Juvenile Salmon Production and Stock Composition in the Lower White Salmon River Prior to Removal of Condit Dam

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U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

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Mitigation, Conservation and Fisheries Restoration in the Columbia River Gorge

- Service has multiple hats in the Gorge
  - Mitigation
  - Conservation
  - Fisheries Restoration
- White Salmon River project between USGS-BRD and the Service but typical of Gorge fisheries work.
  - Builds on continuing data adult escapement estimates by PSMFC and WDFW for the White Salmon River.
  - Providing needed information to assist with potential fish salvage operations prior to removal
- Both tules and upriver brights are on the spawning grounds in the White Salmon River
  - Both stocks raised at Spring Creek and Little White Salmon NFHs.
  - Impacts to restoration of tules in White Salmon post-Condit Dam removal?
  - Concerns from NOAA-Fisheries.
  - Evaluation of Service Ladder operations was the starting point.

Spring Creek and Little White Salmon Fall Chinook Programs

	Spring Creek NFH	Little White Salmon NFH
Stock	Tule Fall Chinook	Upriver Bright Fall Chinook
Origin	Endemic to Area	Endemic to Above Dalles Dam
Run Timing	Late August - September	October – Early November
Harvest	Commercial Ocean, Sport and Tribal harvest.	In-river Tribal and Sport Harvest, Ocean Harvest.

Origin of natural spawning fall Chinook in the White Salmon River, 2003 -05 (WDFW Kelly Jenkins, personal communication). Surveys conducted from September through mid-October.

Origin	Stock	2003 Escapement	2004 Escapement	2005 Escapement
Ringold Hatchery	(URB)	5	*	
Bonneville Hatchery	(BUB)	407	0	56
Klickitat	(PUB)	5	0	
Little White Salmon Hatchery	(PUB)	156	42	199
Spring Creek Hatchery	(BPH)	10,202	5,750	1,249
Unknown Origin	(BPH)	1,696	3,054	
Total Escapement – White Salmon		12,471	8,850	1,504


