Kootenai Basin Operations for 2014

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US Army Corps of Engineers

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Kootenai River Forecasts and Flood Risk Requirements

- April – August Volume 6673 KAF (113% of Average)
- Full December FRM relaxation
- 1.3 MAF Jump in forecast from March to April

Month of Forecast	First-of-Month Apr-Aug Volume Forecast (KAF)*	Model Standard Error (KAF)	Number of Standard Errors Different Than Observed	End-of-Month Flood Risk Management Target (ft)
Dec	5446	947	1.3	2426.6
Jan	5432	841	1.3	2426.7
Feb	5213	564	1.5	2436.4
Mar	5505	527	1.2	2440.9
Apr	6868	532	-0.2	2377.5
May	6996	487	-0.3	
June	7074	418	-0.4	
Observed	6673			

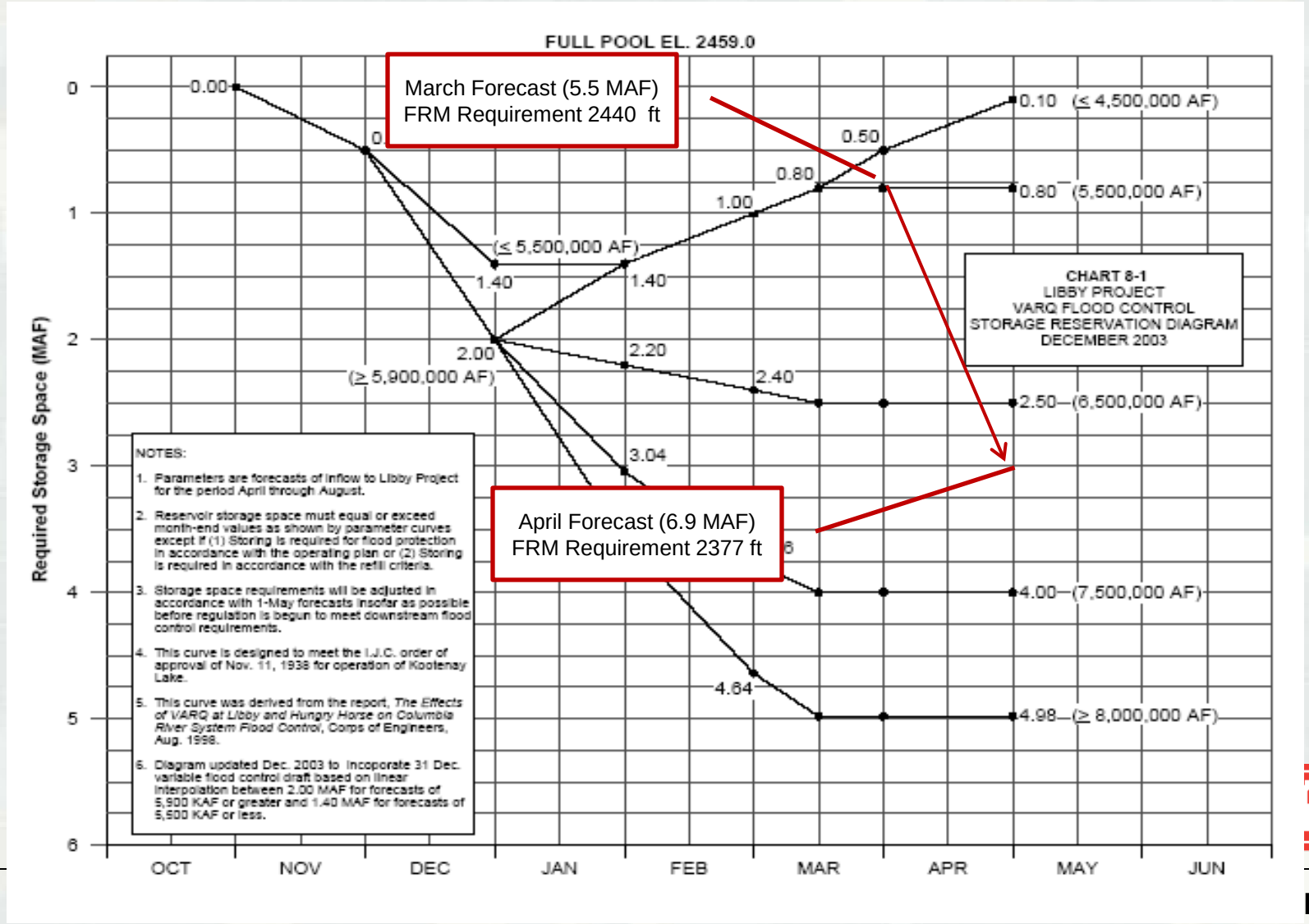
Data Station (click on hyperlink)	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Data Units	Station Number	Station ID	
Precipitation Data (mm & inches)												
Eureka RS, MT	0.37	1.16	0.77	1.06	0.73				inch	242827	EURM	20
or alt website for Eureka RS	39%	96%	61%	111%	121%							
Libby 1 NE RS, MT	0.59	2.22	1.20	1.08	1.96				inch	245015	LIBM	0
or alt website for Libby 1NE RS	42%	96%	51%	59%	167%							
West Glacier, MT	0.55	4.31	2.66	3.37	2.05	6.49	2.17	2.01	inch	248809	WGLM	14
or alt website for West Glacier	25%	137%	74%	96%	105%	312%	89%	76%				
Fernie, BC	27.5	128.5	210.0	91.50	64.0	161.8	27.5	126.0	mm	1152850	FNEB	22
	26%	82%	137%	62%	78%	263%	23%	131%				

