

DIVISION OF MINING, LAND AND WATER
WATER RESOURCES SECTION
www.dnr.state.ak.us/mlw/water/index.htm



Anchorage Office 550 West 7 th Avenue, Suite 1020 Anchorage, AK 99501-3562 (907) 269-8588 Fax: (907) 269-8947		For ADNR Use Only Date/Time Stamp
For ADNR Use Only LAS #	For ADNR Use Only CID #	For ADNR Use Only Receipt Type WR

APPLICATION FOR RESERVATION OF WATER

INSTRUCTIONS	
1. Complete one application per stream segment or water body (incomplete applications will not be accepted). 2. Attach legible map(s) indicating all sections from the beginning to the end of stream segment or for all parts of the lake or water body. 3. Submit non-refundable fee of \$1,500. 4. Attach extra pages for each section, as needed.	

APPLICANT INFORMATION			
_____ Organization Name (if applicable)		_____ Agent or Consultant Name (if applicable)	
_____ Individual Applicant Name (if applicable)		_____ Individual Co-applicant Name (if applicable)	
_____ Mailing Address	_____ City	_____ State	_____ Zip Code
_____ Daytime Phone Number		_____ Alternate Phone Number (optional)	
_____ Fax Number (optional)		_____ E-Mail Address (optional)	

LOCATION OF PROPOSED RESERVATION OF WATER					
Geographic Name of Waterbody _____					
Meridian	Township	Range	Section	Quarter Sections	
				1/4	1/4
				1/4	1/4

Describe the location of the point or points defining the boundary of the proposed reservation of water by river mile index, river mile, geographical or cultural landmark, etc., on the stream or water body.

Attach a US Geological Survey map at 1:63,360 scale, or 1:250,000 scale if 1:63,360 scale is unavailable for the area, clearly identifying the following for the proposed reservation of water:

1. Sections, townships, range and meridians
2. The stream or water body in which the reservation of water is proposed
3. Specific point or points defining the boundary of the proposed reservation of water
4. Permanent, temporary or planned locations of water measurement devices (such as gaging stations, weirs, staff gages)
5. Permanent, temporary or planned bench marks

WATER USE

Identify the purpose(s) of the proposed reservation of water by checking the appropriate box(es).

- Protection of fish and wildlife habitat, migration, and propagation
- Recreation and park purposes
- Navigation and transportation purposes
- Sanitary and water quality purposes

Describe in detail the purpose(s) of the proposed reservation, including, when appropriate, species and life stage, type of recreation, vehicle, or water quality parameter, or other relevant information.

Is the water currently being used for the purpose(s) applied for?

Yes

No If no, when will use for this purpose begin? Specify approximate date _____

WATER QUANTITY

Water requested to be reserved – **Check one**

- To maintain a specific instream flow rate, measured in cubic feet per second
- To maintain a specific amount of surface water, measured in cubic feet or acre feet
- To maintain a specific surface water elevation, measured in relation to a permanent benchmark

Quantify the specific amount of water requested to be reserved. Identify and quantify, as appropriate, flow rates, quantities, surface water elevations, depths, etc., as they relate to the requested time periods of the year during which the reservation is proposed. Include any flow release schedules from projects upstream of the proposed reservation that would be necessary.

METHODOLOGY AND MONITORING

Attach and submit with this application documentation or reports showing facts to support the following:

- (a) The need for the proposed reservation of water, including reasons why the reservation is being requested.
- (b) Identify and describe the methodology, data, and data analysis used to substantiate the need for and the quantity of water requested for the proposed reservation of water, including:
 - 1. Name and description of method used
 - 2. Who conducted the study and analysis
 - 3. Schedule of when data collection and analysis occurred
 - 4. Type(s) of instrument(s) used to collect and analyze data
 - 5. Description of data and how the data were collected, including when applicable, (A) selection of stream reach, study site and transect selection, (B) flow, survey, elevation, and depth measurements, (C) pertinent physical, biological, water chemistry and socio-economic data
 - 6. Description of how data were analyzed, and
 - 7. Maps, photos, aerial photos, calculations, and any other documents supporting this application

If there are provisions for monitoring this proposed reservation of water, include the following:

- (a) Description of monitoring equipment (such as gaging stations, staff gages, weirs)
- (b) Location of monitoring equipment
- (c) Provisions for payment for monitoring
- (d) Reporting system

11 AAC 93.142 sets out the required information on the application for a reservation of water. 11 AAC 93.143 authorizes the commissioner to decide what additional information needed to process an application for a reservation of water. This information is made a part of the state public water records and becomes public information under AS 40.25.110 and 40.25.120. Public information is open to inspection by you or any member of the public. A person who is the subject of the information may challenge its accuracy or completeness under AS 44.99.310, by giving a written description of the challenged information, the changes needed to correct it, and a name and address where the person can be reached. False statements made in an application for a benefit are punishable under AS 11.56.210.

SIGNATURE

The information presented in this application is true and correct to the best of my knowledge.

Signature

Date

Name (please print)

Title (if applicable)

Fee required by regulation 11 AAC 05.010(a)(8)

- **\$1,500** for up to 40 hours of staff time

Make checks payable to "Department of Natural Resources."

LOCATION OF PROPOSED RESERVATION OF WATER

Meridian	Township	Range	Sections
Copper River	48S	63E	27, 34

Kadashan River is located near the community of Tenakee Springs in Southeast Alaska (Figure 1). This proposed reservation of water applies to stream flows within Reach C, one of five reaches within the Kadashan River watershed for which ADF&G has submitted a reservation of water application. Reach C begins just upstream of Reach B and extends upstream 1.6 miles to the Township 48S and 49S boundary (Figure 2). Stream reach boundaries were selected to ensure fish were present and to minimize the differences in flows (from accretion or reduction) within the reach. Reach boundaries were based on U.S. Geological Survey (U.S. Geological Survey, 1962) topographic maps.

