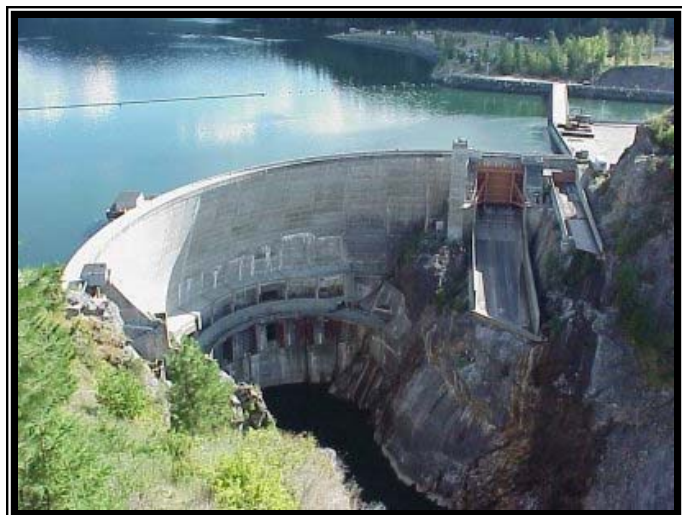


**Pend Oreille River TMDL
Watershed Advisory Group:
Agency Responses to
Preliminary Comments**



**Paul J. Pickett, P.E.
Environmental Assessment Program
Washington State Dept. of Ecology**

February 25, 2008

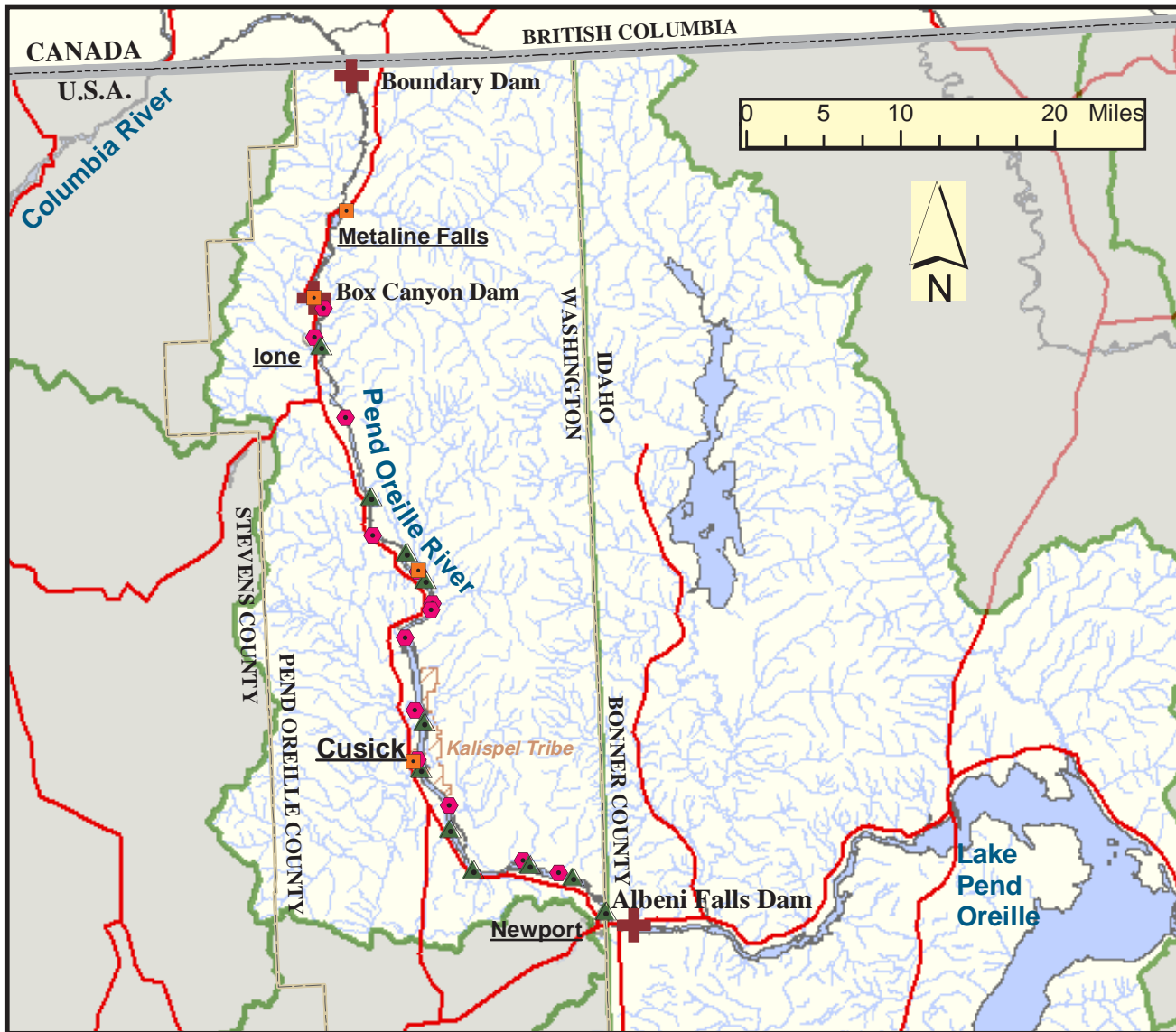


Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



➤ Introduction

- *Where we left off...*
 - A Preliminary Draft was distributed
 - WAG members provided preliminary comments
 - Agencies have reviewed comments
 - Responses have been developed to comments
- *What we will present today...*
 - Dept. of Ecology's responses to major comments
- *What you will not see today...*
 - A revised draft report
 - Responses to all comments

