

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
<ol style="list-style-type: none"> 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 D, one of five reaches within the Kadashan River watershed for which ADF&G has submitted a reservation of water application. Reach D begins at the downstream end of Hook Creek and extends upstream 0.75 miles to the upper extent of Anadromous Water Catalog stream number 112-24-10250-2009 (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 112-24-10250-2009 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	10
February	13
March	15
April	33
May	73
June	53
July	22
August	13
September	26

October	58
November	37
December	16

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 Hook Creek Gage (No. 15106960). This gage is located at latitude 57° 40' 22", longitude 135° 10' 40" on Hook Creek near the upstream boundary of Reach D (Figure 2) and has a period of record from December 1, 1966 to September 30, 1980.

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.
- Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council. Cheyenne, WY.
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- U.S. Geological Survey. 2009. <http://waterwatch.usgs.gov/ptile.html>.

Figure 1. Area map of Kadashan River near Tenakee Springs, Southeast Alaska.

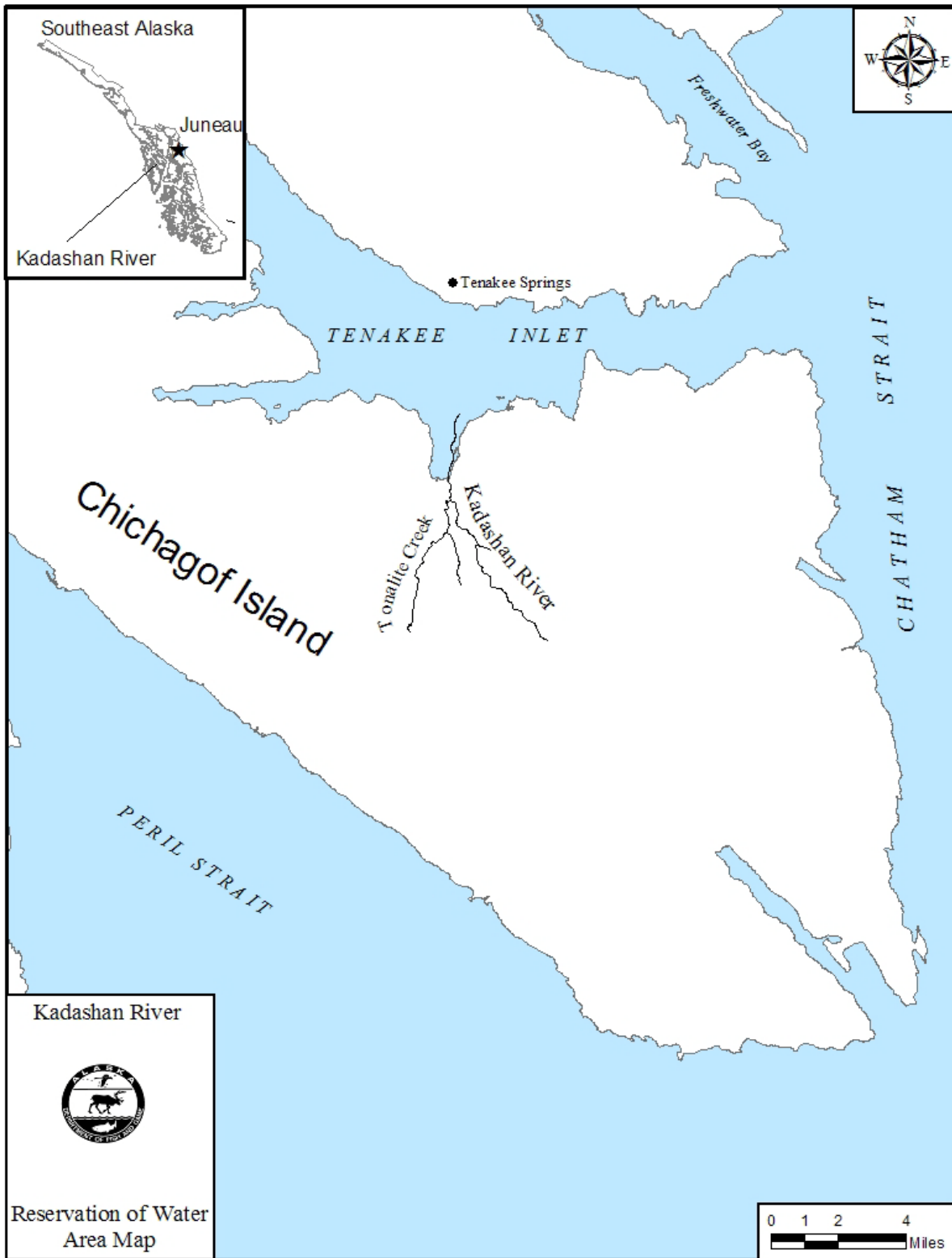


Figure 2. Reservation reach boundaries and location of USGS gages, Kadashan River near Tenakee Springs, Southeast Alaska.

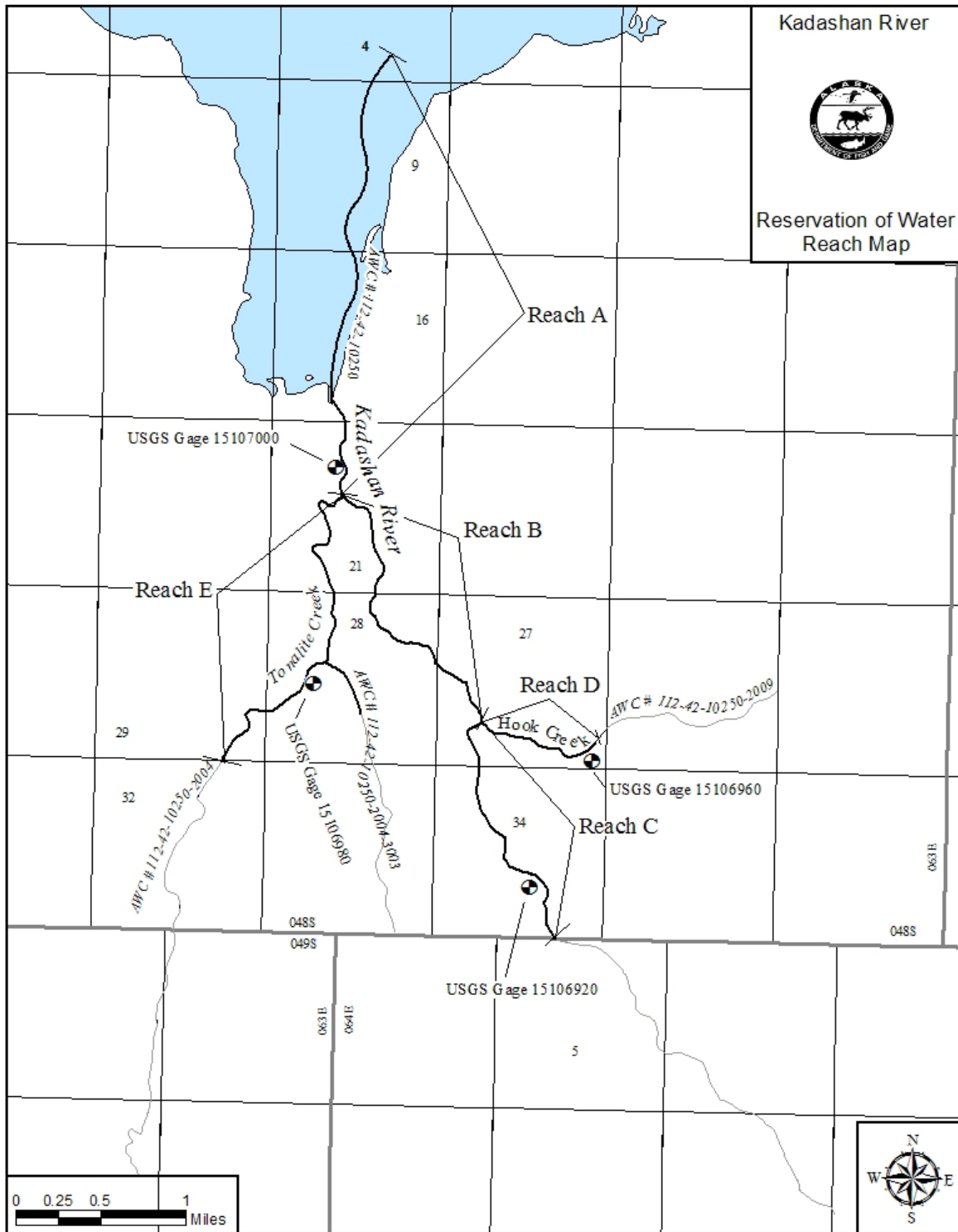


Figure 3. Fish species periodicity chart for Kadashan River near Tenakee Springs, Alaska.