Upriver Bright


Tule

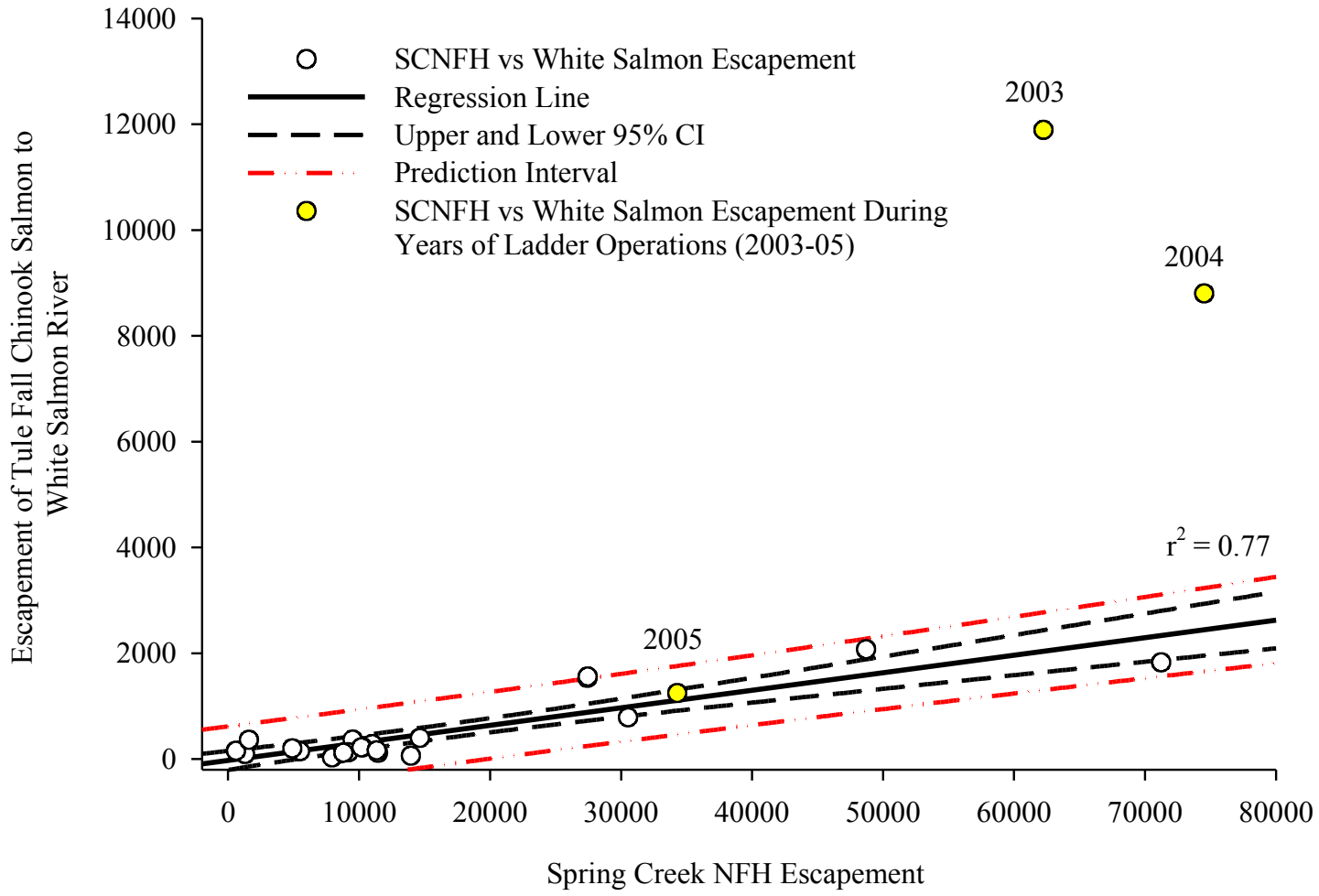


Figure 1. Regression of tule fall Chinook salmon escapement to the White Salmon River to Spring Creek National Fish Hatchery escapement from 1980-2002 with the years of experimental ladder closure (2003-2005). Upper and lower confidence intervals as well as prediction interval are given.

Origin of natural spawning fall Chinook salmon in the White Salmon River, 2003-05 (WDFW – Kelly Jenkins, personal communication). Surveys conducted from October through mid-November annually.

Origin	Stock	2003 Escapement	2004 Escapement	2005 Escapement
Youngs Bay NP	(SAB)	13		
Spring Creek Hatchery	(BPH)	1,065	262	141
Bonneville Hatchery	(BUB)	1,161	1,530	723
Lyons Ferry Hatchery	(URB)	3		
Klickitat Hatchery	(PUB)	25	15	
Little White Salmon Hatchery	(PUB)	2,898	2,260	671
Unknown Origin	(PUB)	226	1,543	1,877
Total Escapement – White Salmon		5,391	5,610	3,412


Upriver Bright


Tule

Mitigation, Conservation and Fisheries Restoration in the Columbia River Gorge

- Part of the Conservation and Fisheries Restoration in the White Salmon River.
- We needed to understand:
  - Current production
  - Life history
  - Genetic distinctness
  - Genetic origin

- Additionally, this information serves fisheries restoration efforts in the White Salmon.

Juvenile Production in the White Salmon River

- Service initiated a request to USGS-BRD a rotary trap in the White Salmon during 2006-2008
  - Determine the fish assemblage and fish use in the lower White Salmon River.
  - Assess growth and survival of fish as one index of productivity.
  - Contribute to complimentary efforts by the U.S. Fish and Wildlife Service to characterize life history, genetics, and fish health of Chinook stocks that currently use the lower White Salmon River, and
  - Coordinate sampling plan and compare results with ongoing efforts associated with the dam removal projects in the Elwha River system (Olympic Peninsula, WA) in order to maximize learning about fish response to dam removal efforts.

2006 Rotary Trap Captures

U.S. Geological Survey Below Condit Dam

23 days of operation

- 2,777 Juvenile Chinook salmon
- 74 Coho Salmon
- 15 wild Steelhead trout
- No efficiency estimate, only raw catch numbers.

2007 Rotary Trap Captures

U.S. Geological Survey Below Condit Dam

79 days of operation

- 1,083 Juvenile Chinook salmon
- 195 Coho Salmon
- 90 wild Steelhead trout
- No efficiency estimate, only raw catch numbers.

