Instream Flow Regime Criteria on a Watershed Scale



VENTURA RIVER

March 2020

Version 2, updated May 2020

Watershed Criteria Report No. 2020-01

California Department of Fish and Wildlife

Instream Flow Program

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Water Branch
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Version 2

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Introduction

This *Instream Flow Regime Criteria on a Watershed Scale* report (Watershed Criteria Report) provides instream flow regime criteria for the Ventura River watershed. Its intended audience includes agencies, water managers, non-governmental organizations, and the public.

The Ventura River was identified as a priority stream in the California Water Action Plan (CWAP; CNRA et al. 2016). Accordingly, the California Department of Fish and Wildlife (Department) initiated studies in the lower Ventura River and San Antonio Creek, as described in the *Habitat and Instream Flow Evaluation for Steelhead in the Ventura River Study Plan* (CDFW 2017a) and its Addendum (CDFW 2017b). This Watershed Criteria Report presents a portion of the results from these studies. Two additional reports provide site-specific information for San Antonio Creek and the intermittent reach of the mainstem Ventura River:

- Instream Flow Evaluation: Southern California Coastal Steelhead Passage in Ventura River, Ventura County (CDFW in prep a); and
- Instream flow evaluation: Steelhead adult spawning and juvenile rearing in San Antonio Creek, Ventura County (CDFW in prep b).

This Watershed Criteria Report presents stream assessments for 16 reaches and includes 18 site-specific field surveys. 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 2020a). 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 on the Department's Instream Flow Program webpage (CDFW 2020b).

Two appendices contain additional supporting information. Appendix A provides supplemental analysis based on a synthetic, least-impaired USGS gage in the Lower Ventura. Appendix B (CDFW 2020c) is available as a separate document and provides additional information about field data collection.

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, establish legal compliance, or ensure project success.

Ventura River Watershed

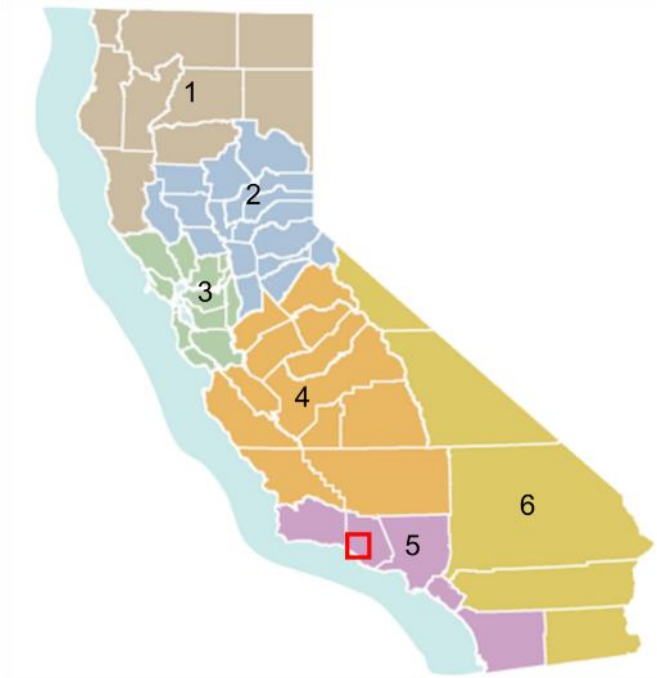


Figure 1. Map of the Department's Regions.

- Located in the Department's Region 5
- Spans Ventura and Santa Barbara counties
- 225.6 square mile (mi^2) drainage area
- Supports Southern California Steelhead Distinct Population Segment

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

In this map (Figure 2), yellow indicates the present-day steelhead range, black dashes are dams, and the checkered line is the Robles Diversion Canal. The orange shapes are United States Geological Survey (USGS) gages. Criteria were developed for each numbered reach.