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 D. Based on complete water years of record for USGS Gaging Station 15106960 (October 1, 1967 to September 30, 1980).

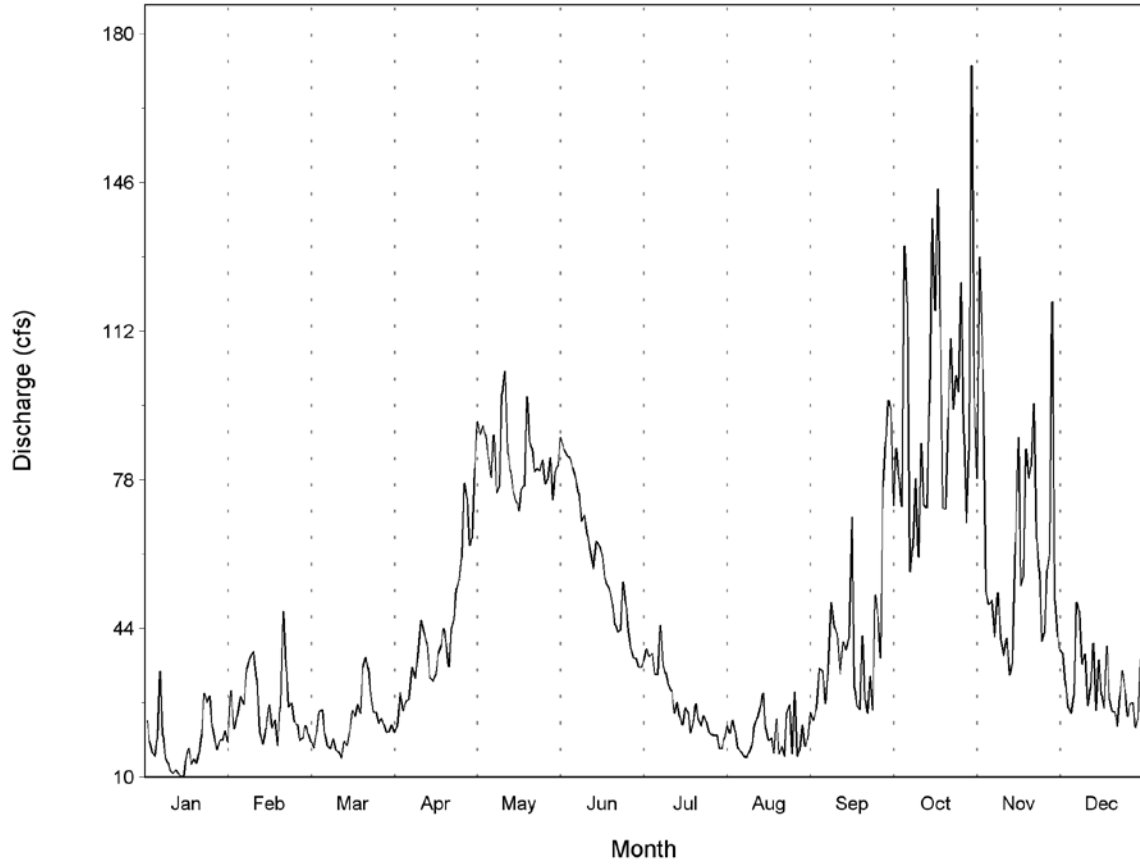
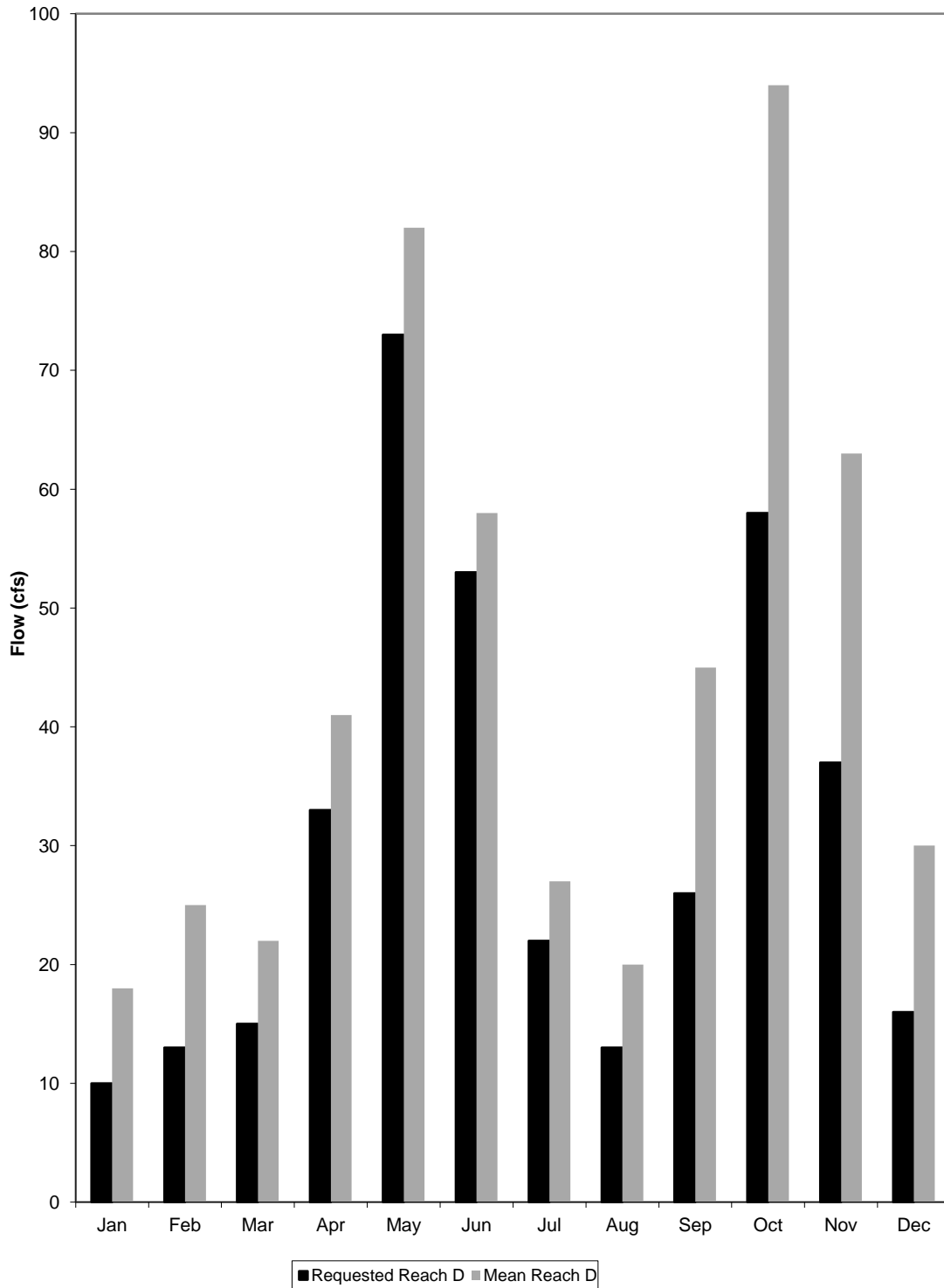


