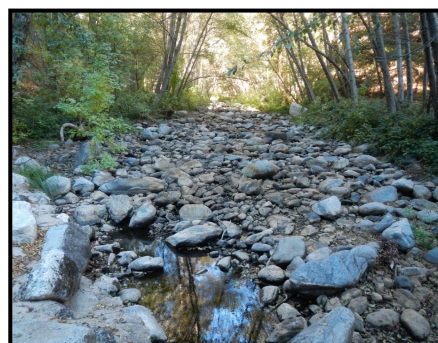
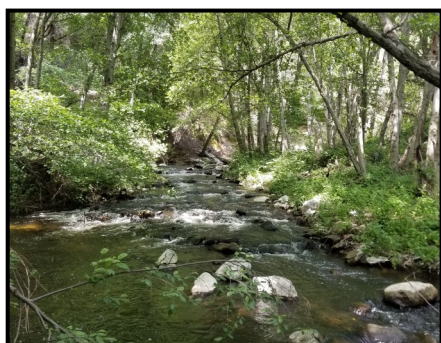


Watershed-Wide Instream Flow Criteria for the West Fork San Gabriel River



California Department of Fish and Wildlife
Instream Flow Program

April 2021



Watershed Criteria Report No. 2021-01

California Department of Fish and Wildlife
Water Branch
Instream Flow Program
Watershed Criteria Report No. 2021–01

Prepared by:

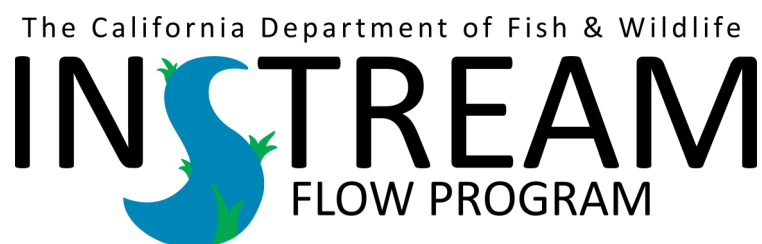
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Introduction

This *Watershed-Wide Instream Flow Criteria* report (Watershed Criteria Report) provides instream flow criteria for the West Fork San Gabriel River (WF San Gabriel River) watershed. Its intended audience includes agencies, water managers, non-governmental organizations, and the public.

This report was prepared in response to a request from the Department's Region 5 staff regarding instream flow information for the WF San Gabriel River. Region 5 staff sought information about stream flows both above and below Cogswell Reservoir (located on the mainstem WF San Gabriel River), to support the issuance of a Lake and Streambed Alteration Agreement for reservoir operations.

This Watershed Criteria Report presents stream assessments for 29 reaches. An overview of the analyses used to create instream flow regime criteria contained in this document, as well as examples of potential criteria applications, is found in the Department's *Overview of Analysis for Instream Flow Regime Criteria on a Watershed Scale* (Overview) document (CDFW 2020). Reviewing and understanding the information contained in the Overview document is essential to understanding flow regime criteria contained in this report. Complete background files for this report are maintained in the Department's Headquarters office. This document and the Overview may be found through the Instream Flow Program's Watershed Criteria webpage (CDFW 2021).

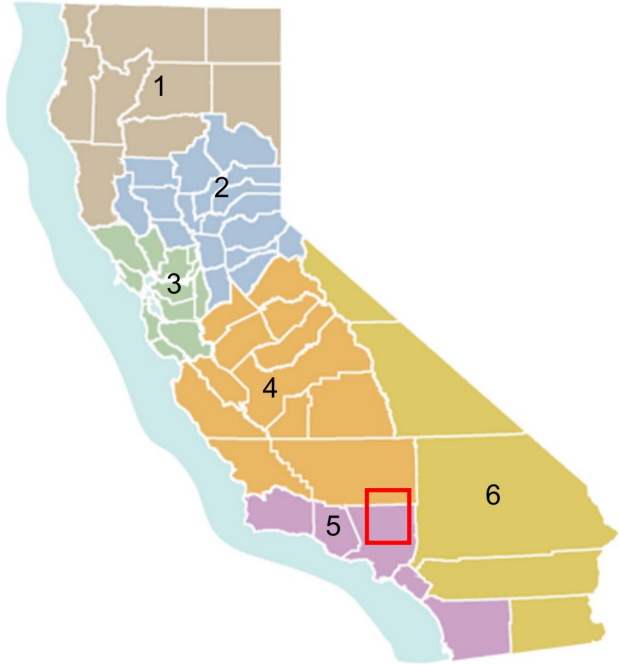
The Department provides this document as a tool for consideration in water management planning. It presents an analytical approach that can be implemented, if appropriate, under the specific circumstances of a watershed, stream, or informational need. This report and the Overview, in and of themselves, should not be considered to provide binding guidelines.



West Fork San Gabriel River

WEST FORK SAN GABRIEL RIVER WATERSHED, LOS ANGELES COUNTY

WF San Gabriel River Watershed



- Located in the Department's Region 5
- Located within Los Angeles County
- 104 square mile (mi²) drainage area
- Supports rainbow trout, Santa Ana sucker, arroyo chub, and Santa Ana speckled dace

Figure 1. Map of the Department's Regions.



West Fork San Gabriel River

WEST FORK SAN GABRIEL RIVER WATERSHED, LOS ANGELES COUNTY

In this map (Figure 2), the orange circle is a United States Geological Survey (USGS) gage, and black lines are dams. Criteria were developed for each numbered reach. The USGS NHD Plus common identifiers (COMIDs) that correspond to the numbered reaches are listed in Appendix A.