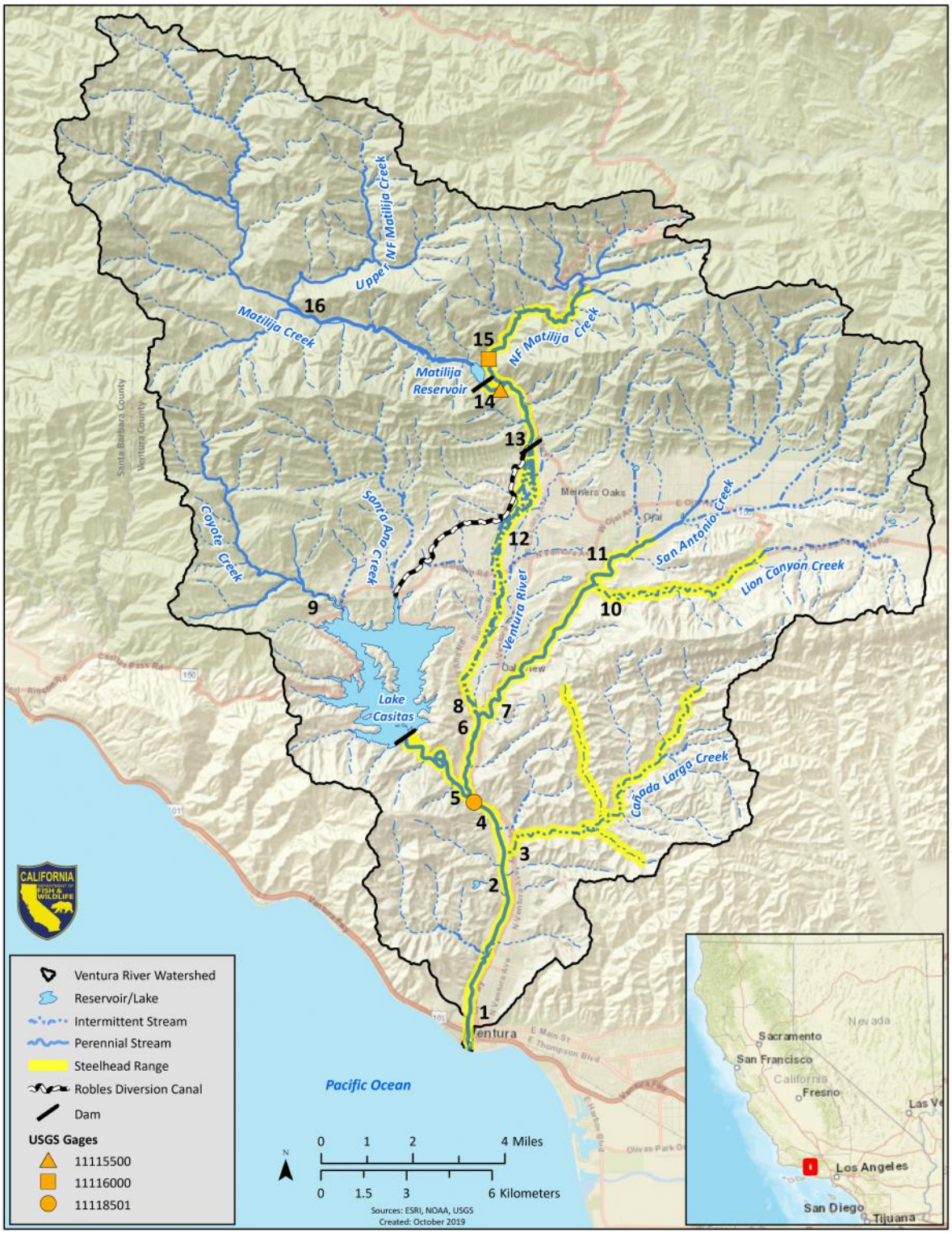


Figure 2. Ventura River watershed map.

