Fall Chinook Work Group

Tuesday, 31 March 2015

Grant PUD (USBOR Building)

Ephrata, WA

Technical members

Paul Wagner, NMFS	Joe Skalicky/Don Anglin, USFWS
Jeff Fryer, CRITFC	Paul Ward/Bob Rose, YN
Holly Harwood, BPA	Brett Swift, American Rivers
Keith Truscott, CPUD	Tom Kahler, DPUD
Bill Tweit, WDFW	Paul Hoffarth, WDFW
Patrick McGuire, WDOE	John Clark, ADFG
Peter Graf, GCPUD	Todd Pearsons, GCPUD
Steve Hemstrom, CPUD	

Attendees: (*Denotes Technical member)

Peter Graf, GCPUD*	Jeff Fryer, CRITFC* (Phone)
Paul Hoffarth, WDFW* (Phone)	Paul Wagner, NMFS* (Phone)
John Clark, ADFG*	Ryan Harnish, Battelle (Phone)
Todd Pearsons*, GCPUD	Geoff McMichael, Mainstem Fish Res
Tracy Hillman, Facilitator	

Action Items:

1. **Peter Graf will provide updates on the HRFCPPA Periods and Flow Constraints.**
2. **Paul Hoffarth will provide the 2014 egg retention report to the FCWG/HRWG by October 2015.**

Meeting Minutes

I. Welcome and Introductions – Tracy Hillman welcomed attendees to the meeting. Attendees introduced themselves.

II. Agenda Review – The agenda was reviewed and approved.

III. Approval of Meeting Minutes

- The February Meeting Minutes were reviewed and approved with edits.

IV. Review of Action Items - Action items identified during the February meeting were discussed.

- Peter Graf will provide updates on the HRFCPPA Periods and Flow Constraints. **Ongoing.**
- Paul Hoffarth will provide the 2014 egg retention report to the FCWG/HRWG by October 2015. **Ongoing. Paul is waiting for the otolith analyses. He will provide the report (memo) to the FCWG when the otolith analyses are complete.**

V. Update on Wanapum Dam Issues

Peter Graf gave an update on the status of Wanapum Dam. Peter said that Grant PUD began filling the reservoir on 16 March at a rate of about 2.5 feet per day. By 21 March the reservoir reached a level of 571.1 feet.

Peter noted that construction/repairs continue on the dam. Those should be completed by late May. Trash rack modifications were removed about two weeks ago.

Peter stated that all ladders are fully operational and providing fish passage.

VI. Final Report and Implementation Feasibility Study/Implementation Feasibility Plan

Peter Graf indicated that he addressed all the comments received from WDFW, USFWS, ADFG, CRITFC, NOAA Fisheries, Battelle, Mainstem Fish Research, and BioAnalysts. Peter indicated that he worked with each commenter on how to address the comments. He also produced a separate document that identifies the commenter, the comment number, report section and paragraph, the comment, and Grant PUD's response to the comment. In addition, Grant PUD is currently working on uploading all the supporting technical documents on the web. Peter noted that the final report is currently going through internal review. After the review is complete, the document will be sent to Ecology on or before 17 April.

VII. HRWG Activities

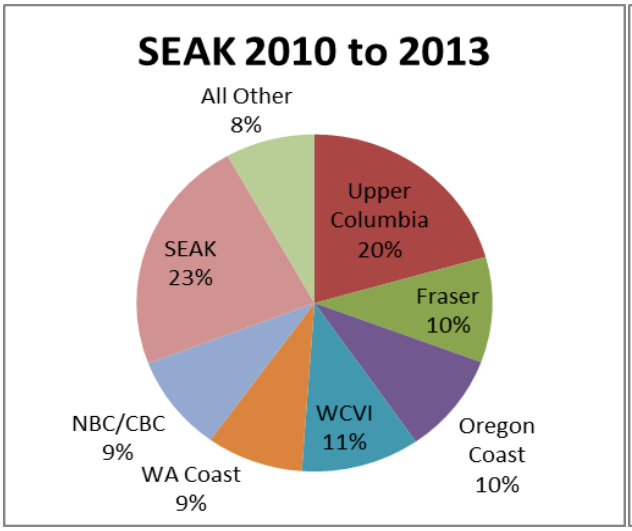
2014-2015 Protection Program Implementation – Peter Graf reported that flow fluctuation constraints are currently in effect. Fall Chinook emergence began on 26 February. The post-emergent period is expected to begin on 5 May. Peter noted that there have been no exceedances during the spawning, incubation, or emergence periods. Peter said that all temperature and flow data are displayed in the Fixed Site Monitoring – Monthly Summary files on the Grant PUD Water Quality Website (http://grantpud.org/environment/water-quality/monitoring-data). The temperature unit tracking spreadsheet is found under "Monthly Summaries (xls)."

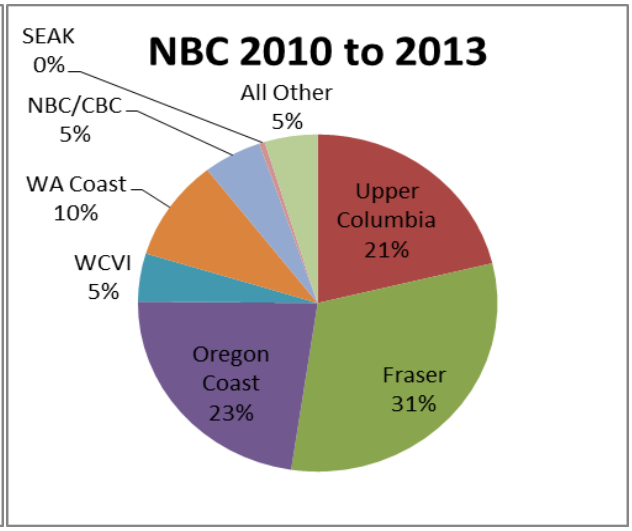
Peter indicated that he will continue to provide updates on protection flows (i.e., HRFCPPA Periods and Flow Constraints).

