



## Klamath River Outmigrant Monitoring Update - April 11, 2016

Synopsis: The outmigration of juvenile salmonids is monitored annually on the mainstem Klamath River by the USFWS Arcata Fish and Wildlife Office (AFWO) and the Karuk Tribe of California. The objectives of this collaborative project are to:

1. Estimate the weekly abundance of juvenile Chinook Salmon and collect pertinent biological data such as fork lengths and presence of clinical signs of disease at three selected locations on the mainstem Klamath River.
2. Collect, preserve, and deliver weekly-stratified, random samples of young-of-the-year (YOY) Chinook Salmon to the Service's California-Nevada Fish Health Center (CA-NV FHC) for conducting qPCR assays to estimate infection rates in the outmigrant population.
3. Collect relative abundance and biological data on Coho Salmon and Steelhead at the three locations on the mainstem Klamath River.

Information generated by this study are used for a variety of purposes, including stock recruitment analyses, to inform flow management decisions, to further refine a fish disease model, and to validate and calibrate the S<sup>3</sup> (Stream Salmonid Simulator) Chinook Salmon production model, among others.

Monitoring this season began on February 23, 2016 at three sites on the mainstem Klamath River between Iron Gate Dam (IGD; rkm 309.65) and the Scott River confluence (rkm 232.95). The upstream-most site (rkm 307.75), referred to as the "Bogus Trap Site", is located on the right bank downstream of the Bogus Creek confluence on Blue Heron RV Park property. The second location is the "I-5 Trap Site" (rkm 293.55), which is positioned on the left bank downstream of the Carson Creek confluence and upstream of the I-5 bridge river crossing. The site located furthest downriver is the "Kinsman Trap Site" (rkm 237.55) and is positioned on the left bank just upstream of the Kinsman Creek confluence. Trapping at the Bogus Trap Site is conducted using a single 3.1-m wide and 1.6-m tall frame net. Sampling at the I-5 Trap Site is conducted using two inline 8-ft diameter rotary screw traps (RST) and one 3.1 m by 1.6 m frame net. One 5-ft diameter RST is used to capture fish at the Kinsman Trap Site. Traps are typically operated four nights per week (Monday through Thursday) and checked once daily while in operation.

Supplemental migration timing and magnitude and fish size data are also collected by weekly depletion seining at the Klamathon (Copco-Ager) Bridge crossing ("Klamathon Seine Site", rkm 300.70). Seine catch numbers are not reported in this summary but fish sizes and disease observations are included.

This project update provides an in-season summary of the total catch (Table 1) and mean catch per day by week (Table 2) of Chinook and Coho salmon, and Steelhead at each trap site. In addition, we provided weekly estimates of the mean fork length of YOY Chinook and Coho salmon from the each of the three trap sites and the Klamathon Seine Site (Table 3). Expansions to generate weekly-stratified abundance estimates are calculated after the end of the season and are not presented here.

Included in this project summary is a weekly-stratified summary of clinical signs of disease observed in the catch for the trap and seine sites (Table 4). Note that these data are based on the visual presence of external symptoms of disease, which may not always be revealed by infected fish. The percentage of live YOY Chinook Salmon in the trap and seine catches that exhibit distended bellies, gill fungus, and pale gills are presented separately for each site on a weekly basis (Table 4). Distended bellies may be a clinical sign of infection by the myxosporean parasites, *Ceratonova shasta* and *Parvicapsula minibicornis*. Gills of juvenile salmonids  $\geq 45$  mm FL are evaluated for color (red, pale/pink, white, or tan) and condition (normal, eroded, or fungal). Pale gills may be due to anemia associated with *P. minibicornis* infection. Gill fungus is likely *Saprolegnia* growing upon a columnaris (*Flavobacterium columnare*) infection.