Rotary Trap Captures 2006

2777 Chinook

74 Coho

14 wild, 45 ad clipped *O. mykiss*

Lamprey, sculpin, stickleback, longnose dace

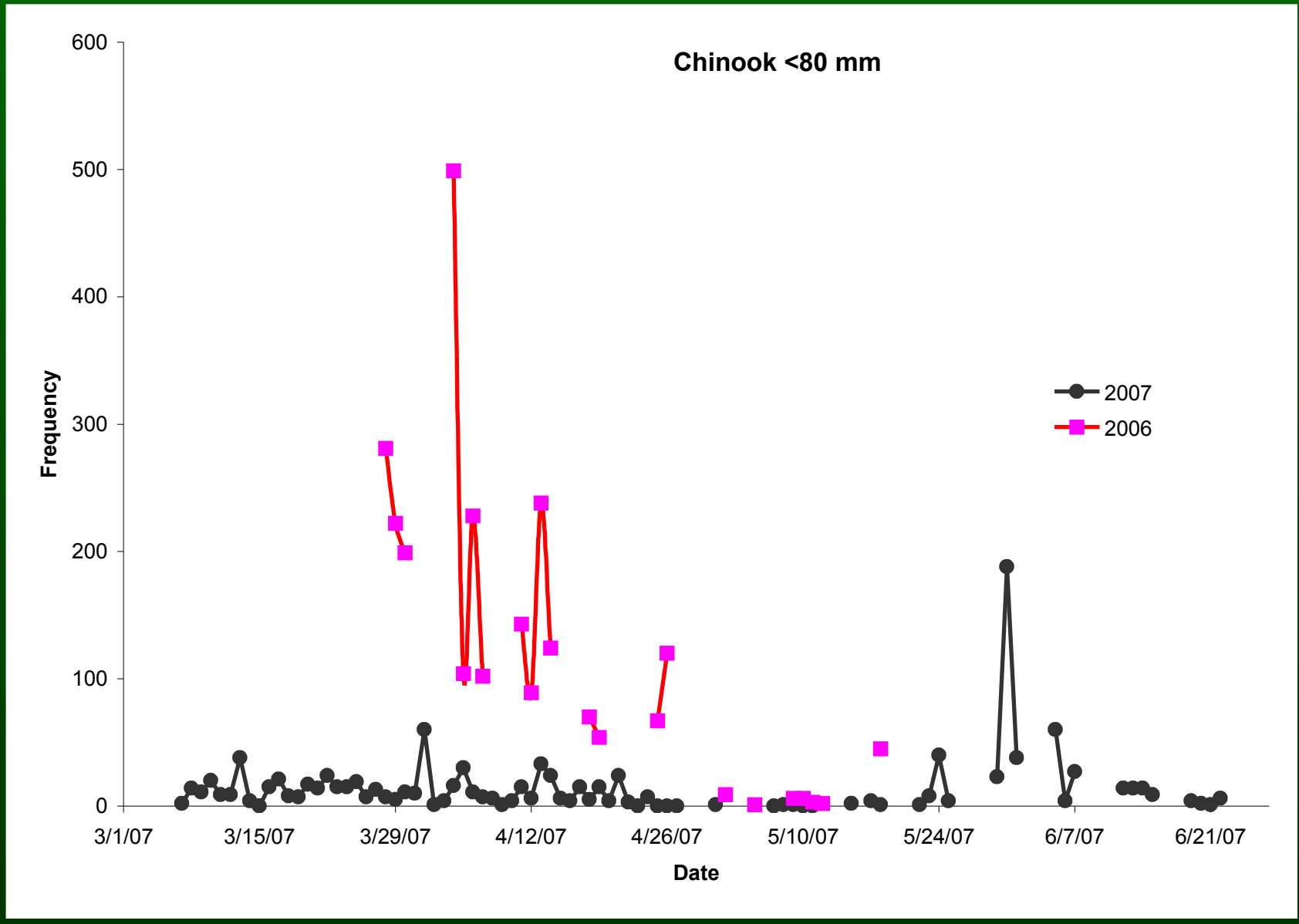
Yolk sac fry collected on last date sampled. Up to 16% in March.