WATER USE

The primary purpose of this proposed reservation is to protect fish habitat, migration and propagation within the Kadashan River and its watershed. This reach has been specified as important to anadromous fish (under AS 16.05.871) as Anadromous Water Catalog stream number 112-24-10250 by the Alaska Department of Fish and Game (Johnson and Blanche 2011). Coho salmon (*Oncorhynchus . kisutch*), chum salmon (*O. keta*), steelhead trout (*O. mykiss*), rainbow trout (*O. mykiss*), pink salmon (*O. gorbuscha*), cutthroat trout (*O. clarki*), and Dolly Varden (*Salvelinus malma*) utilize the Kadashan River for a portion of, or all of their spawning, incubation, rearing, and passage life phases (B. Glynn, Fishery Biologist, Douglas, ADF&G, 2007 personal communication; Figure 3). These species contribute to sport and commercial fisheries in the area and provide recreational opportunities and values as well. Water of sufficient quantity is needed to sustain production of these valuable fisheries.

WATER QUANTITY

Requested instantaneous flows in cubic feet per second (cfs) to be reserved:

Time Period	Requested Reservation Flows (cfs)
January	27
February	26
March	29
April	56
May	85
June	51
July	22
August	19
September	47

October	81
November	52
December	40

METHODOLOGY AND MONITORING

Procedures used to prepare this reservation complied with reservation of water application instructions and requirements established by state law (AS 46.15.145) and regulations (11 AAC 93.141-147), and relevant portions of the *"State of Alaska Instream Flow Handbook"* (DNR 1985).

Requested flows were based primarily on flow duration analyses (Annear et al. 2004) combined with available fish data. Flow duration analyses for specified time periods were used to develop flow requests with seasonal flow variability that mimicked the natural hydrograph of mean daily flows. This approach provided a basis to mimic natural seasonal flows to which fish and other aquatic fauna have adapted to and are dependent upon (Hynes 1970; Estes 1984; Estes and Orsborn 1986; Poff et al. 1997; Richter et al. 1997; Stewardson and Gippel 2003; Annear et al. 2004; Lytle and Poff 2004; Arthington et al. 2006).

Hydrologic Analyses:

Mean daily flow data for the entire period of record were obtained from United State Geological Survey (USGS) National Water Information System website (<http://waterdata.usgs.gov/nwis>) for the Kadashan River above Hook Creek Gage (No. 15106920). This gage is located at latitude 57° 39' 46", longitude 135° 11' 06" on the mainstem of the Kadashan River upstream of Hook Creek (Figure 2) and has a period of record from January 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007.

Flow Duration Analyses:

Duration estimates represent the expected frequency of occurrence of mean daily flows within the specified time periods. The durations of daily mean flows were calculated as the percentiles of the empirical distribution of observed values within the specified time periods over the period of record (Table 1). This provided an estimate of the percentage of time a given mean daily flow was equaled or exceeded within the distribution of mean daily flows for each time period analyzed.

Mean Flow Statistics:

Mean monthly flows were estimated as the mean of monthly mean daily flows for all complete months over the entire period of record (Figure 5 and Table 2). Mean annual flow was estimated as a mean of the annual mean daily flow values for all complete water years of record (Table 3). Mean daily flows are presented in Figure 4 and Table 4.

Reservation of Water:

Sufficient flows are needed to support riverine habitats used by fish and to provide fluvial processes that maintain these habitats. To maintain seasonal uses of habitats by each life history stage, we recommend maintaining a flow regime that mimics the magnitude and timing of the natural flow regime as discussed above. This approach is necessary to meet the needs of species' life history stages that have coevolved and exhibit biological adaptations to the river's flow regime.

In general, flow requests fell within the 25 to 75% exceedance range for the specified time periods. Flows within the 25 to 75% exceedance range are normal hydrologic conditions and should provide flows and habitat conditions to which fish have adapted. Deviations from these levels subject riverine species to conditions that are increasingly uncommon. Flows outside of this range are defined as dry (75 to 100% exceedance) or wet (0 to 25% exceedance) conditions according to the USGS (2009).

Although important for maintaining fish habitat and overall aquatic and riparian productivity, channel maintenance or other high flows were not specified and requested within this application. Channel maintenance flows are gradually ascending and descending and most effectively meet sediment transport thresholds for the full-range of particle sizes. Evidence suggests that bankfull flow approximates the effective discharge in stable stream channels (Andrews 1980; Leopold 1994; Annear et al. 2004). Other types of periodic high flows are recognized for their importance to habitat maintenance and support of other environmental and biological needs, such as fish migration cues. Collectively, these flows provide the function and structure of river ecosystems (Annear et al. 2004; Schmidt and Potyondy 2004).

Currently, there is no monitoring of streamflow in the Kadashan River watershed.

REFERENCES

- Alaska Administrative Code Chapter 11 Section 93.141-147.
- Alaska Department of Natural Resources (DNR). 1985. State of Alaska instream flow handbook. DNR. Anchorage, Alaska.
- Andrews, E.D. 1980. Effective and bankfull discharges of streams in the Yampa River basin, Colorado and Wyoming. *Journal of Hydrology* 46:311-330.
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- Lytle, D.A., and N.L. Poff. 2004. Adaptation to natural flow regimes. *Trends in Ecology and Evolution* 19:94-100.
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Figure 1. Area map of Kadashan River near Tenakee Springs, Southeast Alaska.