To more accurately determine infection rates for the outmigrant juvenile Chinook Salmon population passing the Kinsman Trap Site, weekly-stratified random samples are collected, preserved, and delivered to the CA-NV FHC to process using qPCR assays. This season's sampling will begin the week of March 27. The CA-NV FHC investigates infection rates of *C. shasta*, *P. minibicornis* and other pathogens in juvenile salmonids in the Klamath River annually in the reach between Iron Gate Dam and the estuary. The CA-NV FHC typically releases about two or three in-season updates (which are posted on the AFWO website) and a final report for each season.

We also present daily mean discharge below IGD (Figure 1) and at the Kinsman Trap Site (Figure 2) from March through July 2000–2016 to help portray pertinent flow conditions. Flow at the Bogus and I-5 trap sites is represented by USGS Gauging Station 11516530 (Klamath River below IGD, California). Discharge at USGS 11520500 (Klamath River near Seiad Valley, California) minus discharge at USGS 11519500 (Scott River near Fort Jones, California) is used as a surrogate flow for the Kinsman Trap Site.

If you have any questions regarding this summary, please contact Steve Gough at (707) 825-5197 or Bill Pinnix, (707) 825-5129.



Table 1. In-season summary of the total catch by week of adipose fin-clipped (AD Clip) and non adipose fin-clipped (No Clip) Chinook Salmon and Steelhead and left maxillary-clipped (LM Clip) and non-maxillary clipped (No Clip) Coho Salmon by trap at the Bogus, I-5, and Kinsman trap sites on the mainstem Klamath River, 2016. Note that RST = rotary screw trap, UPS = upstream, DNS = downstream, and YOY = young-of-the-year.

Preliminary Data - Subject to Revision

Trap	Survey Week	Sample Dates	Q (cfs) <sup>a</sup>		Water Temp. (F) <sup>b</sup>		Trapping Days	Chinook ( <i>O. tshawytscha</i> )			Coho ( <i>O. kisutch</i> )			Steelhead ( <i>O. mykiss</i> )			
			Min	Max	Min	Max		YOY			Age 1 +			Age 1 +			
								No Clip	AD Clip	Age 1+	YOY	No Clip	LM Clip	YOY	No Clip	AD Clip	
Bogus Frame	1	2/23-2/26	1290	1580			4	299	0	0	0	0	0	0	0	0	0
	2	3/1-3/4	1220	1790	43.1	44.6	4	1256	0	0	0	0	0	0	0	1	0
	3	3/9-3/11	2390	2710	44.7	45.1	3	390	0	0	0	0	0	0	0	0	0
	4	3/15-3/15	3720	3720	44.9	44.9	1	125	0	0	0	0	0	0	0	0	0
	5	3/22-3/25	3240	4160	46.5	47.1	4	163	0	0	0	0	0	0	0	0	0
	6	3/29-4/1	3320	3820	47.8	49.2	4	426	0	0	1	0	0	1	0	0	0
	7	4/5-4/8	1660	2420	50.7	52.8	4	1069	0	0	17	1	0	0	1	0	0
I-5 UPS RST	1	2/23-2/26	1290	1580			4	220	0	0	0	1	0	0	0	0	0
	2	3/1-3/4	1410	1790	42.4	44.9	3	128	0	0	0	0	0	0	0	1	0
	5	3/22-3/25	3240	4160	47.4	49.2	2	2	0	0	0	0	0	0	1	0	0
	6	3/29-4/1	3320	3820	48.0	50.1	4	47	0	0	3	0	0	0	0	0	0
	7	4/5-4/8	1660	2420	51.0	51.8	3	142	0	0	4	1	27	0	0	0	0
I-5 DNS RST	1	2/23-2/26	1290	1580			4	110	0	0	0	0	0	0	0	0	0
	2	3/1-3/4	1410	1790	42.4	44.9	4	100	0	0	0	0	0	0	0	0	0
	3	3/9-3/10	2390	2710	45.1	45.1	1	15	0	0	0	0	0	0	0	0	0
	4	3/15-3/15	3720	3720	44.9	44.9	1	3	0	0	0	0	0	0	0	0	0
	5	3/22-3/25	3240	4160	47.4	49.2	4	10	0	0	1	0	0	0	0	0	0
	6	3/29-4/1	3320	3820	48.0	50.1	4	28	0	0	2	0	0	0	0	0	0
	7	4/5-4/8	1660	2420	51.0	51.8	3	129	0	0	5	0	12	0	2	0	0
I-5 Frame	1	2/23-2/26	1290	1580			4	99	0	0	0	0	0	0	0	0	0
	2	3/1-3/4	1410	1790	42.4	44.9	2	62	0	0	0	0	0	0	0	0	0
	7	4/6-4/8	1660	1930	51.4	51.8	3	57	0	0	57	0	0	0	0	0	0
Kinsman RST	1	2/25-2/26	2960	3010			2	1061	0	0	0	1	0	0	10	0	0
	2	3/1-3/4	2770	3500	45.3	47.1	2	874	0	0	0	1	0	0	5	0	0
	7	4/5-4/8	3760	4410	49.6	52.1	4	2969	0	0	10	0	8	0	5	0	0