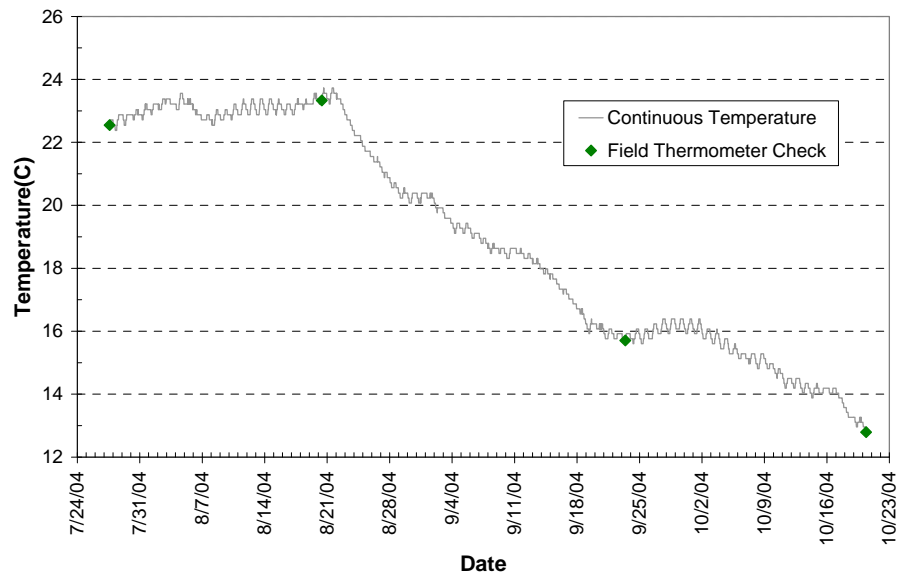


Legend

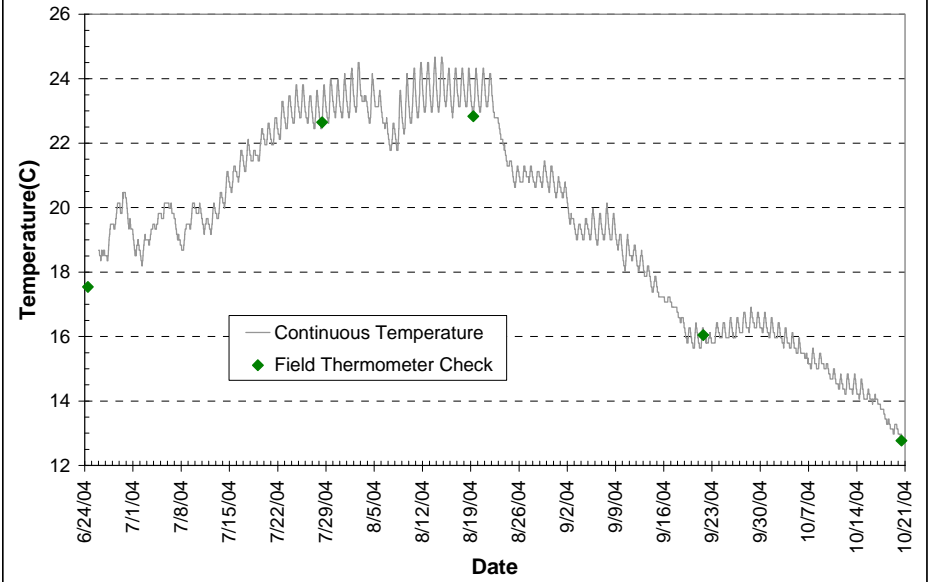
International_Boundary	Dams	<all other values>
County Boundaries	Rivers	Mainstem continuous
Cities	Streams	Spot Profiles
Tribal Lands	Replicate Continuous	
Highways		

Pend Oreille River

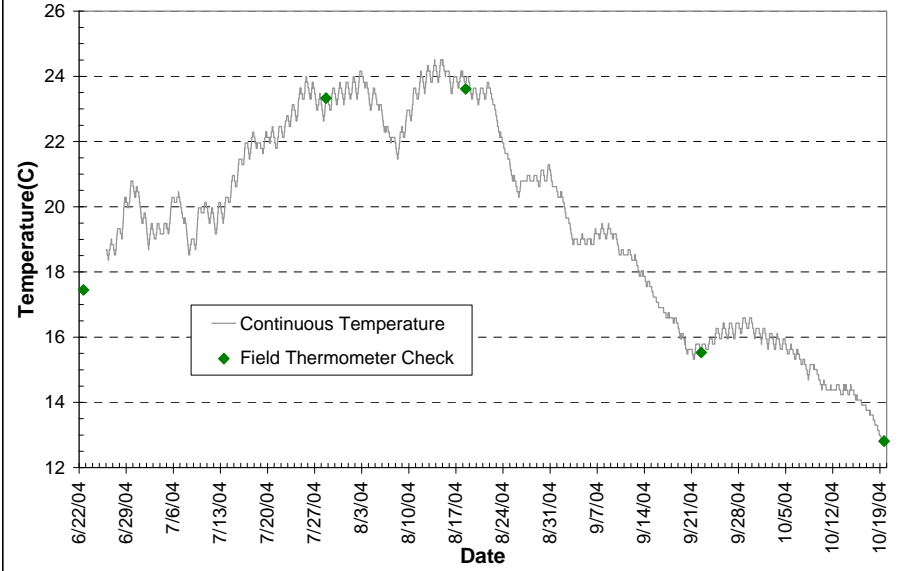
Pend Oreille River near Newport (Kelly Island)