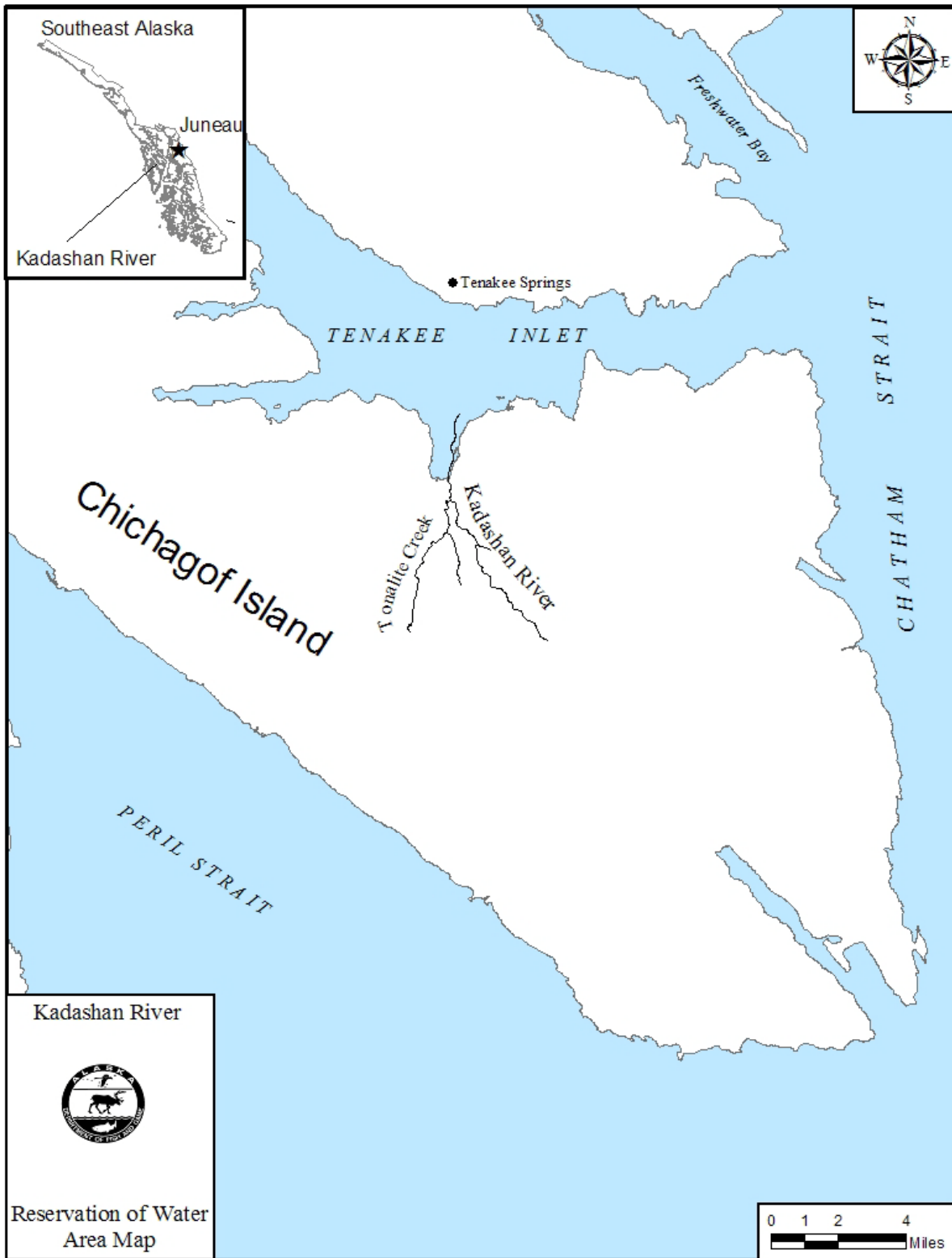


Figure 2. Reservation reach boundaries and location of USGS gages, Kadashan River near Tenakee Springs, Southeast Alaska.