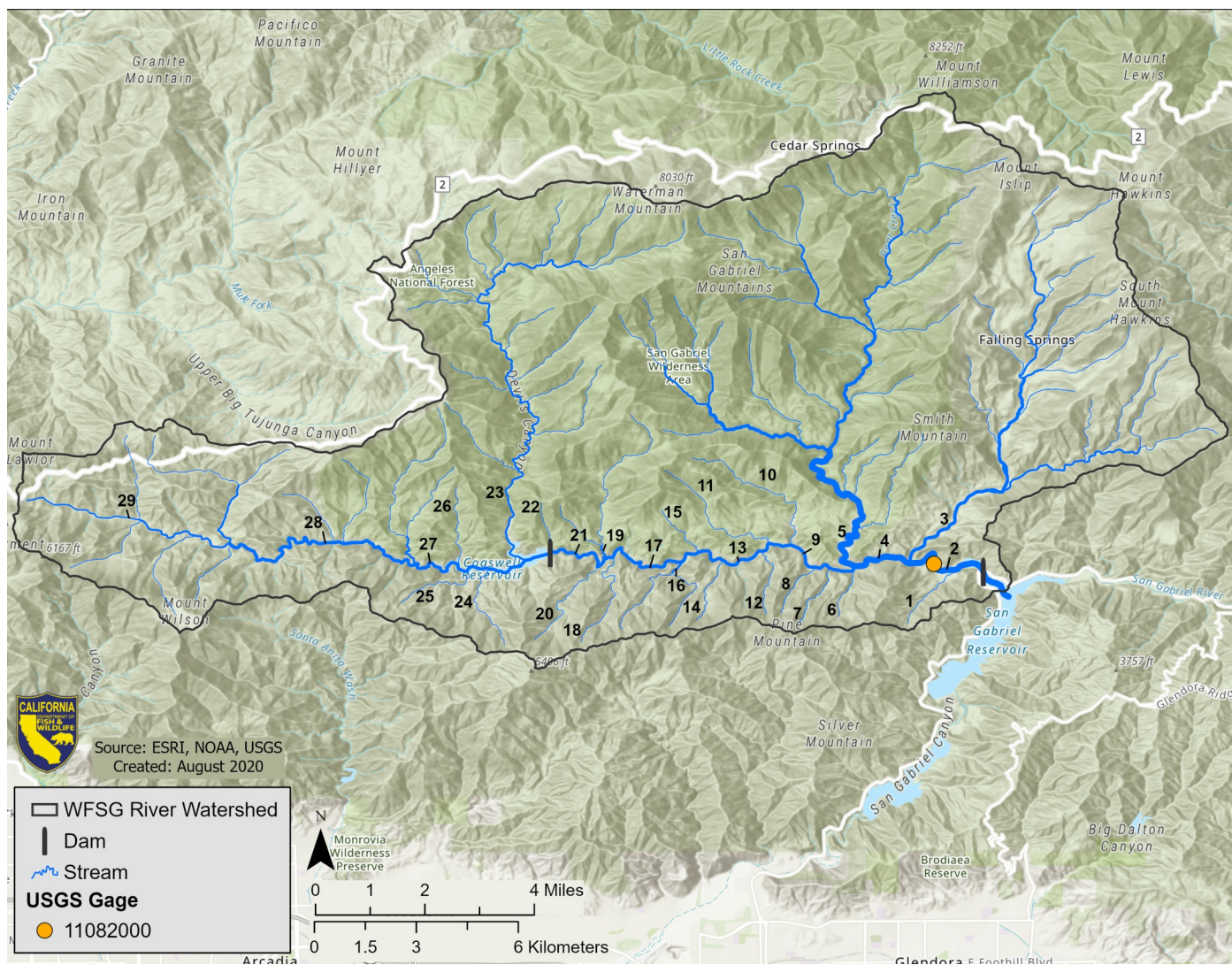


Figure 2. WF San Gabriel River watershed map.

- | | | |
|---------------------------|----------------------------|----------------------------|
| 1) Tributary 1 | 11) Tributary 6 | 21) WF San Gabriel River 6 |
| 2) WF San Gabriel River 1 | 12) Tributary 7 | 22) Tributary 14 |
| 3) NF San Gabriel River | 13) WF San Gabriel River 4 | 23) Tributary 15 |
| 4) WF San Gabriel River 2 | 14) Tributary 8 | 24) Tributary 16 |
| 5) Bear Creek | 15) Tributary 9 | 25) Tributary 17 |
| 6) Tributary 2 | 16) Tributary 10 | 26) Tributary 18 |
| 7) Tributary 3 | 17) WF San Gabriel River 5 | 27) WF San Gabriel River 7 |
| 8) Tributary 4 | 18) Tributary 11 | 28) WF San Gabriel River 8 |
| 9) WF San Gabriel River 3 | 19) Tributary 12 | 29) WF San Gabriel River 9 |
| 10) Tributary 5 | 20) Tributary 13 | |

The summaries in Figure 3 provide an overview of analyses presented in this Watershed Criteria Report. For more details on each analysis see the Overview, which can be found through the Instream Flow Program’s Watershed Criteria webpage (CDFW 2021).