Data Station (click on hyperlink)	1-Jan 2014	1-Feb 2014	1-Mar 2014	1-Apr 2014	1-May 2014	1-Jun 2014	Data Units	Station Number	Station ID	Elevation (feet)
Snow Water Equiv (First of Month values)										
Floe Lake, BC	274.0	408.0	519.0				mm	2C14P	FLOB	6857
	77%	82%	88%							
Sunshine Village, AB	236.0	329.0	409.0	593.0	644.0		mm	05BB803	SUNS	7300
	87%	84%	87%	105%	106%					
East Creek, BC	335.0	471.0	581.0	910.0	1167.0	758.0	mm	2D08P	EACH	7992
	78%	76%	80%	106%	129%	105%				
Stahl Peak, MT	15.4	20.8	26.2	40.4	44.2	36.9	inch	14A12S	STAM	6030
	95%	87%	90%	116%	121%	134%				
Gardiner Creek, AB	257.0	352.0	488.0	753.0	810.0	484.0	mm	05AA809	GARD	6450
	112%	92%	106%	128%	132%	139%				
Three Isle Lake, AB	213.0	279.0	352.0	522.0			mm	05BF824	TISL	7100
	91%	85%	90%	108%						
Lost Creek South, AB	273.0	408.0	535.0				mm	05BL811	LOST	7100
	96%	101%	109%							
Morrissey Ridge, BC	286.0	401.0	537.0				mm	2C09Q	MORB	7087
	97%	86%	93%							
Hawkins Lake, MT	8.4	13.9	19.7				inch	15A03S	HAWM	6450
	78%	85%	97%							

Streamflow (KAF)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun				
Libby Inflow Volume			190.413	138	255.47	460.5687	2092.36	Aug-06	KAF	12301920	LIBQIDR	1445
			85%	73%	103%	88%	132%	117%				

Reservoir Elevation (feet)	1-Nov	1-Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun				
Libby FOM Elev	2452.5	2437.4	2426.3	2424.9	2422.8	2418.6	2387.9	2413.8	KAF	12301920	LIBHFDR	1445