*Due to high flows the I-5 upstream screw trap was not operated or had flawed sets survey weeks 3 and 4, and the I-5 frame net and Kinsman screw trap were not operated survey weeks 3–6.*



Table 2. In-season summary of the average catch-per-day by week of non adipose fin-clipped (No Clip) and adipose fin-clipped (AD Clip) Chinook Salmon and Steelhead and non-maxillary clipped (No Clip) and left maxillary-clipped (LM Clip) Coho Salmon by trap at the Bogus, I-5, and Kinsman trap sites on the mainstem Klamath River, 2016. Note that RST = rotary screw trap, UPS = upstream, DNS = downstream, and YOY = young-of-the-year.

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Trap	Survey Week	Sample Dates	Q (cfs) <sup>a</sup>		Water Temp. (F) <sup>b</sup>		Trapping Days	Chinook ( <i>O. tshawytscha</i> )			Coho ( <i>O. kisutch</i> )			Steelhead ( <i>O. mykiss</i> )				
			Min	Max	Min	Max		YOY			Age 1 +			Age 1 +				
								No Clip	AD Clip	Age 1+	YOY	No Clip	LM Clip	YOY	No Clip	AD Clip		
Bogus Frame	1	2/23-2/26	1290	1580			4	74.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2	3/1-3/4	1220	1790	43.1	44.6	4	314.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	
	3	3/9-3/11	2390	2710	44.7	45.1	3	130.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	4	3/15-3/15	3720	3720	44.9	44.9	1	125.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	5	3/22-3/25	3240	4160	46.5	47.1	4	40.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	6	3/29-4/1	3320	3820	47.8	49.2	4	106.50	0.00	0.00	0.25	0.00	0.00	0.25	0.00	0.00	0.00	
	7	4/5-4/8	1660	2420	50.7	52.8	4	267.25	0.00	0.00	4.25	0.25	0.00	0.00	0.25	0.00	0.00	
I-5 UPS RST	1	2/23-2/26	1290	1580			4	55.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	
	2	3/1-3/4	1410	1790	42.4	44.9	3	42.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	
	5	3/22-3/25	3240	4160	47.4	49.2	2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00		
	6	3/29-4/1	3320	3820	48.0	50.1	4	11.75	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	
	7	4/5-4/8	1660	2420	51.0	51.8	3	47.33	0.00	0.00	1.33	0.33	9.00	0.00	0.00	0.00	0.00	
	I-5 DNS RST	1	2/23-2/26	1290	1580			4	27.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2	3/1-3/4	1410	1790	42.4	44.9	4	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3		3/9-3/10	2390	2710	45.1	45.1	1	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4		3/15-3/15	3720	3720	44.9	44.9	1	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5		3/22-3/25	3240	4160	47.4	49.2	4	2.50	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	
6		3/29-4/1	3320	3820	48.0	50.1	4	7.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	
7		4/5-4/8	1660	2420	51.0	51.8	3	43.00	0.00	0.00	1.67	0.00	4.00	0.00	0.67	0.00	0.00	
I-5 Frame	1	2/23-2/26	1290	1580			4	24.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2	3/1-3/4	1410	1790	42.4	44.9	2	31.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	7	4/6-4/8	1660	1930	51.4	51.8	3	19.00	0.00	0.00	19.00	0.00	0.00	0.00	0.00	0.00	0.00	
Kinsman RST	1	2/25-2/26	2960	3010			2	530.50	0.00	0.00	0.00	0.50	0.00	0.00	5.00	0.00	0.00	
	2	3/1-3/4	1410	3500	45.3	47.1	2	437.00	0.00	0.00	0.00	0.50	0.00	0.00	2.50	0.00	0.00	
	7	4/5-4/8	3760	4410	49.6	52.1	4	742.25	0.00	0.00	2.50	0.00	2.00	0.00	1.25	0.00	0.00	