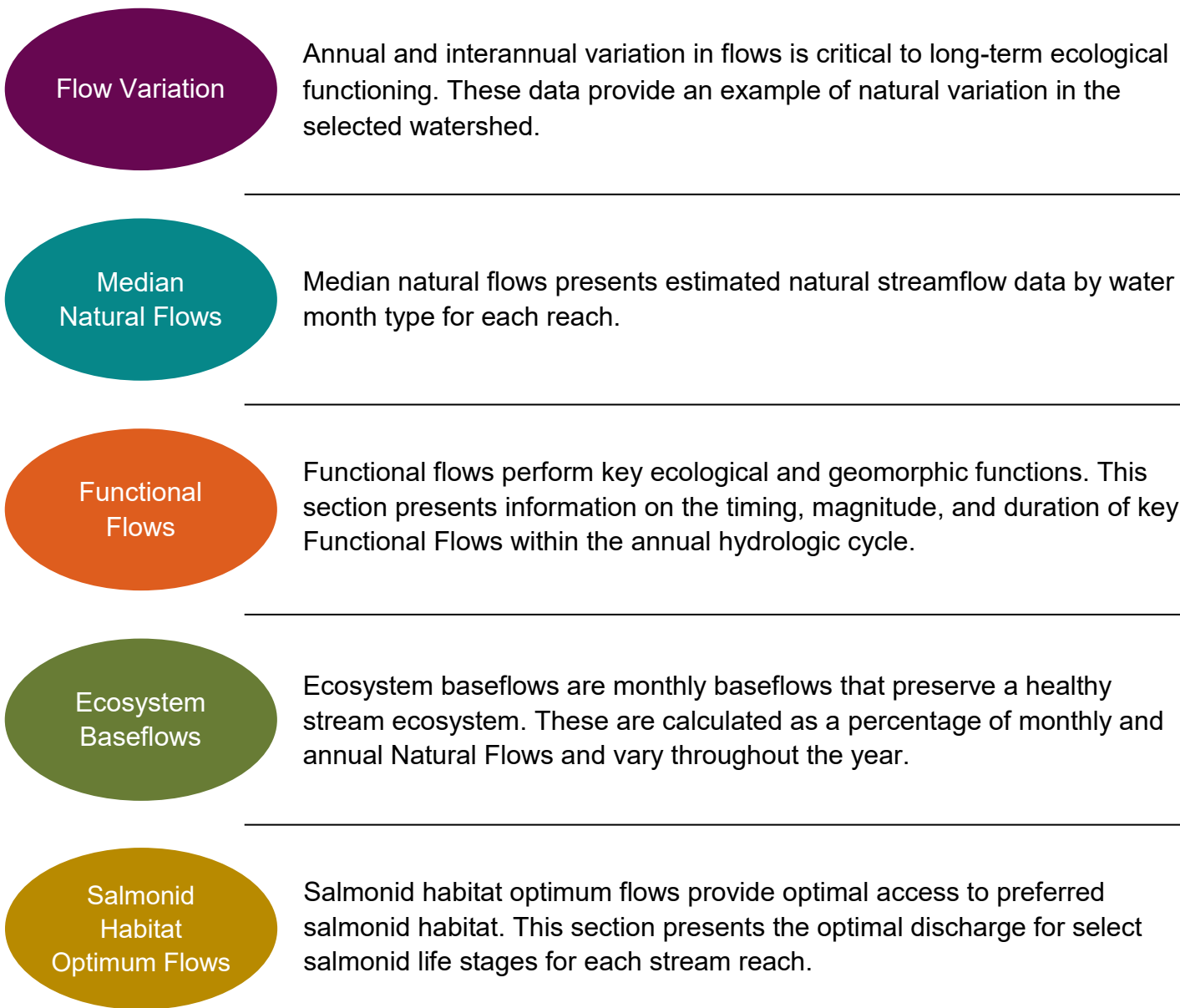


Figure 3. Watershed Criteria Analysis Key.

Flow Variation

Flows in the WF San Gabriel River watershed are variable throughout the year and from year to year. The gage presented below (Figure 4) was selected because it is the least-impaired gage with the longest period of record in the WF San Gabriel River watershed. The y-axis has been truncated; maximum daily flows exceeded 12,000 cfs three times in 1969.

Precipitation variability in the WF San Gabriel River watershed is anticipated to increase and lead to more extreme fluctuations from drought to flooding as climate change impacts intensify (Hall et al. 2018). These shifts, combined with ongoing surface water extractions, may result in higher stress to ecosystems and reduced water availability. Understanding natural variability and projected future changes to flow patterns can help water users and managers create a flow regime and plan for changes in water availability.