VARQ Storage Reservation Diagram



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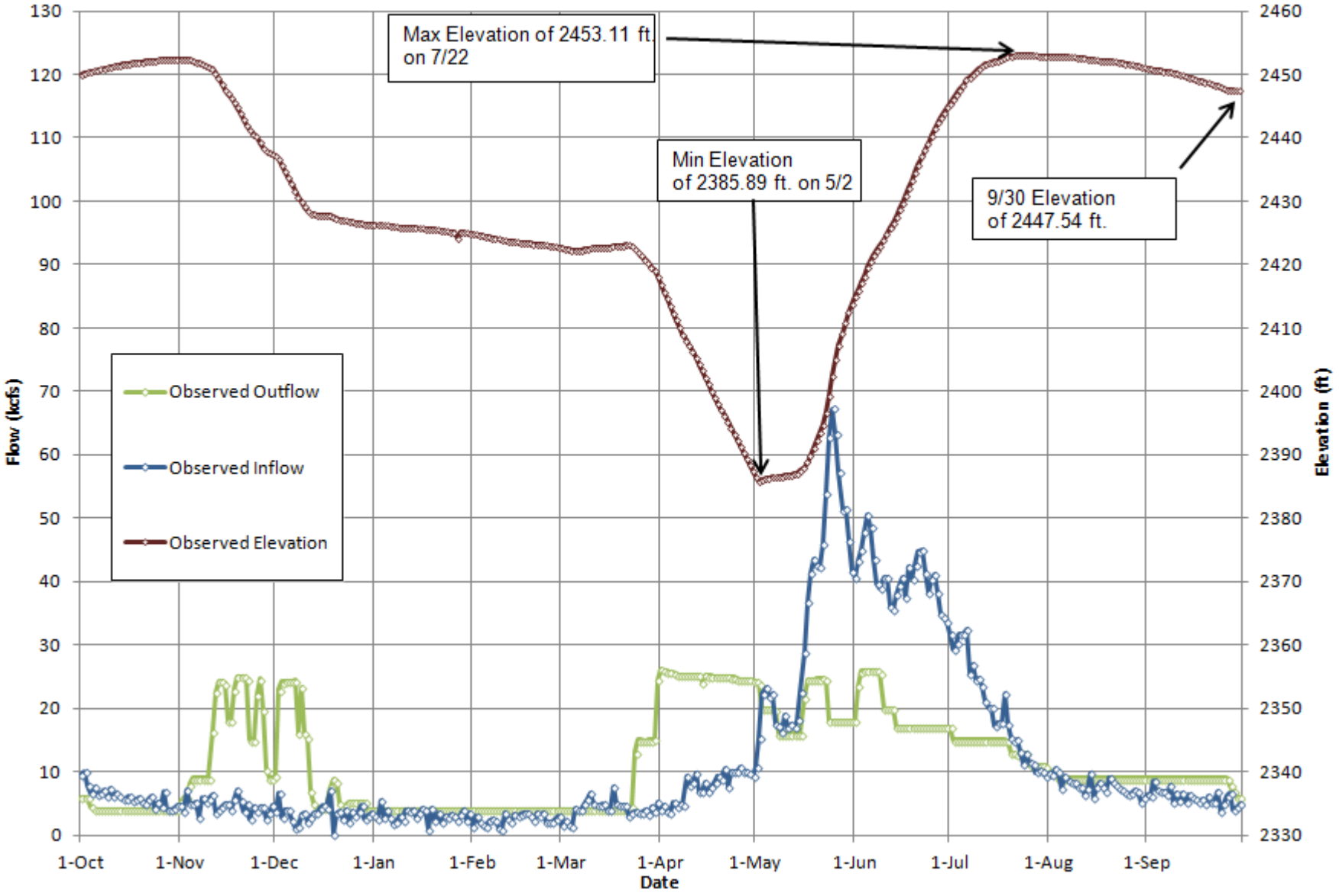
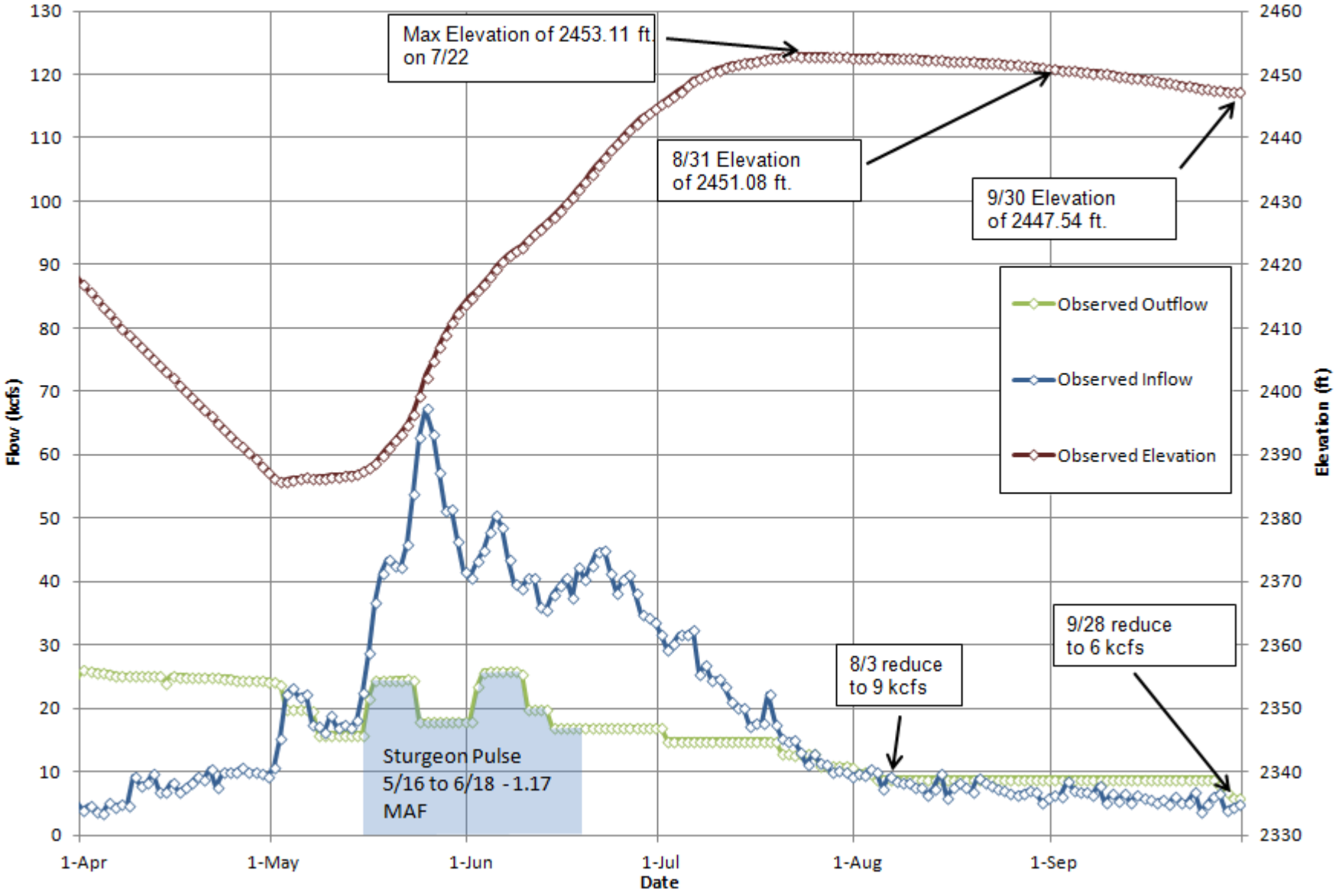
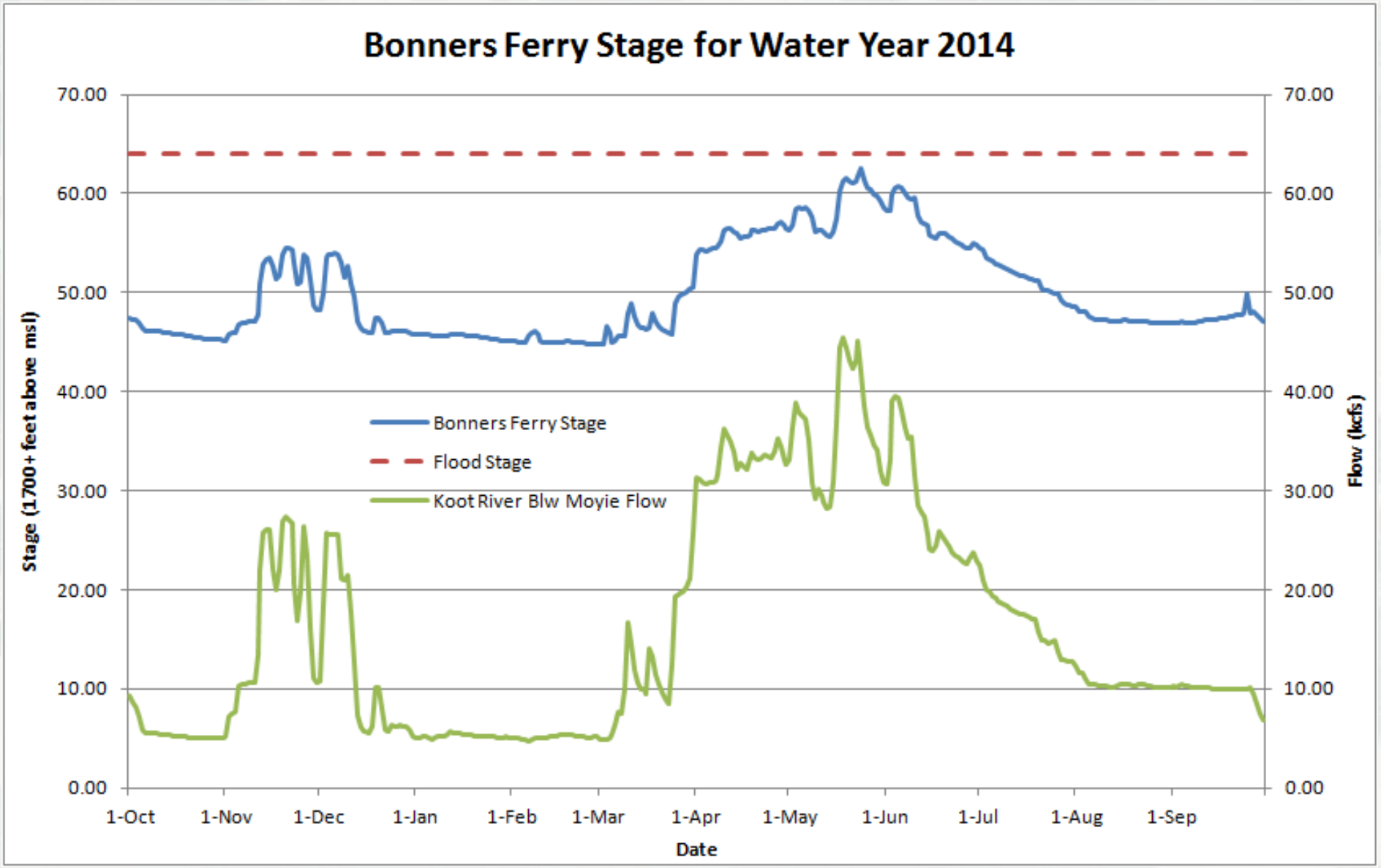
Koocanusa Reservoir Operations Water Year 2014
Observed 6.672 MAF Apr-Aug Inflow Volume