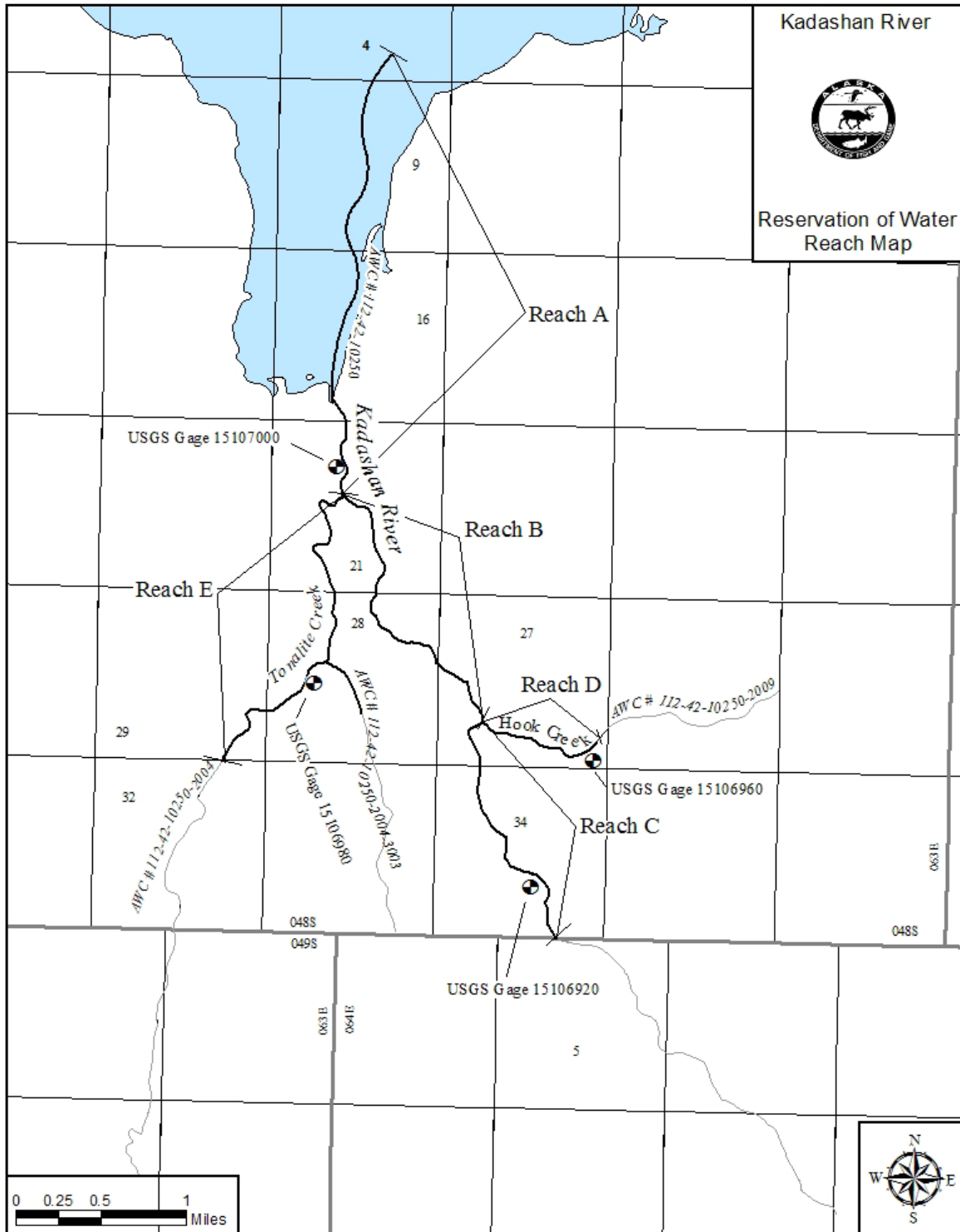


Figure 3. Fish species periodicity chart for Kadashan River near Tenakee Springs, Alaska.

Chum Salmon												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fry Passage			XX	XXXX	XXXX	XX						
Adult Passage							X	XXXX	XXXX	XX		
Spawning								XXXX	XXXX	XXX		
Incubation	XXXX	XXXX	XXXX	XXXX				XXXX	XXXX	XXXX	XXXX	XXXX
Rearing				XXXX	XX							
Coho Salmon												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage			XX	XXXX	XXXX	XX						
Adult Passage								XXXX	XXXX	XXXX	XX	
Spawning								XX	XXXX	XXXX	XXXX	XX
Incubation	XXXX	XXXX	XXXX	XXXX				XX	XXXX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Pink Salmon												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fry Passage			XX	XXXX	XXXX	XX						
Adult Passage							XXXX	XXXX	XXXX			
Spawning							XX	XXXX	XXXX	XX		
Incubation	XXXX	XXXX	XXXX	XXXX	XX		XX	XXXX	XXXX	XXXX	XXXX	XXXX
Rearing				XXXX	XX							
Dolly Varden												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage*			XXXX	XXXX	XXXX							
Adult Passage			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	
Spawning									XX	XXXX	XX	
Incubation	XXXX	XXXX	XXXX	XXXX	XX				XX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Based upon professional judgment of ADF&G biologists												
Smolt passage is for juvenile emigration to estuarine/marine environment												
Adult passage: for salmon is immigration: for trout, char, and other species, immigration and emigration.												
Incubation life phase includes time of egg deposition to fry emergence												
* DV and CT smolt defined as those fish undergoing initial emigration												

Figure 3. continued.

Steelhead Trout												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage				XX	XXXX	XXXX						
Adult Passage				XXXX	XXXX	XXXX	XX					
Spawning				XX	XXXX	XXXX						
Incubation				XX	XXXX	XXXX	XXXX	XXXX				
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Rainbow Trout												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Resident Adult Passage			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
Spawning			X	XXXX	XXXX	XXXX						
Incubation			X	XXXX	XXXX	XXXX	XXXX	XXXX				
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Cutthroat Trout												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage*			XXXX	XXXX	XXXX							
Adult Passage			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	
Spawning				XXX	XXXX	XX						
Incubation				XXX	XXXX	XXXX	XXXX	XX				
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Based upon professional judgment of ADF&G biologists												
Smolt passage is for juvenile emigration to estuarine/marine environment												
Adult passage: for salmon is immigration: for trout, char, and other species, immigration and emigration.												
Incubation life phase includes time of egg deposition to fry emergence												
* DV and CT smolt defined as those fish undergoing initial emigration												

Figure 4. Annual hydrograph of mean daily flows (cfs) for Kadashan Reservation Reach C. Based on complete water years of record for USGS Gaging Station 15106920 (October 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).