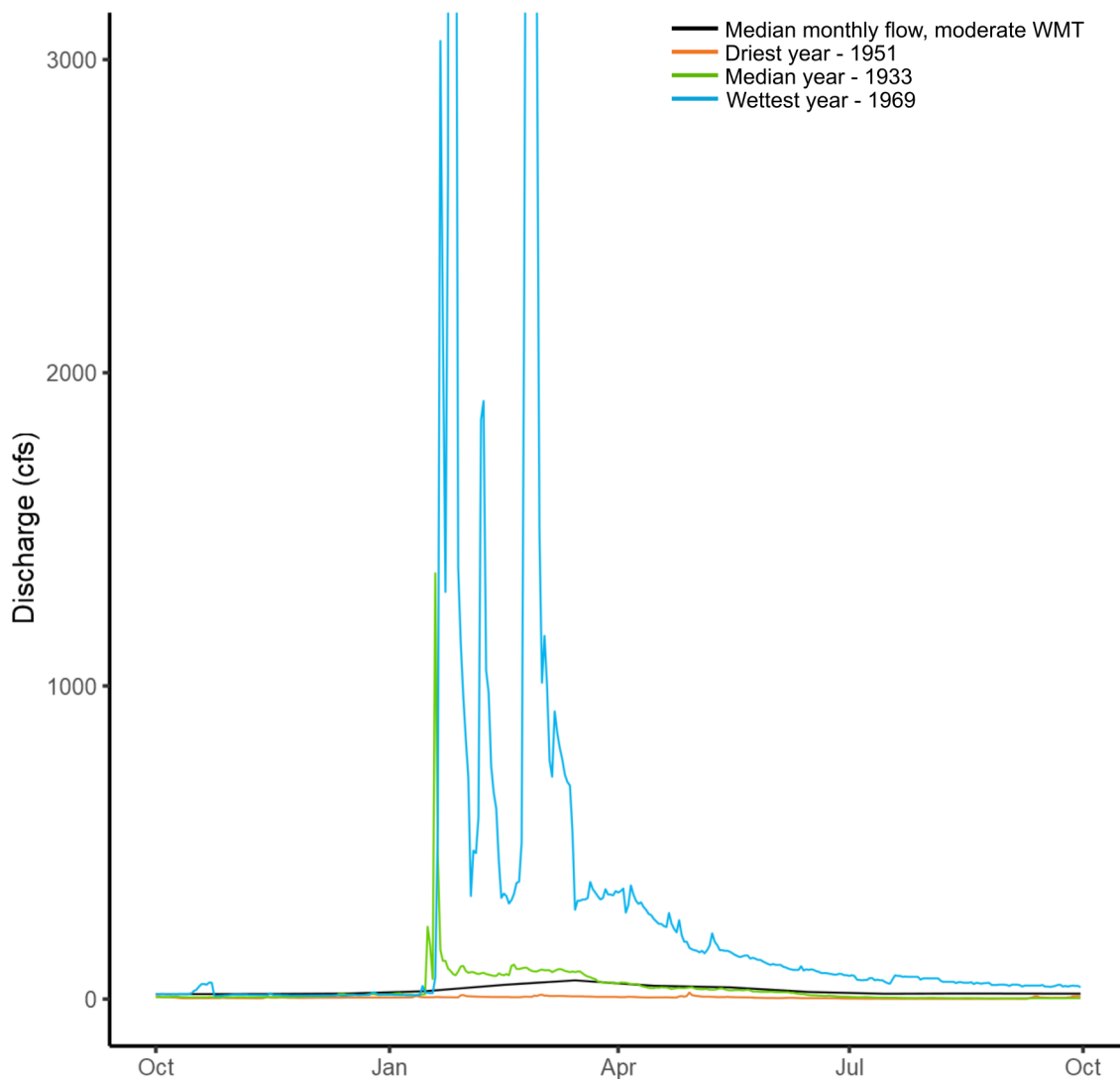


Figure 4. Variation in mean daily WF San Gabriel River flows at USGS gage 11082000 in extreme and median conditions (the driest, median, and wettest year) between 1928 and 1978 (USGS 2020). Median monthly flow for a moderate water month type (WMT) is also included.

Median Natural Flows

Natural Flows are the streamflows (in cfs) that would be expected with no human influence (data from Zimmerman et al. 2020). Table 1 presents monthly median natural flows by month for wet, moderate, and dry water month types for each WF San Gabriel River tributary and mainstem reach analyzed in this report. It also presents the drainage area in square miles (mi²). The numbers next to each stream name correspond to the numbers found on the WF San Gabriel River watershed map (Figure 2).

Table 1. Median natural flows.

1) Tributary 1 0.9 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	2	2	1	1	1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

2) WF San Gabriel River 1 103.7 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	97	188	306	181	115	69	50	44	38	33	32	53
Moderate	25	45	60	42	37	23	17	18	17	16	16	18
Dry	15	18	18	17	15	11	9	8	8	7	9	9

3) NF San Gabriel River 18.8 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	21	42	52	36	30	18	10	8	6	6	6	9
Moderate	5	9	11	9	9	5	4	3	3	3	3	4
Dry	3	4	4	4	3	2	2	1	1	2	2	2

4) WF San Gabriel River 2 102.5 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	77	159	248	148	90	55	39	32	28	22	24	42
Moderate	20	37	51	37	28	19	13	13	14	12	13	14
Dry	12	14	15	13	11	8	7	7	7	6	8	8

5) Bear Creek 28.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	30	62	84	58	48	31	18	13	10	9	10	14
Moderate	7	13	18	15	14	9	7	5	5	5	5	6
Dry	4	6	6	6	5	4	3	2	2	2	3	3

6) Tributary 2 0.7 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	1	1	1	1	1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

7) Tributary 3 0.3 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

8) Tributary 4 0.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	<1	1	1	1	1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

9) WF San Gabriel River 3 53.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	47	105	155	92	52	31	21	16	15	12	15	25
Moderate	11	22	32	21	16	12	8	6	7	7	8	9
Dry	6	8	9	8	6	5	4	4	4	4	5	5

10) Tributary 5 1.8 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	3	4	2	2	1	1	<1	<1	<1	<1	1
Moderate	<1	1	1	1	1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

11) Tributary 6 1.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	3	3	2	1	1	1	<1	<1	<1	<1	<1
Moderate	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

12) Tributary 7 0.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	<1	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

13) WF San Gabriel River 4 49.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	44	97	143	87	46	27	19	16	14	11	14	23
Moderate	11	20	29	20	15	11	7	6	7	6	7	8
Dry	6	8	8	7	6	5	4	4	4	4	4	5

14) Tributary 8 0.6 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	1	1	1	1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

15) Tributary 9 0.5 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	<1	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

16) Tributary 10 1.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	3	3	2	1	1	1	<1	<1	<1	<1	1
Moderate	<1	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

17) WF San Gabriel River 5 46.0 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	42	91	135	84	44	26	18	15	14	11	13	24
Moderate	10	19	28	20	14	11	7	6	6	6	7	8
Dry	6	8	8	7	6	5	4	3	4	3	4	5

18) Tributary 11 0.7 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	2	2	1	1	1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

19) Tributary 12 3.0 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	6	9	5	4	2	2	1	1	1	1	1
Moderate	1	1	2	1	1	1	1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

20) Tributary 13 1.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	3	4	2	1	1	1	<1	<1	<1	<1	1
Moderate	<1	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

21) WF San Gabriel River 6 41.2 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	37	81	119	79	38	23	16	13	11	9	10	20
Moderate	10	17	24	19	12	10	6	5	5	5	6	8
Dry	5	6	6	6	5	4	3	2	3	3	3	5

22) Tributary 14 0.3 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

23) Tributary 15 17.0 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	19	39	55	46	30	19	11	8	6	5	5	11
Moderate	6	9	13	11	8	6	4	3	3	3	3	4
Dry	3	4	4	4	3	3	2	2	2	2	2	2

24) Tributary 16 0.9 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	2	3	2	1	1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

25) Tributary 17 1.0 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	2	3	2	1	1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