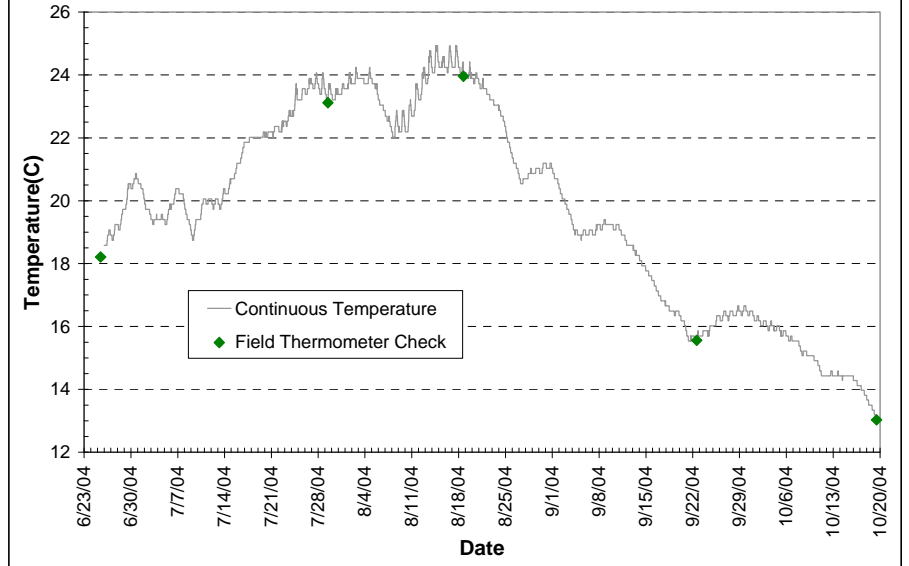
Pend Oreille River above Skookum Creek



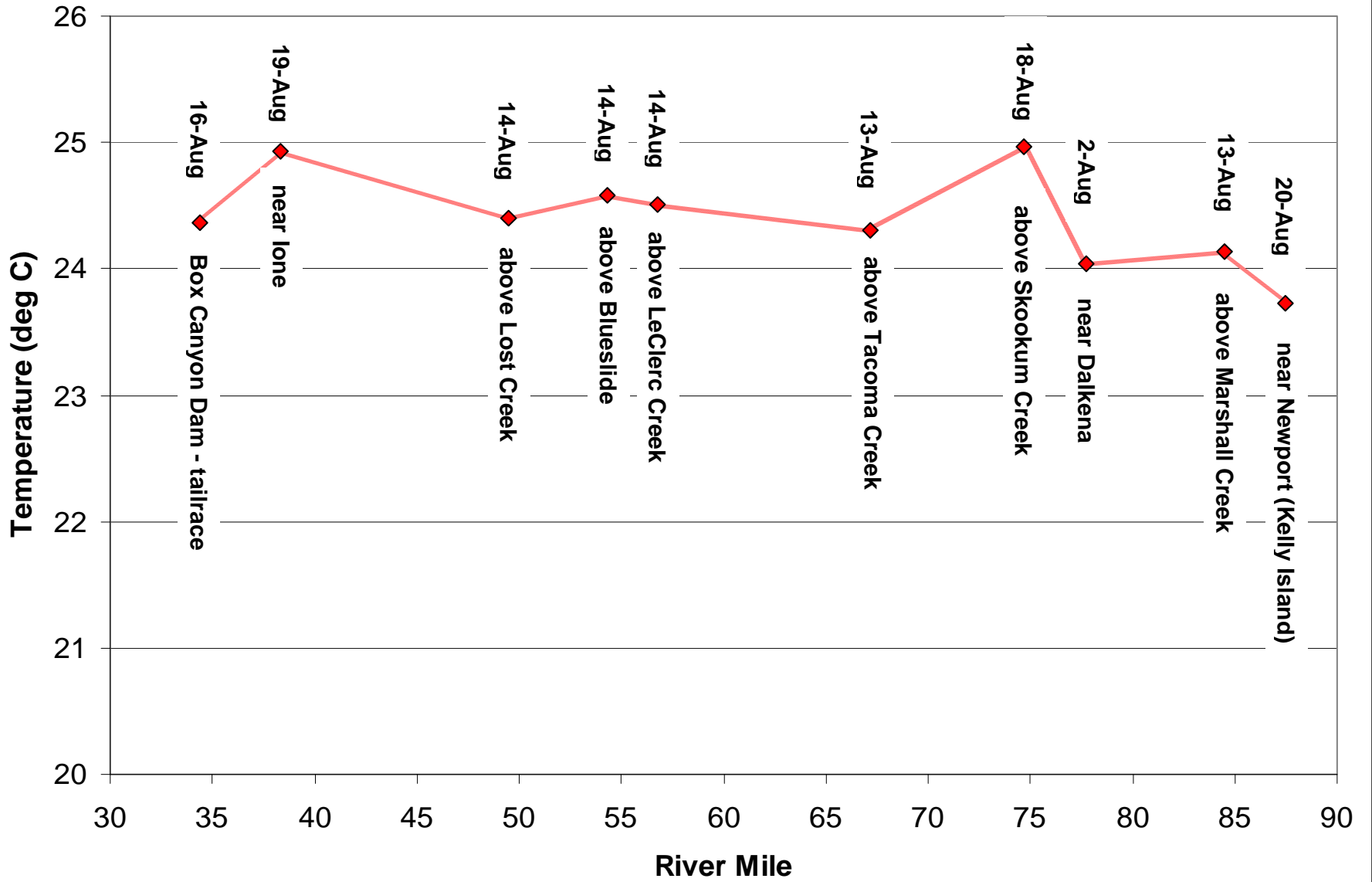
Pend Oreille River above LeClerc Creek

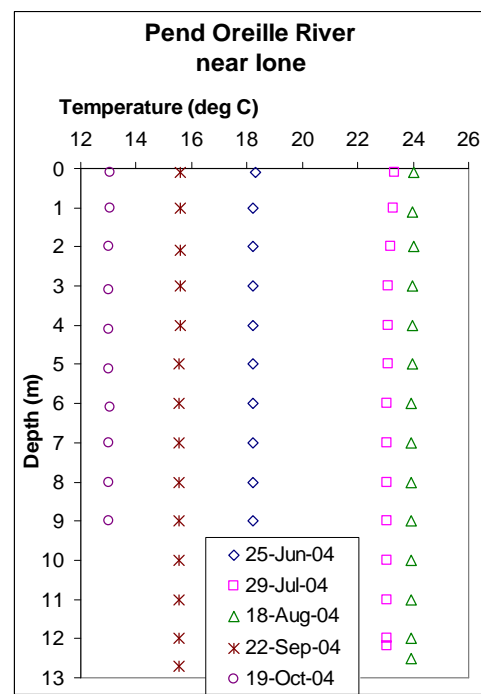