Figure 5. Mean monthly flows and reservation requests (cfs) for Kadashan Reservation Reach D. Based on complete months of record for USGS Gaging Station 15106960 (December 1, 1966 to September 30, 1980).



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

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Table 1. Monthly exceedance flows (cfs) for Kadashan Reservation Reach D. Based on complete months of record for USGS Gaging Station 15106960 (December 1, 1966 to September 30, 1980).

% Time exceeded	January	February	March	April	May	June	July	August	September	October	November	December
0	200	352	176	220	335	190	184	233	440	905	660	230
5	50	92	60	102	160	126	67	60	147	299	211	89
10	39	57	45	84	135	101	50	40	98	200	130	67
15	32	42	38	71	115	95	42	32	73	164	100	54
20	26	36	30	60	105	85	36	26	60	134	84	43
25	22	30	26	52	98	77	33	22	50	111	70	37
30	19	23	22	47	92	70	30	20	44	93	58	33
35	16	20	20	41	85	66	28	18	36	82	53	28
40	15	17	18	39	80	60	25	16	31	71	48	24
45	12	15	16	36	77	57	23	15	29	62	42	20
50	10	13	15	33	73	53	22	13	26	58	37	16
55	9.0	11	13	30	70	48	20	13	23	50	33	14
60	8.0	10	10	28	66	43	18	11	21	45	29	13
65	7.0	9.0	10	25	61	39	17	10	20	39	27	12
70	6.3	7.0	9.4	24	58	35	15	9.0	18	35	24	11
75	5.8	6.0	8.5	21	55	32	13	8.3	16	32	21	10
80	5.3	5.3	7.5	17	51	27	12	7.5	15	28	19	9.4
85	5.0	5.0	7.0	14	48	24	11	6.8	13	25	16	8.6
90	4.3	4.5	6.0	11	43	19	9.7	6.1	8.8	21	13	7.6
95	3.2	3.4	5.0	8.4	36	14	6.8	5.2	6.7	18	9.0	6.0
100	2.5	2.6	3.6	4.0	15	7.0	3.4	4.3	4.6	11	6.0	4.0
Mean	18	25	22	41	82	58	27	20	45	94	63	30

Table 2. Monthly flow summaries (cfs) for Kadashan Reservation Reach D. Based on complete months of record for USGS Gaging Station 15106960 (December 1, 1966 to September 30, 1980).

Month	# of Months	Minimum monthly flow (cfs)	Mean monthly flow (cfs)	Maximum monthly flow (cfs)
January	14	4.9	18	40
February	14	3.6	25	81
March	14	7.5	22	49
April	14	11	41	75
May	14	41	82	123
June	14	24	58	105
July	14	8.7	27	47
August	14	7.3	20	40
September	14	22	45	97
October	13	30	94	213
November	13	12	63	120
December	14	9.0	30	63

Table 3. Annual flow summaries (cfs) for Kadashan Reservation Reach D. Based on complete water years of record for USGS Gaging Station 15106960 (October 1, 1967 to September 30, 1980).

Water year	Number of days of record	QAA (cfs)
1968	366	43
1969	365	38
1970	365	49
1971	365	44
1972	366	39
1973	365	42
1974	365	35
1975	365	59
1976	366	48
1977	365	45
1978	365	35
1979	365	55
1980	366	42
Mean for period of record	4,749	44

Table 4. Daily flow summaries (cfs) for Kadashan Reservation Reach D. Based on complete water years of record for USGS Gage 15106960 (October 1, 1967 to September 30, 1980).

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	13	4.5	23	79
2	January 2	13	4.5	18	53
3	January 3	13	4.5	16	36
4	January 4	13	4.5	15	28
5	January 5	13	4.0	19	63
6	January 6	13	3.8	34	200
7	January 7	13	3.6	20	100
8	January 8	13	3.4	15	55
9	January 9	13	3.3	13	50
10	January 10	13	3.2	11	35
11	January 11	13	3.1	11	30
12	January 12	13	3.0	12	30
13	January 13	13	3.0	11	28
14	January 14	13	3.0	10	25
15	January 15	13	3.0	10	23
16	January 16	13	3.0	14	52
17	January 17	13	3.0	16	79
18	January 18	13	3.0	13	46
19	January 19	13	3.1	14	50
20	January 20	13	2.5	13	40
21	January 21	13	2.5	15	49
22	January 22	13	2.5	20	62
23	January 23	13	2.5	29	163
24	January 24	13	2.5	27	107
25	January 25	13	2.5	28	110
26	January 26	13	2.5	21	45
27	January 27	13	2.5	19	40
28	January 28	13	2.5	16	41
29	January 29	13	2.5	18	50
30	January 30	13	3.0	19	52
31	January 31	13	4.0	20	68

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Table 4. Page 2 of 12.