26) Tributary 18 0.8 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	2	3	1	1	<1	<1	<1	<1	<1	<1	<1
Moderate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

27) WF San Gabriel River 7 18.0 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	19	41	58	34	15	9	6	4	4	3	4	9
Moderate	4	7	10	7	4	3	2	1	2	1	2	3
Dry	2	3	2	2	2	1	1	1	1	1	1	2

28) WF San Gabriel River 8 12.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	13	30	41	23	10	6	4	3	3	2	3	6
Moderate	3	5	7	5	3	2	1	1	1	1	2	2
Dry	2	2	2	1	1	1	1	1	1	<1	1	1

29) WF San Gabriel River 9 3.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	5	7	4	2	1	1	1	1	<1	<1	1
Moderate	1	1	1	1	1	<1	<1	<1	<1	<1	<1	<1
Dry	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1



West Fork San Gabriel River

WEST FORK SAN GABRIEL RIVER WATERSHED, LOS ANGELES COUNTY

Functional Flows

This section presents examples illustrating functional flows in the WF San Gabriel River watershed (data from Lane et al. 2020 and California Environmental Flows Working Group 2020). Flow metrics for the lower WF San Gabriel River are based on observed flows at USGS gage 11082000. Flow metrics for the middle WF San Gabriel River are based on modeled functional flows for WF San Gabriel River 6, the reach directly downstream of Cogswell Dam. Functional flow timing throughout the watershed is likely consistent, but magnitudes differ (Rodríguez-Iturbe and Valdés 1979). Figure 5 and Table 2 are representative of the lower mainstem WF San Gabriel River and its tributaries, Table 3 is representative of the middle WF San Gabriel River and its tributaries, and include functional flows for three water year types (wet, moderate, dry).



West Fork San Gabriel River

WEST FORK SAN GABRIEL RIVER WATERSHED, LOS ANGELES COUNTY

In Figure 5, the darkest colored boxes indicate the start timing and magnitude in 50% of years (25th–75th percentile values) for each functional flow component. The medium-colored boxes represent start timing and magnitude in 80% of years (10th–90th percentile). The light-blue and light-yellow boxes link wet season start and dry season start to the next functional flow “season.” The arrow indicates the spring recession rate. Table 2 presents median start timing and magnitude along with additional metrics for each component (with 10th–90th percentile values in parentheses).

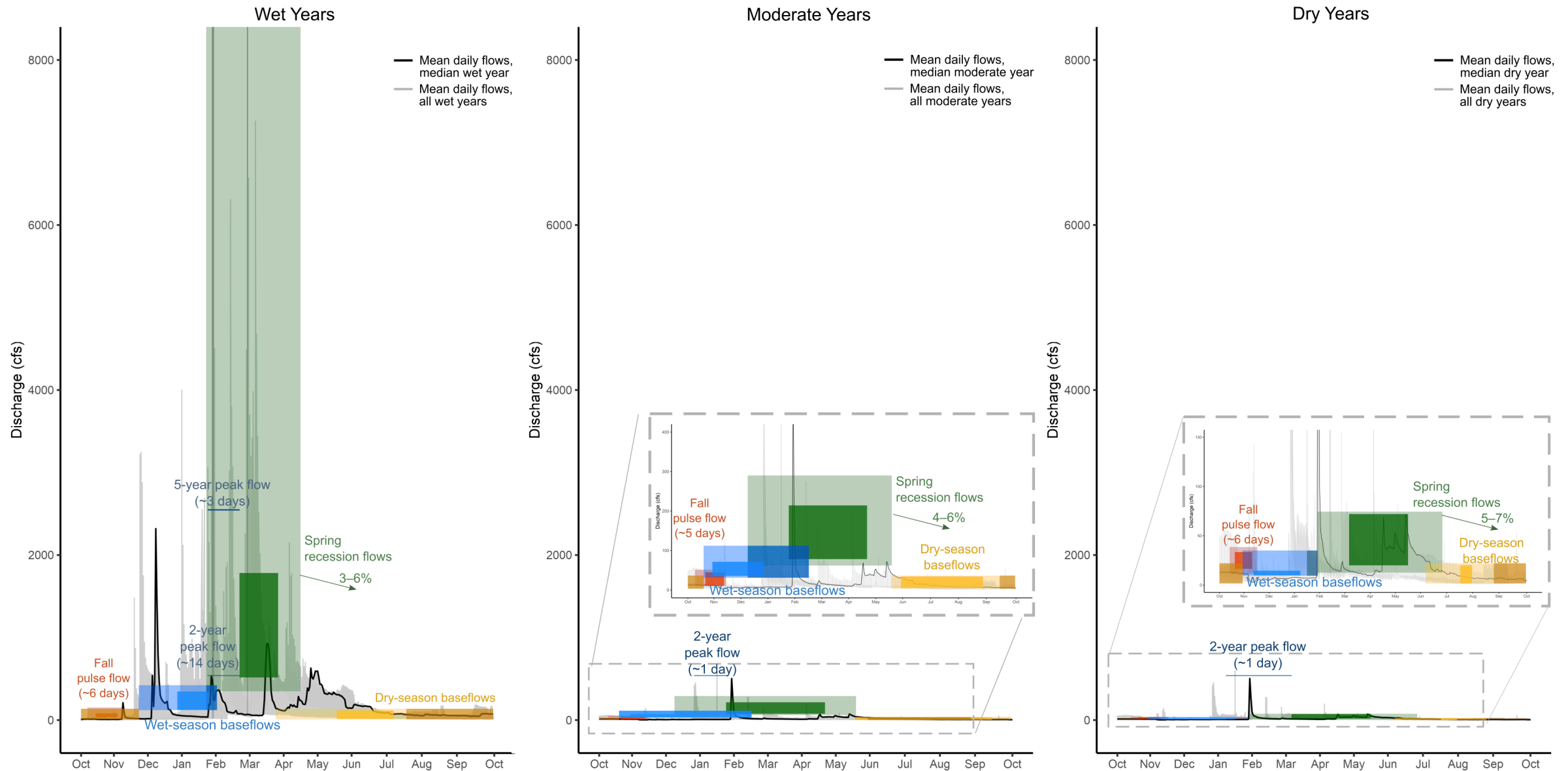


Figure 5. Timing and magnitude of WF San Gabriel River functional flows by water year type (from left to right, wet, moderate, dry years), based on water years 1951–1978 at the USGS gage 11082000, on the WF San Gabriel River at Rincon.