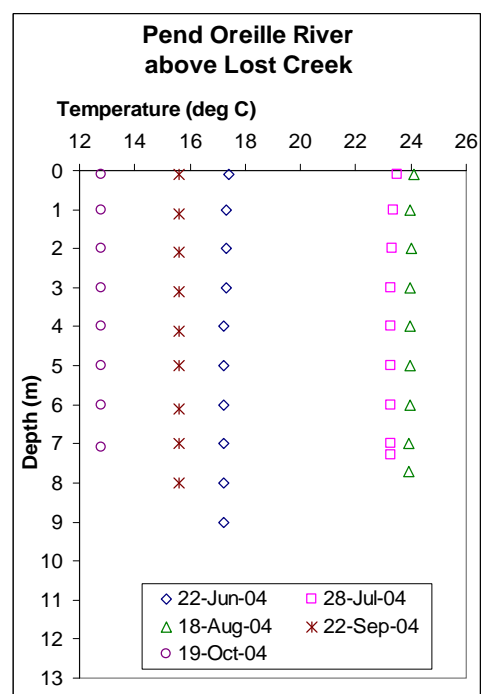
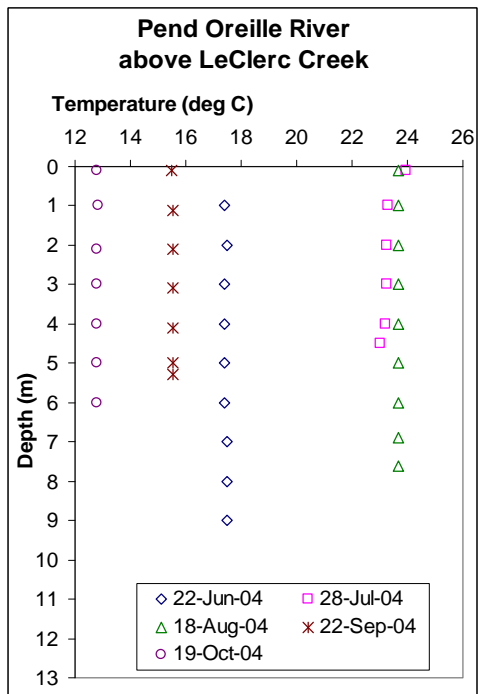
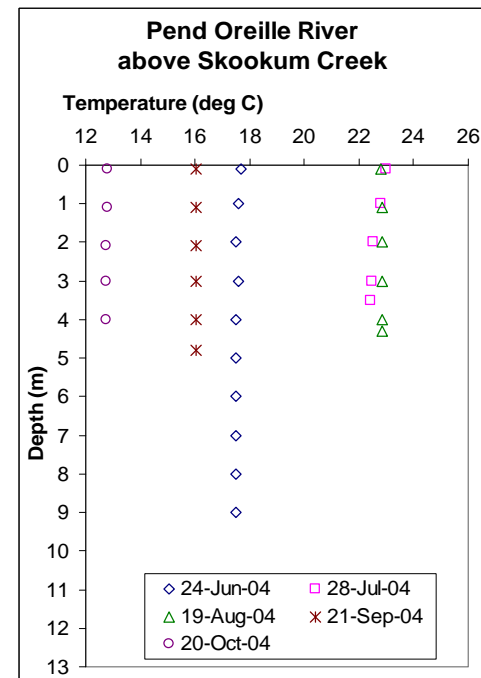
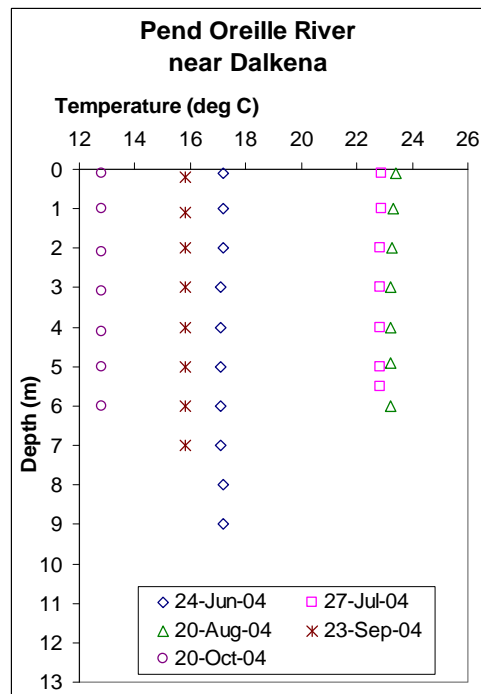
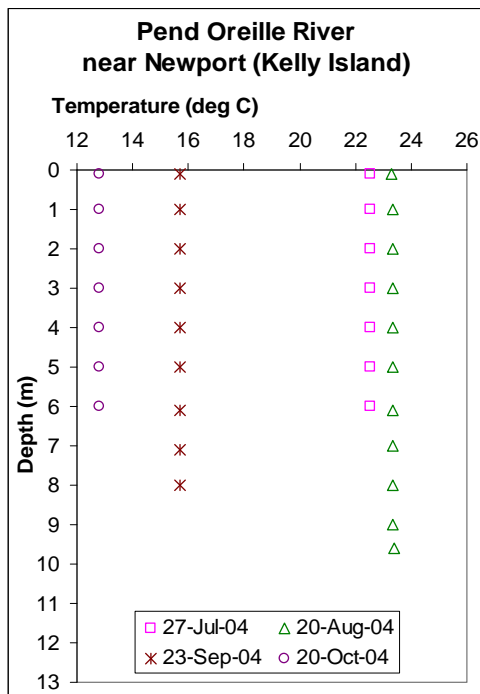