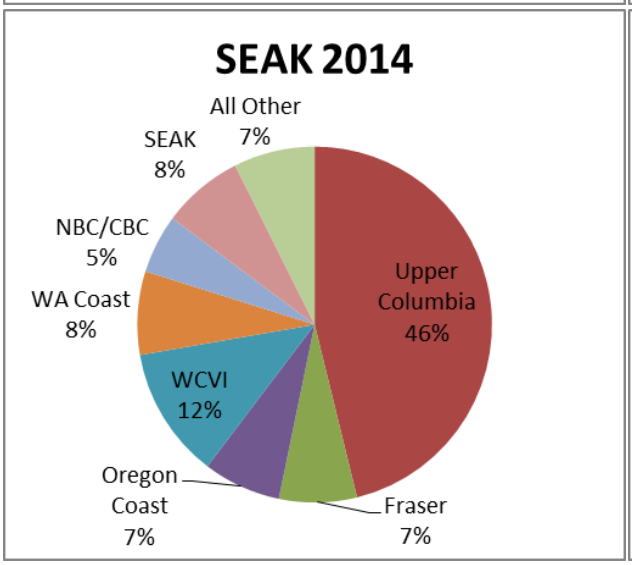
2015 Fall Chinook Run Forecast – Paul Hoffarth gave a presentation on Hanford Reach fall Chinook run forecasts and harvest management (see Attachment #1). Paul began by discussing the analytical tools used in forecasting, including both regression procedures and cohort ratios. Paul also described the use of juvenile-to-adult CWT expansions and adult-to-adult CWT expansions. Based on this work, Paul reported that the forecast for 2015 is about 900,200 adult fall Chinook to the Columbia River. The Upriver Bright forecast is about 500,300 adult Chinook. The Hanford Reach forecast is about 250,000 adults (about 98,572 to Priest Rapids Hatchery, 23,146 to Ringold Hatchery, and 127,543 to the Reach).

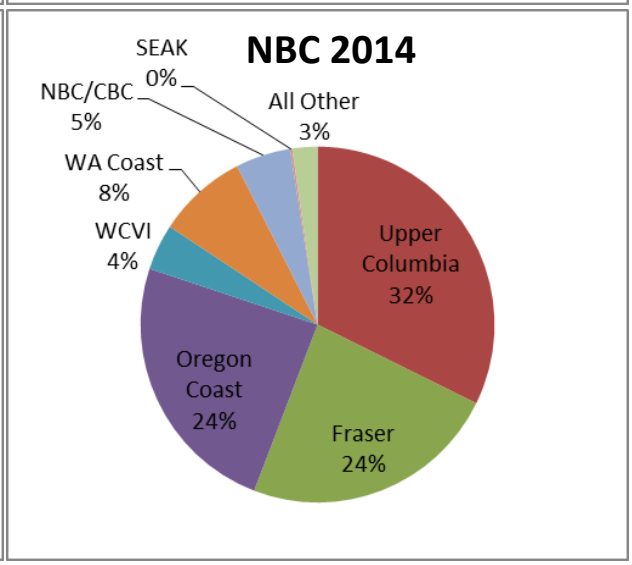
Paul then described the Hanford Reach Fall Chinook Management Plan. He described how harvest is allocated based on returns less than or greater than 36,000 adults. He indicated that they currently use an escapement goal of 28,800 adults; however, this will likely change based on the stock-recruitment work conducted by Ryan Harnish and others. Paul showed both in-season return estimates and weekly and cumulative harvest. Paul noted that by 15 September, he will have a rough estimate of the return and can reduce harvest by closing the season or reducing the daily limit.

John Clark commented that in order to increase precision in the run forecasts, WDFW should include ocean harvest in their analyses. John provided the following figures that show the composition of stocks within the Southeast Alaska (SEAK) and Northern British Columbia (NBC) fisheries. It is clear that upper Columbia summer and fall Chinook made up a larger percentage of the catch in 2014 than in previous years. John noted that by adding the ocean harvest data to the run forecast, the accuracy of the 2014 estimate would have been much closer to the actual escapement size. As a final point, John noted that the run forecasts should include confidence intervals.









2014 Egg Retention Report – Paul Hoffarth indicated that he will provide the 2014 egg retention report to the FCWG/HRWG after the analyses of otoliths are complete. Nonetheless, Paul shared with the group his spreadsheets that show the spawning success of fall Chinook in the Hanford Reach (see tables below). Paul noted that the combined spawning success of fall Chinook in 2014 was 93.3%. About 79.8% of the fish voided all their eggs in 2014. About 81.1% of the wild fish voided all their eggs, while about 63.8% of the hatchery fish voided all their eggs. The percentages of wild and hatchery fish that successfully spawned will likely change after the otoliths are analyzed.

Year	Total Sample	Jacks	Adult Male	Adult Female	Percent Spawned					Spawn Success	
					100%	75%	50%	25%	0%	100%	Combined
2004	1,807	36	595	1,176	1,151		21		4	97.9%	98.8%
2005	2,096	19	754	1,323	1,310		6		7	99.0%	99.2%
2006	565	34	179	352	343	0	8	0	1	97.4%	98.6%
2007	724	4	266	454	443	0	8	0	3	97.6%	98.5%
2008	1,061	20	457	584							
2009*	849	23	327	499	484	0	5	0	10	97.0%	97.5%
2010	2,355	35	1,147	1,173	1,147	6	13	1	6	97.8%	98.7%
2011	2,172	51	857	1,264	1,203	1	52	5	3	95.2%	97.4%
2012**	1,651	67	813	771	747	14	5	1	4	96.9%	98.6%
2013**	2,117	59	1,373	685	536	90	20	16	23	78.2%	90.1%
2014	3,259	86	1,537	1,636	1,305	285	11	9	26	79.8%	93.3%
Mean	**1,696**	**39**	**755**	**902**						**93.7%**	**97.1%**

* Spawn success was categorized as fully spawned or partial spawn from 2009 and earlier

** Otoliths were used in addition to adipose clips and CWTs to determine origin. Ages 2-4 could be identified by otoliths

Year	Wild							
	Percent Spawned						Spawn Success	
	Sampled	100%	75%	50%	25%	0%	100%	Combined
2009*	494	482		12			97.6%	98.8%
2010	1,125	1,101	6	12	1	5	97.9%	98.8%
2011	1,176	1,121	1	48	4	2	95.3%	97.5%
2012**	681	658	14	5	1	3	96.6%	98.6%
2013**	461	392	51	9	3	6	85.0%	94.5%
2014	1,506	1,222	254	6	5	19	81.1%	94.1%
Mean	**907**						**92.3%**	**98.8%**

Year	Hatchery*							
	Percent Spawned						Spawn Success	
	Sampled	100%	75%	50%	25%	0%	100%	Combined
2009*	13	12		1			92.3%	96.2%
2010	48	46		1		1	95.8%	96.9%
2011	88	82		4	1	1	93.2%	95.7%
2012**	90	89	0	0	0	1	98.9%	98.9%
2013**	224	144	39	11	13	17	64.3%	81.3%
2014	130	83	31	5	4	7	63.8%	84.4%
Mean	**99**						**84.7%**	**92.2%**