500 genetics samples taken

Table 1: Total fish capture for screw trap in the White Salmon River

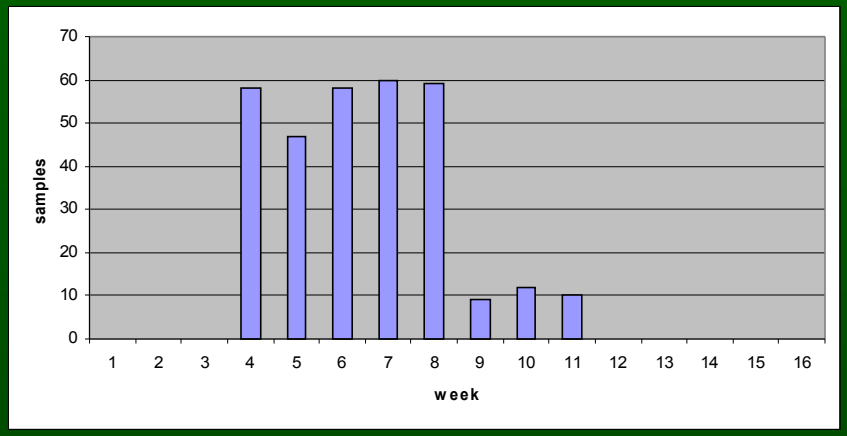
Date	CHK<80mm	CHK>80mm	COH	OMY<80mm	OMY>80mm*
March-28	281	0	2	0	0
March-29	222	0	7	0	0
March-30	199	0	9	0	0
April-4	499	0	8	0	0
April-5	104	1	1	1	2(1)
April-6	228	0	5	0	0
April-7	102	0	7	0	0
April-11	143	0	3	0	2(0)
April-12	89	1	1	0	0
April-13	238	3	4	0	0
April-14	124	3	1	0	1(0)
April-18	70	0	1	0	0
April-19	54	0	1	0	0
April-25	67	1	4	0	0
April-26	120	5	1	0	1(0)
May-2	9	0	1	0	5(5)
May-5	1	35	1	0	20(19)
May-9	6	26	1	0	1(1)
May-10	6	29	1	0	9(7)
May-11	3	26	1	0	5(3)
May-12	2	26	2	1	7(3)
May-18	45	9	3	2	2(0)

*Indicates that numbers in parenthesis are known hatchery fish by AD clips.

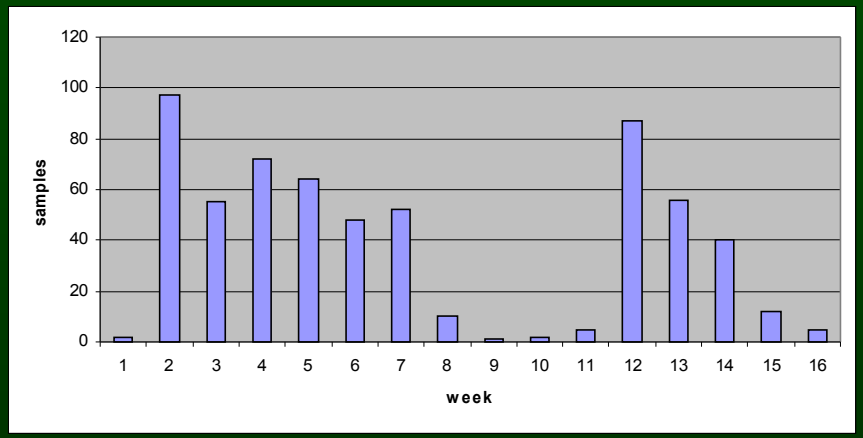

Chinook <80 mm
Frequency
600
500
400
300
200
100
0
3/1/07
3/15/07
3/29/07
4/12/07
4/26/07
5/10/07
5/24/07
6/7/07
6/21/07
Date
2007
2006