Pend Oreille River near Ione



Annual Maximum Temperature, Pend Oreille River, 2004







Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



➤ Monitoring

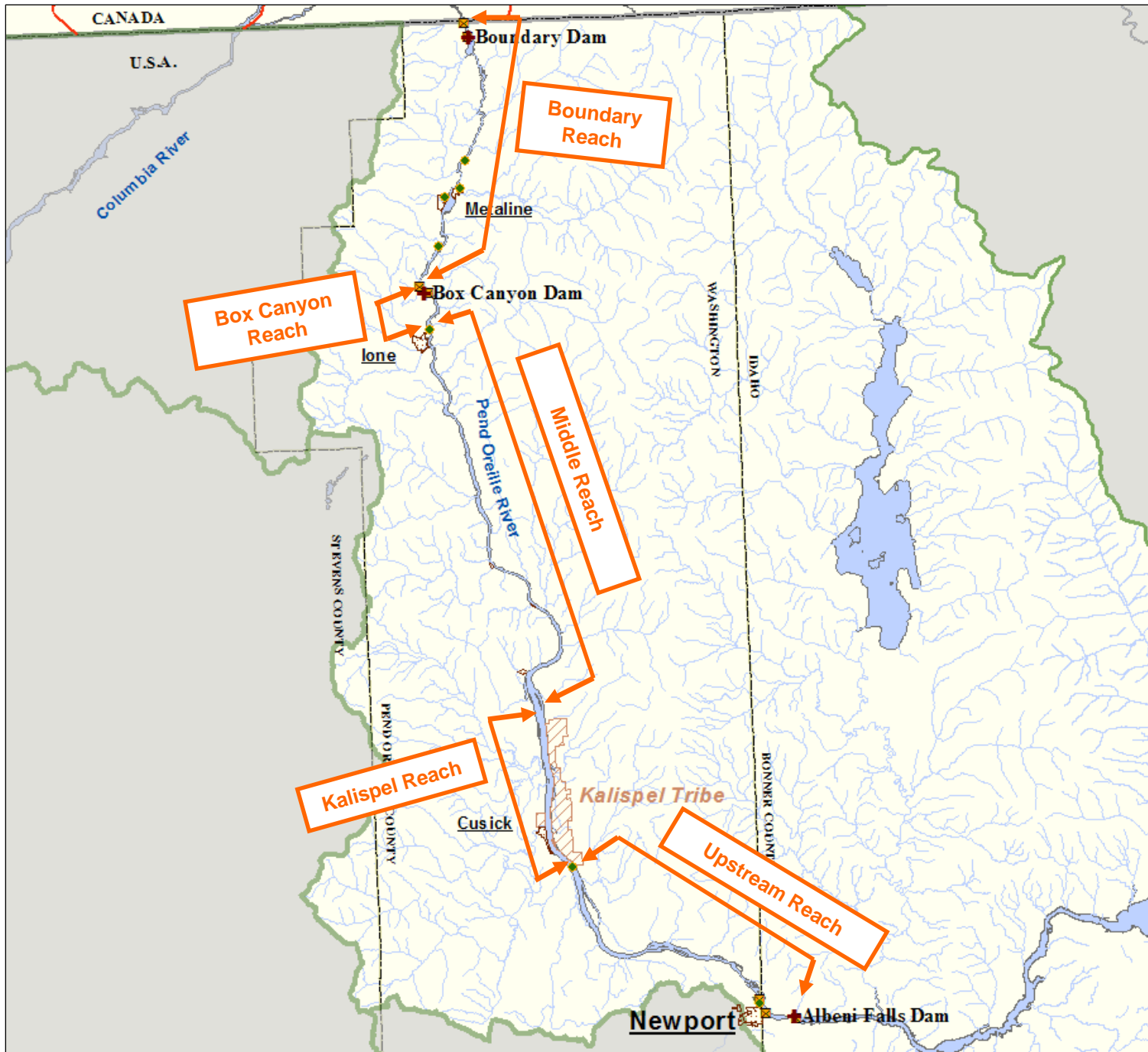
- *“Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site.”*

- WAC 173-201A-200(1)(c)(vi)

➤ TMDL Modeling and Margin of Safety

- *“Such estimates shall include ... a margin of safety which takes into account any lack of knowledge concerning the development of thermal water quality criteria for such protection and propagation in the identified waters or parts thereof.”*

- Federal Water Pollution Control Act (Clean Water Act)





Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



➤ Summary of scenarios

Summary of Box Canyon and Boundary Canyon Modeling Scenarios

No.	Name	Upstream	Downstream Dam	NPDES	Tributaries	Mainstem shade
1	Existing	Current	Impounded	present	current	current
2	Existing-NPDES	Current	Impounded	removed	current	current
2.5	Existing - Tribs PNV	Current	Impounded	present	PNV temps	current
3	Natural - Impounded	Natural	Impounded	removed	PNV temps	PNV shade
4	Existing - Unimpounded	Current	Unimpounded	present	current	current
7	Existing - mainstem PNV	Current	Impounded	present	current	PNV shade
7.5	Existing - Upstream Natural	Natural	Impounded	present	current	current
8	Natural	Natural	Unimpounded	removed	PNV temps	PNV shade