Koocanusa Reservoir Operations Apr-Aug 2014
Observed 6.672 MAF Apr-Aug Inflow Volume




Bonners Ferry Stage for Water Year 2014
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Stage (1700+ feet above msl)
Flow (kcfs)
Bonners Ferry Stage
Flood Stage
Koot River Blw Moyie Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date

Questions

Kootenai River White Sturgeon
Libby Dam Flow Augmentation
2014 Summary

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Bonneville Power Administration

Greg Hoffman

U.S. Army Corps of Engineers

Technical Management Team
Annual Review of Lessons Learned

3 December 2014

US Army Corps of Engineers
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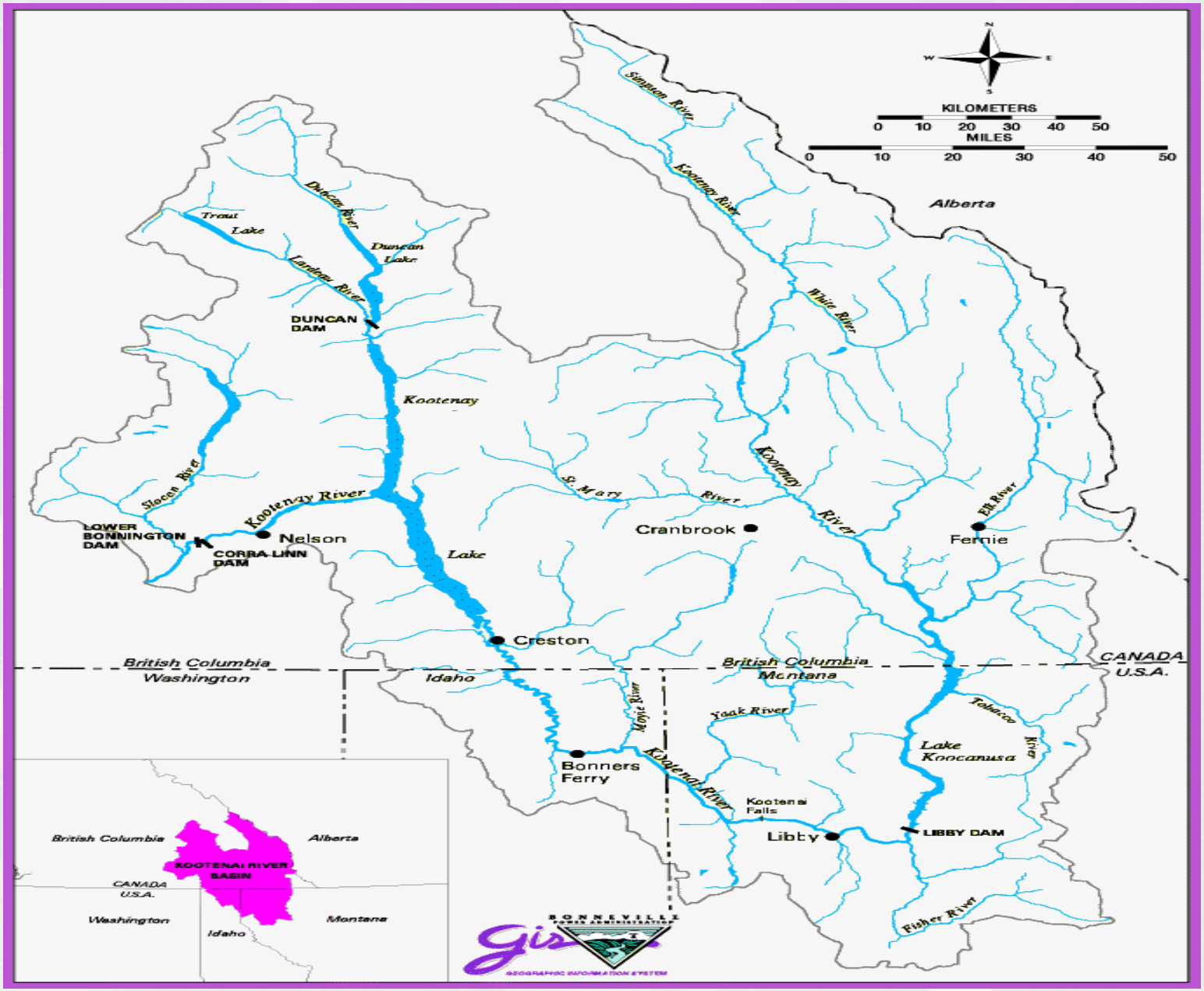