Genetic Analysis
Abernathy Fish Technology Center

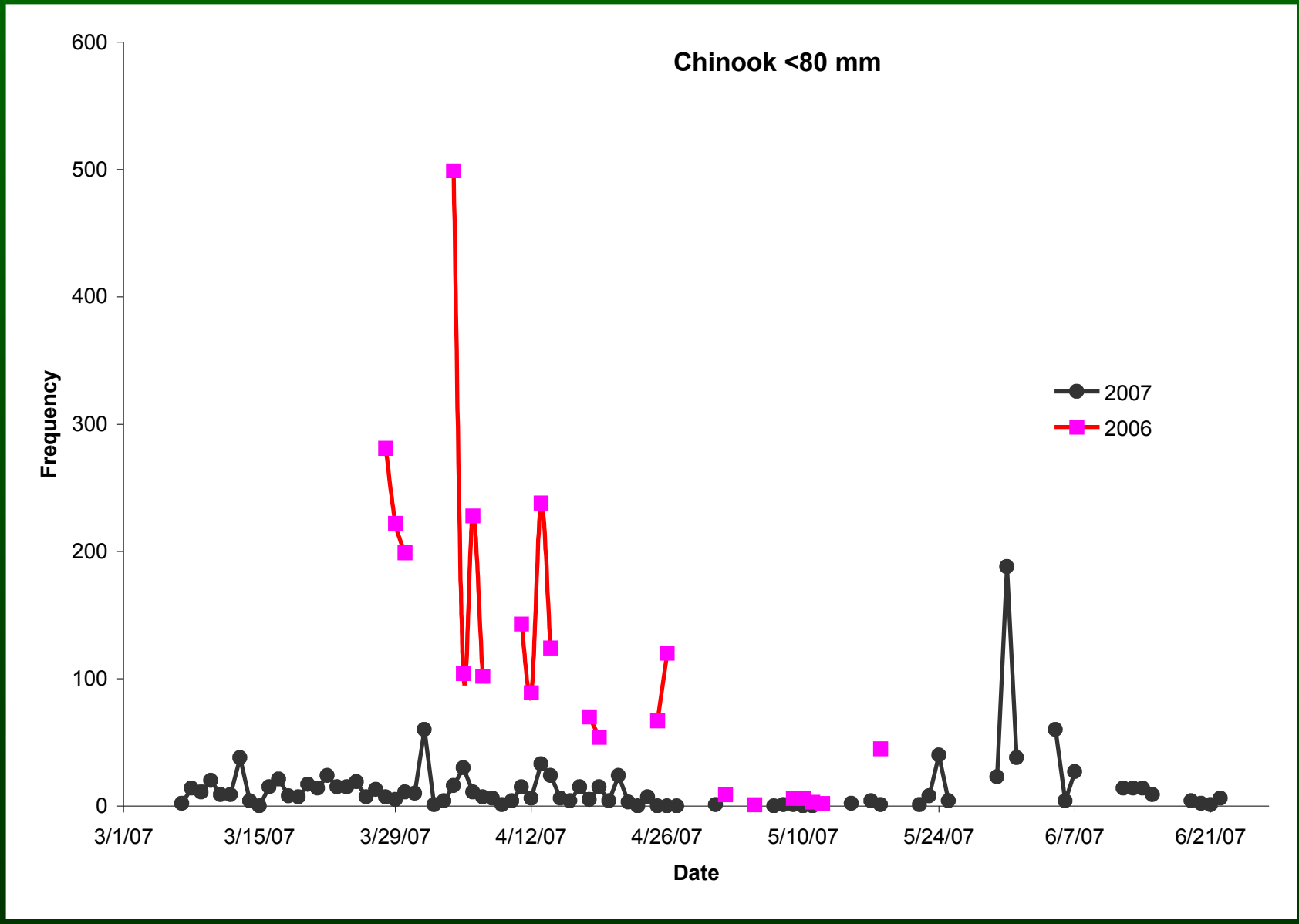
- USGS-BRD collected tissue samples from rotary screw trap in representation of weekly catch up to a maximum collection point per species for that week.
- Abernathy FTC used the Columbia River Chinook salmon baseline in addition to information from CRITFC for microsatellite analysis.
- Total comparison was 54 populations of Chinook in the basin
  - including Spring Creek NFH, Carson spring Chinook salmon and Little White Salmon upriver bright fall Chinook.
- 437 of 921 (47%) individuals were assigned to a population with greater than 90% confidence.