*Due to high flows the I-5 upstream screw trap was not operated or had flawed sets survey weeks 3 and 4, and the I-5 frame net and Kinsman screw trap were not operated survey weeks 3–6.*



Table 3. In-season summary of fork lengths, compared with the last ten years, of naturally-produced Chinook and Coho salmon by trap type at the Bogus, Klamathon, I-5, and Kinsman sites on the mainstem Klamath River, 2016. Note that RST = rotary screw trap and YOY = young-of-the-year.

Preliminary data - Subject to revision

Site	Calendar Week	2016 sampling dates	YOY Chinook (natural) - fork length data								YOY Coho - fork length data							
			2016				Previous 10 years				2016				Previous 10 years			
			n	Mean (mm)	Min. (mm)	Max. (mm)	% > 55 mm	n	Years of data	Mean (mm)	n	Mean (mm)	Min. (mm)	Max. (mm)	% > 55 mm	n	Years of data	Mean (mm)
Bogus Frame	9	Feb. 23-24	60	37.9	34	42	0.0%	60	2	37.6	0	-	-	-	-	0	0	-
	10	Mar. 1-3	90	37.5	34	41	0.0%	300	4	37.1	0	-	-	-	-	0	0	-
	11	Mar. 9-10	60	38.3	34	43	0.0%	533	9	37.0	0	-	-	-	-	2	1	34.0
	12	Mar. 15	30	38.1	36	41	0.0%	845	10	37.2	0	-	-	-	-	29	4	34.9
	13	Mar. 22-24	88	38.5	34	47	0.0%	832	9	37.5	0	-	-	-	-	145	5	34.1
	14	Mar. 29-31	90	39.4	33	52	0.0%	870	10	37.5	0	-	-	-	-	163	9	34.4
	15	Apr. 5-7	90	41.3	34	55	0.0%	750	9	38.2	13	34.5	32	37	0.0%	241	9	34.7
Klamathon Seine	9	Feb. 25	0	-	-	-	-	30	1	40.7	0	-	-	-	-	0	0	-
	10	Mar. 5	30	40.1	36	46	0.0%	32	3	39.6	0	-	-	-	-	0	0	-
	11	Mar. 10	1	37.0	37	37	0.0%	101	4	39.9	0	-	-	-	-	0	0	-
	12	-	0	-	-	-	-	206	10	38.5	0	-	-	-	-	0	0	-
	13	Mar. 24	22	40.2	35	54	0.0%	194	8	40.1	0	-	-	-	-	0	0	-
	14	Mar. 31	8	40.6	37	45	0.0%	148	8	40.0	0	-	-	-	-	1	1	42.0
	15	Apr. 7	13	45.5	38	58	7.7%	249	9	41.0	0	-	-	-	-	1	1	33.0
I-5 RST's	9	Feb. 23-24	60	38.5	36	42	0.0%	60	1	39.8	0	-	-	-	-	0	0	-