Table 2. WF San Gabriel River observed functional flow metric median values, 10th–90th percentile in parentheses. Results are based on observed flows at USGS gage 11082000, on the WF San Gabriel River at Rincon, and are provided by water year type (wet, moderate, dry).

Metric	Wet Years	Moderate Years	Dry Years
Fall pulse flow magnitude (cfs)	47, (24–152)	26, (10–52)	25, (11–39)
Fall pulse flow duration (total days per year, when present)	6, (3–8)	5, (3–7)	6, (4–8)
Fall pulse flow start timing	Oct 18, (Oct 6–Nov 7)	Nov 2, (Oct 8–Nov 12)	Oct 29, (Oct 13–Nov 14)
Wet-season baseflow magnitude (cfs)	39, (18–79)	18, (9–27)	8, (6–10)
Median wet-season flow magnitude (cfs)	189, (121–421)	48, (31–112)	12, (10–35)
Wet-season duration (days)	62, (20–103)	63, (27–114)	108, (55–186)
Wet-season start timing	Jan 4, (Nov 21–Jan 29)	Nov 5, (Oct 18–Feb 12)	Dec 12, (Oct 28–Jan 13)
2-year peak flow magnitude (cfs)	536	536	536
2-year peak flow duration (total days per year, when present)	14, (3–42)	1, (1–2)	1
2-year peak flow frequency (events per year, when present)	3, (1–6)	1	1
5-year peak flow magnitude (cfs)	2,542	–	–
5-year peak flow duration (total days per year, when present)	3, (2–9)	–	–
5-year peak flow frequency (events per year, when present)	2, (1–2)	–	–
Spring recession flow magnitude (cfs)	819, (351–8,688)	124, (62–290)	44, (13–74)
Spring recession flow duration (days)	88, (30–147)	120, (33–204)	76, (59–139)
Spring recession flow start timing	Feb 28, (Jan 19–Apr 12)	Mar 1, (Dec 6–May 15)	May 4, (Jan 25–Jun 22)
Spring recession flow rate of change (%)	4, (3–6)	5, (4–6)	6, (5–7)
Dry-season baseflow magnitude (cfs)	35, (21–68)	16, (6–18)	6, (3–11)
Dry-season duration (days)	263, (173–288)	287, (227–348)	293, (246–327)
Dry-season start timing	Jun 20, (Mar 22–Jul 15)	Jul 14, (May 15–Sep 12)	Jul 20, (Jun 3–Aug 23)

Table 3. WF San Gabriel River modeled functional flow metric median values, 10th–90th percentile in parentheses. Results are based on modeled functional flows for the reach directly downstream of Cogswell Dam, 21) WF San Gabriel River 6, and are provided by water year type (wet, moderate, dry).

Metric	Wet Years	Moderate Years	Dry Years
Fall pulse flow magnitude (cfs)	20, (5–109)	18, (5–66)	9, (2–36)
Fall pulse flow duration (total days per year, when present)	6, (3–8)*	5, (3–7)*	6, (4–8)*
Fall pulse flow start timing	Nov 3, (Oct 9–Nov 25)	Nov 9, (Oct 10–Nov 24)	Nov 11, (Oct 5–Dec 1)
Wet-season baseflow magnitude (cfs)	17, (6–36)	5, (1–14)	3, (1–8)
Median wet-season flow magnitude (cfs)	66, (28–145)	17, (7–39)	6, (2–14)
Wet-season duration (days)	81, (48–134)	86, (35–148)	99, (39–181)
Wet-season start timing	Jan 2, (Dec 7–Jan 19)	Jan 12, (Dec 6–Feb 2)	Dec 17, (Oct 31–Jan 23)
2-year peak flow magnitude (cfs)	210, (89–411)	210, (89–411)	210, (89–411)
2-year peak flow duration (total days per year, when present)	14, (3–42)*	1, (1–2)*	1*
2-year peak flow frequency (events per year, when present)	3, (1–6)*	1*	1*
5-year peak flow magnitude (cfs)	983, (445–1,963)	*	*
5-year peak flow duration (total days per year, when present)	3, (2–9)*	*	*
5-year peak flow frequency (events per year, when present)	2, (1–2)*	*	*
Spring recession flow magnitude (cfs)	344, (113–1223)	80, (28–277)	19, (6–57)
Spring recession flow duration (days)	86, (45–148)	87, (40–156)	96, (46–170)
Spring recession flow start timing	Mar 14, (Feb 24–Apr 17)	Mar 29, (Feb 27–Apr 25)	Mar 20, (Feb 17–May 24)
Spring recession flow rate of change (%)	4, (3–6)*	5, (4–6)*	6, (5–7)*
Dry-season baseflow magnitude (cfs)	9, (2–16)	4, (1–8)	2, (<1–5)
Dry-season baseflow start timing	Jun 20, (Apr 22–Aug 15)	Jul 1, (May 5–Aug 27)	Jul 17, (May 21–Sep 2)
Dry-season baseflow duration (days)	179, (101–248)	171, (97–234)	166, (97–225)

* indicates a metric with inferred ranges, where observed functional flow metric ranges from Table 2 were applied.

Ecosystem Baseflows

In wet water month types, median monthly discharge (MMD), derived using Natural Flows (data from Zimmerman et al. 2018), meets or exceeds ecosystem baseflows (Tessmann 1980) every month if the water year for most reaches in the WF San Gabriel River watershed.