BoxCyn Natural max.xls																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2																
3																
4		Minimum	0.00	0.00	0.00	0.00	0.00	0.00	3.81	0.00	0.00	4.00	0.00			
5		10%	2.55	2.55	2.56	2.56	2.56	2.56	4.15	2.55	2.55	4.11	2.55			
6		50%	11.66	11.66	11.66	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.65			
7		90%	22.59	22.59	22.59	22.58	22.58	22.58	22.58	22.58	22.58	22.57	22.57			
8		Maximum	24.74	24.75	24.76	24.77	24.77	24.77	24.78	24.78	24.79	24.79	24.79			
9																
10	Date of maximum		8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04			
11																
12	JDAY	Date	Seg 350	Seg 351	Seg 352	Seg 353	Seg 354	Seg 355	Seg 356	Seg 357	Seg 358	Seg 359	Seg 360	Max for Date	Max Loc	
13	14	14-Jan-04	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	5.24	5.24	5.236	
14	15	15-Jan-04	3.95	3.95	3.95	3.96	3.95	3.96	4.01	3.96	3.96	4.01	3.96	4.01	4.029	
15	16	16-Jan-04	3.10	3.10	3.09	3.09	3.09	3.09	4.03	3.09	3.09	4.02	3.09	4.03	4.029	
16	17	17-Jan-04	1.70	1.70	1.70	1.70	1.70	1.69	4.04	1.69	1.69	4.02	1.69	4.04	4.029	
17	18	18-Jan-04	1.86	1.86	1.86	1.86	1.86	1.86	4.05	1.86	1.86	4.03	1.86	4.05	4.029	
18	19	19-Jan-04	1.99	1.99	1.99	1.99	1.99	1.99	4.05	1.99	1.99	4.03	1.99	4.05	4.029	
19	20	20-Jan-04	2.09	2.09	2.09	2.09	2.09	2.09	4.07	2.09	2.09	4.04	2.09	4.07	4.029	
20	21	21-Jan-04	2.10	2.10	2.10	2.10	2.10	2.10	4.08	2.10	2.10	4.04	2.10	4.08	4.029	
21	22	22-Jan-04	1.85	1.85	1.85	1.85	1.85	1.85	4.09	1.85	1.85	4.05	1.85	4.09	4.029	
22	23	23-Jan-04	1.87	1.87	1.87	1.87	1.87	1.87	4.09	1.87	1.87	4.05	1.87	4.09	4.029	
23	24	24-Jan-04	2.00	2.00	2.00	2.00	2.00	2.00	4.10	2.00	2.00	4.05	2.00	4.10	4.029	
24	25	25-Jan-04	1.74	1.74	1.74	1.73	1.73	1.73	4.13	1.73	1.73	4.06	1.73	4.13	4.029	
25	26	26-Jan-04	1.37	1.37	1.37	1.37	1.37	1.37	4.13	1.37	1.37	4.06	1.37	4.13	4.029	
26	27	27-Jan-04	1.70	1.70	1.70	1.70	1.70	1.70	4.13	1.70	1.70	4.06	1.70	4.13	4.029	
27	28	28-Jan-04	1.76	1.76	1.76	1.76	1.76	1.77	4.14	1.77	1.77	4.06	1.77	4.14	4.029	
28	29	29-Jan-04	2.08	2.08	2.08	2.08	2.08	2.08	4.15	2.07	2.07	4.07	2.07	4.15	4.029	
29	30	30-Jan-04	2.36	2.36	2.36	2.36	2.36	2.35	4.17	2.35	2.35	4.08	2.35	4.17	4.029	
30	31	31-Jan-04	2.06	2.06	2.06	2.06	2.06	2.06	4.19	2.06	2.05	4.10	2.05	4.19	4.029	
31	32	1-Feb-04	1.80	1.80	1.80	1.80	1.80	1.80	4.21	1.80	1.80	4.11	1.80	4.21	4.029	
32	33	2-Feb-04	1.85	1.85	1.84	1.84	1.84	1.84	4.23	1.84	1.84	4.11	1.83	4.23	4.029	
33	34	3-Feb-04	1.33	1.33	1.33	1.33	1.33	1.33	4.23	1.33	1.32	4.11	1.32	4.23	4.029	
34	35	4-Feb-04	1.51	1.51	1.51	1.51	1.51	1.51	4.23	1.51	1.51	4.11	1.51	4.23	4.029	
35	36	5-Feb-04	1.42	1.42	1.42	1.42	1.42	1.42	4.23	1.42	1.42	4.11	1.42	4.23	4.029	
36	37	6-Feb-04	1.11	1.11	1.11	1.12	1.12	1.12	4.24	1.11	1.12	4.11	1.12	4.24	4.029	
37	38	7-Feb-04	1.60	1.60	1.60	1.60	1.60	1.60	4.24	1.60	1.61	4.11	1.60	4.24	4.029	
38	39	8-Feb-04	1.35	1.36	1.36	1.36	1.36	1.36	4.25	1.36	1.36	4.11	1.36	4.25	4.029	
39	40	9-Feb-04	1.23	1.23	1.23	1.23	1.23	1.23	4.26	1.23	1.23	4.11	1.23	4.26	4.029	
40	41	10-Feb-04	1.40	1.40	1.40	1.40	1.40	1.40	4.26	1.40	1.40	4.11	1.40	4.26	4.029	
41	42	11-Feb-04	1.47	1.47	1.47	1.48	1.48	1.48	4.29	1.48	1.48	4.13	1.48	4.29	4.029	
42	43	12-Feb-04	1.45	1.45	1.45	1.45	1.45	1.45	4.32	1.46	1.46	4.14	1.46	4.32	4.029	
43	44	13-Feb-04	1.57	1.57	1.57	1.57	1.57	1.57	4.36	1.57	1.57	4.16	1.57	4.36	4.029	
44	45	14-Feb-04	1.77	1.77	1.77	1.77	1.77	1.77	4.36	1.77	1.77	4.16	1.77	4.36	4.029	
45	46	15-Feb-04	2.02	2.02	2.02	2.01	2.01	2.01	4.36	2.01	2.01	4.16	2.01	4.36	4.029	
46	47	16-Feb-04	2.18	2.18	2.18	2.18	2.18	2.18	4.39	2.18	2.18	4.18	2.18	4.39	4.029	
47	48	17-Feb-04	2.84	2.84	2.84	2.84	2.84	2.85	4.43	2.85	2.85	4.22	2.85	4.43	4.029	
48	49	18-Feb-04	3.21	3.21	3.21	3.21	3.21	3.21	4.45	3.20	3.20	4.23	3.20	4.45	4.029	