	10	Mar. 1-3	90	38.9	33	48	0.0%	210	3	38.1	0	-	-	-	-	0	0	-
	11	Mar. 9	15	39.7	36	43	0.0%	400	9	37.3	0	-	-	-	-	0	0	-
	12	Mar. 15	3	37.0	34	39	0.0%	512	10	37.9	0	-	-	-	-	0	0	-
	13	Mar. 22-24	8	39.6	34	44	0.0%	616	9	37.8	0	-	-	-	-	12	3	35.1
	14	Mar. 29-31	50	42.1	34	56	6.0%	648	9	38.3	1	31.0	31	31	0.0%	9	3	33.9
	15	Apr. 5-7	89	48.3	35	57	5.6%	640	9	39.7	13	33.7	32	35	0.0%	35	5	34.7
I-5 Frame	9	Feb. 23-24	47	38.1	34	44	0.0%	30	1	39.5	0	-	-	-	-	0	0	-
	10	Mar. 1-2	50	38.9	36	43	0.0%	90	1	38.9	0	-	-	-	-	0	0	-
	11	-	0	-	-	-	-	191	6	37.7	0	-	-	-	-	1	1	35.0
	12	-	0	-	-	-	-	339	8	37.4	0	-	-	-	-	15	3	33.9
	13	-	0	-	-	-	-	498	8	38.0	0	-	-	-	-	86	6	34.6
	14	-	0	-	-	-	-	493	8	38.4	0	-	-	-	-	64	7	35.0
	15	Apr. 6-7	42	45.0	34	56	2.4%	380	5	39.0	29	32.8	26	35	0.0%	49	5	34.7
Kinsman RST	9	Feb. 23-24	30	37.8	35	45	0.0%	60	2	37.9	0	-	-	-	-	0	0	-
	10	Mar. 1-2	60	38.8	35	59	1.7%	194	3	38.7	0	-	-	-	-	0	0	-
	11	-	0	-	-	-	-	376	9	39.5	0	-	-	-	-	12	1	33.4
	12	-	0	-	-	-	-	568	10	41.4	0	-	-	-	-	34	3	35.0
	13	-	0	-	-	-	-	672	8	43.1	0	-	-	-	-	104	4	35.0
	14	-	0	-	-	-	-	717	9	44.4	0	-	-	-	-	66	8	35.1
	15	Apr. 5-7	90	50.5	35	70	18.9%	659	9	46.2	2	34.0	33	35	0.0%	66	7	35.3

*Due to high flows the I-5 frame net and Kinsman screw trap were not operated calendar weeks 11 through 14 and seining at Klamathon was not conducted in calendar week 12.*



Table 4. In-season summary of clinical signs of disease in young-of-the-year Chinook Salmon by site at the Bogus, Klamathon, I-5, and Kinsman sites on the mainstem Klamath River, 2016. *Note: Although only Chinook Salmon are reported in this table, we do monitor clinical signs of diseases in Coho Salmon and other species as well. We have not observed any clinical signs of disease in Coho Salmon so far this season.*