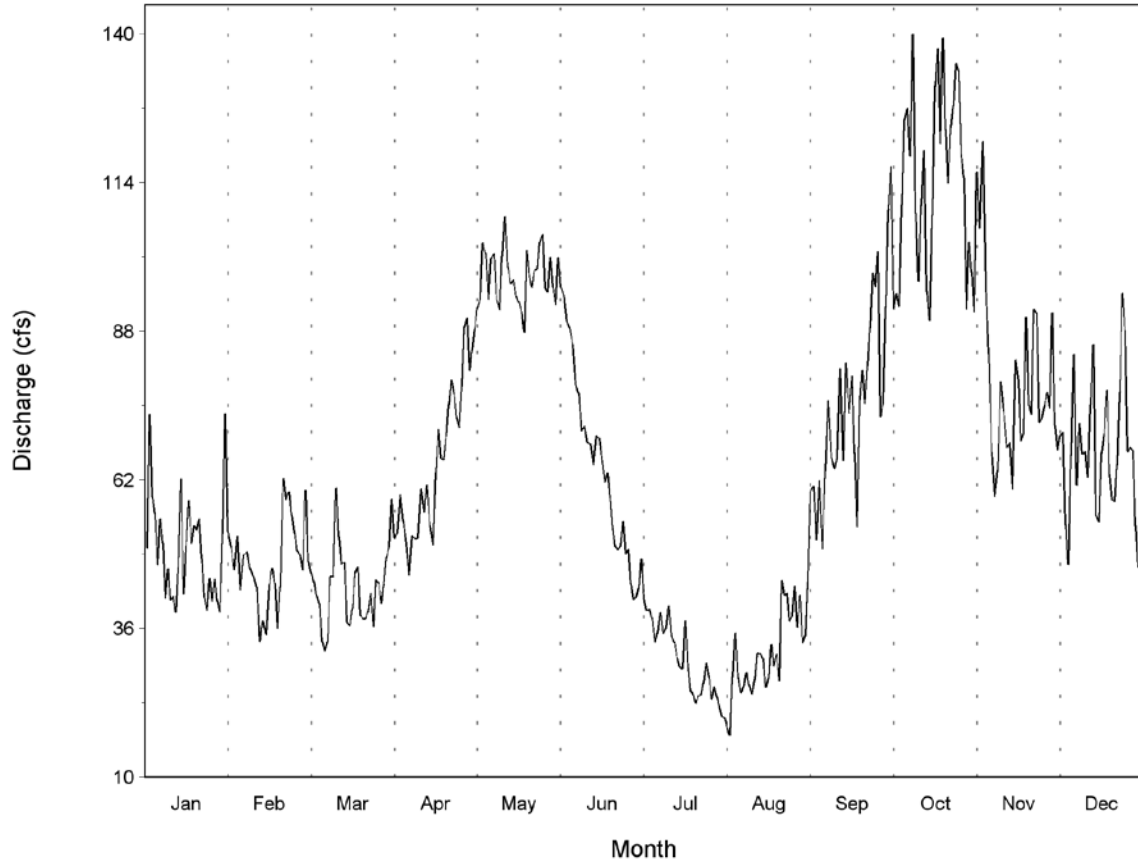
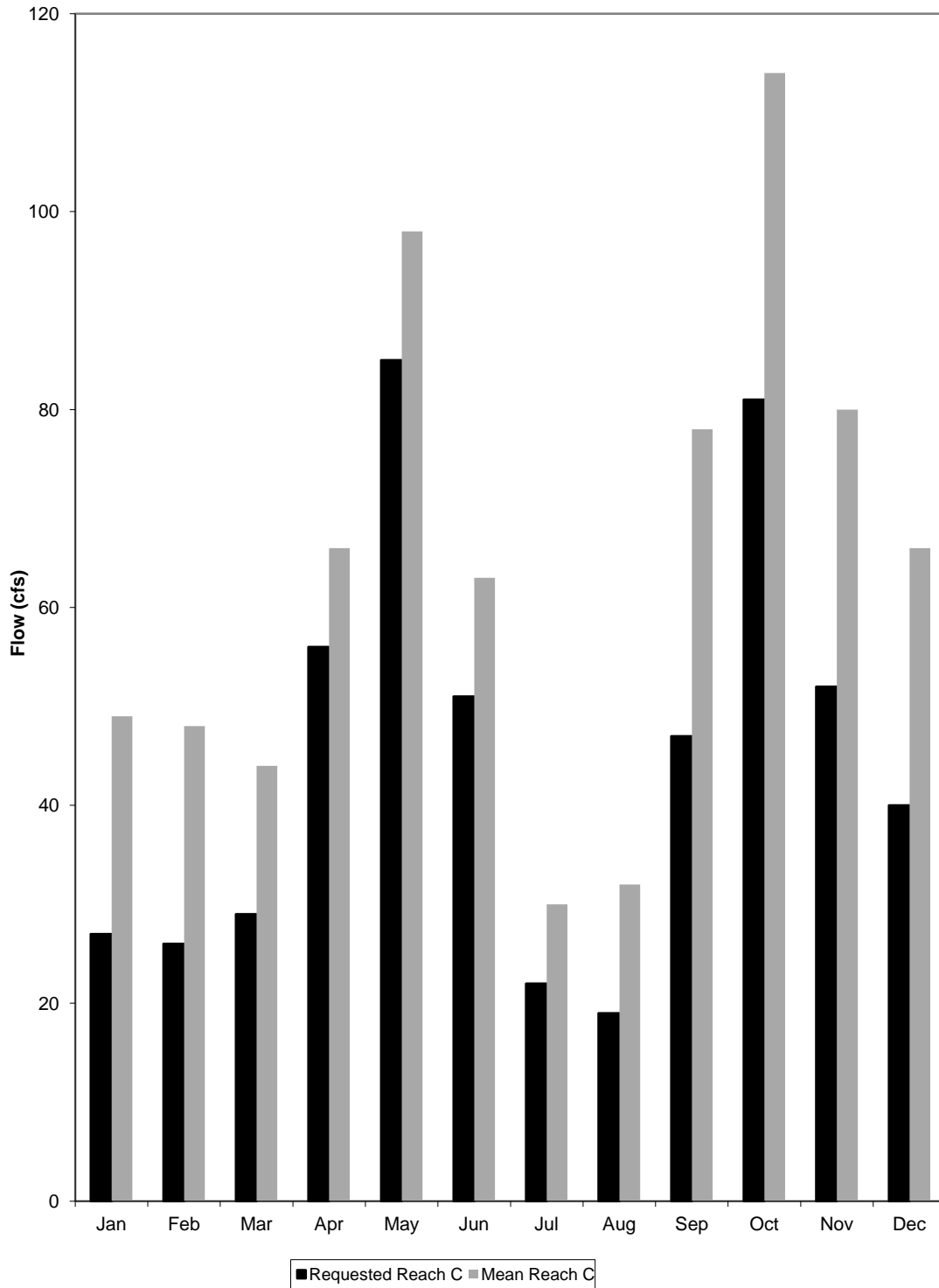


Figure 5. Mean monthly flows and reservation requests for Kadashan Reservation Reach C. Based on complete months of record for USGS Gaging Station 15106920 (January 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).



ATTACHMENT A. KADASHAN RIVER REACH C RESERVATION OF WATER APPLICATION.

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Table 1. Monthly exceedance flows (cfs) for Kadashan Reservation Reach C. Based on complete months of record for USGS Gaging Station 15106920 (January 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).

