



# **Trinity River Restoration Program 2013 Science Symposium**

## **TRRP's Scientific Advisory Board Review of Phase 1**

### **High-level Indicators of Program Performance**

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# Approach

- Used the Program's Performance Measures (i.e., the Partners are closest to the data)
- Did not critically review the Measures
- Evaluated trends relative to IAP objectives (TRRP and ESSA 2009)
- Authors: myself, Elizabeth Appy (Anchor QEA, Arcata), Tracy Hillman (BioAnalysts, Boise) and Jay Stallman (SWS, Arcata)
- This material was prepared under the direction of the SAB for their use, and is still under review for approval by the SAB

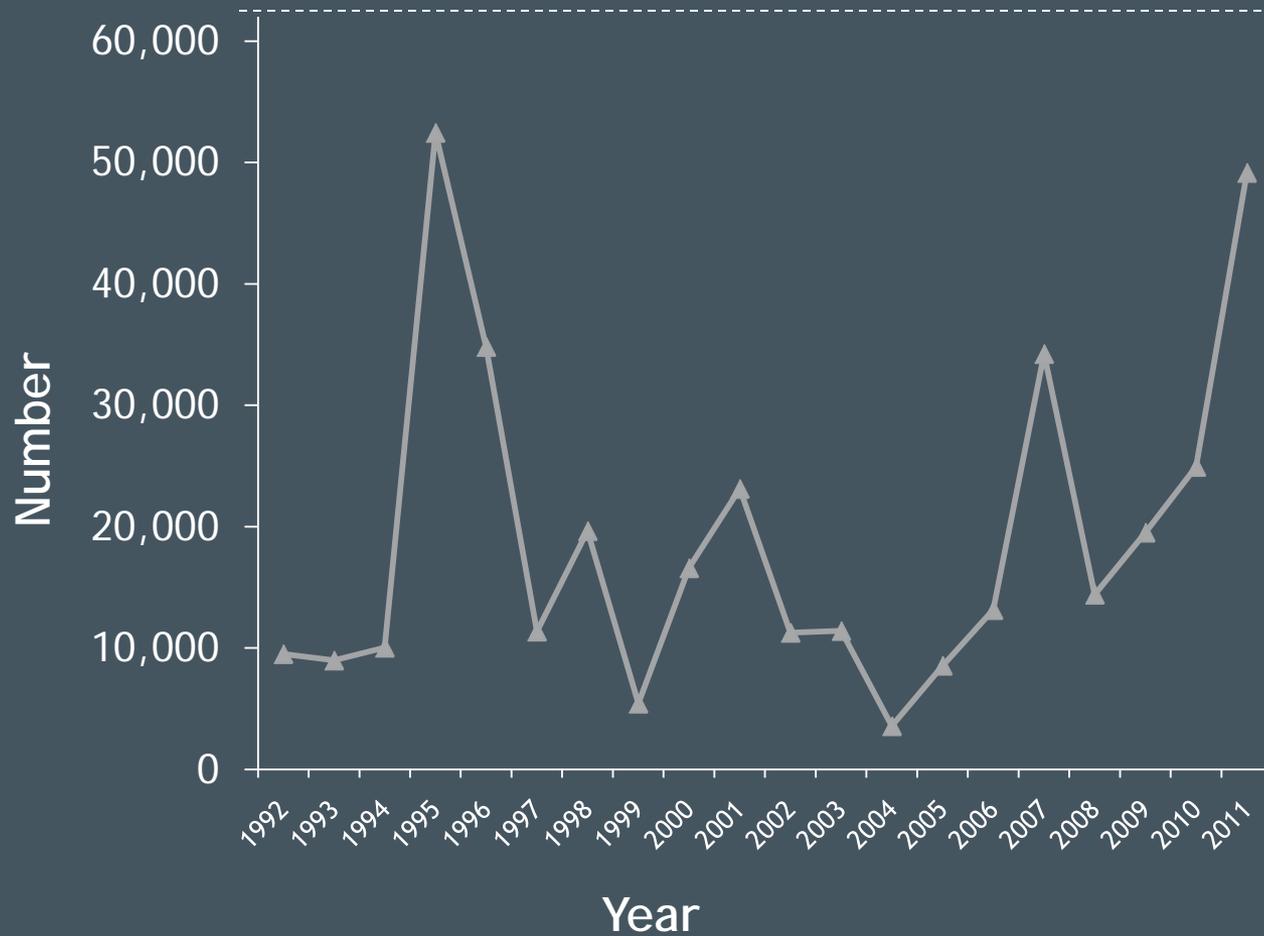
# 1. Spawning escapement of naturally produced salmonids

- IAP: Increase escapement of natural-origin
  - Fall-run Chinook salmon to 62,000 adults
  - Spring-run Chinook salmon to 6,000 adults
  - Coho salmon to 1,400 adults
  - Fall-run steelhead to 40,000 adults
- Methods:
  - Partners conducted trend analyses, 1992 - 2010
  - We conducted additional analysis using least-squares
  - Compared the pretreatment period (1992 to 2002) and treatment period (2003 to 2011) (lagged)