Preliminary Data - Subject to Revision

Site	Calendar Week	Sampling Dates	Weekly Mean Flow (cfs) <sup>a</sup>	Water Temp. (F) <sup>b</sup>		Belly Condition			Gills				
						Sample Size	Distended		Sample Size	Color		Condition	
							n	%		n	%	n	%
Bogus	9	Feb. 23-24	1,474	-	-	60	0	0.0%	0	-	-	-	-
	10	Mar. 1-3	1,489	43.1	44.0	90	0	0.0%	0	-	-	-	-
	11	Mar. 9-10	2,387	44.7	45.1	60	0	0.0%	0	-	-	-	-
	12	Mar. 15	5,516	44.9	44.9	30	0	0.0%	0	-	-	-	-
	13	Mar. 22-24	4,089	46.5	47.1	86	0	0.0%	1	0	- <sup>c</sup>	0	- <sup>c</sup>
	14	Mar. 29-31	3,581	47.8	48.7	90	0	0.0%	13	0	-	0	-
	15	Apr. 5-7	2,056	50.7	51.9	90	0	0.0%	30	0	0.0%	0	0.0%
Klamathon	10	Mar. 3	1,489	46.9	46.9	30	0	0.0%	0	-	-	-	-
	11	Mar. 10	2,387	44.9	44.9	1	0	- <sup>c</sup>	0	-	- <sup>c</sup>	-	- <sup>c</sup>
	12	-	5,516	-	-	-- SEINING SUSPENDED THIS WEEK DUE TO HIGH FLOWS --							
	13	Mar. 24	4,089	-	-	22	0	0.0%	1	0	- <sup>c</sup>	0	- <sup>c</sup>
	14	Mar. 31	3,581	50.3	50.3	8	0	- <sup>c</sup>	2	0	- <sup>c</sup>	0	- <sup>c</sup>
	15	Apr. 7	2,056	53.4	53.4	13	0	0.0%	6	0	- <sup>c</sup>	0	- <sup>c</sup>
I-5	9	Feb. 23-24	1,474	-	-	87	0	0.0%	0	-	-	-	-
	10	Mar. 1-3	1,489	42.4	44.9	140	0	0.0%	0	-	-	-	-
	11	Mar. 9	2,387	45.1	45.1	15	0	0.0%	0	-	-	-	-
	12	Mar. 15	5,516	44.9	44.9	3	0	- <sup>c</sup>	0	-	-	-	-
	13	Mar. 22-24	4,089	47.4	49.2	8	0	- <sup>c</sup>	0	-	-	-	-
	14	Mar. 29-31	3,581	48.0	50.1	50	0	0.0%	17	1	5.9%	0	0.0%
	15	Apr. 5-7	2,056	51.0	51.8	131	0	0.0%	86	0	0.0%	0	0.0%
Kinsman	9	Feb. 25	3,256	-	-	30		0.0%	1	0	- <sup>c</sup>	0	- <sup>c</sup>
	10	Mar. 1-2	3,147	45.3	45.3	60	0	0.0%	3	0	- <sup>c</sup>	0	- <sup>c</sup>
	11	-	6,256			-- TRAP NOT OPERATED THIS WEEK DUE TO HIGH FLOWS --							
	12	-	9,403			-- TRAP NOT OPERATED THIS WEEK DUE TO HIGH FLOWS --							
	13	-	7,464			-- TRAP NOT OPERATED THIS WEEK DUE TO HIGH FLOWS --							
	14	-	5,780			-- TRAP NOT OPERATED THIS WEEK DUE TO HIGH FLOWS --							
	15	Apr. 5-7	4,133	49.6	51.8	90	0	0.0%	79	2	2.5%	0	0.0%

<sup>a</sup> discharge below IGD used for Bogus, Klamathon, and I-5 sites; flow at Kinsman Site is Klamath River flow at Seiad minus Scott River flow

<sup>b</sup> temperature recorded at time of trap check/seine (true daily ranges from temperature loggers will become available at the end of the season)