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	13	4.0	18	50
33	February 2	13	3.7	30	153
34	February 3	13	3.5	21	74
35	February 4	13	3.5	24	92
36	February 5	13	3.3	28	133
37	February 6	13	3.0	27	106
38	February 7	13	3.0	35	113
39	February 8	13	3.0	37	160
40	February 9	13	3.6	39	176
41	February 10	13	3.2	32	140
42	February 11	13	3.0	20	60
43	February 12	13	2.8	18	54
44	February 13	13	2.7	21	104
45	February 14	13	2.6	26	173
46	February 15	13	2.7	21	84
47	February 16	13	2.8	23	75
48	February 17	13	2.9	17	50
49	February 18	13	3.0	26	157
50	February 19	13	3.1	48	352
51	February 20	13	3.2	35	215
52	February 21	13	3.2	26	97
53	February 22	13	3.3	27	90
54	February 23	13	3.4	23	68
55	February 24	13	3.4	22	88
56	February 25	13	3.4	18	52
57	February 26	13	3.5	19	45
58	February 27	13	3.5	22	85
59	February 28 OR 29	17	3.5	20	44

-continued-

Table 4. Page 3 of 12.

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	13	3.6	18	51
61	March 2	13	3.7	17	60
62	March 3	13	3.8	20	94
63	March 4	13	4.0	25	134
64	March 5	13	4.3	25	176
65	March 6	13	4.8	20	107
66	March 7	13	5.0	17	60
67	March 8	13	4.8	17	45
68	March 9	13	4.5	19	45
69	March 10	13	4.5	16	45
70	March 11	13	5.8	16	41
71	March 12	13	6.0	14	30
72	March 13	13	6.0	18	45
73	March 14	13	6.0	17	40
74	March 15	13	6.0	21	70
75	March 16	13	6.0	25	94
76	March 17	13	6.0	24	85
77	March 18	13	6.0	27	92
78	March 19	13	6.0	25	54
79	March 20	13	6.7	35	130
80	March 21	13	6.0	37	134
81	March 22	13	6.0	35	83
82	March 23	13	6.0	29	68
83	March 24	13	6.0	25	70
84	March 25	13	7.0	25	80
85	March 26	13	6.0	22	55
86	March 27	13	6.0	23	83
87	March 28	13	6.4	22	52
88	March 29	13	9.7	20	44
89	March 30	13	9.4	20	37
90	March 31	13	9.4	22	50

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

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Table 4. Page 4 of 12.

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	13	9.7	20	43
92	April 2	13	10	22	40
93	April 3	13	9.2	29	100
94	April 4	13	8.8	25	51
95	April 5	13	8.4	27	64
96	April 6	13	8.4	28	61
97	April 7	13	8.0	35	102
98	April 8	13	7.2	33	71
99	April 9	13	8.0	38	87
100	April 10	13	7.6	46	132
101	April 11	13	7.2	43	90
102	April 12	13	7.2	41	101
103	April 13	13	7.2	33	50
104	April 14	13	7.6	32	53
105	April 15	13	7.6	34	92
106	April 16	13	6.8	38	142
107	April 17	13	6.8	40	94
108	April 18	13	16	44	114
109	April 19	13	15	40	83
110	April 20	13	10	35	69
111	April 21	13	8.8	44	147
112	April 22	13	8.4	46	90
113	April 23	13	8.0	53	84
114	April 24	13	16	55	126
115	April 25	13	19	60	102
116	April 26	13	21	77	172
117	April 27	13	24	74	146
118	April 28	13	20	63	135
119	April 29	13	16	65	160
120	April 30	13	14	81	220

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Table 4. Page 5 of 12.

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	13	15	91	255
122	May 2	13	20	88	210
123	May 3	13	33	90	290
124	May 4	13	35	88	240
125	May 5	13	35	83	160
126	May 6	13	38	79	144
127	May 7	13	42	88	196
128	May 8	13	39	75	149
129	May 9	13	34	77	180
130	May 10	13	30	98	205
131	May 11	13	27	103	221
132	May 12	13	26	84	154
133	May 13	13	27	80	152
134	May 14	13	33	75	139
135	May 15	13	35	73	152
136	May 16	13	33	71	108
137	May 17	13	38	76	141
138	May 18	13	52	77	126
139	May 19	13	49	97	335
140	May 20	13	45	87	270
141	May 21	13	33	85	150
142	May 22	13	30	80	115
143	May 23	13	34	81	166
144	May 24	13	38	80	142
145	May 25	13	38	82	118
146	May 26	13	36	77	120
147	May 27	13	37	78	170
148	May 28	13	40	83	170
149	May 29	13	36	73	150
150	May 30	13	36	80	210
151	May 31	13	35	81	160

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Table 4. Page 6 of 12.