White Salmon River 2006:
N=427 total, n=313 used



White Salmon River 2007:
N=612 total, n=608 used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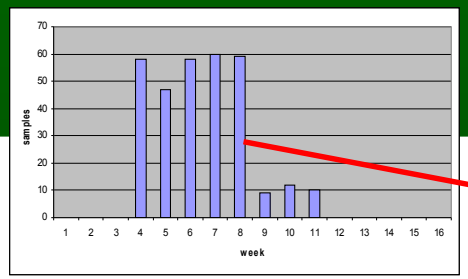
Date
2007
2006

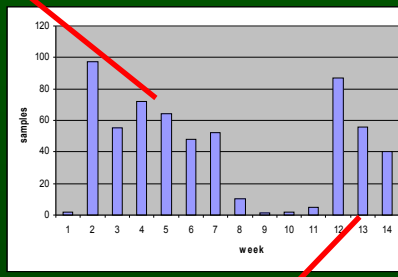
Correspondence analysis of 54 populations



WSR 2007 early

Spring Creek NFH

WSR 2006



Low Col

Tule

Hood River

Mid-up spring

LWS spring

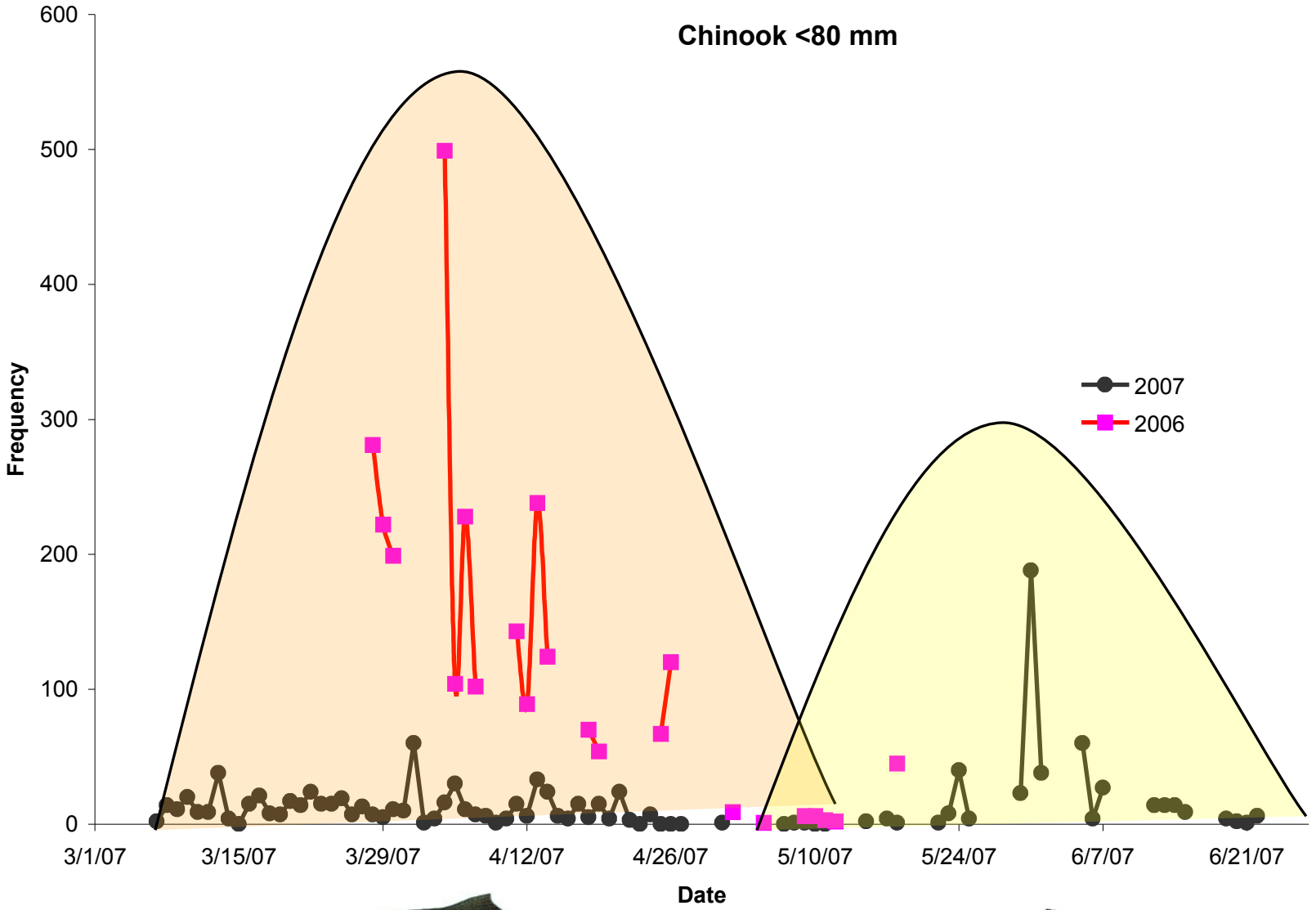
LWS fall

WSR 2007 late

Mid-up fall

Axe 2 (11.89 %)

Axe 1 (27.26 %)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3/15/07
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4/12/07
4/26/07
5/10/07
5/24/07
6/7/07
6/21/07
Date


Tule


Upriver Bright

Results from Genetics

- The present data support the existence of two populations of Chinook salmon in the White Salmon River:
  - Population with “early” out-migration time is genetically similar to fall tule runs and in particular to the tule stock at Spring Creek NFH.
  - Population with “late” out-migration time is genetically similar to fall stocks from the middle and upper Columbia River. The present baseline does not provide sufficient resolving power to infer similarity to Little White Salmon NFH, relative to other URB stocks.
- In the two years of samples examined here, transition between the two populations for out-migrating smolts took place in the first two weeks of May.

Ongoing Study

Entering final year of study

- Genetics
  - Run through samples from rotary trap again this year using same protocol for tissue collection.
  - Additional blind samples from Columbia Gorge facilities.
- Rotary Trapping
  - Efforts in place to use hatchery fish in addition to normal trap catch to determine trap efficiency during “early”, middle and “late” Chinook salmon outmigration
  - Addition of another trap to increase efficiency estimates

Acknowledgements

Hood River Data - Eric Olsen and Rod French (ODFW)

Baseline data - Shawn Narum (CRITFC)

DNA sequencing and genetic species ID - Linda Park and Anna Elz (NOAA Fisheries)