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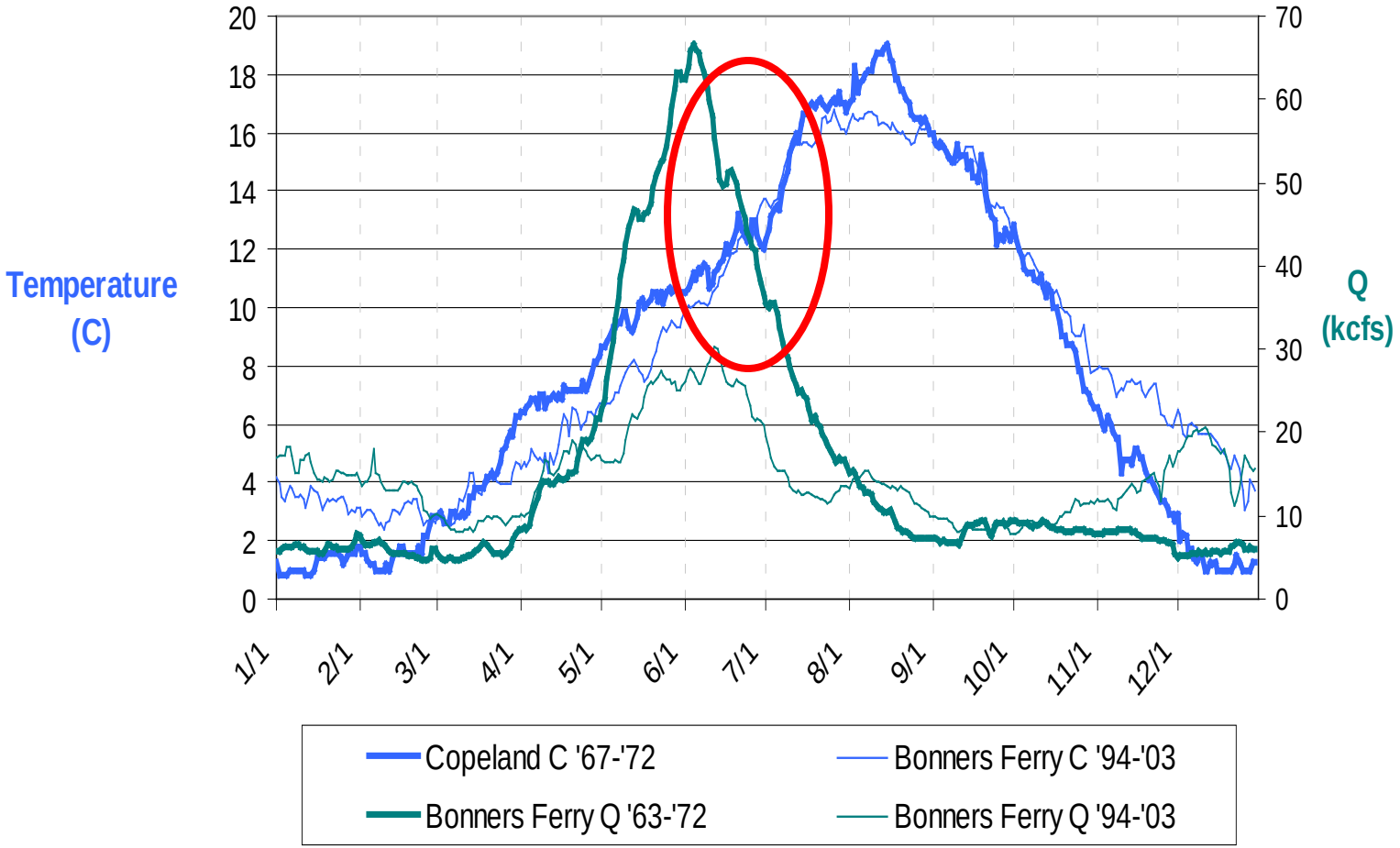
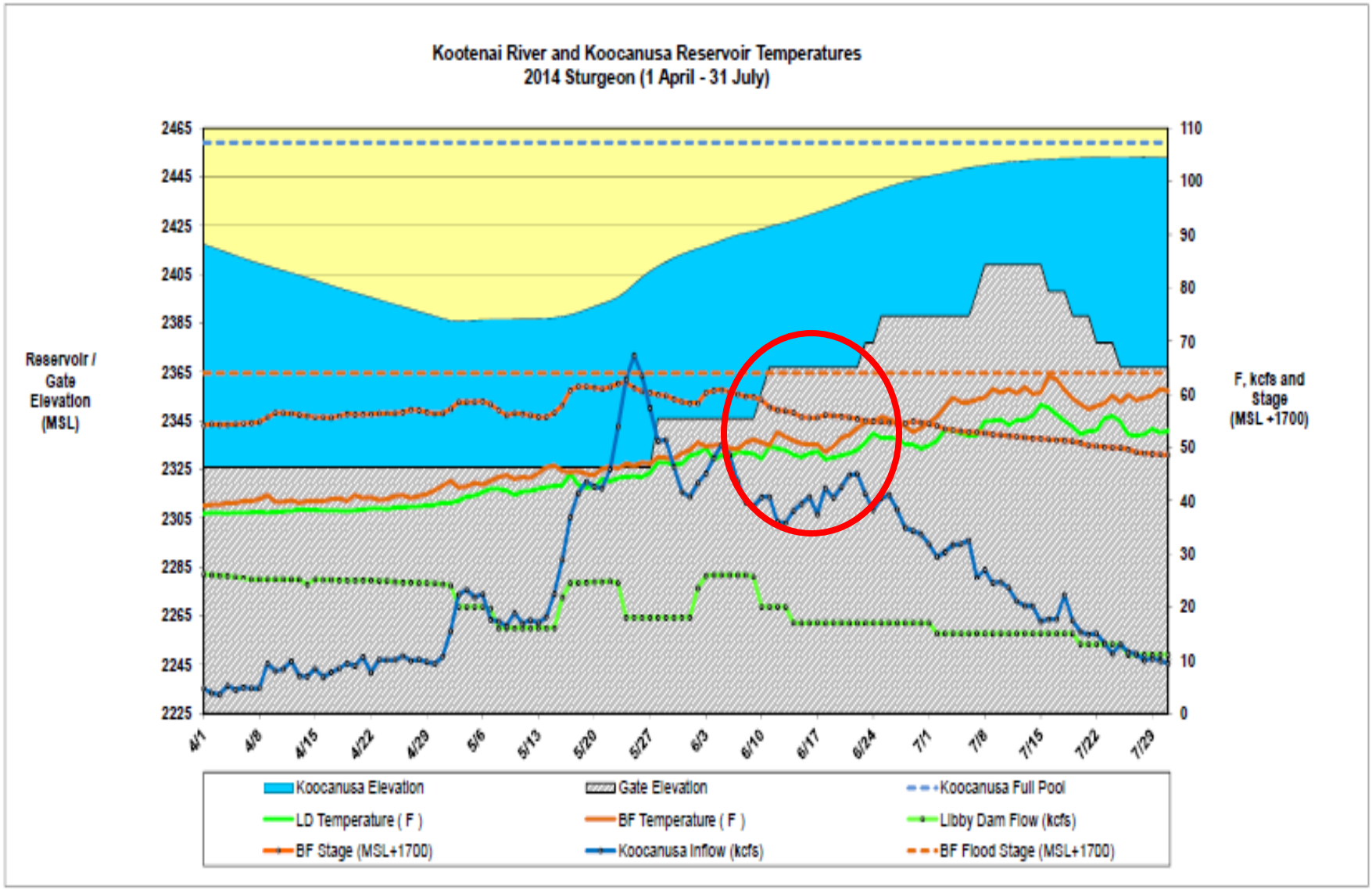
BiOp Habitat Attributes