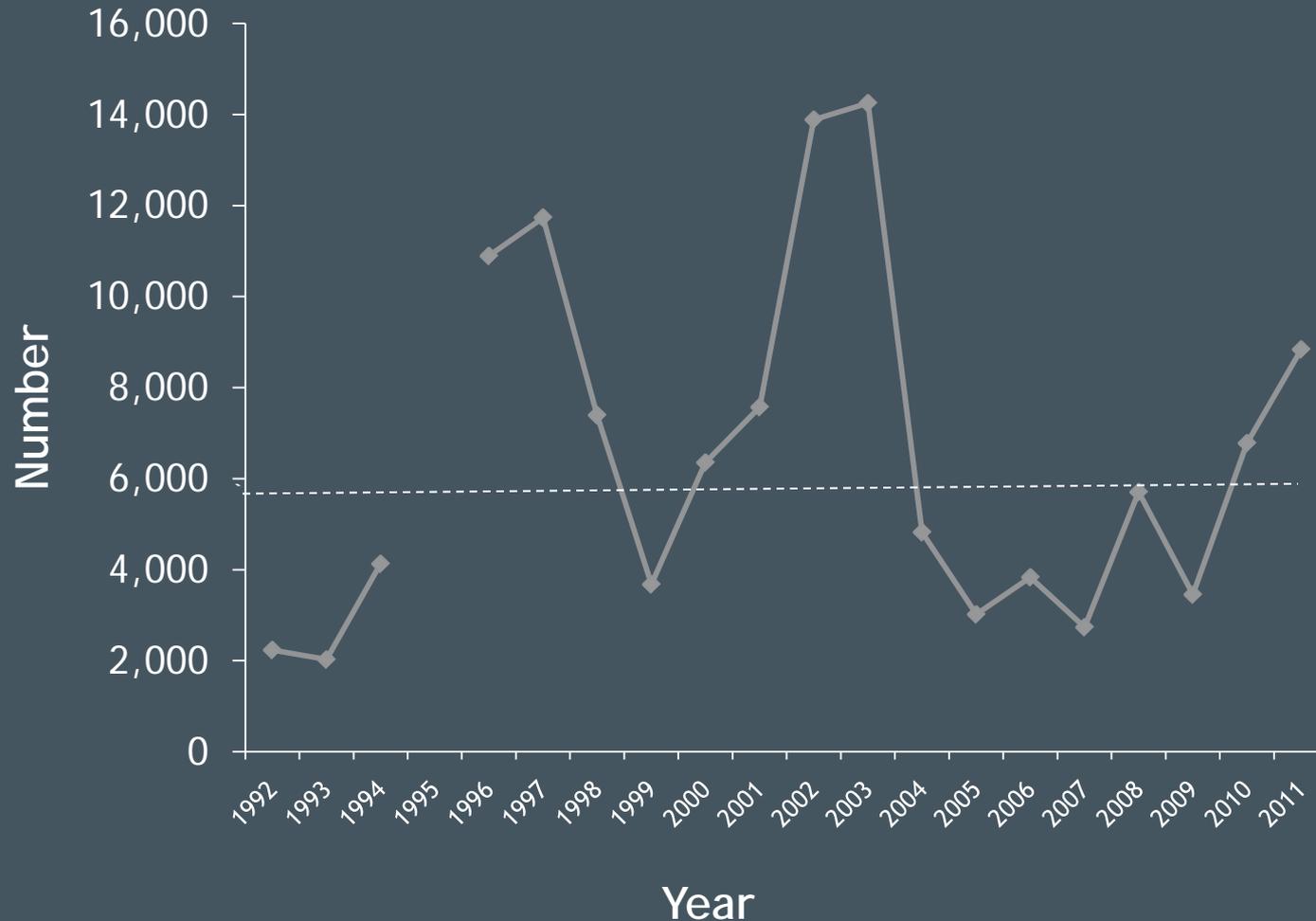
# Results: Trend analysis – was there a detectable increase/decrease?

	Partners: 1992-2010	1992 - 2002 pre-treatment	2003 - 2011 treatment
Fall-run Chinook	No	No	Yes (+ 4,000 fish per year)
Spring-run Chinook	No	No	No
Coho (1997 - 2010)	No	No	Yes (- 650 fish per year)
Steelhead	Yes (+)	Insufficient data	No