<sup>c</sup> sample size too low for a reportable calculation

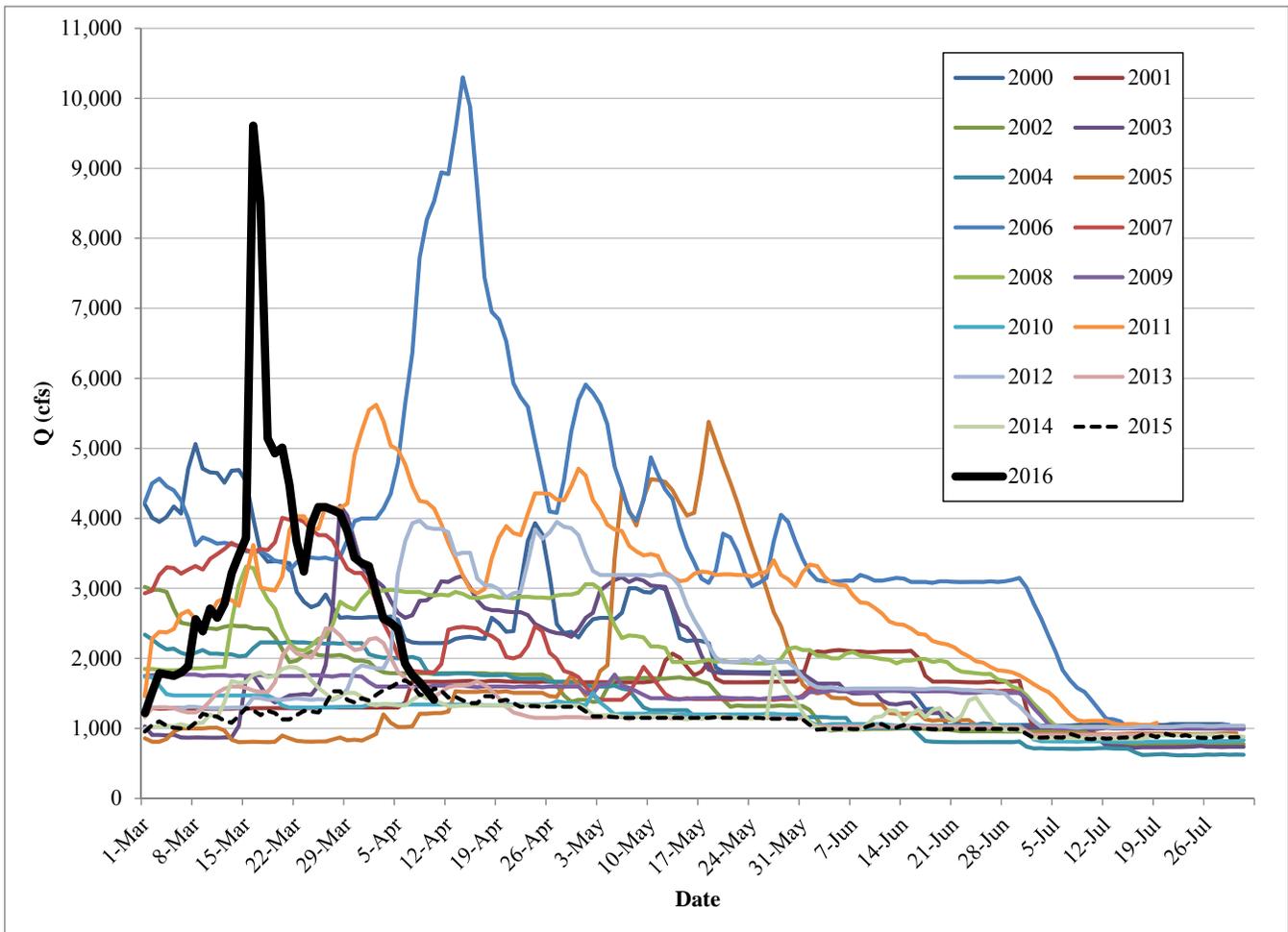


Figure 1. Daily mean discharge below Iron Gate Dam, Klamath River (USGS Gaging Station 11516530) from March through July, 2000 to 2016.