1) Ventura River 1
2) Ventura River 2
3) Cañada Larga Creek
4) Ventura River 3
5) Coyote Creek 1
6) Ventura River 4
7) San Antonio Creek 1
8) Ventura River 5
9) Coyote Creek 2
10) Lion Canyon Creek
11) San Antonio Creek 2
12) Ventura River 6
13) Ventura River 7
14) Matilija Creek 1
15) NF Matilija Creek
16) Matilija Creek 2

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 on the Department's Instream Flow Program webpage (CDFW 2020b).

Figure 3. Watershed Criteria Analysis Key.

Flow Variation

Flows in the Ventura River watershed are variable throughout the year and from year to year. The hydrograph, in Figure 4, depicts the variation in mean daily flow at the USGS gage 11115500 on Matilija Creek in extreme and median conditions (the driest, median, and wettest year) between 1928 and 1988 (USGS 2019). Median monthly flow for a moderate water month type (WMT) is also included. This gage was selected because it represents a medium-size drainage and has a long period of record. The y-axis has been truncated; the maximum daily flow in 1941 was 3,480 cubic feet per second (cfs).

Precipitation variability in the Ventura River watershed is anticipated to increase and lead to more extreme fluctuations from drought to flooding as climate change impacts intensify (Langridge 2018). These shifts, combined with ongoing surface water and groundwater 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.