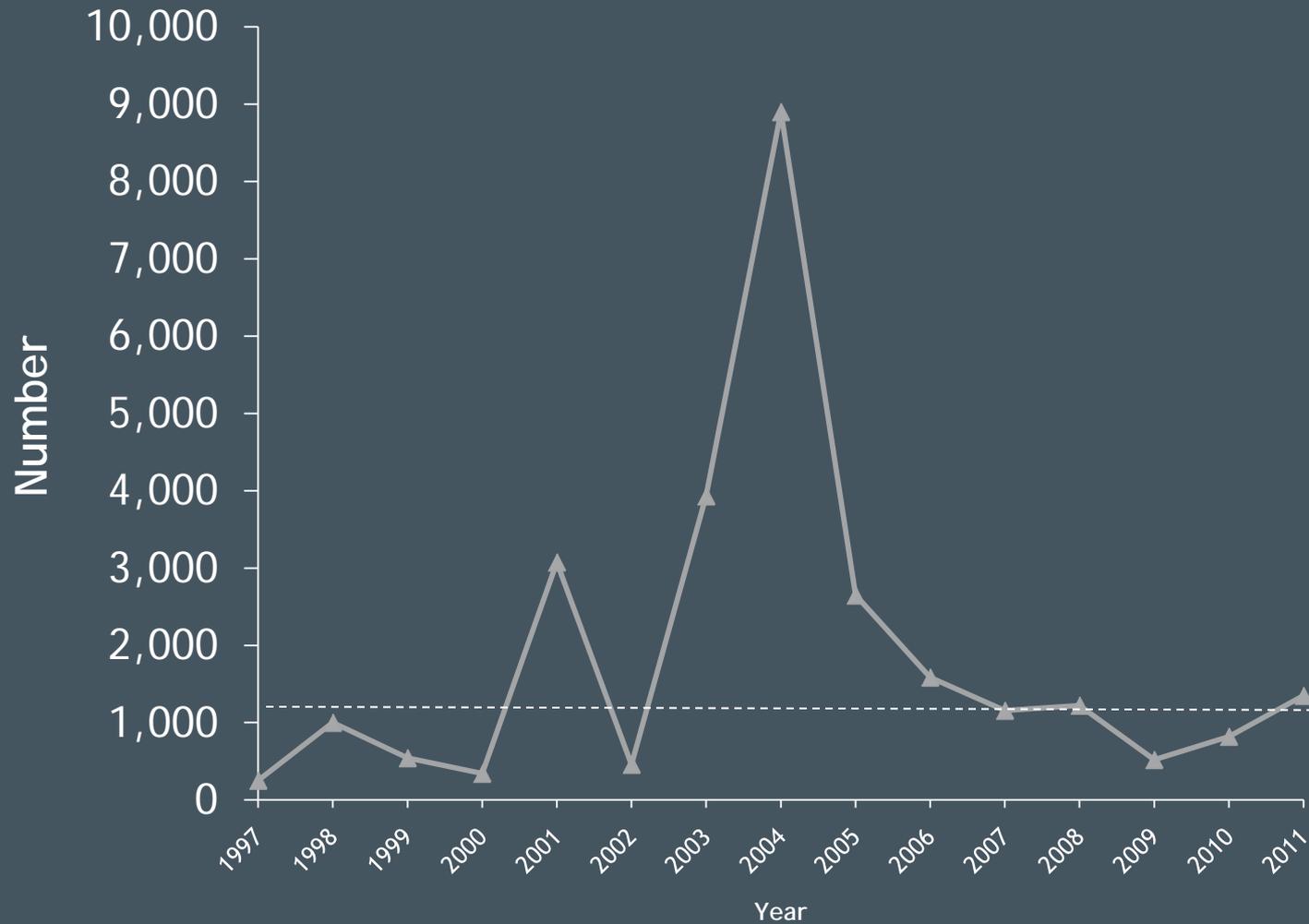
# Results: Fall-run Chinook



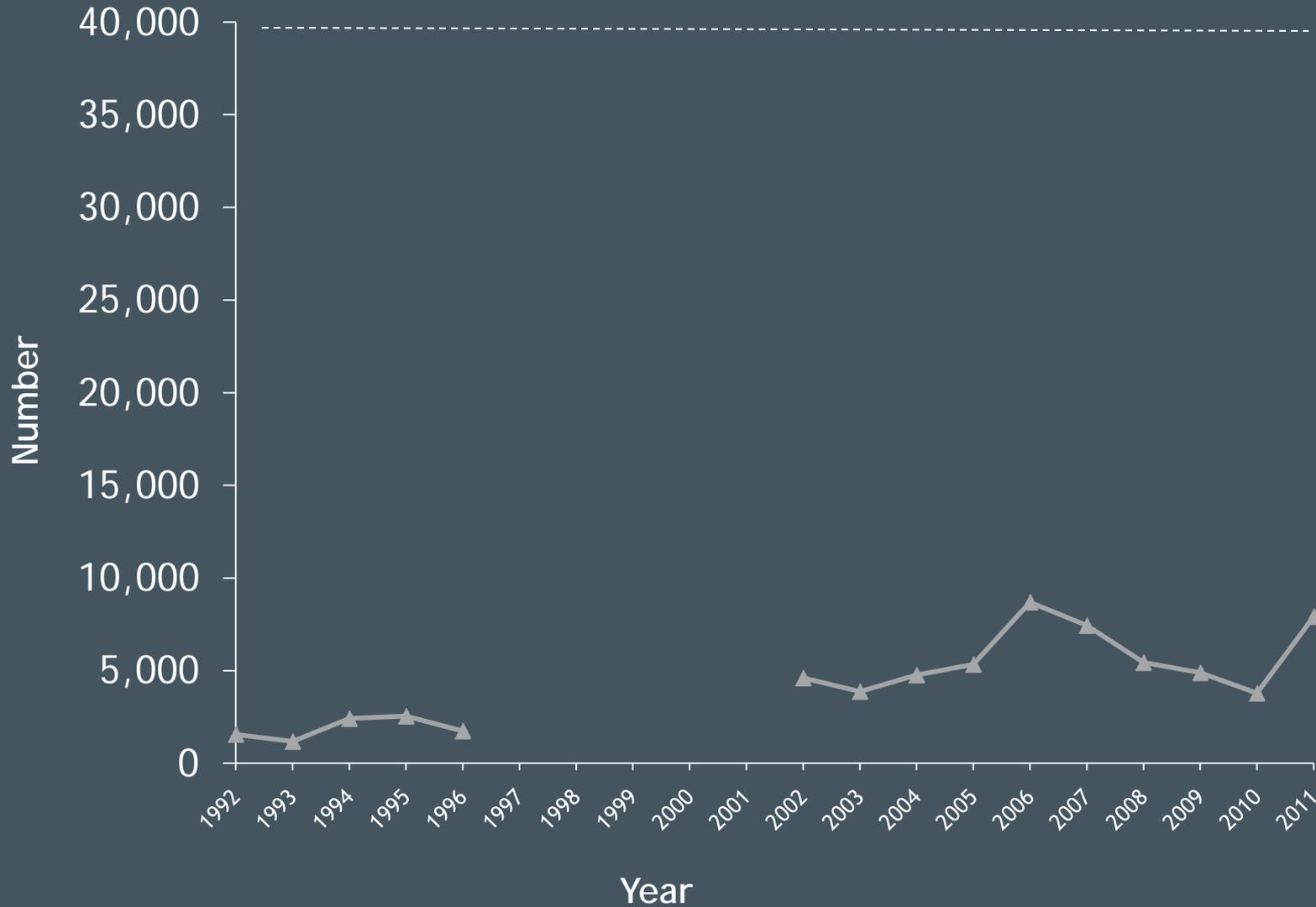
# Results: Spring-run Chinook



# Results: Coho



# Results: Fall-run Steelhead



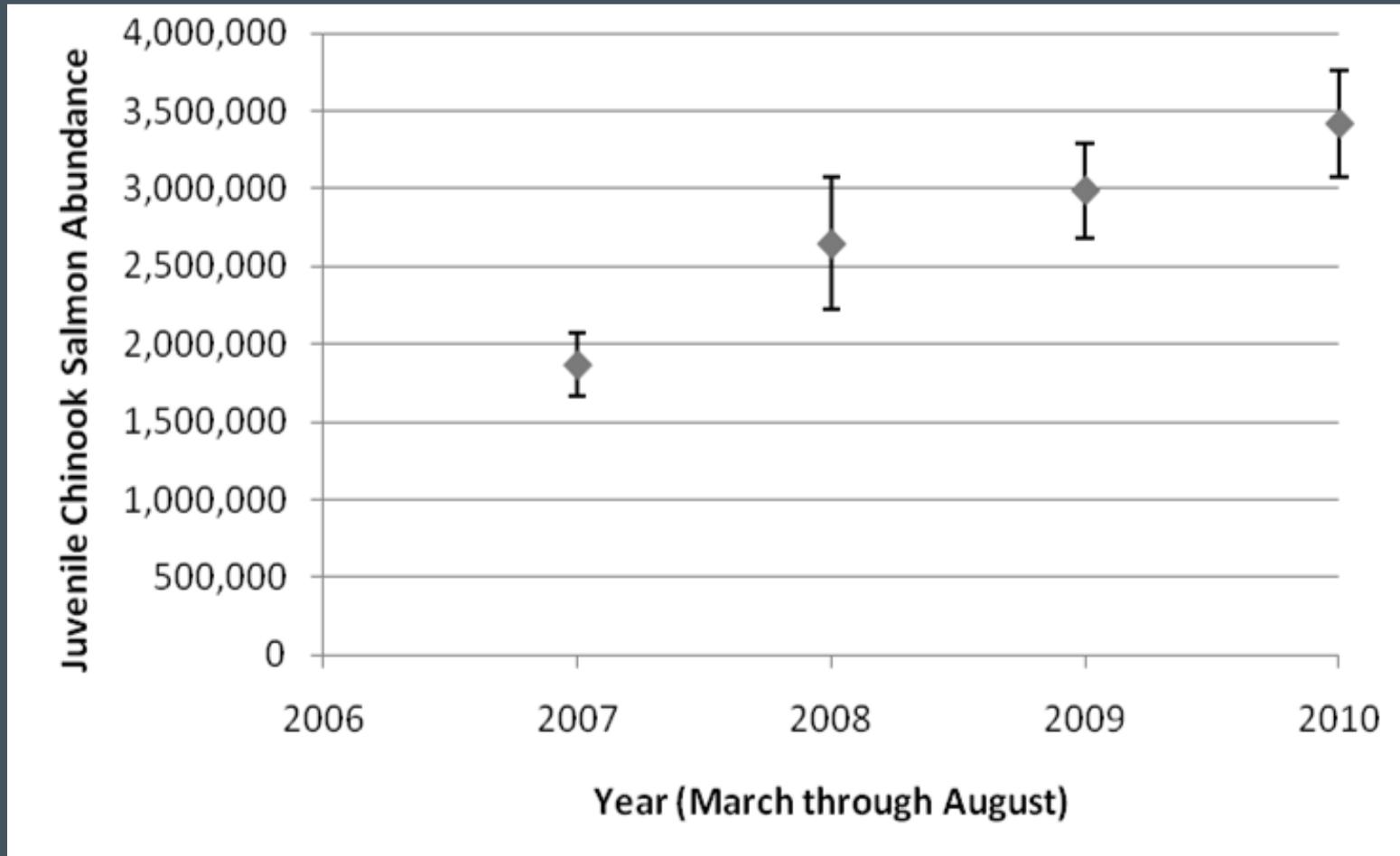
## 2. Abundance of natural-origin juvenile Chinook salmon