For moderate month types, median natural flows may exceed ecosystem baseflows for approximately ten months of the water year (Figure 6).

This pattern is similar for most mainstem reaches in the WF San Gabriel River watershed.

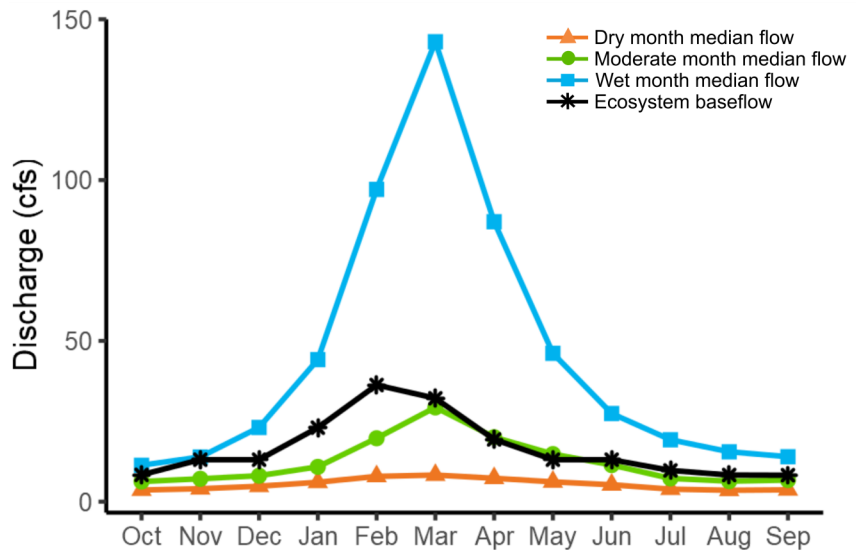


Figure 6. Ecosystem baseflows (WF San Gabriel River 3).



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Ecosystem baseflows and drainage area are provided in Table 4 for each WF San Gabriel River tributary and mainstem reach analyzed in this report. There is one ecosystem baseflow value (in cfs) per month, which applies across all years. The numbers next to each stream name correspond to the numbers found on the WF San Gabriel River watershed map (Figure 2).

Table 4. Ecosystem baseflows.

Stream	Drainage Area (mi ²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1) Tributary 1	0.9	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2) WF San Gabriel River 1	103.7	51	81	69	42	29	29	24	22	23	24	29	29
3) NF San Gabriel River	18.8	11	15	13	9	6	6	5	4	4	4	6	6
4) WF San Gabriel River 2	102.5	40	64	55	34	23	23	19	16	17	16	23	23
5) Bear Creek	28.2	15	23	20	13	10	9	9	7	6	6	9	9
6) Tributary 2	0.7	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
7) Tributary 3	0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
8) Tributary 4	0.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
9) WF San Gabriel River 3	53.2	25	39	34	20	14	14	11	9	9	9	14	14
10) Tributary 5	1.8	1	2	1	1	<1	<1	<1	<1	<1	<1	<1	<1
11) Tributary 6	1.4	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
12) Tributary 7	0.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
13) WF San Gabriel River 4	49.2	23	36	32	19	13	13	10	8	8	8	13	13
14) Tributary 8	0.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
15) Tributary 9	0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
16) Tributary 10	1.2	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
17) WF San Gabriel River 5	46.0	22	34	30	19	12	12	9	8	8	8	12	12

Table 4. Ecosystem baseflows (continued).

Stream	Drainage Area (mi ²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
18) Tributary 11	0.7	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
19) Tributary 12	3.0	1	2	2	1	1	1	1	1	1	1	1	1
20) Tributary 13	1.2	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
21) WF San Gabriel River 6	41.2	19	30	27	17	11	11	8	7	6	7	11	11
22) Tributary 14	0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
23) Tributary 15	17.0	10	14	13	10	6	6	6	5	4	4	6	6
24) Tributary 16	0.9	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
25) Tributary 17	1.0	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
26) Tributary 18	0.8	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
27) WF San Gabriel River 7	18.0	11	15	12	7	5	5	3	3	2	2	5	5
28) WF San Gabriel River 8	12.4	8	11	8	5	4	3	2	2	2	1	4	4
29) WF San Gabriel River 9	3.4	1	2	1	1	1	1	<1	<1	<1	<1	1	1



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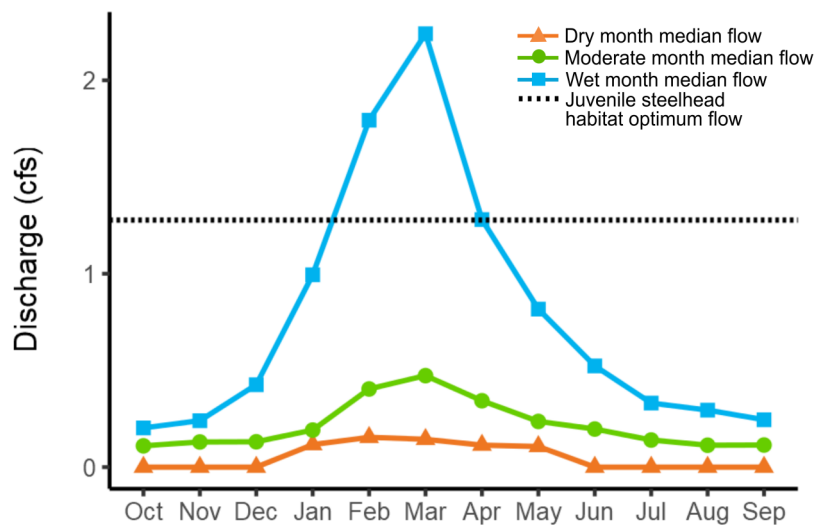
Salmonid Habitat Optimum Flows By Monthly Duration



Figure 7 displays flows that maximize usable habitat for juvenile steelhead (Hatfield and Bruce 2000) along with median natural flows (data from Zimmerman et al. 2020). The information is sorted by drainage size category (i.e., small streams and the mainstem WF San Gabriel River and major tributaries). In drainages with altered flow, the period of flow below the juvenile steelhead habitat optimum flows (i.e., steelhead optimum flows) may have a longer or shorter duration than shown here.

