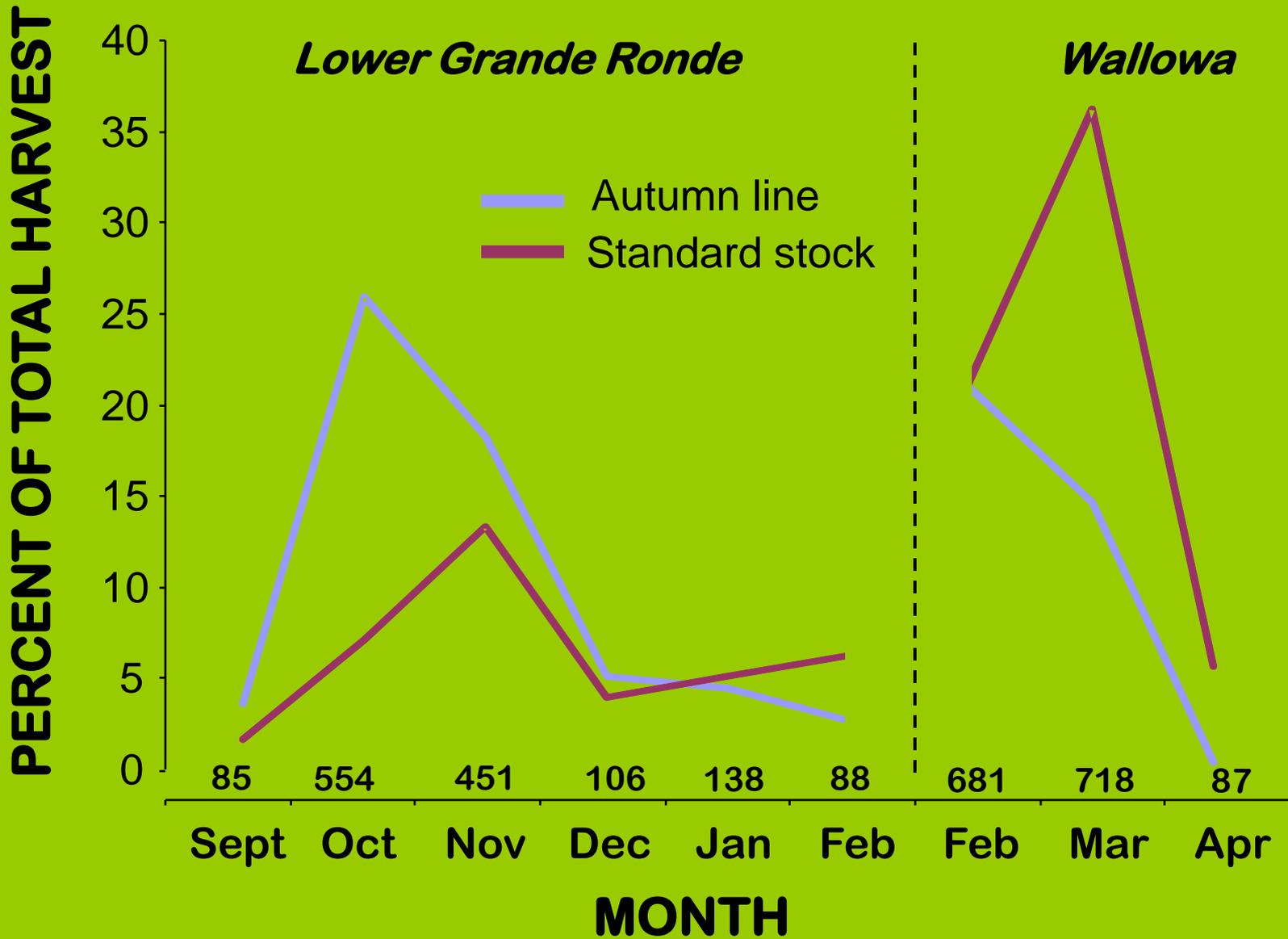
Run Year	Experimental Group	Number Detected at Sherars Falls	Number Later Detected at McNary or Above	Percent Later Detected at McNary or Above
2007-08	Autumn Line	5	0	0
	Standard Stock	7	5	71
2008-09	Autumn Line	6	1	17
	Standard Stock	3	0	0
2009-10	Autumn Line	19	4	21
	Standard Stock	15	2	13
2010-11	Autumn Line	5	2	40
	Standard Stock	5	0	0
Total Autumn Line		35	7	20
Total Standard Stock		30	7	23