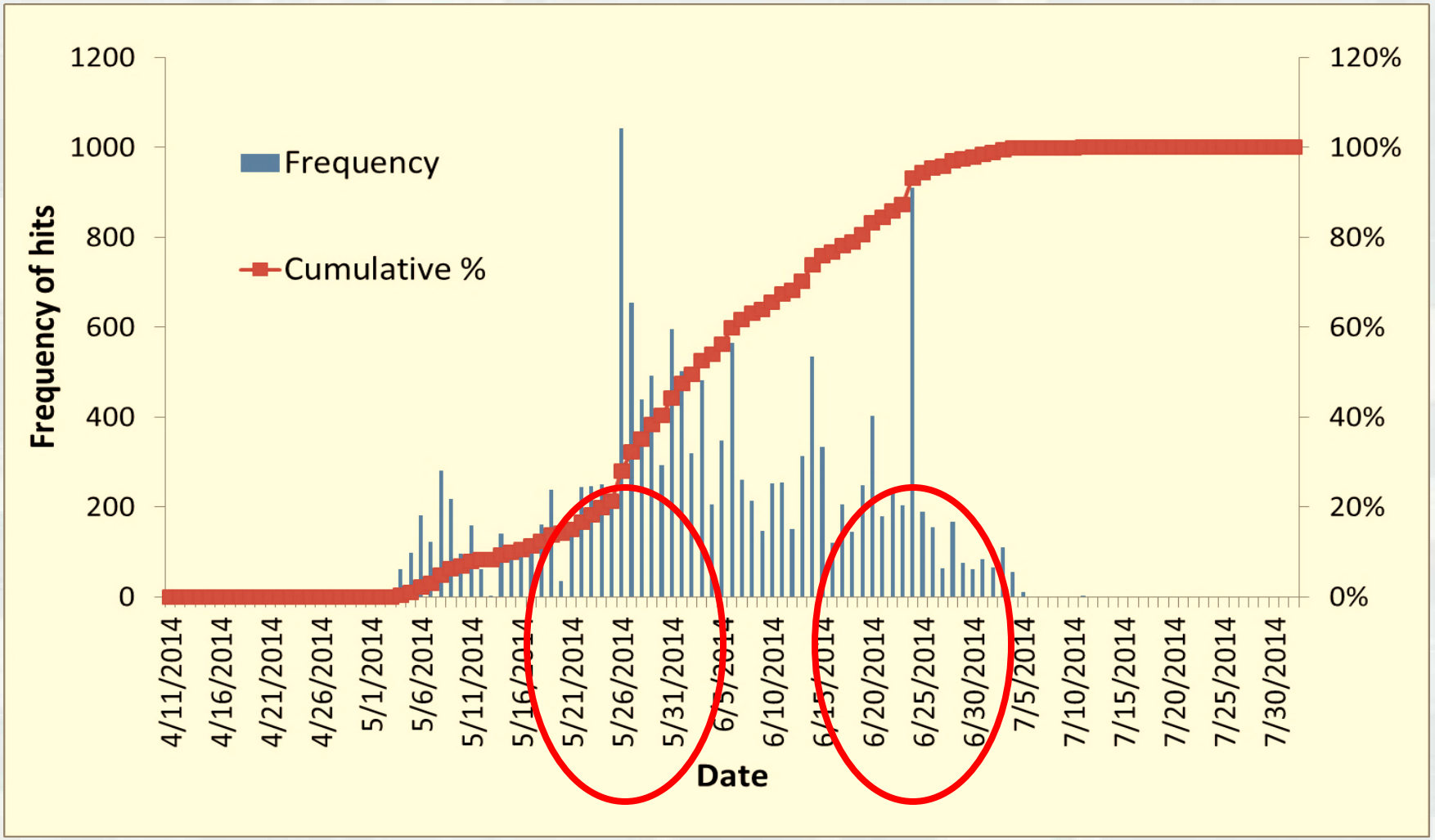
Attribute	Measure	Objective
Duration of peak augmentation flows for adult migration and spawning	Maximize peak augmentation flows with available water for as many days as possible up to 14 during peak of spawning period with pulses in all years except Tier 1.	Through in-season management, provide peak augmentation flows that lead to a biological benefit for sturgeon to maximize migration and spawning behavior via a normalized hydrograph.
Duration of post-peak augmentation flows for incubation and rearing	Maximize post-peak augmentation flows with available water for as many days as possible up to 21 days in all years except for Tier 1.	Through in-season management, provide post-peak augmentation flows that lead to a biological benefit for sturgeon to maximize embryo/free-embryo incubation and tearing via descending limb of normalized hydrograph.
Minimum flow velocity	3.3 ft/s and greater in about 60% of rocky substrate of RM 152-157 during post-peak augmentation flows.	Provide conditions for spawning and embryo/free embryo incubation and rearing.
Temperature fluctuation	Optimize temperature releases at Libby Dam to maintain 50 degrees F at Bonners Ferry with no more than a 3.6 degree F drop.	Provide conditions for normal migration and spawning behavior via a normalized hydrograph.
Depth at spawning sites.	Intermittent depths of 16.5-23 ft or greater in 60% of rocky substrate from RM 152-157 during peak augmentation flows.	Provide conditions for normal migration and spawning behavior.
Minimum frequency of occurrence	To facilitate meeting the attributes via: powerhouse plus up to 10,000 cfs flow test: a flow test will occur 2010 through 2012 (or until the Kootenai River Restoration Project is implemented) if the Service determines in 2008 and 2009 that the success criteria described in Action 1.3(b) have not been met.	