Small Streams: 0.3–3.4 mi²

Natural Flows for a wet water month type are typically above the Optimum flow for **1–4 months** of the year.



WF San Gabriel River and Major Tributaries: 12.4–103.7 mi²

Natural Flows for a wet water month type are typically above the Optimum flow for **5–12 months** of the year.

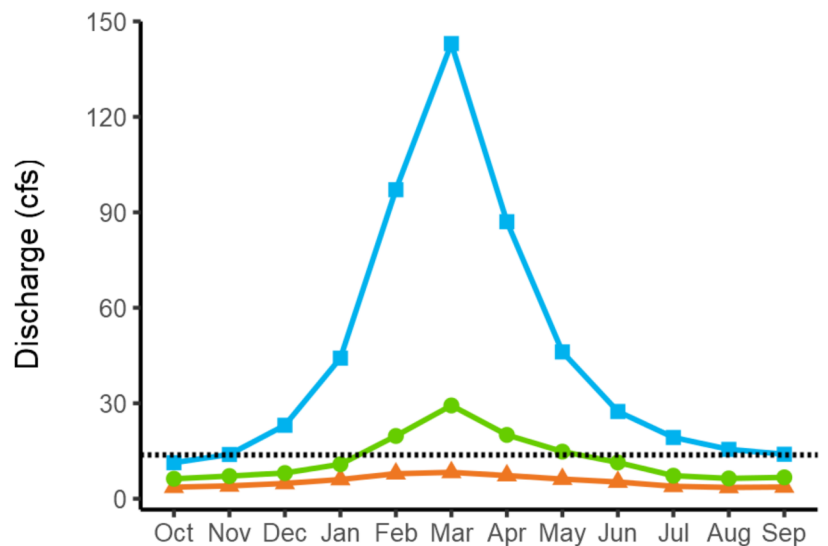


Figure 7. Juvenile steelhead optimum flows.

Salmonid Habitat Optimum Flows By Drainage Area



Generally, the surface flow required to meet the steelhead optimum flows increases as the drainage area increases. Table 4 groups and presents optimum flows by stream size (small streams and the mainstem WF San Gabriel River and major tributaries). The numbers next to each stream name correspond to the numbers found on the WF San Gabriel River watershed map (Figure 2).

Table 5. Juvenile steelhead optimum flows (by drainage area).

Small Streams

Stream	Drainage Area (mi ²)	Juvenile Steelhead Optimum Flows (cfs)
7) Tributary 3	0.3	1
22) Tributary 14	0.3	1
8) Tributary 4	0.4	1
12) Tributary 7	0.4	1
15) Tributary 9	0.5	1
14) Tributary 8	0.6	1
6) Tributary 2	0.7	1
18) Tributary 11	0.7	1
26) Tributary 18	0.8	1
1) Tributary 1	0.9	1
24) Tributary 16	0.9	1
25) Tributary 17	1.0	1
16) Tributary 10	1.2	2
20) Tributary 13	1.2	2
11) Tributary 6	1.4	2
10) Tributary 5	1.8	2
19) Tributary 12	3.0	3
29) WF San Gabriel River 9	3.4	2

WF San Gabriel River and Major Tributaries

Stream	Drainage Area (mi ²)	Juvenile Steelhead Optimum Flows (cfs)
28) WF San Gabriel River 8	12.4	6
23) Tributary 15	17.0	9
27) WF San Gabriel River 7	18.0	8
3) NF San Gabriel River	18.8	9
5) Bear Creek	28.2	11
21) WF San Gabriel River 6	40.0	12
17) WF San Gabriel River 5	45.9	13
13) WF San Gabriel River 4	49.2	14
9) WF San Gabriel River 3	53.2	14
4) WF San Gabriel River 2	83.6	19
2) WF San Gabriel River 1	103.7	22



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All photos in this document were taken by Department Staff. Cover photos from left to right are the WF San Gabriel River, Cogswell Reservoir, and the WF San Gabriel River (all in the WF San Gabriel River watershed, Los Angeles County).



Appendix A

Reach Definition

Table A-1 presents each reach analyzed in this report with the associated NHDPlus COMIDs. The stream reaches were delineated using NHDPlus Version 2 medium resolution mapping (USEPA and USGS 2012). The COMIDs were used to identify and download natural flow estimates for each selected reach.

Table A-1. Reach delineation.

Stream	COMID
1) Tributary 1	22522891
2) WF San Gabriel River 1	22524649
3) NF San Gabriel River	22524631
4) WF San Gabriel River 2	22522827
5) Bear Creek	22524629
6) Tributary 2	22522873
7) Tributary 3	22522887
8) Tributary 4	22522867
9) WF San Gabriel River 3	22522829
10) Tributary 5	22524627
11) Tributary 6	22524625
12) Tributary 7	22522869
13) WF San Gabriel River 4	22522819
14) Tributary 8	22522877
15) Tributary 9	22524623
16) Tributary 10	22522835
17) WF San Gabriel River 5	22522825
18) Tributary 11	22522903
19) Tributary 12	22522809
20) Tributary 13	22522901
21) WF San Gabriel River 6	22524651
22) Tributary 14	22524863
23) Tributary 15	22524617
24) Tributary 16	22522859
25) Tributary 17	22522847
26) Tributary 18	22524615
27) WF San Gabriel River 7	22522823
28) WF San Gabriel River 8	22520983
29) WF San Gabriel River 9	22520971