Compensation Plan Fisheries

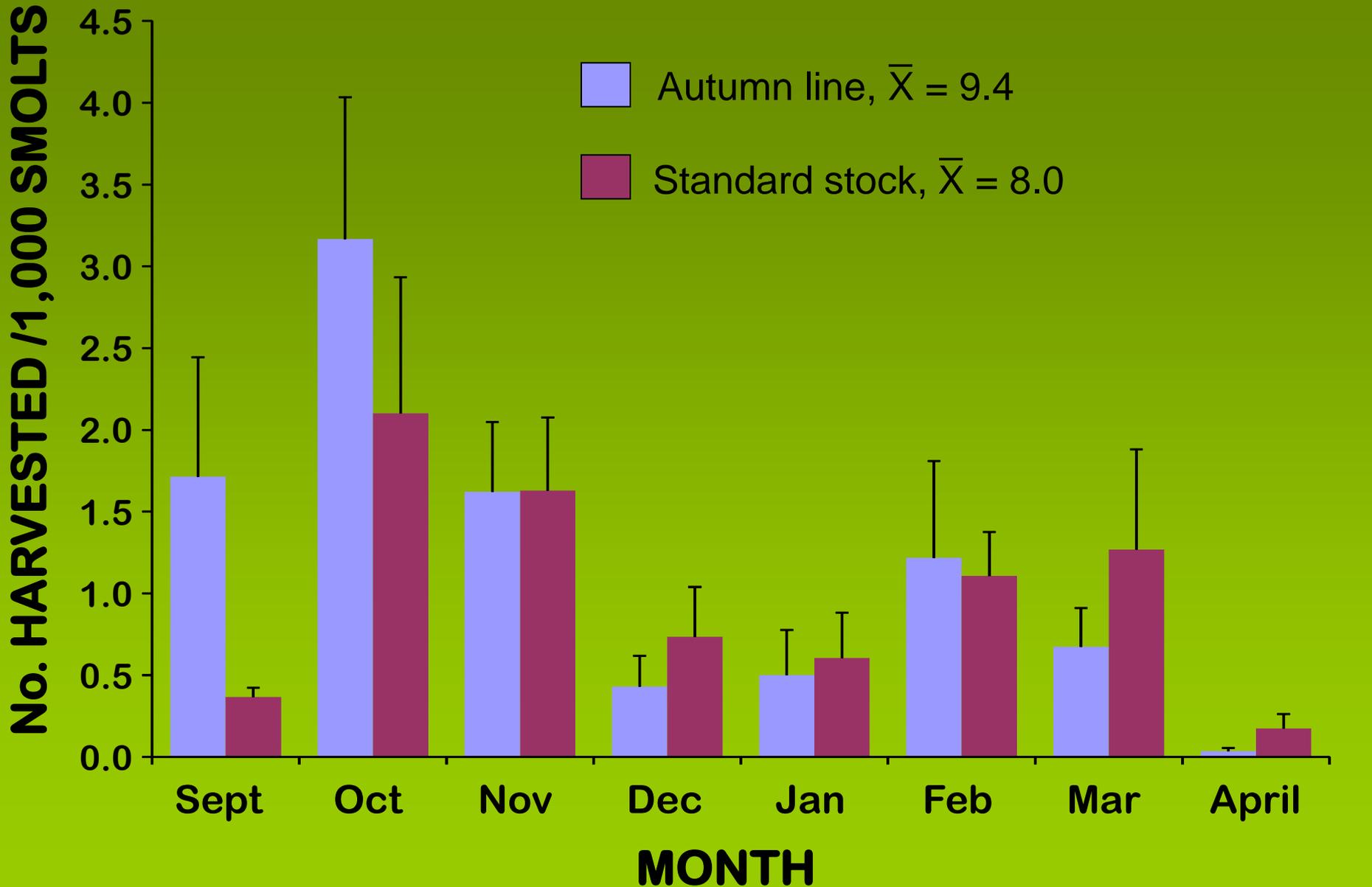


Harvest Timing in the Grande Ronde Basin

(run years 2006-07 to 2010-11)



Harvest in the Compensation Area



Error bars = 1 SE

Conclusions

- **Autumn Line F_1 adults pass Lower Granite Dam earlier, provide increased autumn fishing opportunities in Grande Ronde River.**
 - Will F_2 and subsequent generations continue to return earlier?
- **Greater Autumn Line survival to adulthood.**
 - Is it just because they return at an earlier ocean age?
 - Will the trend continue?
- **No apparent straying benefit to Autumn Line.**
 - Will stray rates remain low for all release groups?
 - Are there other broodstock, rearing, or release strategies that can be used to reduce straying.

Future Plans for the Autumn Line

1. **Brood Year 2012:** Increase smolt production to 240,000 smolts (30% of entire Wallowa stock production). Maintain current marking and tagging to assess whether F_3 generation performs similarly to F_1 generation.
2. **Brood Year 2013 and beyond:** Increase Autumn Line production to 320,000 smolts in BY 2013, 400,000 smolts in BY 2014.
 - Releasing both lines would benefit autumn and spring fishing periods, provided future generations perform similarly to the F_1 generation.
 - Autumn Line may require occasional refreshing with new broodstock collected via angling in the Grande Ronde in autumn.
 - During this time, straying information from F_1 and F_2 generations will continue to be collected and assessed.
 - The ability of the hatchery to concurrently spawn, rear, and release Autumn Line and standard production groups (each consisting of 400,000 smolts) will impact future decisions.

Acknowledgements

- Many thanks to the 192 anglers and volunteers for:
 - 7,000 hours
 - 111,000 miles of travel
 - 2500 meals served
- ODFW Wallowa Hatchery and NE Region fish liberation staff
- Rick Madigan – Wenaha Wildlife Area
- Volunteers from local state and tribal agencies