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	13	32	88	138
153	June 2	13	30	85	148
154	June 3	13	35	84	161
155	June 4	13	40	83	134
156	June 5	13	40	81	157
157	June 6	13	35	78	190
158	June 7	13	29	75	184
159	June 8	13	25	69	169
160	June 9	13	24	70	152
161	June 10	13	24	65	143
162	June 11	13	20	61	136
163	June 12	13	21	58	116
164	June 13	13	20	64	114
165	June 14	13	19	63	136
166	June 15	13	17	61	149
167	June 16	13	17	55	101
168	June 17	13	17	54	96
169	June 18	13	19	52	99
170	June 19	13	17	49	99
171	June 20	13	14	45	99
172	June 21	13	13	43	84
173	June 22	13	14	44	84
174	June 23	13	14	55	160
175	June 24	13	14	50	109
176	June 25	13	13	43	80
177	June 26	13	12	39	77
178	June 27	13	12	37	75
179	June 28	13	10	37	68
180	June 29	13	8.8	35	73
181	June 30	13	7.0	35	96

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Table 4. Page 7 of 12.

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	13	9.6	37	88
183	July 2	13	8.8	39	103
184	July 3	13	8.8	38	88
185	July 4	13	9.1	38	79
186	July 5	13	7.1	33	77
187	July 6	13	5.8	34	70
188	July 7	13	5.7	45	184
189	July 8	13	6.0	35	91
190	July 9	13	6.7	34	72
191	July 10	13	4.6	31	56
192	July 11	13	3.7	30	71
193	July 12	13	3.4	25	52
194	July 13	13	7.6	27	71
195	July 14	13	7.2	24	47
196	July 15	13	6.8	22	47
197	July 16	13	5.5	26	60
198	July 17	13	5.4	25	39
199	July 18	13	4.2	20	34
200	July 19	13	6.0	23	57
201	July 20	13	5.8	27	106
202	July 21	13	5.7	23	71
203	July 22	13	5.7	22	44
204	July 23	13	5.5	24	53
205	July 24	13	5.4	23	33
206	July 25	13	5.2	20	47
207	July 26	13	6.8	20	56
208	July 27	13	11	20	36
209	July 28	13	11	20	35
210	July 29	13	9.4	17	29
211	July 30	13	9.0	17	34
212	July 31	13	8.2	19	47

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Table 4. Page 8 of 12.

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	13	7.2	22	86
214	August 2	13	6.7	20	67
215	August 3	13	6.2	23	88
216	August 4	13	5.8	20	55
217	August 5	13	5.4	17	40
218	August 6	13	5.2	16	38
219	August 7	13	5.1	15	28
220	August 8	13	6.8	15	30
221	August 9	13	5.8	16	40
222	August 10	13	5.4	17	58
223	August 11	13	5.1	22	71
224	August 12	13	5.0	24	100
225	August 13	13	4.8	26	83
226	August 14	13	4.7	29	118
227	August 15	13	4.8	21	81
228	August 16	13	4.8	18	38
229	August 17	13	5.2	19	59
230	August 18	13	5.0	16	47
231	August 19	13	4.7	23	99
232	August 20	13	4.4	15	32
233	August 21	13	5.4	17	57
234	August 22	13	5.3	15	50
235	August 23	13	5.2	25	119
236	August 24	13	5.0	26	141
237	August 25	13	4.9	15	40
238	August 26	13	4.8	29	233
239	August 27	13	4.7	15	56
240	August 28	13	4.6	16	52
241	August 29	13	4.5	22	68
242	August 30	13	4.4	17	45
243	August 31	13	4.3	19	71

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Table 4. Page 9 of 12.