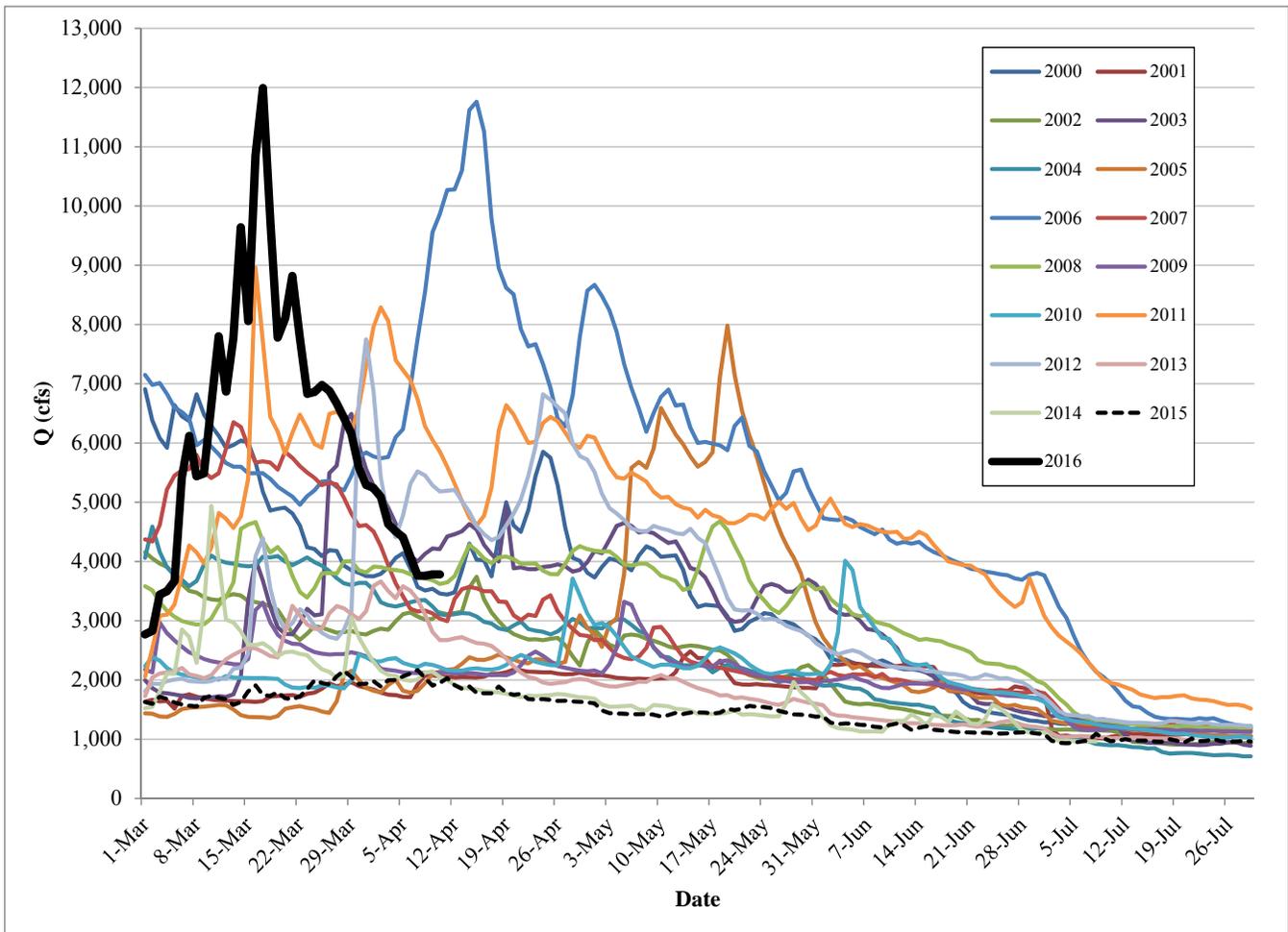


Figure 2. Klamath River daily mean discharge at the Kinsman Trap Site from March through July, 2000 to 2016. Flow measurements are not available at this location. Therefore Klamath River flow near Seiad Valley, CA (USGS Gaging Station 11520500) minus flow from the Scott River near Fort Jones, CA (USGS 11511950) is used as a surrogate.