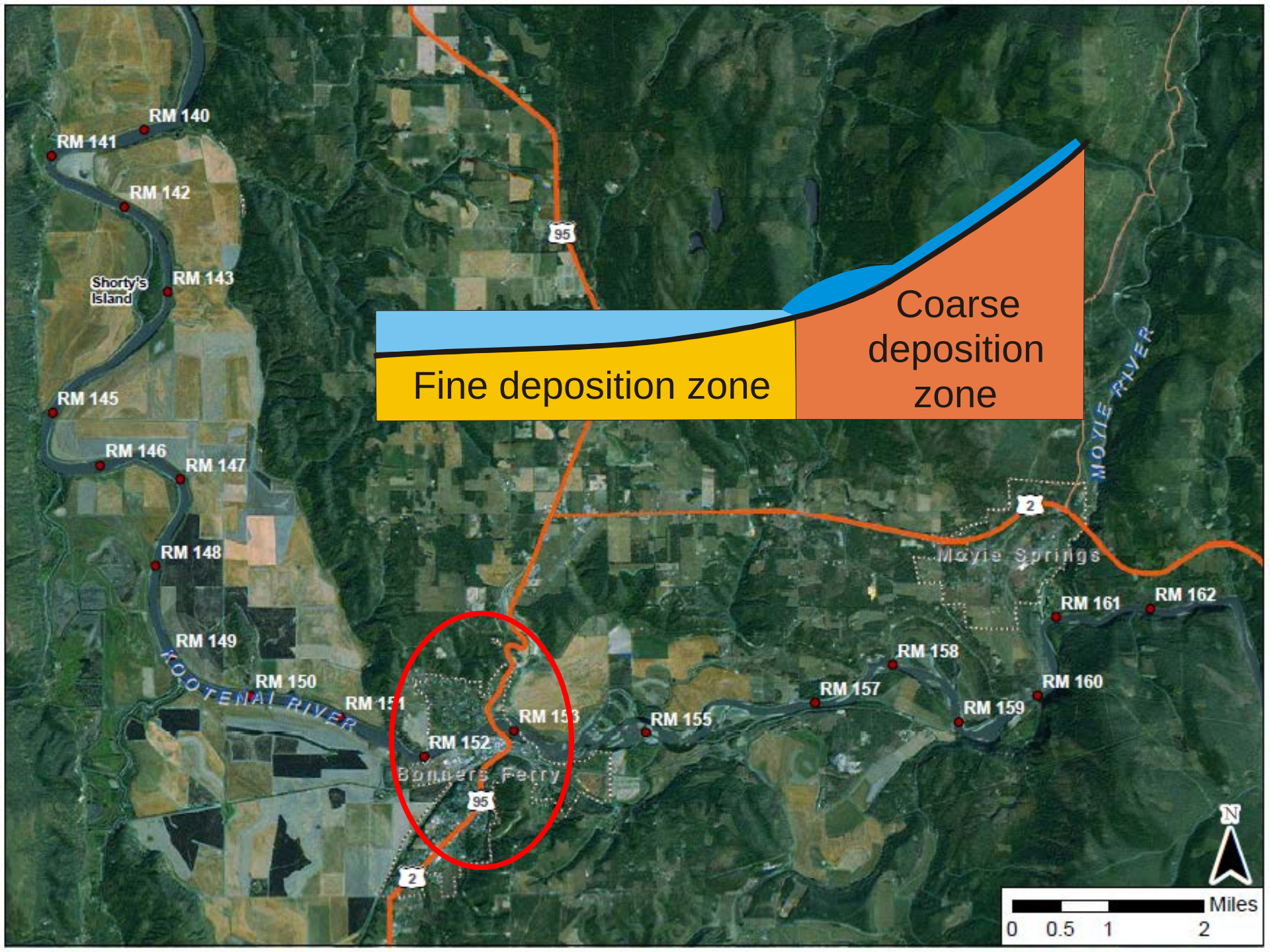
Kootenai River Temperature and Flow
Pre-Libby Dam vs Post-Libby Dam




Kootenai River and Koocanusa Reservoir Temperatures
2014 Sturgeon (1 April - 31 July)
Reservoir / Gate Elevation (MSL)
F, kcfs and Stage (MSL +1700)
2465
2445
2425
2405
2385
2365
2345
2325
2305
2285
2265
2245
2225
110
100
90
80
70
60
50
40
30
20
10
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
Koocanusa Elevation
Gate Elevation
Koocanusa Full Pool
LD Temperature (F)
BF Temperature (F)
Libby Dam Flow (kcfs)
BF Stage (MSL+1700)
Koocanusa Inflow (kcfs)
BF Flood Stage (MSL+1700)