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	13	6.0	25	96
245	September 2	13	5.8	23	73
246	September 3	13	5.6	26	69
247	September 4	13	5.5	35	176
248	September 5	13	5.5	34	120
249	September 6	13	5.8	27	83
250	September 7	13	5.9	34	146
251	September 8	13	5.5	50	192
252	September 9	13	5.0	44	98
253	September 10	13	4.6	43	176
254	September 11	13	5.6	34	94
255	September 12	13	7.4	41	133
256	September 13	13	10	39	98
257	September 14	13	13	42	123
258	September 15	13	17	69	440
259	September 16	13	17	30	60
260	September 17	13	14	26	45
261	September 18	13	12	25	46
262	September 19	13	11	42	180
263	September 20	13	8.4	28	110
264	September 21	13	7.1	25	71
265	September 22	13	6.7	33	110
266	September 23	13	14	25	53
267	September 24	13	13	52	352
268	September 25	13	14	47	139
269	September 26	13	13	37	128
270	September 27	13	12	77	440
271	September 28	13	11	87	352
272	September 29	13	13	96	378
273	September 30	13	18	94	282

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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	13	17	72	198
275	October 2	13	15	85	335
276	October 3	13	14	78	353
277	October 4	13	13	72	153
278	October 5	13	18	131	816
279	October 6	13	17	118	574
280	October 7	13	15	57	170
281	October 8	13	12	63	237
282	October 9	13	20	78	405
283	October 10	13	19	60	145
284	October 11	13	20	86	240
285	October 12	13	21	72	155
286	October 13	13	20	72	222
287	October 14	13	18	96	420
288	October 15	13	17	138	442
289	October 16	13	17	117	464
290	October 17	13	15	144	540
291	October 18	13	15	113	503
292	October 19	13	17	72	174
293	October 20	13	21	71	260
294	October 21	13	20	92	306
295	October 22	13	18	110	481
296	October 23	13	14	94	345
297	October 24	13	14	102	325
298	October 25	13	13	98	464
299	October 26	13	12	123	619
300	October 27	13	11	89	191
301	October 28	13	11	68	116
302	October 29	13	20	85	267
303	October 30	13	28	173	905
304	October 31	13	28	97	291

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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	13	25	78	264
306	November 2	13	26	129	470
307	November 3	13	22	103	395
308	November 4	13	19	53	131
309	November 5	13	15	49	166
310	November 6	13	13	50	154
311	November 7	13	11	42	91
312	November 8	13	10	52	224
313	November 9	13	8.9	42	109
314	November 10	13	8.7	38	90
315	November 11	13	7.8	42	130
316	November 12	13	7.1	33	64
317	November 13	13	9.0	36	81
318	November 14	13	8.5	64	186
319	November 15	13	8.0	88	518
320	November 16	13	7.8	54	125
321	November 17	13	7.4	56	135
322	November 18	13	7.2	85	481
323	November 19	13	6.8	78	264
324	November 20	13	6.8	81	326
325	November 21	13	7.3	95	352
326	November 22	13	9.0	65	146
327	November 23	13	8.0	57	209
328	November 24	13	7.5	41	80
329	November 25	13	7.0	43	138
330	November 26	13	6.5	57	158
331	November 27	13	6.0	61	358
332	November 28	13	6.0	119	660
333	November 29	13	7.0	50	179
334	November 30	13	9.0	42	111

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Table 4. Page 12 of 12.

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	13	8.5	39	117
336	December 2	13	8.0	38	114
337	December 3	13	7.5	31	86
338	December 4	13	7.5	26	80
339	December 5	13	6.0	25	66
340	December 6	13	6.0	29	82
341	December 7	13	5.0	50	203
342	December 8	13	5.0	48	177
343	December 9	13	8.0	36	97
344	December 10	13	9.6	38	126
345	December 11	13	9.3	26	58
346	December 12	13	8.0	30	86
347	December 13	13	7.0	40	171
348	December 14	13	7.0	25	54
349	December 15	13	8.0	37	176
350	December 16	13	8.5	29	90
351	December 17	13	8.0	26	102
352	December 18	13	8.0	40	230
353	December 19	13	7.0	28	79
354	December 20	13	6.0	25	63
355	December 21	13	6.0	25	62
356	December 22	13	5.0	22	67
357	December 23	13	4.0	29	141
358	December 24	13	4.5	34	160
359	December 25	13	4.0	30	114
360	December 26	13	4.0	24	81
361	December 27	13	4.0	27	101
362	December 28	13	4.0	27	79
363	December 29	13	5.0	21	58
364	December 30	13	6.5	23	72
365	December 31	13	5.0	37	195