* hatchery origin was based on adipose clip and/or CWT origin

2015 Northwest Scientific Association Annual Meeting – Tracy Hillman reported that the 2015 Northwest Scientific Association Annual Conference is taking place at Columbia Basin College in Pasco, WA on 1-4 April. The conference will examine *Past, Present, and Future Challenges to Natural and Managed Ecosystems: sagebrush, salmon,*

and syrah in a non-stationary environment. PNNL is hosting a symposium on *Fish Passage and Salmon Recovery in the Columbia River Basin.* Additional information on the conference can be found at: http://www.northwestscience.org/2015meeting

VIII. Qualitative Assessment of Egg Loss

Geoff McMichael gave a presentation on fall Chinook egg loss in the Hanford Reach (see Attachment #2). Geoff began by providing a brief background on Hanford Reach fall Chinook and the possibility of density dependence affecting pre-smolt recruitment at high spawning escapements. Geoff indicated that high spawning escapements could result in density-dependence mortality during the spawning period or during early juvenile rearing. Geoff explored that possibility that high escapements increase the number of eggs dislodged during fall Chinook spawning. He used underwater observations and underwater video to assess the number of eggs visible on the substrate within four spawning areas in the Hanford Reach. Each of the four spawning areas had equivalent spawning habitat.

Geoff found that despite high escapement levels and high redd densities (with overlapping redd margins), few eggs were actually observed on the substrate. Geoff noted that if eggs were dug up, they may not have detected them because of the timing of their surveys (they conducted their surveys during the daytime; Oldenburg et al. captured drifting eggs mostly at night) and/or because scavengers consumed the eggs before the surveys were conducted. Nevertheless, the surveys showed that redd superimposition did not result in widespread loss of buried eggs. It also demonstrated that the quantity of spawning habitat may be greater than previously thought.

Geoff provided the following link, which is a short video of the egg-loss work in the Hanford Reach: https://youtu.be/NutSOf04mIU

IX. Next Meeting: The FCWG will next meet on Tuesday morning, 6 October 2015 at Grant PUD in Ephrata, WA.

Attachment 1

Presentation by Paul Hoffarth on Hanford Reach Fall Chinook Forecasts and Harvest Management

HANFORD REACH FALL CHINOOK FORECASTS & HARVEST MANAGEMENT AGREEMENT

COLUMBIA RIVER FALL CHINOOK

2014 Forecast/Actual Returns and 2015 Preseason Forecasts

Stock Group	2014		2015
	Forecasts	Actual Returns	Forecasts
Lower River Hatchery - LRH	110,000	101,800	94,900
Lower River Wild - LRW	34,200	25,800	18,900
Bonneville Pool Hatchery - BPH	115,100	127,000	160,500
Upriver Bright – URB	973,300	684,200	500,300
Bonneville Upriver Bright - BUB	49,500	33,900	26,800
Pool Upriver Bright - PUB	310,600	169,900	86,500
Select Area Bright - SAB	10,200	16,500	12,300
Columbia River Total	**1,602,900**	**1,159,100**	**900,200**

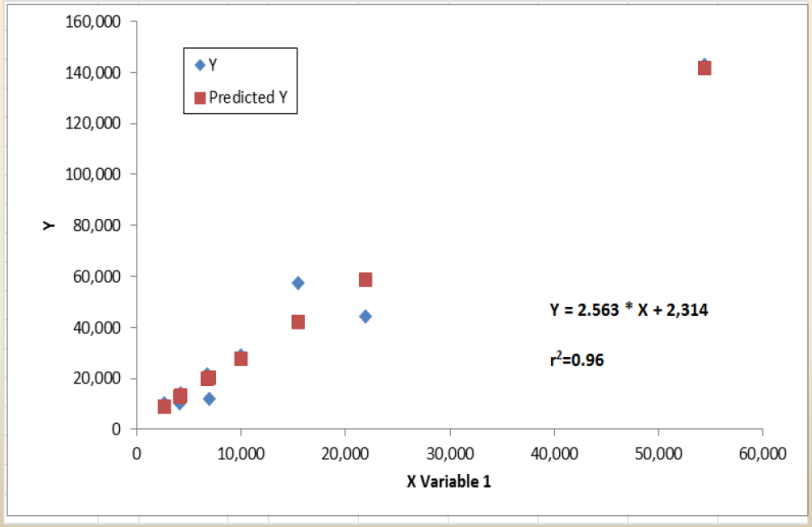
Table 1. 2015 Columbia River Adult Fall Chinook Salmon Pre-season Run Size Forecasts, by Stock and Age (in thousands of fish).

Age	Lower River Hatchery Stock		Lower River Wild Stock		Bonneville Pool Hatchery Stock		Upriver Bright Stock		Mid.-Col. Bright Stock (BUB + PUB)	SAB's Select Area Bright Stock	Total Columbia River Run		MCB's Bonn. Upriver Bright Stock		MCB's Pool Upriver Bright Stock	
β	44.1	a/	2.5	d/	126.2	h/	195.4	k/	20.1	N/A	388.3		7.1	o/	13.0	s/
4	43.8	b/	6.7	e/	34.2	i/	174.8	l/	41.0	N/A	300.5		15.2	p/	25.8	t/
5	7.0	c/	9.7	f/	0.1	j/	129.8	m/	52.0	N/A	198.6		4.5	q/	47.5	u/
6	NA		0.0	g/	NA		0.3	n/	0.2	N/A	0.5		0.0	r/	0.2	v/
Total	94.9		18.9		160.5		500.3		113.3	12.3	900.2	w/	26.8		86.5	

a/ 2's vs 3's (BY 81-11) r2=.86
b/ 3's vs 4's (BY 80-10) r2=.91
c/ 4/5 cohort ratio 8.3606 (02-09)
d/ Recent 10 yr avg return
e/ 3's vs 4's (BY 75-10) r2=.81
f/ 4/5 cohort ratio 2.2374 (94-09)
g/ No prediction
h/ Max observed since 1999
i/ 3/4 cohort ratio 3.0571 (81-10)
j/ No prediction
k/ 2/3 cohort ratio .5995 (00-11)
l/ 3's vs 4's (BY 86-10) r2=.87
m/ Recent 5 yr avg cohort 3.9942
n/ Recent 5 yr avg return
o/ 2/3 cohort ratio .2111 (93-11)
p/ 3's vs 4's (BY 77-10) r2=.59
q/ 4/5 cohort ratio 5.2795 (92-09)
r/ No prediction
s/ 2/3 cohort ratio .4168 (88-11)
t/ 3's vs 4's (BY 84-10) r2=.71
u/ Recent 5 yr avg cohort 2.6437
v/ Recent 5 yr avg return
w/ Total includes SABs