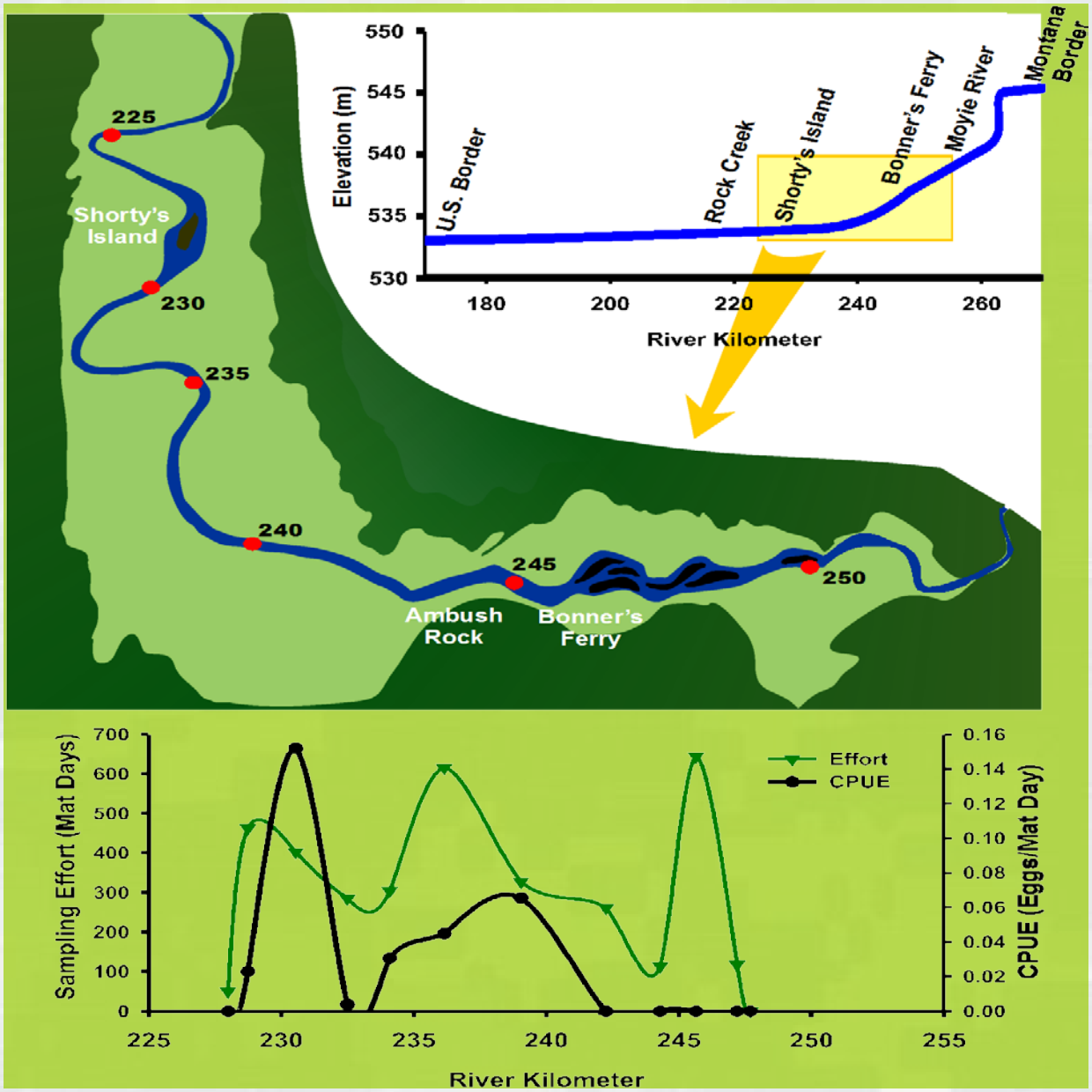
KRWS Arrival at VR2W Receivers Upstream of Bonners Ferry




RM 140
RM 141
RM 142
RM 143
Shorty's Island
RM 145
RM 146
RM 147
RM 148
RM 149
RM 150
RM 151
RM 152
RM 153
RM 155
RM 157
RM 158
RM 159
RM 160
RM 161
RM 162
KOOTENAI RIVER
MOYIE RIVER
Moyie Springs
Bonners Ferry
95
2
Fine deposition zone
Coarse deposition zone
N
Miles
0 0.5 1 2

Proportion of Adult Sturgeon Upstream Movements 2010 – 2014

Site Name	RKM	2010	2011	2012	2013	2014
Lower Shorty's	228.5	100 (37)	100 (27)	100 (32)	100 (39)	100 (44)
Mid Shorty's	230.1	NA	96	100	100	99
Strait Below Log house	232	100	100	97	100	100
Lower Refuge	235	100	100	97	95	NA
Burbot log jam	240	89	93	NA	85	84
Pete's hole (ab. Deep)	240.7	83	89	72	79	84
Below Ambush	243.5	69	63	59	54	57
Ambush (SAR dock)	244.7	64	59	59	46	57
Below RR bridge	245.6	44	33	44	36	64
Below RR bridge	245.7	44	44	44	44	55
Snag 400m above br	246	25	41	34	31	39
Top of Casino	246.6	19	15	28	31(12)	30 (7 F)
Dead man slough	248.1	0	11	6	NA	NA
Snag (mid channel)	248.5	0	11	17	18	9
Snag (mid channel)	249.5	0	4	NA	NA	0
Eagles nest	250.7	3	NA	0	1 (fall)	0
Below Cabin on west side	250.9	0	0	0	NA	0


550
545
540
535
530
Elevation (m)
U.S. Border
Rock Creek
Shorty's Island
Bonner's Ferry
Moyie River
Montana Border
180
200
220
240
260
River Kilometer
225
Shorty's Island
230
235
240
245
250
Ambush Rock
Bonner's Ferry
700
600
500
400
300
200
100
0
Sampling Effort (Mat Days)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
CPUE (Eggs/Mat Day)
Effort
CPUE
225
230
235
240
245
250
255
River Kilometer

Questions