IAP: 3.2.2: Increase outmigrant juvenile life stage abundance, growth, physical condition and health from baseline conditions in the mainstem Trinity River within 3-4 brood cycles following rehabilitation of fluvial river processes

### Methods:

- Intensive mark-recapture method was employed at the Willow Creek trap starting in 2007
- Partner's are working to update the earlier data
- Used available data from the 2007 – 2010 period

# Results: Outmigrants increased by approximately 535,000 fish each year



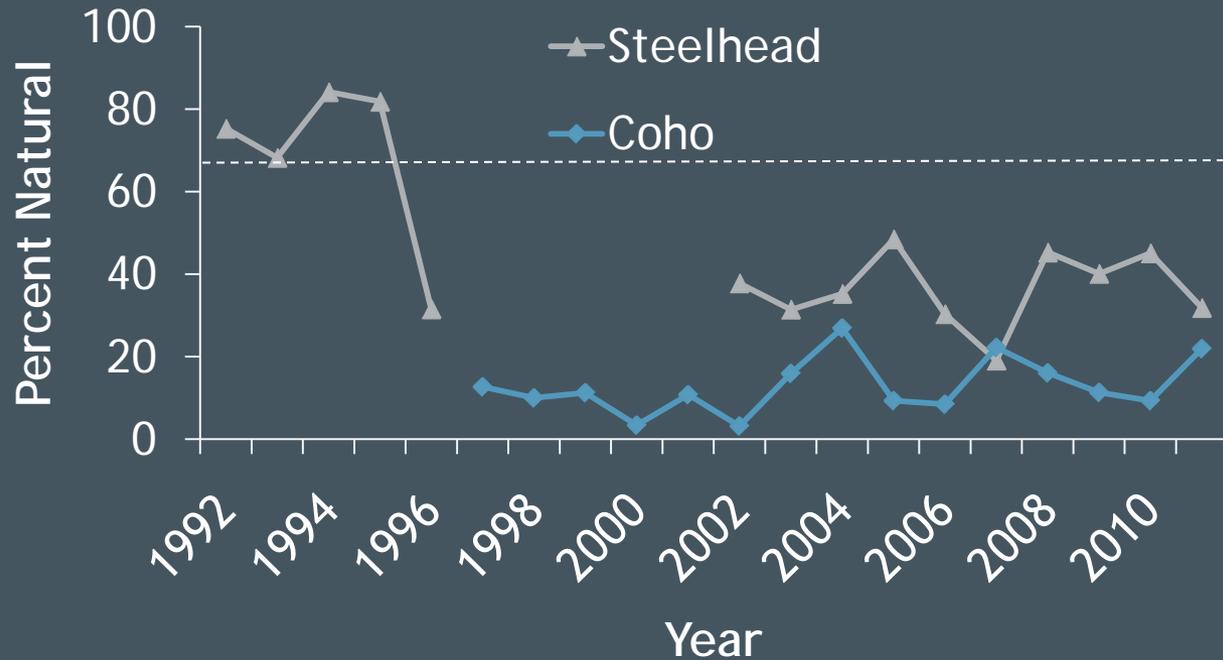
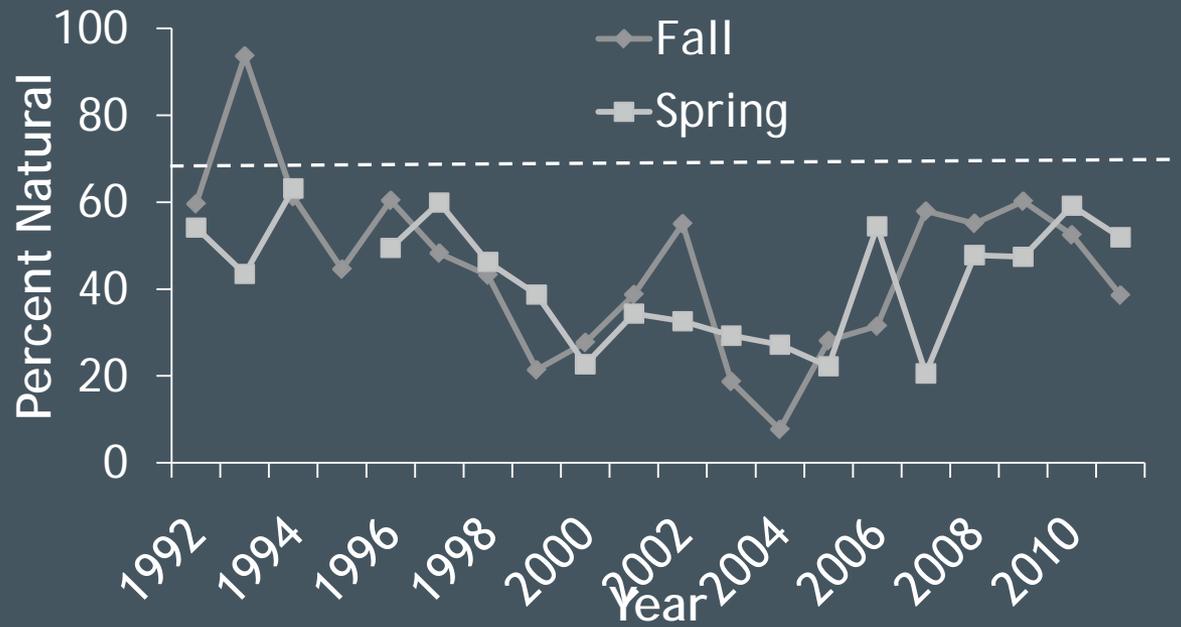
### 3. Proportion of natural-origin adult salmon

- IAP:
  - 3.3.1: Limit impacts of hatchery fish predation on naturally produced juvenile salmonids to less than 20% over the 40 miles
  - 3.3.2: Increase proportion of natural influence (pNI) to 0.7 or greater (**note**: we used 0.5 in draft report)
- Methods:
  - We conducted least-squares trend analyses comparing pretreatment (1992 to 2002) to treatment period (2003 to 2011)

# Results: Trend analysis – was there a detectable increase/decrease in pNI?

	1992 - 2002 pre-treatment	2003 - 2011 treatment
Fall-run Chinook (1992 - 2011)	Yes (- 4%/year)	Yes (+ 5%/year)
Spring-run Chinook (1992 - 2011)	Yes (- 3%/year)	Yes (+ 4%/year)
Coho (1997 - 2010)	No	No
Steelhead(2004 - 2010)	Insufficient data	No