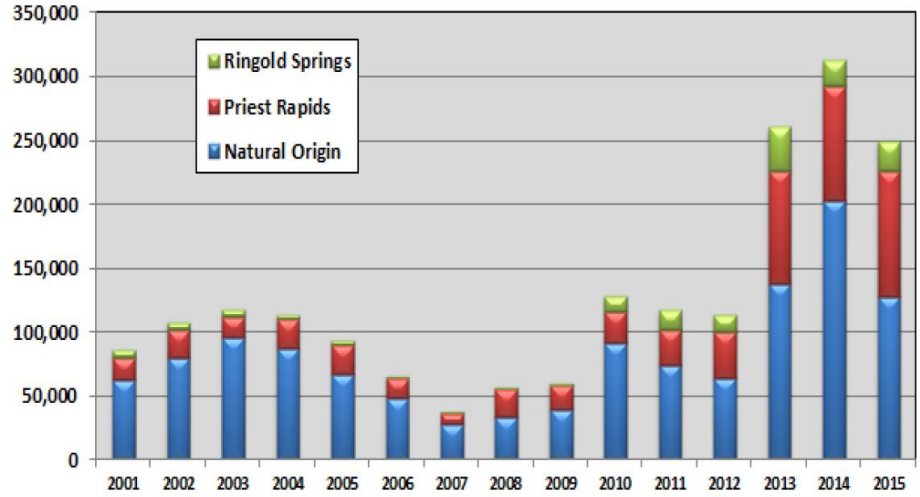
FORECASTING 101

Year	Age 2	Age 3	Age 4	Age 5	Age 6	Total
2014	34,617	15,629	143,365	8,914	87	202,611



BY 2011: 15,629 Age 3 ⟶ 42,371 Age 4

HANFORD REACH RETURNS



HANFORD REACH ESCAPEMENT

Hanford Reach URB						
Return	Age					
Year	2	3	4	5	6	Total
2014	30,664	10,596	122,950	7,507	48	171,764
2013	16,573	46,341	54,247	5,613	75	122,850
2012	4,706	11,387	19,306	16,172	0	51,571
2011	8,841	4,972	38,957	10,726	152	63,649
2010	6,608	17,133	32,622	23,942	68	80,372
2009	10,210	2,456	11,055	6,627	0	30,348
2008	5,697	2,015	8,657	10,110	45	26,524
2007	7,806	1,365	6,824	4,576	348	20,920
2006	4,606	3,716	11,235	25,120	532	45,210
2005	7,612	6,240	26,463	19,836	674	60,824
2004	8,006	7,860	15,685	45,663	1,806	79,019
2003	11,196	4,677	41,334	31,449	81	88,737
2002	14,200	9,581	35,410	14,716	50	73,957
2001	15,047	8,777	22,091	9,484	486	55,884
Mean	**10,841**	**9,794**	**31,917**	**16,539**	**312**	**69,402**

JUNENILE TO ADULT CWT EXPANSIONS

Brood Year	Release Year	Released	Ad/CWT	CWT Only	AD Only	PIT (NM)	Unmarked (no clips/tags)	Expansion	
								Ad/CWT	All CWT
2013	2014	7,267,248	603,417	603,439	2,712,975	42,998	3,304,419	12.0	6.0
2012	2013	6,822,861	603,930	601,009	2,712,228	44,083	2,861,611	11.3	5.7
2011	2012	7,056,948	595,608	598,031	2,768,651	42,844	3,051,814	11.8	5.9
2010	2011	6,798,390	602,580	1,108,990	1,702,961	2,994	3,380,865	11.3	4.0
2009	2010	6,776,651	619,594	1,026,605	1,718,104	1,995	3,410,353	10.9	4.1
2008	2009	6,788,314	216,137		1,702,264	2,994	4,866,919	31.4	31.4
2007*	2008	4,548,306	202,568		813	3,000	4,341,925	22.5	22.5
2006	2007	6,743,101	202,000			3,000	6,538,101	33.4	33.4
2005	2006	6,876,290	199,445		1,628,614	3,000	5,045,231	34.5	34.5
2004	2005	6,599,838	200,072			3,000	6,396,766	33.0	33.0
2003	2004	6,814,560	399,116			3,000	6,412,444	17.1	17.1
2002	2003	6,777,605	355,373			3,000	6,419,232	19.1	19.1
2001	2002	6,779,035	219,926			3,000	6,556,109	30.8	30.8
2000	2001	6,862,550	200,779			3,000	6,658,771	34.2	34.2

JUVENILE TO ADULT CWT EXPANSIONS

		Hatchery Origin				Natural
Year	Sampled	Priest	Ringold	Other	Total	Origin
2014	77,259	80.9%	1.5%	1.1%	83.5%	21
2013	41,636	71.7%	3.1%	0.4%	75.2%	9
2012	28,039	68.0%	1.2%	0.3%	69.5%	4
2011	20,823	61.3%	0.5%	0.1%	61.9%	1
2010	19,169	60.2%	0.3%	0.3%	60.8%	1
2009	12,778	42.8%	0.0%	0.4%	43.2%	2
2008	321	49.1%	0.1%	0.7%	49.9%	0
2007	6,000	67.1%	0.0%	0.3%	67.4%	4
2006	8,223	49.0%	0.2%	0.0%	49.3%	0
2005	10,616	62.2%	0.4%	0.4%	63.0%	1
2004	15,886	76.3%	0.7%	0.1%	77.1%	1
2003	9,757	84.4%	2.2%	0.2%	86.8%	1
2002	12,401	83.5%	0.8%	1.2%	85.5%	3
2001	15,317	79.4%	3.8%	1.3%	84.5%	3
2000	7,678	73.7%	3.8%	0.6%	78.1%	0
1999	23,359	68.9%	0.3%	0.6%	69.8%	5
1998	16,175	69.8%	0.5%	0.6%	70.9%	1
1997	12,461	77.8%	0.0%	0.7%	78.5%	1
Mean	**18,772**	**68.1%**	**1.1%**	**0.5%**	**69.7%**	**3**