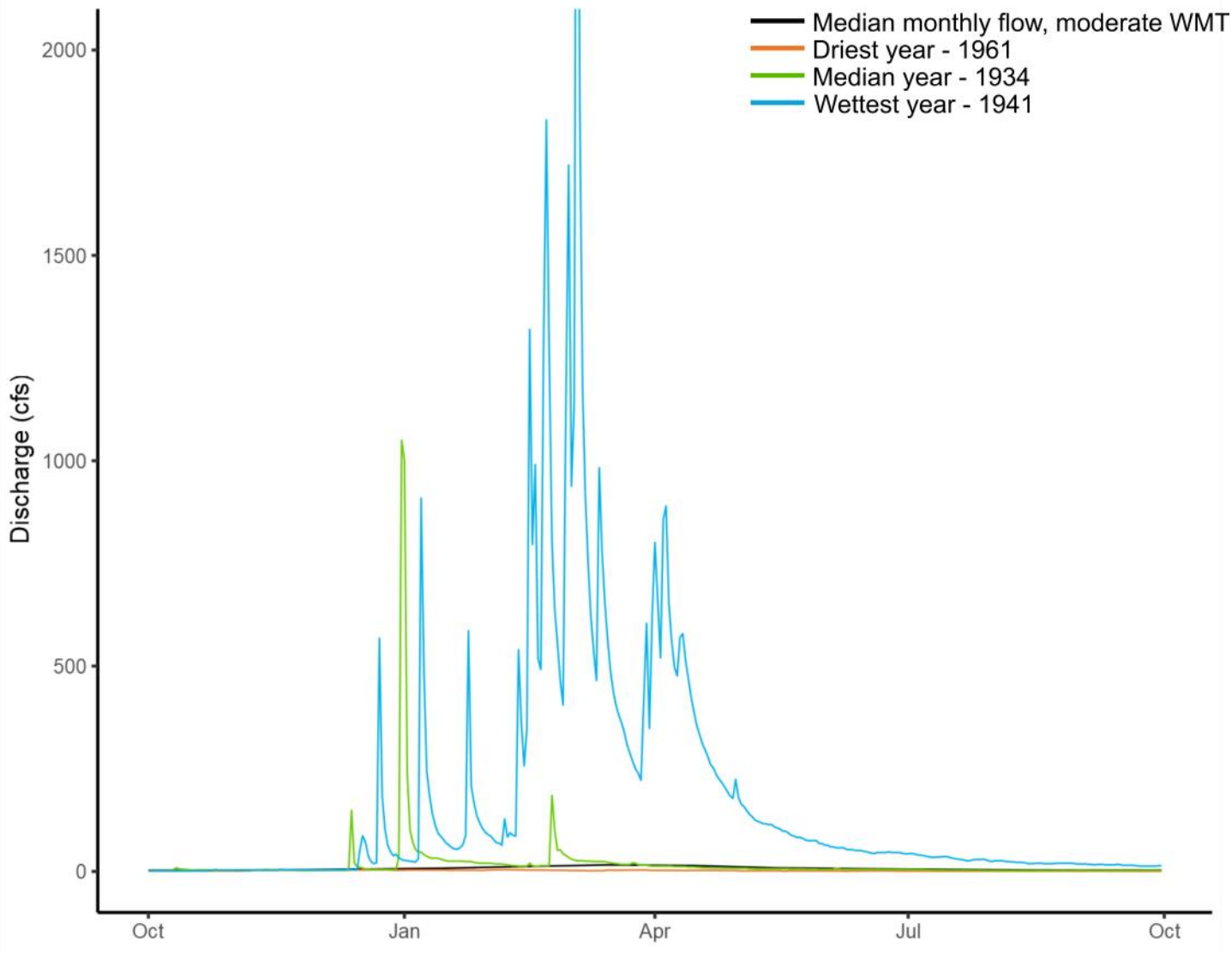


Figure 4. Variation in the Matilija Creek hydrograph (1928 –1988).

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 median monthly Natural Flows by month for wet, moderate, and dry water month types for each Ventura River tributary and mainstem reach analyzed in this report. It also presents the drainage area in square miles (mi^2). The numbers next to each stream name correspond to the numbers found on the Ventura River watershed map (Figure 2).

Table 1. Natural Flows.

1) Ventura River 1 225.6 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	97	323	335	166	74	29	10	5	5	5	8	24
	Moderate	19	42	41	30	16	7	2	2	2	2	7	13
	Dry	11	16	14	8	4	2	1	1	1	1	3	7

2) Ventura River 2 214.3 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	103	315	338	166	71	29	10	5	5	5	8	24
	Moderate	18	42	39	29	15	6	2	1	2	2	7	13
	Dry	12	16	13	8	4	2	1	1	1	1	3	7

3) Cañada Larga Creek 19.3 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	5	16	15	9	4	2	1	<1	<1	<1	<1	1
	Moderate	1	3	3	2	1	<1	<1	<1	<1	<1	<1	1
	Dry	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	1

4) Ventura River 3 188.5 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	88	285	316	155	66	28	9	4	5	4	8	22
	Moderate	17	38	36	27	15	6	2	1	1	1	6	11
	Dry	11	15	11	7	4	2	1	1	1	1	3	7

5) Coyote Creek 1 43.5 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	16	49	52	27	11	5	2	1	1	1	1	3
	Moderate	3	8	6	5	3	1	<1	<1	<1	<1	1	2
	Dry	2	3	2	1	1	<1	<1	<1	<1	<1	1	1

6) Ventura River 4 141.6 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	72	218	268	143	57	24	9	4	4	4	6	20
	Moderate	13	30	31	23	12	5	2	1	1	1	5	8
	Dry	9	12	10	6	3	2	1	<1	1	1	2	5

7) San Antonio Creek 1 50.7 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flow (cfs)	Wet	22	63	75	38	15	6	2	1	1	1	2	6
	Moderate	5	10	10	7	4	1	<1	<1	<1	<1	2	3
	Dry	3	4	3	2	1	<1	<1	<1	<1	<1	1	2

8) Ventura River 5 90.0 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	51	150	179	104	41	18	7	4	3	3	4	13
	Moderate	9	18	18	17	8	4	1	1	1	1	3	5
	Dry	5	8	7	4	2	2	1	<1	1	1	2	3

9) Coyote Creek 2 13.1 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	6	21	25	11	5	2	1	1	1	1	1	2
	Moderate	1	2	2	2	1	1	<1	<1	<1	<1	<1	1
	Dry	1	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1

10) Lion Canyon Creek 12.8 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	8	27	23	10	4	2	1	<1	<1	<1	1	2
	Moderate	2	3	3	2	1	<1	<1	<1	<1	<1	<1	1
	Dry	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	1