Insights, ideas and ongoing support - Don Campton, Larry Marchant and Speros Doulos (USFWS) and White Salmon River – Condit Dam Workgroup

Trap checking, data entry, trap installation - Jodi Charrier, Carrie Munz, Ian Jezorek and Kyle Martens of USGS-BRD

5 foot Rotary Trap - USGS's Western Fisheries Research Center Steve Reuben and Reginald Reisenbichler

USFWS - Doug Olsen, Dave Hand, Jeff Hogle, Marshall Barrows, and several other USFWS staff assisted in trap installation and data collection._
Susan Gutenberger and Ken Lujan for fish health profiles

Yakama Nation - Joe Zendt and others with the Yakama Nation fisheries staff assisted in identifying the trap location and installation, as well as providing some equipment.

Bureau of Indian Affairs - Keith Hatch for allowing us to use the Underwood and White Salmon in-lieu boat launches.

The views expressed here are those of the authors and do not necessarily represent those of the United States Fish and Wildlife Service.

Table 10. Escapement estimates fall Chinook salmon within the White Salmon River from 1998-2005 during September and October (Kelly Jenkins, Pacific States Marine Fisheries Commission, personal communication). Surveys conducted by WDFW and PSMFC staff during September and Early October and coincide with tule fall Chinook salmon spawning in the White Salmon. Recovery of coded wire tags is expanded based on tagging records and applied to escapement estimates. Unknown Origin fish may include wild fish. Clackamas Hatchery recoveries in 2001 and 2002 are spring Chinook salmon stock. Recovery of Little White Salmon NFH, Klickitat and Bonneville Hatchery stock are upriver bright fall Chinook salmon.

Origin	1998	1999	2000	2001	2002	2003	2004	2005
Snake River Hatchery (unknown)				5				
Clackamas Hatchery					28			
Ringold Hatchery						5		
Bonneville Hatchery						407		56
Klickitat Hatchery						5		
Little White Salmon NFH						156	42	199
Spring Creek NFH		344		1,702	1,385	10,202	5,750	1,249
Unknown Origin	242	57	167	370	446	1,696	3,054	
Total Escapement	242	401	167	2,077	1,859	12,471	8,846	1,504