Adult to Adult CWT Expansions

	Age 2	Age 3	Age 4	Age 5	Age 6	Total	
Priest Rapids Return	**12,073**	**20,821**	**42,385**	**1,980**	**0**	**77,259**	
Priest Rapids Origin	**11,907**	**20,505**	**41,354**	**1,883**	**-4**	**75,645**	
Adult to Adult	**6.234**	**7.899**	**4.743**	**4.626**		**5.549**	
"J to A" CWT Expansion	5.662	5.912	3.972	4.117		4.583	
CWTs							
Priest Rapids	1,910	2,596	8,719	407		13,632	
Ringold Springs	8	9	52	5		74	
Hanford Reach URB	5	3	13			21	
Other Hatchery	28	85	153	8	4	278	
Total	**1,951**	**2,693**	**8,937**	**420**	**4**	14,005	
CWT Juvenile Expansions							**% of Return**
Priest Rapids	10,815	15,348	34,632	1,675		62,471	**80.9%**
Ringold Springs	118	154	811	84		1,166	**1.5%**
Hanford Reach URB	0	0	0			0	**0.0%**
Other Hatchery	48	162	220	13	4	448	**0.6%**
Total	**10,981**	**15,664**	**35,663**	**1,772**	**4**	64,085	**82.9%**
Priest Rapids %	**98.5%**	**98.0%**	**97.1%**	**94.5%**	**0.0%**	**97.5%**	

Hanford Reach Natural Origin Returns

Brood Year	Age 2	3	4	5	6	Total
2012	34,617					
2011	18,892	15,629				
2010	8,551	54,423	143,365			206,340
2009	10,563	15,481	57,668	8,914		92,625
2008	7,128	6,812	21,845	5,777	87	41,648
2007	12,453	21,926	44,541	17,313	75	96,309
2006	7,005	3,686	36,182	11,511	0	58,383
2005	8,594	4,200	14,575	25,520	152	53,041
2004	5,057	2,622	10,575	7,673	68	25,997
2003	8,044	4,096	10,464	11,031	18	33,652
2002	8,711	6,950	12,569	5,477	52	33,759
2001	11,803	9,966	29,332	26,089	368	77,558
2000	14,895	5,432	18,073	21,510	574	60,484
1999	16,069	10,421	44,803	48,619	761	120,673
1998	11,984	10,974	38,006	32,755	1,869	95,588
1997	3,033	2,345	24,134	16,105	81	45,698
Mean	**11,712**	**11,664**	**36,152**	**18,330**	**342**	**61,899**

COMPOSITION OF RETURN

NOR Contributions to Hanford Reach

Year	Stream	Sport	Priest Rapids	Ringold Springs	Return
2014	84.8%	13.0%	2.2%	0.0%	202,611
2013	89.8%	9.3%	0.9%	0.0%	136,835
2012	81.6%	15.8%	2.6%	0.0%	63,191
2011	86.5%	13.1%	0.4%	0.0%	73,579
2010	88.5%	11.0%	0.5%	0.0%	90,824
2009	79.0%	19.6%	1.4%	0.0%	38,406
2008	80.7%	19.3%	0.0%	0.0%	32,863
2007	76.0%	18.8%	5.2%	0.0%	27,525
2006	93.4%	6.6%	0.0%	0.0%	48,384
2005	91.3%	8.3%	0.3%	0.0%	66,597
2004	90.6%	9.2%	0.2%	0.0%	87,237
2003	93.5%	6.4%	0.1%	0.0%	94,874
2002	93.1%	6.6%	0.3%	0.0%	79,476
2001	90.4%	9.3%	0.2%	0.0%	61,800
Mean	**87.1%**	**11.9%**	**1.0%**	**0.0%**	78,872

Priest Rapids Hatchery Contributions to Hanford Reach

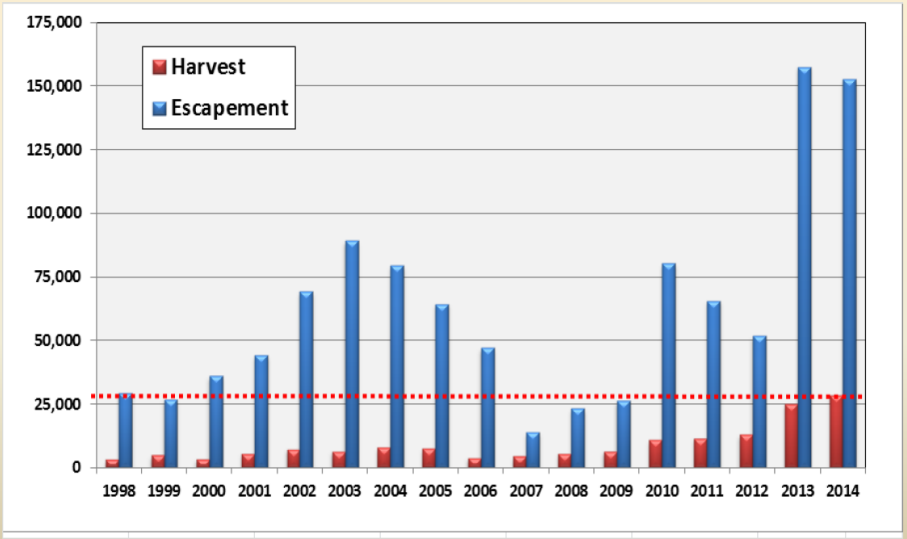
Year	Priest Rapids	Sport	Stream	Ringold Springs	Return
2014	84.7%	4.7%	10.5%	0.1%	89,291
2013	45.6%	10.1%	44.0%	0.4%	88,675
2012	74.6%	15.3%	9.7%	0.3%	37,029
2011	72.8%	8.5%	18.0%	0.7%	28,476
2010	77.2%	7.2%	14.9%	0.7%	24,753
2009	64.2%	6.4%	29.2%	0.2%	19,836
2008	86.4%	2.6%	11.0%	0.0%	22,489
2007	70.0%	13.7%	16.3%	0.0%	8,491
2006	53.3%	8.4%	38.4%	0.0%	15,356
2005	46.4%	8.8%	44.1%	0.6%	22,608
2004	68.1%	2.1%	29.8%	0.1%	23,139
2003	56.7%	3.5%	39.7%	0.0%	16,641
2002	54.6%	9.7%	35.7%	0.0%	22,599
2001	83.7%	2.3%	13.8%	0.3%	17,370
Mean	**67.0%**	**7.4%**	**25.4%**	**0.3%**	**31,197**