11) San Antonio Creek 2 33.9 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	15	41	49	28	10	4	2	1	1	1	1	4
	Moderate	3	6	7	5	2	1	<1	<1	<1	<1	1	2
	Dry	2	3	2	1	1	<1	<1	<1	<1	<1	1	1

12) Ventura River 6 80.3 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	52	146	189	105	45	26	15	9	7	5	6	11
	Moderate	8	18	19	18	10	5	2	2	2	2	3	4
	Dry	4	7	6	4	3	2	1	1	1	1	1	2

13) Ventura River 7 74.0 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	50	149	187	107	44	26	16	9	7	5	6	10
	Moderate	8	18	18	18	10	6	2	2	2	2	3	4
	Dry	4	7	6	4	3	2	1	1	1	1	1	2

14) Matilija Creek 1 54.6 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	46	109	159	96	34	21	14	8	7	5	6	8
	Moderate	8	12	16	14	9	6	5	3	3	3	4	5
	Dry	5	5	5	4	3	3	2	2	2	1	2	4

15) NF Matilija Creek 16.1 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	9	25	39	18	10	6	4	4	3	3	2	3
	Moderate	3	4	5	4	3	2	1	1	1	1	2	2
	Dry	2	2	1	1	1	1	1	<1	1	1	1	1

16) Matilija Creek 2 44.7 mi^2

	Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Flows (cfs)	Wet	41	98	140	92	30	18	11	6	5	4	6	8
	Moderate	8	13	14	15	8	4	3	2	1	2	4	6
	Dry	4	5	5	4	2	2	1	1	1	1	2	3

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

Functional Flows

This section presents examples illustrating Functional Flow components in the Ventura River watershed (data from Lane et al. 2020). As a variation to the Overview, the Fall Pulse Flow is not included because it rarely occurs in this watershed. Figure 5 and Table 2 are representative of the mainstem Ventura River, while Figure 6 and Table 3 are representative of the tributaries.

In Figures 5 and 6, the darkest-colored boxes indicate the magnitude in 50% of years (25th–75th percentile values) and start timing in 50% of wet years for each Functional Flow component. The medium-colored boxes represent magnitude in 80% of years (10th–90th percentile) and start timing in 80% of wet years. Timing in moderate and dry years was not included as many of the components occur only in wet years. The light blue and light yellow boxes link wet season start and dry season start to the next functional flow "season." The smaller inset plots provide a closer look at low flows and include the spring recession rate. The tables present median start timing and magnitude along with additional metrics for each component (with 10th–90th percentile values in parentheses).

The metric values that define each Functional Flow component in Figure 5 and Table 2 are based on the period of record 1965–2007 at the USGS gage 11118501, on the lower Ventura River.