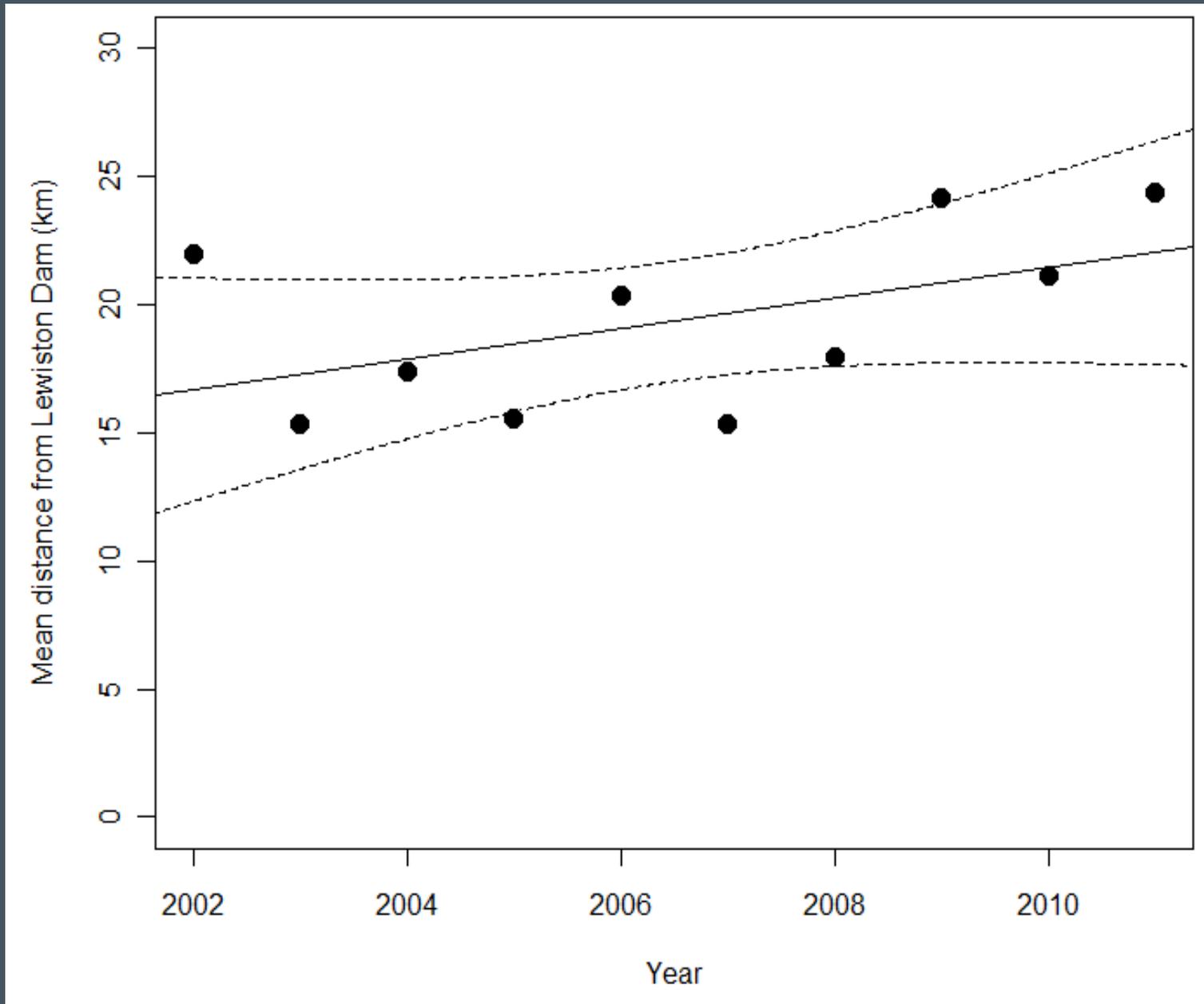
# Results



## 4. Distribution of natural-origin Chinook salmon spawners

- IAP:
  - No specific objective identified
  - 3.1.1: Optimize adult utilization of suitable spawning habitat areas in the mainstem within 3-4 brood cycles following rehabilitation of fluvial river processes
- Methods:
  - Used data from 1992 – 2011 (Chamberlain et al. (2012))