% Time exceeded	January	February	March	April	May	June	July	August	September	October	November	December
0	800	583	400	361	452	350	311	375	740	1,010	889	841
5	173	154	128	147	200	155	80	105	254	309	229	208
10	115	110	96	120	163	126	63	70	182	230	160	148
15	85	84	76	107	143	109	50	51	147	198	131	112
20	70	69	65	97	130	97	43	41	115	168	110	92
25	58	56	54	89	120	86	36	34	95	145	94	80
30	47	47	46	80	111	79	33	30	81	127	85	67
35	40	40	41	74	103	71	29	26	70	113	74	59
40	33	35	36	67	97	65	27	23	60	100	66	51
45	30	30	32	62	91	57	25	21	53	90	59	46
50	27	26	29	56	85	51	22	19	47	81	52	40
55	24	24	25	51	80	45	20	17	41	73	46	35
60	21	21	22	46	76	41	18	15	36	65	42	30
65	18	19	20	43	71	36	17	14	31	59	38	25
70	17	17	17	39	67	31	15	12	28	54	32	22
75	15	15	15	35	62	27	14	11	24	48	29	19
80	13	13	13	31	59	24	12	10	21	43	25	17
85	11	12	12	27	52	20	11	8.9	18	38	21	15
90	8.9	10	9.7	23	45	17	9.4	7.8	14	32	18	12
95	6.0	7.8	8.0	18	38	14	7.5	6.1	11	24	13	9.0
100	3.8	4.0	5.2	10	20	7.7	3.2	3.6	4.5	9.4	9.0	4.5
Mean	49	48	44	66	98	63	30	32	78	114	80	66

Table 2. Monthly flow summaries (cfs) for Kadashan Reservation Reach C. Based on complete months of record for USGS Gaging Station 15106920 (January 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).

Month	# of Months	Minimum monthly flow (cfs)	Mean monthly flow (cfs)	Maximum monthly flow (cfs)
January	38	6.2	49	147
February	38	6.0	48	118
March	38	9.2	44	129
April	38	23	66	118
May	38	38	98	182
June	38	15	63	151
July	38	6.4	30	60
August	38	5.7	32	79
September	38	17	78	141
October	37	51	114	234
November	37	18	80	184
December	37	8.1	66	147

Table 3. Annual flow summaries (cfs) for Kadashan Reservation Reach C. Based on complete water years of record for USGS Gaging Station 15106920 (October 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).

Water year	Number of days of record	QAA (cfs)
1969	365	58
1970	365	69
1971	365	69
1972	366	66
1973	365	68
1974	365	54
1975	365	78
1976	366	65
1977	365	68
1978	365	44
1979	0	
1980	0	
1981	365	59
1982	365	62
1983	365	62
1984	366	64
1985	365	76
1986	365	65
1987	365	69
1988	366	79
1989	365	55
1990	365	66
1991	365	70
1992	366	81
1993	365	53
1994	365	74
1995	365	62
1996	366	52
1997	365	51
1998	365	55
1999	365	80
2000	366	78
2001	365	60
2002	365	53
2003	365	51
2004	366	60
2005	365	67
2006	365	62
2007	365	60
Mean for period of record	13,513	64

Table 4. Estimated daily flow summaries (cfs) for Kadashan Reservation Reach C. Based on complete water years of record for USGS Gaging Station 15106920 (October 1, 1968 to September 30, 1978 and October 1, 1980 to September 30, 2007).

Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
1	January 1	37	6.0	50	200
2	January 2	37	5.4	73	800
3	January 3	37	5.0	59	439
4	January 4	37	4.6	56	400
5	January 5	37	6.0	47	197
6	January 6	37	7.0	55	246
7	January 7	37	6.0	51	250
8	January 8	37	6.0	41	136
9	January 9	37	6.0	46	266
10	January 10	37	5.0	41	153
11	January 11	37	5.0	41	227
12	January 12	37	5.0	39	196
13	January 13	37	4.5	47	343
14	January 14	37	4.5	62	306
15	January 15	37	4.0	42	132
16	January 16	37	4.0	50	351
17	January 17	37	4.0	58	350
18	January 18	37	4.0	51	220
19	January 19	37	4.0	54	376
20	January 20	37	3.8	53	399
21	January 21	37	4.0	55	263
22	January 22	37	4.5	48	189
23	January 23	37	4.5	41	183
24	January 24	37	5.0	39	178
25	January 25	37	5.0	45	301
26	January 26	37	5.0	41	217
27	January 27	37	5.0	45	220
28	January 28	37	5.0	41	305
29	January 29	37	5.0	39	134
30	January 30	37	5.0	53	365
31	January 31	37	5.0	73	800

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
32	February 1	37	5.0	53	400
33	February 2	37	5.0	50	305
34	February 3	37	5.0	46	226
35	February 4	37	5.0	52	473
36	February 5	37	6.0	43	150
37	February 6	37	6.0	49	184
38	February 7	37	5.0	49	286
39	February 8	37	5.0	46	246
40	February 9	37	4.5	45	338
41	February 10	37	4.5	43	256
42	February 11	37	4.0	34	141
43	February 12	37	4.0	37	173
44	February 13	37	4.0	35	142
45	February 14	37	4.5	44	185
46	February 15	37	5.0	46	176
47	February 16	37	6.0	44	120
48	February 17	37	6.0	36	167
49	February 18	37	6.0	43	286
50	February 19	37	6.0	62	442
51	February 20	37	6.0	59	373
52	February 21	37	6.0	60	454
53	February 22	37	6.0	56	345
54	February 23	37	6.0	53	583
55	February 24	37	6.0	50	314
56	February 25	37	6.0	49	335
57	February 26	37	6.0	46	270
58	February 27	37	6.0	60	483
59	February 28 OR 29	45	6.0	48	260