BoxCyn Existing USMod max.xls																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2																
3																
4		Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
5		10%	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.41	2.39			
6		50%	12.10	12.10	12.10	12.16	12.15	12.15	12.17	12.17	12.17	12.18	12.14			
7		90%	22.17	22.22	22.23	22.29	22.30	22.33	22.33	22.34	22.34	22.36	22.27			
8		Maximum	25.97	26.03	26.02	26.04	26.00	26.02	26.01	26.01	25.98	25.95	25.78			
9																
10		Date of maximum	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04	8/16/04			
11																
12																
13	JDAY	Date	Seg 348	Seg 349	Seg 350	Seg 351	Seg 352	Seg 353	Seg 354	Seg 355	Seg 356	Seg 357	Seg 358	Max for Date	Max Loc	
14	14	14-Jan-04	4.04	4.04	4.03	4.03	4.03	4.04	4.04	4.04	4.04	4.03	4.02	4.04	Seg 348	
15	15	15-Jan-04	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	Seg 348	
16	16	16-Jan-04	3.93	3.93	3.94	3.94	3.94	3.94	3.95	3.95	3.95	3.96	3.94	3.96	Seg 357	
17	17	17-Jan-04	3.78	3.79	3.80	3.80	3.81	3.82	3.83	3.83	3.83	3.85	3.83	3.85	Seg 357	
18	18	18-Jan-04	3.54	3.55	3.56	3.57	3.57	3.59	3.61	3.60	3.60	3.63	3.60	3.63	Seg 357	
19	19	19-Jan-04	3.17	3.19	3.22	3.24	3.24	3.27	3.32	3.30	3.31	3.35	3.30	3.35	Seg 357	
20	20	20-Jan-04	2.69	2.71	2.72	2.74	2.75	2.77	2.82	2.80	2.81	2.85	2.80	2.85	Seg 357	
21	21	21-Jan-04	2.16	2.21	2.25	2.28	2.29	2.33	2.38	2.36	2.36	2.41	2.35	2.41	Seg 357	
22	22	22-Jan-04	1.15	1.14	1.14	1.15	1.16	1.20	1.27	1.24	1.24	1.34	1.24	1.34	Seg 357	
23	23	23-Jan-04	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.18	Seg 348	
24	24	24-Jan-04	1.16	1.16	1.16	1.15	1.15	1.15	1.16	1.16	1.15	1.16	1.15	1.16	Seg 348	
25	25	25-Jan-04	1.15	1.15	1.14	1.14	1.14	1.14	1.13	1.13	1.13	1.13	1.12	1.15	Seg 348	
26	26	26-Jan-04	1.15	1.15	1.15	1.14	1.15	1.15	1.15	1.15	1.14	1.14	1.14	1.15	Seg 348	
27	27	27-Jan-04	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.09	1.11	Seg 354	
28	28	28-Jan-04	0.99	0.99	1.00	1.00	1.01	1.02	1.03	1.02	1.02	1.04	1.02	1.04	Seg 357	
29	29	29-Jan-04	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.19	1.20	Seg 348	
30	30	30-Jan-04	1.70	1.69	1.69	1.69	1.69	1.69	1.68	1.68	1.68	1.68	1.67	1.70	Seg 348	
31	31	31-Jan-04	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.79	1.80	Seg 348	
32	32	1-Feb-04	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.79	1.80	1.79	1.80	Seg 349	
33	33	2-Feb-04	1.70	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	Seg 353	
34	34	3-Feb-04	1.27	1.27	1.28	1.29	1.29	1.30	1.32	1.32	1.32	1.34	1.33	1.34	Seg 357	
35	35	4-Feb-04	1.09	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.10	Seg 350	
36	36	5-Feb-04	0.98	0.98	0.98	0.97	0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.98	Seg 348	
37	37	6-Feb-04	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.00	1.02	Seg 348	
38	38	7-Feb-04	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.06	1.06	1.05	1.07	Seg 348	
39	39	8-Feb-04	1.08	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.06	1.08	Seg 348	
40	40	9-Feb-04	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.07	1.08	Seg 348	
41	41	10-Feb-04	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.01	Seg 357	
42	42	11-Feb-04	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.01	1.02	Seg 348	
43	43	12-Feb-04	0.95	0.96	0.97	0.98	0.98	0.99	1.01	1.00	1.00	1.01	1.00	1.01	Seg 357	
44	44	13-Feb-04	0.86	0.87	0.88	0.89	0.90	0.90	0.91	0.91	0.91	0.91	0.90	0.91	Seg 357	
45	45	14-Feb-04	0.72	0.72	0.75	0.75	0.75	0.76	0.77	0.76	0.76	0.76	0.76	0.77	Seg 354	
46	46	15-Feb-04	0.72	0.72	0.72	0.71	0.71	0.72	0.72	0.71	0.71	0.71	0.71	0.72	Seg 348	
47	47	16-Feb-04	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	Seg 354	



Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



- Calculating exceedance of criteria
 - Paired values from same day and segment
 - Calculate Loading Capacity from Natural
 - Natural is less than 20.0 °C → LC = 20 °C
 - Natural is greater than 20.0 °C → LC = 0.3 °C + Natural
 - Impairment = where Existing exceeds LC
 - Identify worst day and largest impairment
 - Evaluate number of days and segments impaired
 - Compare scenarios to determine effect of each source → Load Allocation for source



Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



➤ Calculating heat load

- Heat load for LC and for dam LA
 - Use flow & temperature at time of worst impairment
 - Use daily average heat load
 - ✧ for day of worst impairment?
 - ✧ For all days in critical season?
 - Other approaches?



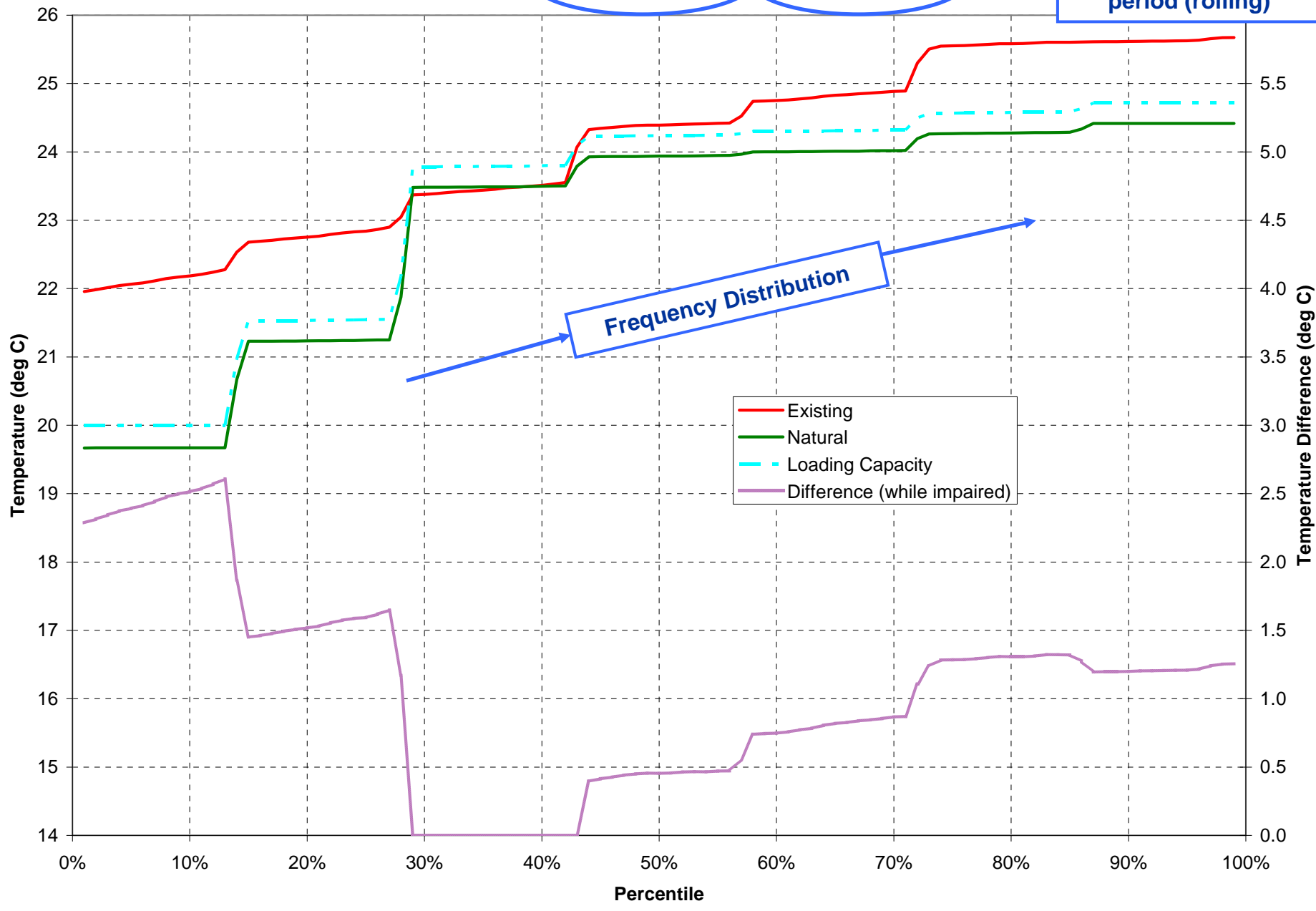
Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