Expected Return to PRH - 98,572		Hatchery	Stream	Sport Fishery	Ringold Springs
Mean (2001-2013)	% of Return	67.0%	25.4%	7.4%	0.3%
	Return (#)	66,043	25,037	7,294	296
2014 Return	% of Return	84.7%	10.5%	4.7%	0.1%
	Return (#)	83,490	10,350	4,633	99

COMPOSITION OF SPORT FISHERY

Return Year	NORs	% Hatchery Origin				Harvest
		Combined	PRH	RSRF	OOB	
2014	81%	19%	13%	5%	1%	32,417
2013	46%	54%	32%	20%	2%	27,630
2012	53%	47%	30%	16%	1%	18,854
2011	68%	32%	17%	14%	1%	14,262
2010	80%	20%	14%	6%	0%	12,499
2009	85%	15%	14%	0%	0%	8,806
2008	90%	10%	8%	1%	0%	7,013
2007	80%	20%	18%	1%	1%	6,466
2006	70%	30%	28%	1%	0%	4,506
2005	70%	30%	25%	5%	0%	7,978
2004	91%	9%	5%	3%	0%	8,787
2003	84%	16%	8%	7%	1%	7,190
2002	63%	37%	26%	8%	3%	8,325
2001	83%	17%	6%	10%	1%	7,001
Mean	**74.6%**	**25.4%**	**17.6%**	**6.8%**	**0.9%**	**12,267**

HANFORD REACH HARVEST MANAGEMENT PLAN



HARVEST MANAGEMENT PLAN

Return < 36,000

Anglers will be restricted to 10% of the Return

If the estimated return is 28,000, the allowable sport harvest is 2,800 adult chinook.

28,000 x 10% = 2,800 Chinook

Escapement = 28,000 – 2,800 = 25,200

Return > 36,000

Fish above the escapement goal will be divided equally between the sport fishery and the spawning escapement

If the estimated return is 46,000, the allowable sport harvest is 8,600 adult Chinook.

46,000 - 28,800 = 17,200 Chinook

50% of the excess is available for the sport fishery

17,200 ÷ 2 = 8,600

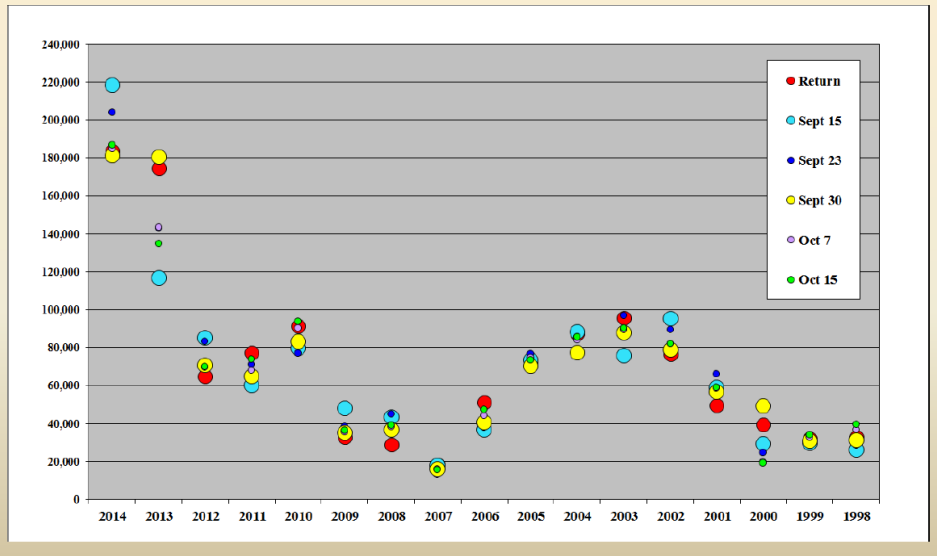
IN-SEASON RETURN ESTIMATES

McNary AFC – Priest Rapids AFC – Ice Harbor AFC

	MCN-PRD-IHR											
	thru Sept 15		thru Sept 23		thru Sept 30		thru Oct 7		thru Oct 10		thru Oct 15	
Year	Adult	%	Adult	%	Adult	%	Adult	%	Adult	%	Adult	%
2014	125,970	69%	176,031	96%	206,007	112%	220,619	120%	225,163	122%	229,571	125%
2013	67,310	38%	123,400	71%	205,186	117%	171,119	98%	168,947	97%	165,547	95%
2012	49,012	76%	71,873	111%	80,475	124%	83,138	128%	84,246	130%	86,153	133%
2011	34,737	45%	61,546	80%	73,818	95%	81,216	105%	84,828	110%	90,794	117%
2010	46,037	50%	66,490	73%	94,570	103%	107,798	118%	111,691	122%	115,101	126%
2009	27,719	84%	33,257	101%	40,182	122%	42,359	129%	44,171	134%	44,850	136%
2008	24,921	86%	38,713	133%	41,777	144%	45,598	105%	47,199	128%	47,825	165%
2007	10,300	56%	11,062	60%	18,256	99%	19,179	107%	19,198	119%	19,146	103%
2006	21,245	42%	32,777	64%	46,074	90%	52,701	143%	55,031	136%	58,087	114%
2005	42,353	59%	66,242	92%	80,095	111%	89,339	122%	100,036	142%	90,257	126%
2004	50,837	58%	73,830	84%	87,810	100%	100,152	114%	101,925	132%	105,227	120%
2003	43,781	46%	83,660	87%	100,049	104%	106,780	141%	108,162	123%	110,890	116%
2002	54,973	72%	77,376	101%	89,771	117%	98,029	103%	99,243	126%	100,825	132%
2001	33,926	68%	57,184	115%	64,320	129%	69,900	119%	71,438	126%	72,403	146%
2000	16,998	43%	21,281	54%	55,758	141%	23,541	80%	23,587	48%	23,552	60%
1999	17,169	53%	25,845	80%	35,113	109%	39,216	132%	40,396	131%	41,929	131%
1998	15,120	46%	24,760	76%	35,346	108%	44,002	168%	46,217	148%	48,468	148%
1997	25,266		41,369		47,475		50,982		51,501		49,305	
Mean		58%	45,181	86%	57,079	114%	60,137	119%	62,162	122%	62,520	123%