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ATTACHMENT A. KADASHAN RIVER REACH C RESERVATION OF WATER APPLICATION.
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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
60	March 1	37	6.0	46	268
61	March 2	37	6.0	44	260
62	March 3	37	5.8	42	218
63	March 4	37	5.6	40	170
64	March 5	37	5.4	34	128
65	March 6	37	5.2	32	185
66	March 7	37	6.0	34	128
67	March 8	37	7.0	45	264
68	March 9	37	7.6	45	250
69	March 10	37	7.6	60	332
70	March 11	37	7.5	52	243
71	March 12	37	7.4	47	346
72	March 13	37	7.4	48	400
73	March 14	37	7.4	37	193
74	March 15	37	7.2	37	122
75	March 16	37	7.2	40	217
76	March 17	37	7.0	46	357
77	March 18	37	7.0	47	279
78	March 19	37	7.0	38	174
79	March 20	37	7.0	38	288
80	March 21	37	7.0	38	197
81	March 22	37	7.0	39	132
82	March 23	37	7.0	42	197
83	March 24	37	7.0	36	99
84	March 25	37	7.0	44	241
85	March 26	37	7.0	44	161
86	March 27	37	7.0	40	160
87	March 28	37	7.0	44	124
88	March 29	37	9.0	48	168
89	March 30	37	13	50	151
90	March 31	37	12	59	221

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
91	April 1	37	12	52	184
92	April 2	37	12	53	168
93	April 3	37	11	59	320
94	April 4	37	10	55	171
95	April 5	37	10	51	146
96	April 6	37	11	45	94
97	April 7	37	11	52	122
98	April 8	37	11	52	104
99	April 9	37	11	52	126
100	April 10	37	10	60	205
101	April 11	37	11	56	155
102	April 12	37	11	61	243
103	April 13	37	12	54	131
104	April 14	37	14	51	125
105	April 15	37	16	63	229
106	April 16	37	16	71	361
107	April 17	37	16	66	234
108	April 18	37	16	66	162
109	April 19	37	21	70	192
110	April 20	37	25	75	227
111	April 21	37	20	79	194
112	April 22	37	19	77	151
113	April 23	37	19	73	171
114	April 24	37	28	71	122
115	April 25	37	29	78	187
116	April 26	37	26	89	193
117	April 27	37	26	90	217
118	April 28	37	27	81	177
119	April 29	37	28	85	171
120	April 30	37	30	88	201

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
121	May 1	37	28	92	262
122	May 2	37	35	94	234
123	May 3	37	33	103	351
124	May 4	37	29	102	346
125	May 5	37	27	94	256
126	May 6	37	25	101	306
127	May 7	37	26	101	338
128	May 8	37	28	93	216
129	May 9	37	32	92	207
130	May 10	37	33	101	273
131	May 11	37	34	108	315
132	May 12	37	37	99	210
133	May 13	37	32	96	189
134	May 14	37	28	97	194
135	May 15	37	32	94	263
136	May 16	37	32	93	170
137	May 17	37	27	91	200
138	May 18	37	27	88	178
139	May 19	37	28	102	452
140	May 20	37	28	98	423
141	May 21	37	29	96	233
142	May 22	37	28	99	236
143	May 23	37	39	99	241
144	May 24	37	42	104	294
145	May 25	37	32	105	233
146	May 26	37	31	95	190
147	May 27	37	29	95	256
148	May 28	37	24	101	240
149	May 29	37	22	96	243
150	May 30	37	22	93	329
151	May 31	37	20	101	237

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
152	June 1	37	20	96	186
153	June 2	37	18	94	237
154	June 3	37	16	90	247
155	June 4	37	23	89	225
156	June 5	37	20	86	236
157	June 6	37	15	79	205
158	June 7	37	14	77	201
159	June 8	37	12	71	201
160	June 9	37	12	71	192
161	June 10	37	12	68	176
162	June 11	37	11	68	195
163	June 12	37	11	65	183
164	June 13	37	11	70	188
165	June 14	37	15	69	207
166	June 15	37	14	65	227
167	June 16	37	14	62	237
168	June 17	37	12	63	185
169	June 18	37	11	59	153
170	June 19	37	12	53	146
171	June 20	37	12	50	135
172	June 21	37	14	50	142
173	June 22	37	13	50	179
174	June 23	37	13	55	212
175	June 24	37	12	49	158
176	June 25	37	11	50	158
177	June 26	37	10	44	143
178	June 27	37	9.4	41	125
179	June 28	37	8.8	42	107
180	June 29	37	8.2	43	119
181	June 30	37	7.7	48	350

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
182	July 1	37	7.5	41	129
183	July 2	37	7.4	39	150
184	July 3	37	7.2	39	130
185	July 4	37	7.4	38	126
186	July 5	37	7.5	34	121
187	July 6	37	7.1	35	114
188	July 7	37	7.0	39	311
189	July 8	37	6.5	35	176
190	July 9	37	5.4	36	136
191	July 10	37	5.2	40	145
192	July 11	37	4.9	35	103
193	July 12	37	4.0	34	160
194	July 13	37	3.6	31	73
195	July 14	37	6.6	29	75
196	July 15	37	6.3	29	69
197	July 16	37	5.3	37	234
198	July 17	37	4.4	29	109
199	July 18	37	4.2	25	74
200	July 19	37	3.7	24	69
201	July 20	37	6.1	23	58
202	July 21	37	7.0	24	76
203	July 22	37	7.0	24	86
204	July 23	37	6.0	27	132
205	July 24	37	5.0	30	114
206	July 25	37	4.2	27	101
207	July 26	37	3.9	24	99
208	July 27	37	3.6	26	74
209	July 28	37	3.2	24	71
210	July 29	37	3.2	22	84
211	July 30	37	7.2	21	53
212	July 31	37	6.6	20	78