# Results

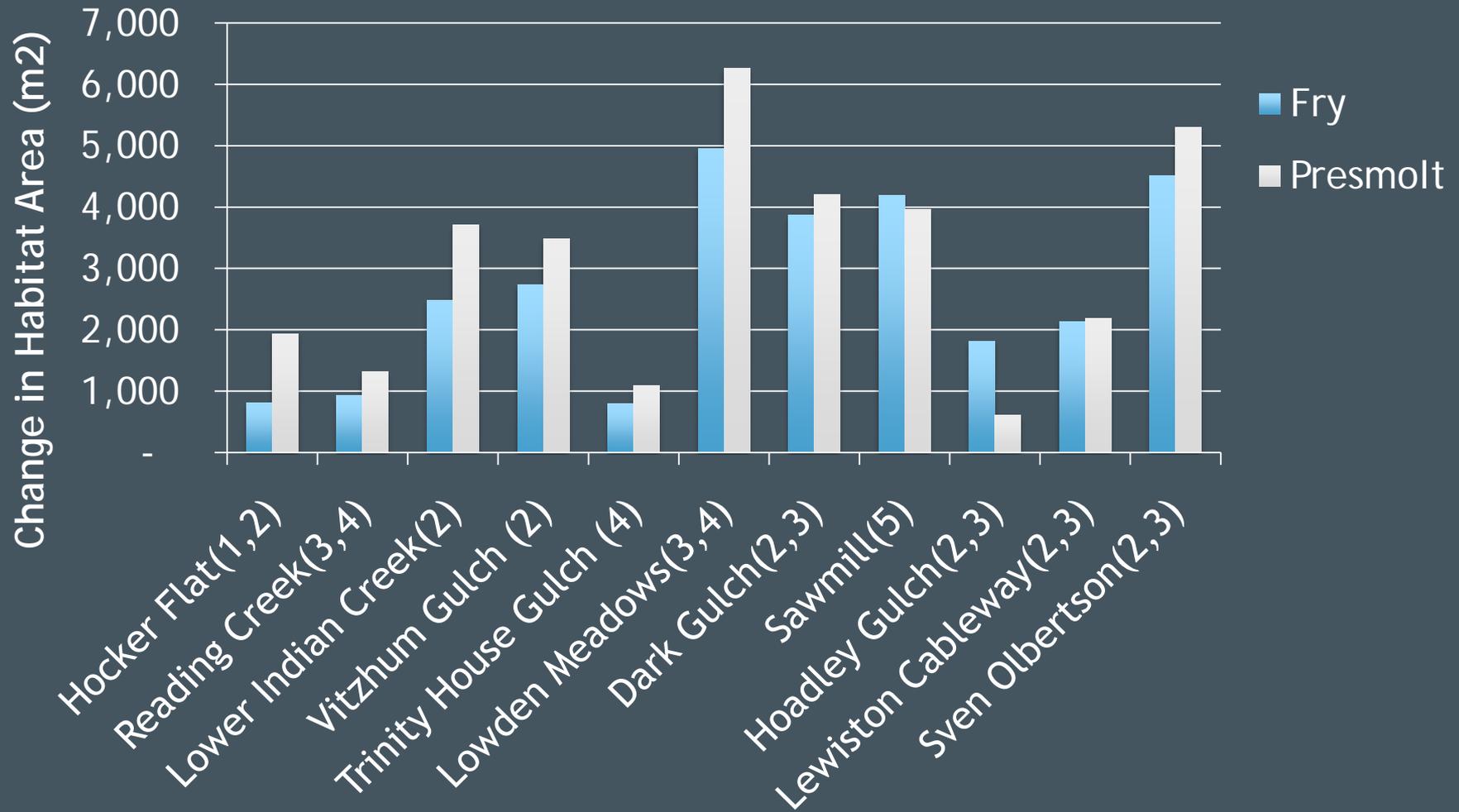


## 5. Changes in juvenile Chinook and coho salmon rearing habitat

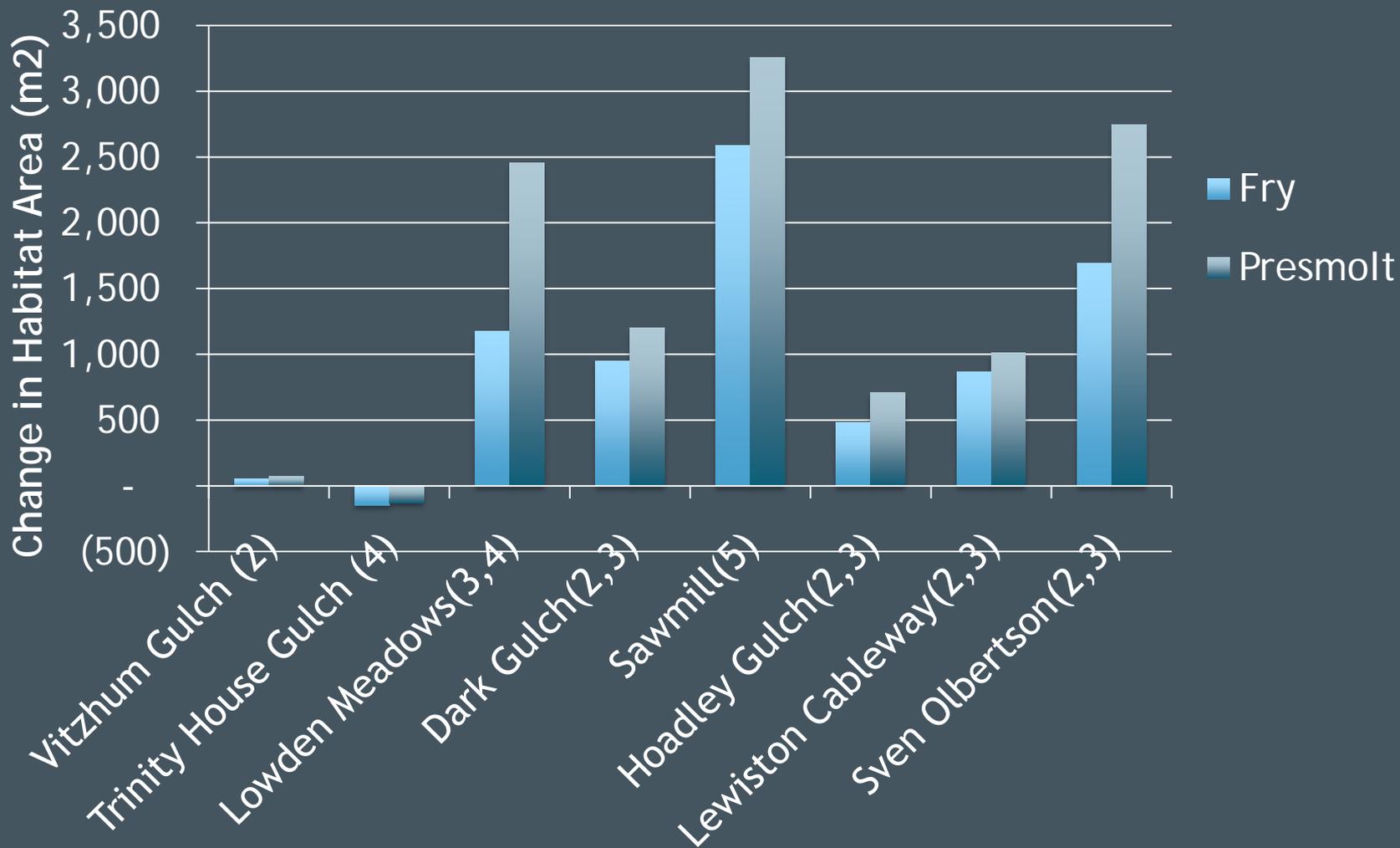
- IAP:
  - 2.1.1: Increase/maintain salmonid fry and juvenile rearing habitat in the upper 64 km of the mainstem Trinity River by a minimum of 400% following rehabilitation of fluvial attributes
- Methods: Goodman et al. (2010)

Habitat Guild	Variable	Criteria
Fry (<50 mm)	Depth	>0 to 0.61 m
	Mean water column velocity	0 to 0.15 m/sec
	Distance to cover	0 to 0.61 m
Pre-smolt (>50 mm)	Depth	>0 to 1 m
	Mean water column velocity	0 to 0.24 m/sec
	Distance to cover	0 to 0.61 m