IN-SEASON RETURN ESTIMATES

McNary AFC – Priest Rapids AFC – Ice Harbor AFC



WEEKLY & CUMULATIVE HARVEST

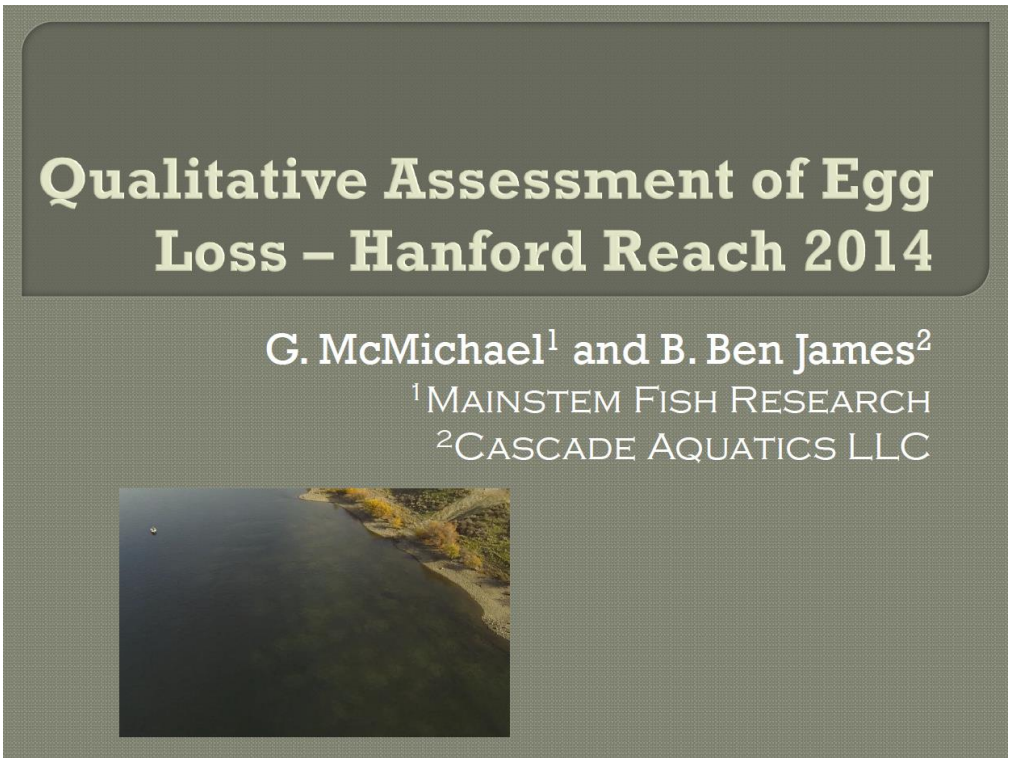
Weekly Harvest (avg 2005-08)			
	Adult	Jack	Total
Aug 16 - 17	3	0	3
Aug 18 - 24	2	0	2
Aug 25 - 31	6	0	6
Sept 1 - 7	90	33	123
Sept 8 - 14	304	65	369
Sept 15 - 21	769	113	882
Sept 22 - 28	1,030	191	1,221
Sept 29 - Oct 5	1,280	230	1,509
Oct 6 - 12	990	160	1,150
Oct 13 - 19	834	171	1,004
Oct 20 - 26	107	15	122
Average	5,461	1,023	6,484

Cummulative Harvest by Week		
Adult	Jack	Total
0%	0%	0%
0%	0%	0%
0%	0%	0%
2%	3%	2%
7%	13%	8%
20%	24%	21%
39%	41%	39%
63%	64%	63%
81%	79%	81%
97%	94%	97%
99%	95%	99%

By September 15, We have a rough estimate of the return and can reduce harvest by closing the season or reducing the daily limit

Attachment 2

Presentation by Geoff McMichael on Qualitative Assessment of Egg Loss in the Hanford Reach



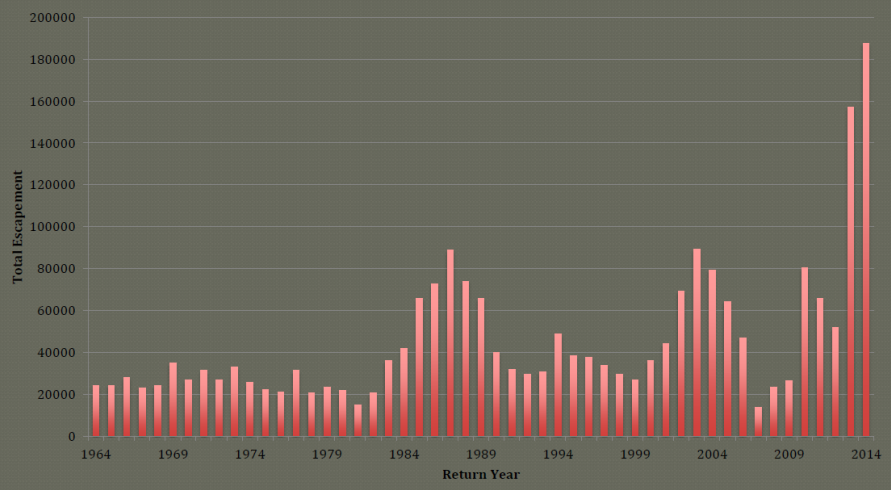
Outline

- Background
- Methods
- Results
- Context
- Discussion

Background

- Hanford Reach fall Chinook salmon – driver stock for several fisheries that involve the PSC (e.g. SEAK and NBC)
- Hanford Reach fall Chinook salmon population highly productive
  - BY 1975–2004 mean egg-to-presmolt survival = 35% (Harnish et al. 2014)
  - 2011 fertilized egg-to-fry survival ~ 70% (Oldenburg et al. 2012)
- Reduced productivity associated with escapements over 42,000
  - State's escapement goal is 28,800
  - MSY at 37,639 (Harnish et al. 2012)
- Record high escapement in 2014
  - Over 150,000 adults (+31,000 jacks)
  - Additional 91,000 adults returned to hatcheries in the Hanford Reach (with about 6k needed for brood)
  - Sport harvest of over 32,000 fish
- 2014 provided opportunity to begin to look into DD mechanisms

Hanford Reach Fall Chinook Escapement

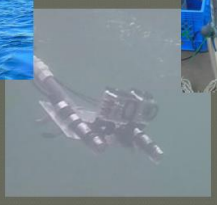


Density Dependence

- Mechanisms unknown
- Possibilities…
  - Spawning habitat
    - Evidence of 'superimposition' in the past
    - Most habitat models say there is more available than is used (changes since hydro development)
    - Superimposition could lead to later emergence/smaller size/later emigration
  - Early rearing juvenile habitat/food