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
213	August 1	37	6.2	19	42
214	August 2	37	5.4	17	45
215	August 3	37	5.6	28	154
216	August 4	37	5.3	35	171
217	August 5	37	5.1	27	125
218	August 6	37	4.9	25	101
219	August 7	37	4.5	26	116
220	August 8	37	4.5	28	138
221	August 9	37	4.2	26	126
222	August 10	37	4.0	25	76
223	August 11	37	4.7	27	207
224	August 12	37	4.7	32	239
225	August 13	37	4.5	32	150
226	August 14	37	4.3	31	150
227	August 15	37	4.3	26	100
228	August 16	37	4.1	27	230
229	August 17	37	4.1	33	295
230	August 18	37	4.2	30	193
231	August 19	37	5.1	32	131
232	August 20	37	4.8	27	119
233	August 21	37	4.7	44	375
234	August 22	37	4.3	42	232
235	August 23	37	4.0	42	194
236	August 24	37	4.0	37	188
237	August 25	37	4.0	38	322
238	August 26	37	4.3	43	361
239	August 27	37	6.3	36	188
240	August 28	37	4.7	42	327
241	August 29	37	3.6	34	129
242	August 30	37	6.6	35	149
243	August 31	37	6.6	44	184

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
244	September 1	37	5.9	60	378
245	September 2	37	6.9	61	406
246	September 3	37	6.5	52	267
247	September 4	37	5.9	62	294
248	September 5	37	5.4	50	184
249	September 6	37	5.3	64	448
250	September 7	37	7.3	76	612
251	September 8	37	7.3	66	296
252	September 9	37	6.9	64	254
253	September 10	37	6.9	66	322
254	September 11	37	7.4	81	434
255	September 12	37	7.6	65	320
256	September 13	37	6.9	82	723
257	September 14	37	6.5	74	319
258	September 15	37	6.0	80	567
259	September 16	37	5.5	67	511
260	September 17	37	5.1	54	271
261	September 18	37	4.5	76	386
262	September 19	37	4.5	81	302
263	September 20	37	4.5	75	335
264	September 21	37	4.9	82	317
265	September 22	37	12	89	443
266	September 23	37	18	98	413
267	September 24	37	17	96	473
268	September 25	37	13	102	740
269	September 26	37	9.9	73	237
270	September 27	37	12	75	278
271	September 28	37	11	92	395
272	September 29	37	12	109	466
273	September 30	37	13	117	438

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
274	October 1	37	24	92	325
275	October 2	37	22	94	374
276	October 3	37	16	92	336
277	October 4	37	13	110	386
278	October 5	37	11	125	900
279	October 6	37	9.4	127	500
280	October 7	37	24	119	335
281	October 8	37	21	140	850
282	October 9	37	16	109	360
283	October 10	37	17	97	301
284	October 11	37	16	110	310
285	October 12	37	15	120	575
286	October 13	37	14	95	255
287	October 14	37	14	90	321
288	October 15	37	14	108	436
289	October 16	37	17	131	421
290	October 17	37	16	137	579
291	October 18	37	16	121	350
292	October 19	37	17	139	1,010
293	October 20	37	19	123	980
294	October 21	37	20	114	544
295	October 22	37	16	124	500
296	October 23	37	16	127	492
297	October 24	37	18	135	700
298	October 25	37	16	133	431
299	October 26	37	15	119	713
300	October 27	37	14	115	295
301	October 28	37	13	92	340
302	October 29	37	26	104	378
303	October 30	37	21	98	369
304	October 31	37	21	91	261

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
305	November 1	37	19	116	742
306	November 2	37	18	106	466
307	November 3	37	16	121	707
308	November 4	37	23	96	410
309	November 5	37	21	84	476
310	November 6	37	20	67	232
311	November 7	37	17	59	214
312	November 8	37	17	64	314
313	November 9	37	15	79	321
314	November 10	37	15	74	353
315	November 11	37	13	68	338
316	November 12	37	13	68	529
317	November 13	37	12	60	217
318	November 14	37	12	83	308
319	November 15	37	11	79	468
320	November 16	37	11	69	237
321	November 17	37	11	70	370
322	November 18	37	10	90	785
323	November 19	37	9.0	75	469
324	November 20	37	9.0	73	363
325	November 21	37	9.0	92	889
326	November 22	37	10	91	881
327	November 23	37	11	72	385
328	November 24	37	12	73	260
329	November 25	37	11	75	411
330	November 26	37	10	77	482
331	November 27	37	10	75	386
332	November 28	37	9.0	91	554
333	November 29	37	9.0	71	388
334	November 30	37	9.5	67	442

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Julian Day	Day of Year	# of days of record	Minimum-mean daily flow (cfs)	Mean-mean daily flow (cfs)	Maximum-mean daily flow (cfs)
335	December 1	37	9.0	70	442
336	December 2	37	9.0	70	414
337	December 3	37	10	54	253
338	December 4	37	10	47	233
339	December 5	37	9.7	66	440
340	December 6	37	9.0	84	677
341	December 7	37	8.0	61	300
342	December 8	37	7.8	72	316
343	December 9	37	7.3	66	236
344	December 10	37	6.8	67	433
345	December 11	37	6.6	62	304
346	December 12	37	6.2	75	423
347	December 13	37	6.3	86	755
348	December 14	37	6.7	56	265
349	December 15	37	7.3	55	150
350	December 16	37	8.5	67	515
351	December 17	37	8.2	70	598
352	December 18	37	7.4	78	744
353	December 19	37	6.6	63	367
354	December 20	37	6.0	58	283
355	December 21	37	5.6	58	247
356	December 22	37	5.3	65	392
357	December 23	37	5.1	77	504
358	December 24	37	4.6	95	385
359	December 25	37	4.5	88	641
360	December 26	37	6.6	67	301
361	December 27	37	6.8	68	841
362	December 28	37	6.7	67	562
363	December 29	37	6.6	54	285
364	December 30	37	6.6	47	172
365	December 31	37	6.2	47	200