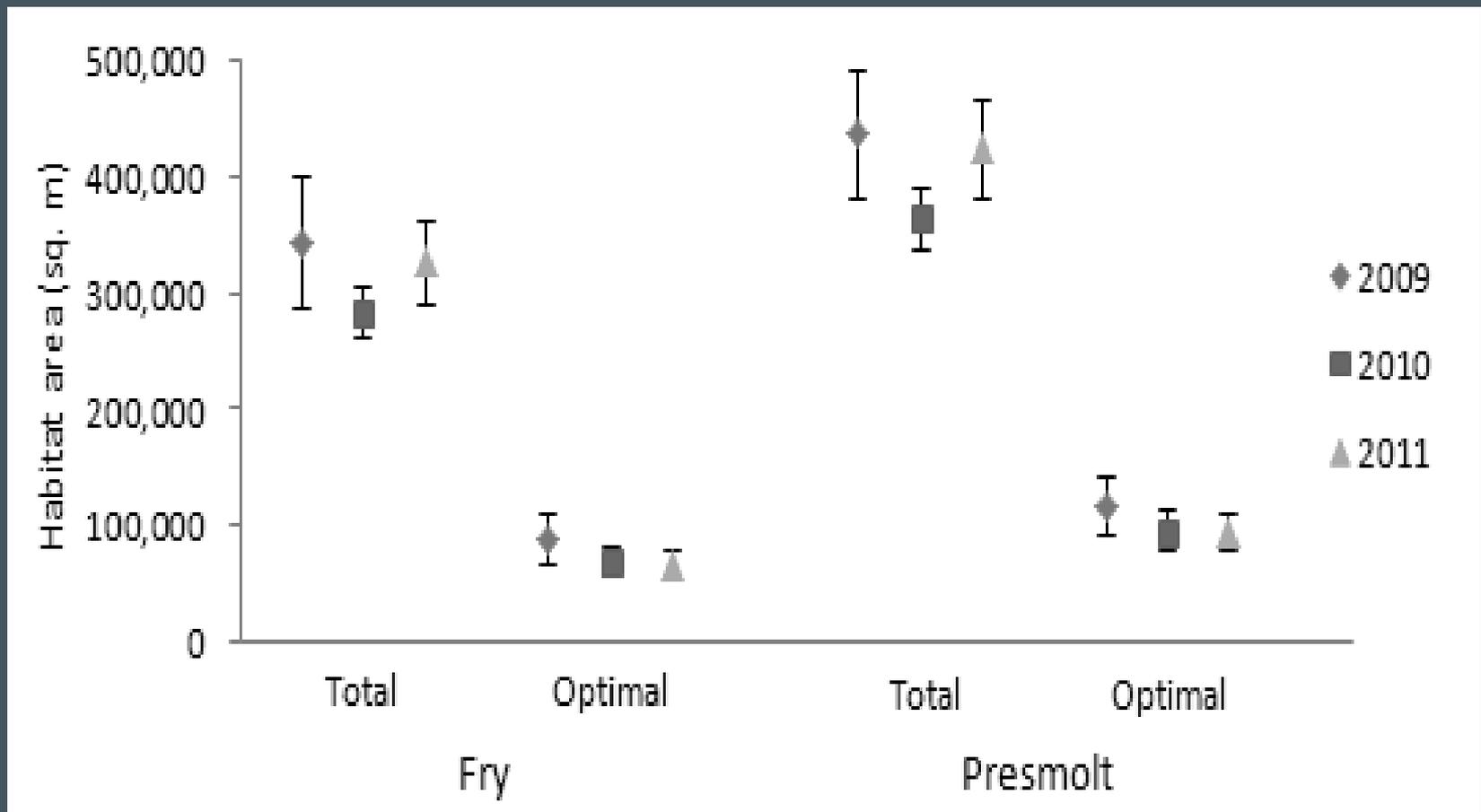
**Results: Change in Total Habitat Area for Juvenile Chinook and Coho Salmon at Restoration Sites from Pre- to Post-construction Condition at Base Flows (Chamberlain et al. 2007 (1), Goodman et al. 2010 (2), Alvarez et al. 2011 (3), preliminary data provided by Program Partners (4), and Martin et al. 2012 (5)).**



**Results: Change in Optimal Habitat Area for Juvenile Chinook and Coho Salmon at Restoration Sites from Pre- to Post-construction Condition at Base Flows (Goodman et al. 2010 (2), Alvarez et al. 2011 (3), preliminary data provided by Program Partners (4), and Martin et al. 2012 (5)).**



Results: Total and Optimal Chinook and Coho Salmon Fry and Presmolt Rearing Habitat Available from 2009 to 2011 Under a Release of  $12.7 \text{ m}^3 \cdot \text{s}^{-1}$  (450 cfs) from Lewiston Dam Throughout the Restoration Reach (GRTS) (Goodman et al. In Review).



## 6. Change in fine sediment storage in the restoration reach

- IAP: 1.4: Reduce fine sediment storage
- Methods:
  - Testing of 1.4 based on sediment transport monitoring and estimation of sediment loads at mainstem sampling sites: Lewiston, Lowden Meadows, Limekiln Gulch and Douglas City; 2003 - 2010
- Results (covered after lunch):
  - Fine bed material storage is decreasing throughout much of the Trinity River upstream of Reading Creek, and may be similar to pre-dam levels.

## 7. Change in coarse sediment storage in the restoration reach

- IAP: 1.3: Increase and maintain coarse sediment storage
- Methods:
  - Bedload transport monitoring and load estimation at mainstem sampling sites: Lewiston, Lowden Meadows, Limekiln Gulch and Douglas City
- Results (covered after lunch):
  - Deficit in coarse sediment storage is being reduced from Lewiston to Limekiln Gulch

## 8. Volume of water released annually for restoration

- IAP:
  - No specific objectives related to flow management
  - Action supports all fluvial goals and objectives (IAP 1. Create and maintain spatially complex channel morphology)

# Methods

- The “restoration water volume ratio” developed to assess whether actual restoration releases are in balance with ROD allocations.
- Ratio is restoration water volume released based on the forecasted WY type, divided by the volume that should have been released based on the actual WY type that occurred each year.
- A value of 1.0 indicates that water releases are consistent with the targeted allocation for restoration, and values greater or less than 1.0 indicate that overall water releases are greater or less than the target allocation, respectively.
- Evaluated WYs 2001 - 2011

# Results

- 2001-2011: ratio averaged 0.943
- Court-ordered restrictions from 2001 to 2004 resulted in a cumulative reduction of 563,000 acre-feet being released during that time period compared to ROD flow releases
- 2005-2011: ratio averaged 1.025
- The target value was met during the 2005 to 2011 period.

<b>Water Year</b>	<b>Forecast Water Year Type</b>	<b>Actual Water Year Type</b>	<b>Restoration Releases<sup>1,2,3</sup> (acre-feet)</b>	<b>Allocation based on Actual Water Year Type (acre-feet)</b>	<b>Volume Difference (acre-feet)</b>
2001	Dry	Dry	379,600	453,000	(73,400)
2002	Normal	Normal	482,700	647,000	(164,300)
2003	Wet	Wet	448,100	701,000	(252,900)
2004	Wet	Wet	651,000	701,000	(50,000)
2005	Normal	Wet	647,600	701,000	(53,400)
2006	Extremely Wet	Extremely Wet	809,900	815,000	(5,100)
2007	Dry	Dry	453,700	453,000	700
2008	Normal	Dry	648,700	453,000	195,700
2009	Dry	Dry	445,500	453,000	(7,500)
2010	Normal	Wet	656,700	701,000	(44,300)
2011	Wet	Wet	721,800	701,000	20,800
Total for 2001 to 2011			6,345,300	6,779,000	(433,700)