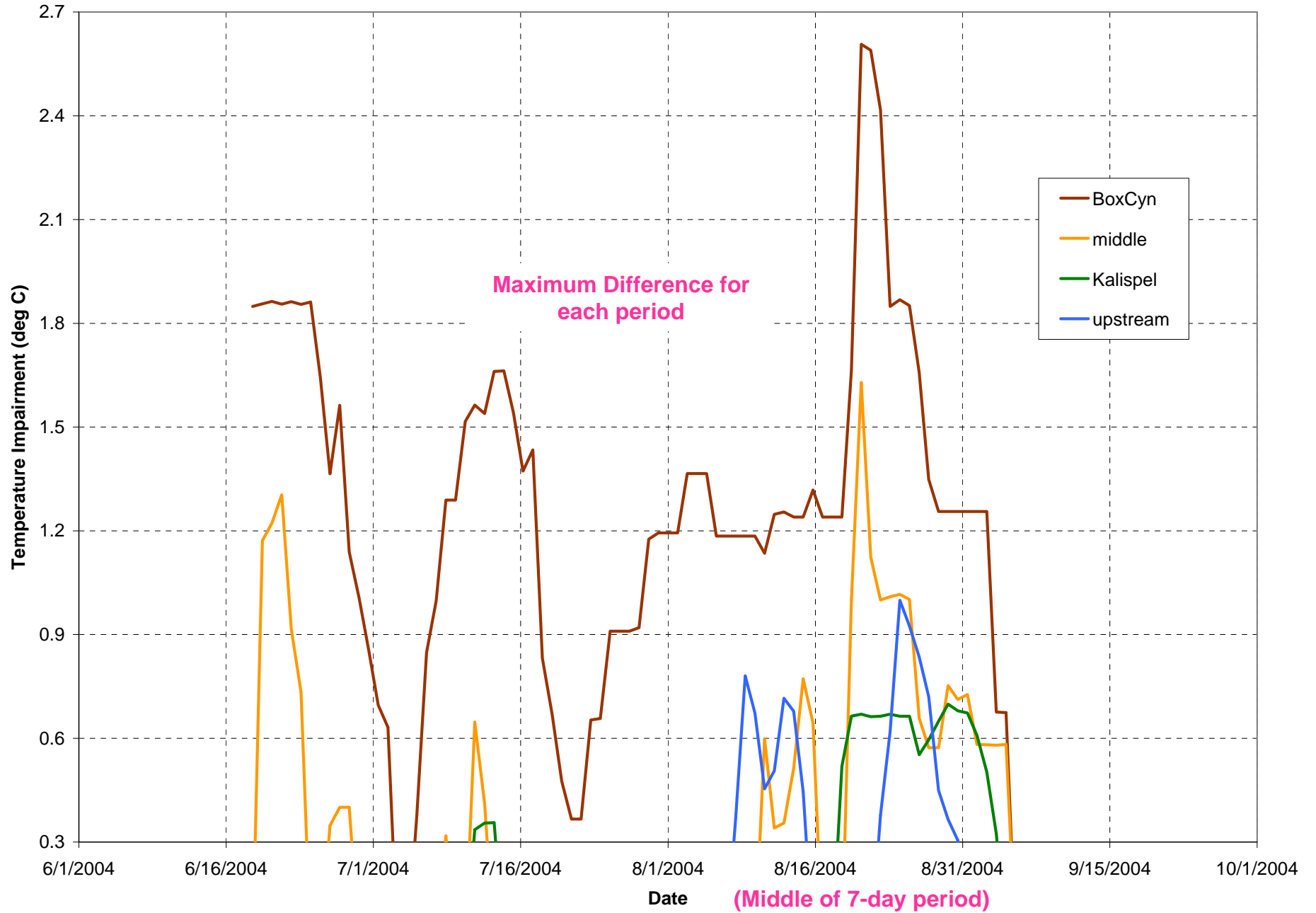
- Frequency distribution approach
 - Pooled values from 7-day period for each reach
 - “Rolling” 7-day period (drop first day add another day)
 - Cumulative Distribution of pooled values
 - 1st to 99th percentile of values
 - Compare Existing and Natural Distributions
 - Impairment = where Existing exceeds LC
 - Each percentile compared for each reach and time period

Box Canyon Dam, Box Canyon Reach 18-24 August 2004

Pooled Data for Reach over a 7-day period (rolling)



Pend Oreille River Temperature Impairments, Box Canyon Reservoir





Pend Oreille River Temperature TMDL: Responses to Preliminary Comments



Comparison of results from paired values method and from paired percent exceedance

Reach	Paired Values		Paired percentiles	
	Max Imp.	Date	Max Imp.	Dates
Upstream Box	1.63	Aug 11, 2004	0.79	Aug 13-19, 2005
Kalispel Box	0.93	Jun 30, 2004	0.43	Jul 13-19, 2005
Middle Box	2.03	Aug 24, 2004	1.33	Aug 18-24, 2004
Box Canyon	2.28	Aug 24, 2004	2.31	Aug 18-24, 2004
Boundary	2.79	Aug 25, 2004	3.05	Aug 19-25, 2004

Critical Period = June 16 - Sept 8