Methods

- Snorkeling/underwater video
  - 4 spawning areas
  - 1 reference area
  - 3 reps of 300 m drifts at each site on each date
  - Counted redds and eggs


Study Area

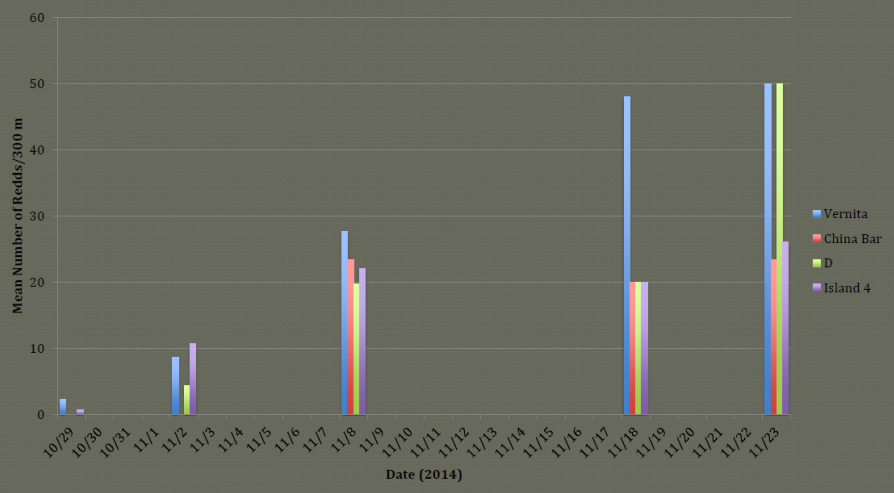
Sample Dates

Sample Date	Site(s)	Method	Obs Time	PRD Discharge
10/29/14	VB, CB, Ref, 604, Island 4	snorkeling, video	49:10	58
11/2/14	VB, CB, Ref, D, Island 4	snorkeling, video	1:21:10	50
11/8/14	VB, CB, Ref, D, Island 4	snorkeling, video	1:30:00	63
11/18/14	VB, CB, D, Island 4	video	1:00:40	65
11/23/14	VB-upper, VB-lower, VB-609, CB, D, Island 4	snorkeling, video	1:56:30	50
11/30/14	VB	aerial photos	0:00	>100
11/26/14	Channel below PRH	video	0:30:00	NA

Results

- Record high escapement → lots of redds
- Overlapping margins in many areas by 11/8/14
- Peak spawning between 11/8 and 11/18
- Some spawning still occurring on 11/23
- Despite very high redd density, only found 2 eggs

Redd density through time

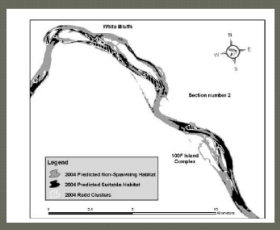


Context

- Spawning habitat models
- 2010 egg loss research

Spawning Habitat Models

- Expansion area is available
- Models predict more spawning habitat is available than is used



Hatten et al. 2009

*lower escapement years

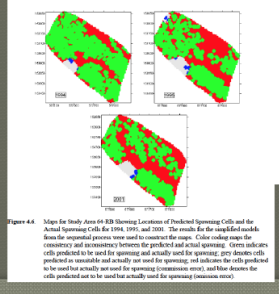


Figure 4.6 Maps for Study Area 6b EB Showing Locations of Predicted Spawning Cells and the Actual Spawning Cells for 1994, 1995, and 2000. The results for the simplified models from the sequential process were used to construct the maps. Color codeup maps the consistency and inconsistency between the predicted and actual spawning. Green indicates cells predicted to be used for spawning and actually used for spawning; grey denotes cells predicted as unsuitable and actually not used for spawning; red indicates the cells predicted to be used but actually not used for spawning (commission error); and blue denotes the cells predicted not to be used but actually used for spawning (omission error)

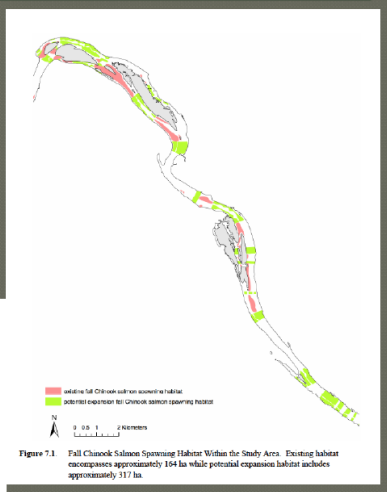


Figure 7.1 Fall Chinook Salmon Spawning Habitat Within the Study Area. Existing habitat encompasses approximately 164 ha while potential expansion habitat includes approximately 317 ha.

Geist et al. 2006

2010 Egg Drift

- Drift net egg data (2010- adult escap~80k)
  - a lot of egg drift – related to near-bed velocity
  - Most eggs were 24-48 after fertilization
  - Most fertilization took place at night

Oldenburg et al. 2012

Table 2. The number and mean duration of drift net sets, range in the total number of eggs sampled, and the mean (± 95% confidence interval) sampling rate among drift net sets by sampling date (November 7 vs. November 14), upstream redd activity (active locations vs. inactive locations), and overall.

	N Sets	Set Duration (h)	Eggs Sampled	Sampling Rate (eggs/h)
November 7	5	20.8	232–728	23.9 ± 18.6
November 14	6	27.5	27–248	3.8 ± 5.8
Active location	6	22.6	31–728	13.9 ±25.0
Inactive location	5	26.6	27–637	11.8 ± 25.3
Overall	11	24.4	27–728	12.9 ± 24.1

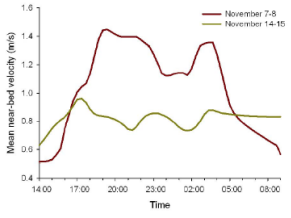


Figure 33. Mean near-bed (i.e., 20 cm above the riverbed) velocity at drift net locations among 24-h deployments for the November 7 and 14, 2010 deployments. Velocity was estimated using the MASS2 model. Only hours in which all drift nets were simultaneously deployed (within each sampling day) are shown.

Discussion - Conclusion

- If eggs were dug up, we may have not detected them
  - Oldenburg et al. (2012) captured many drifting eggs – mostly at night when flows were high
  - Many scavengers
    - Mountain whitefish, sturgeon, birds
- Conclusion
  - It was not obvious that superimposition resulted in widespread loss of buried eggs
  - Spawning habitat **may** not be a primary factor in the density dependence (big caveat)