## 9. Temperature targets (adults)

- IAP: 2.2.1: Provide optimal temperatures to improve spawning success of spring and fall-run Chinook salmon
  - Lewiston to Douglas City, July 1 to September 15,  $\leq 60^{\circ}$  F
  - Lewiston to Douglas City, September 15 to 30,  $\leq 56^{\circ}$  F
  - Lewiston to North Fork, October 1 to December 31,  $\leq 56^{\circ}$  F
- Methods:
  - Temp data from gauges accessed via the CDEC and daily mean temp compared to daily target (met/exceed)
  - Number of days temp  $>$  criteria summed for each period and divided by the total number of days in period; result was proportion of time a criterion was met
  - To assess the relative magnitude of exceedances, cumulative distributions of exceedances at Douglas City and North Fork plotted in  $0.25^{\circ}$  F increments and visually inspected.
  - Based on 2001 - 2011 data

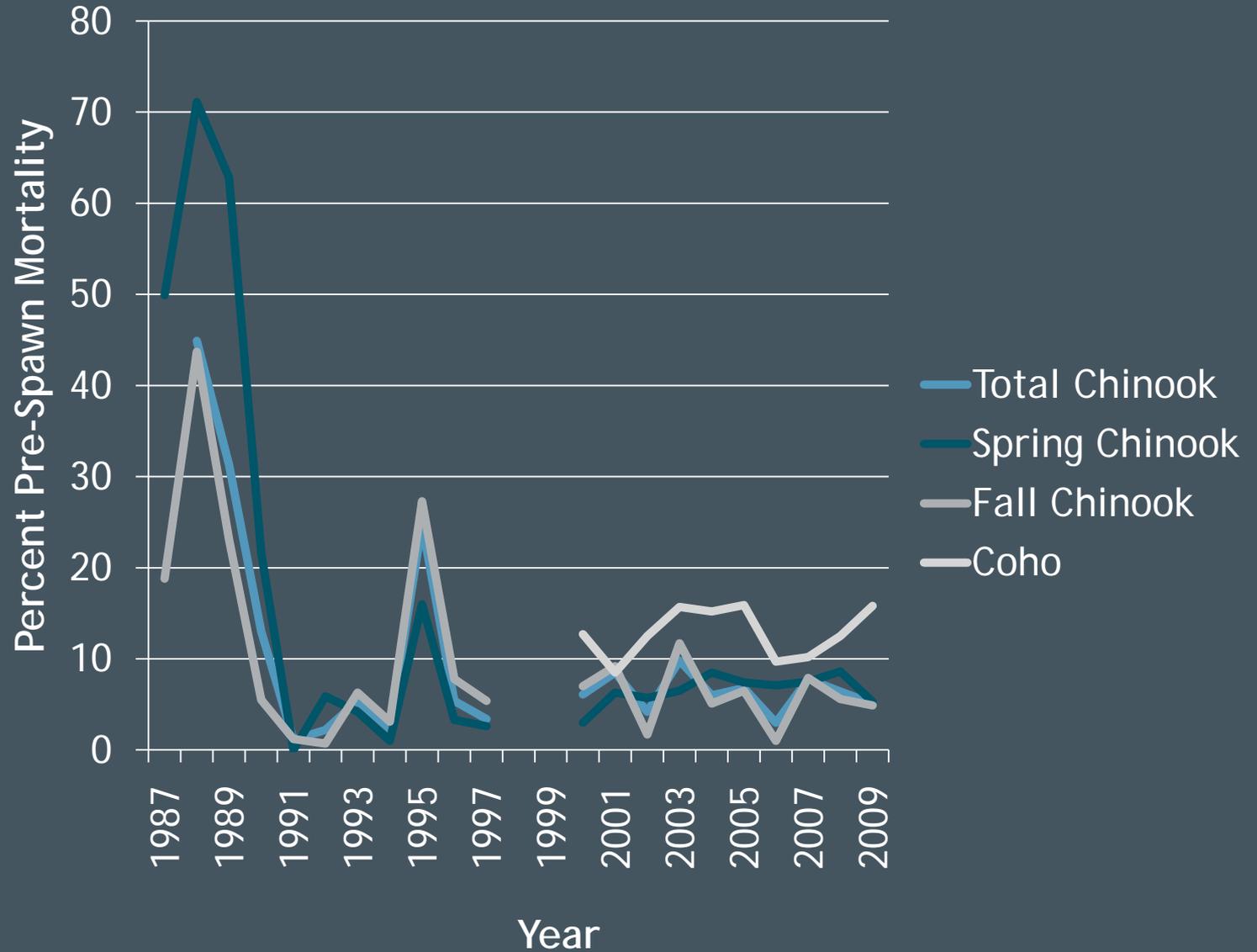
# Results

- July 1 - September 14: 80 exceedances (9.5%)
- September 15 - 30: 6 exceedances (3.6%)
- October 1 - December 31: 30 exceedances (3.0%)
- Temperature targets met > 90% of time during the summer holding period and more than 96% of the time during the two spawning periods
- Cumulative distributions of exceedances at Douglas City and North Fork suggest that 60 to 70% of the exceedances were  $\leq 1^\circ \text{F}$

## 10. Adult pre-spawn mortality

- IAP:
  - No specific objective related to prespawn mortality
  - 2.2.1: Provide optimal temperatures to improve spawning success of spring and fall-run Chinook salmon
- Methods:
  - Field surveys to assess proportion of female carcasses that were unspawned (contained majority of their eggs)
  - Based on 1987 – 2009 data

# Results



# 11. Proportion of time 80% of smolts passed the Willow Creek trap by a certain date

- IAP: NA
- TRFEFR (USFWS and HVT 1999):
  - Steelhead: May 22 (we used May 21)
  - Coho: June 4
  - Chinook salmon: July 9
- **Note:** In the draft report we used July 9 for all three species, and have updated our analysis to reflect the dates shown above
- Based on data collected from 2002 to 2008

# Results

- Age-0 natural-origin Chinook salmon:
  - Annual range: 63 - 99%
  - Target achieved 6 of 7 years (86% of the time)
- Age-0 natural-origin coho salmon:
  - Annual range: 59 - 93%
  - Target achieved 5 of 7 years (71% of the time)
- Age-1+ natural-origin steelhead:
  - Annual range: 56 - 85%
  - Target achieved 4 of 7 years (57% of the time)
- Age-0 natural-origin steelhead:
  - Annual range: 3 - 62%
  - Target achieved 0 of 7 years (0% of the time)

# Summary

- Indicators are neutral-to-positive in terms of lending support for the Program's objectives (exceptions: coho escapement trend (-); low fall Chinook and steelhead escapement; 0+ steelhead outmigration timing)
- Many of the IAP objectives would benefit from additional review
  - Vague (e.g., "increase")
  - Categorical (62,000 fall Chinook - every year?)
  - Temp criteria: using daily means doesn't capture extremes, which can be important
  - Is there a need to adjust the measure's spatial scales to data collection scales (adult traps)?
- Steelhead are clearly under escaping