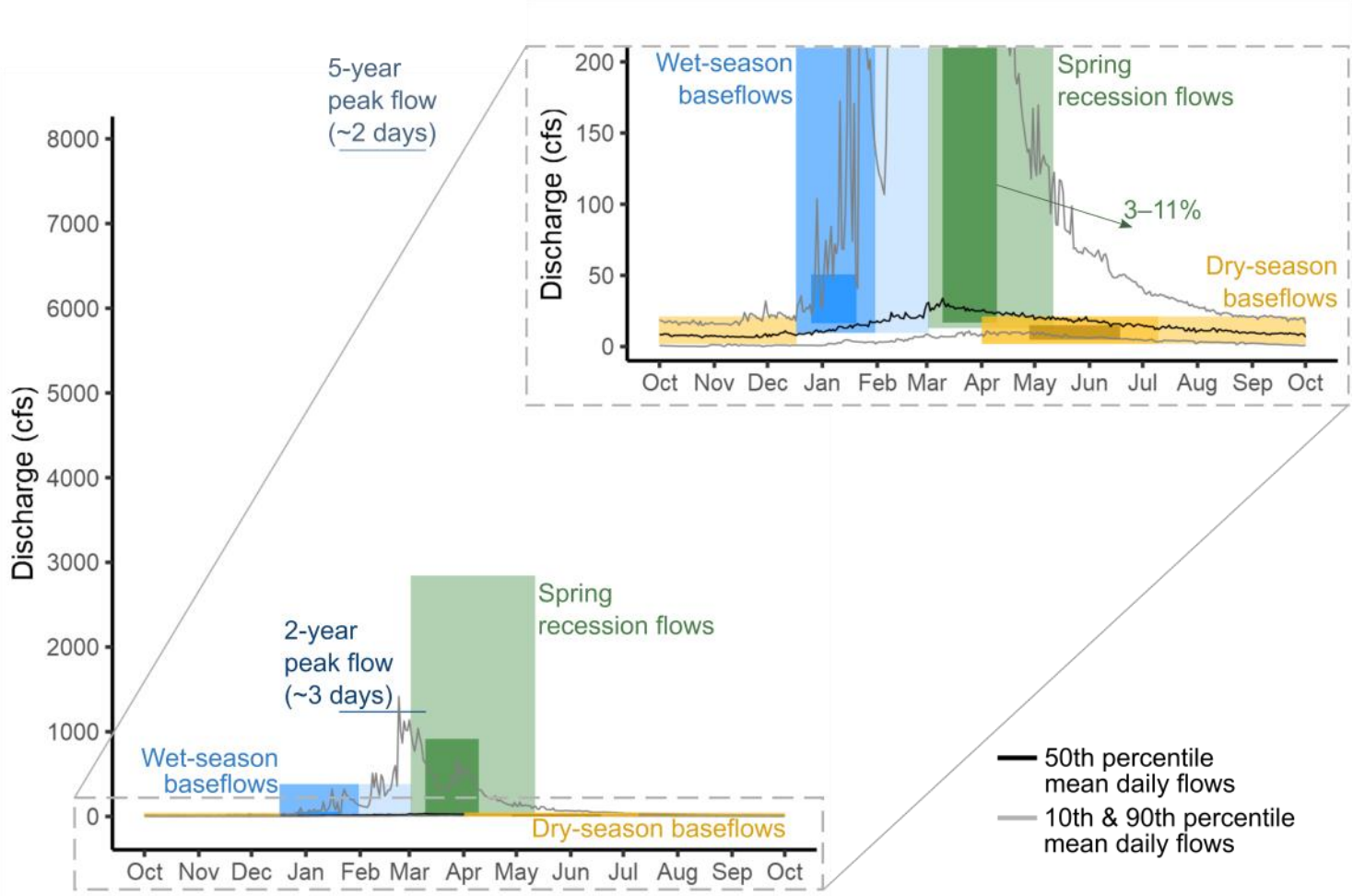


Figure 5. Timing and magnitude of lower Ventura River Functional Flows.

Table 2. Lower Ventura River Functional Flow metric median values (10th–90th percentile in parentheses).

Metric	**Start Timing** (in wet years)	**Duration** (total days per year, when present)	**Magnitude** (cfs)	**Frequency** (events per year, when present)	**Rate of Change** (percent per day)
Wet-season baseflows	Jan 10 (Dec 17–Jan 30)	-	23 (10–380)	-	-
2-year peak flow	-	3 (1–20)	1,230	2 (1–5)	-
5-year peak flow	-	2 (1–3)	7,860	2 (1–2)	-
10-year peak flow	-	1 (1–3)	16,320	1 (1–2)	-
Spring recession flows	Mar 28 (Mar 1–May 11)	79 (23–153)	36 (13–2,840)	-	6 (3–11)
Dry-season baseflows	Jun 2 (Apr 1–Jul 9)	156 (86–260)	8 (2–21)	-	-

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

Functional Flow metrics representative of Ventura River tributaries are presented in Figure 6 and Table 3. The metric values that define each Functional Flow component are based on the period of record 1929–1983 at the USGS gage 11116000 on North Fork (NF) Matilija Creek.

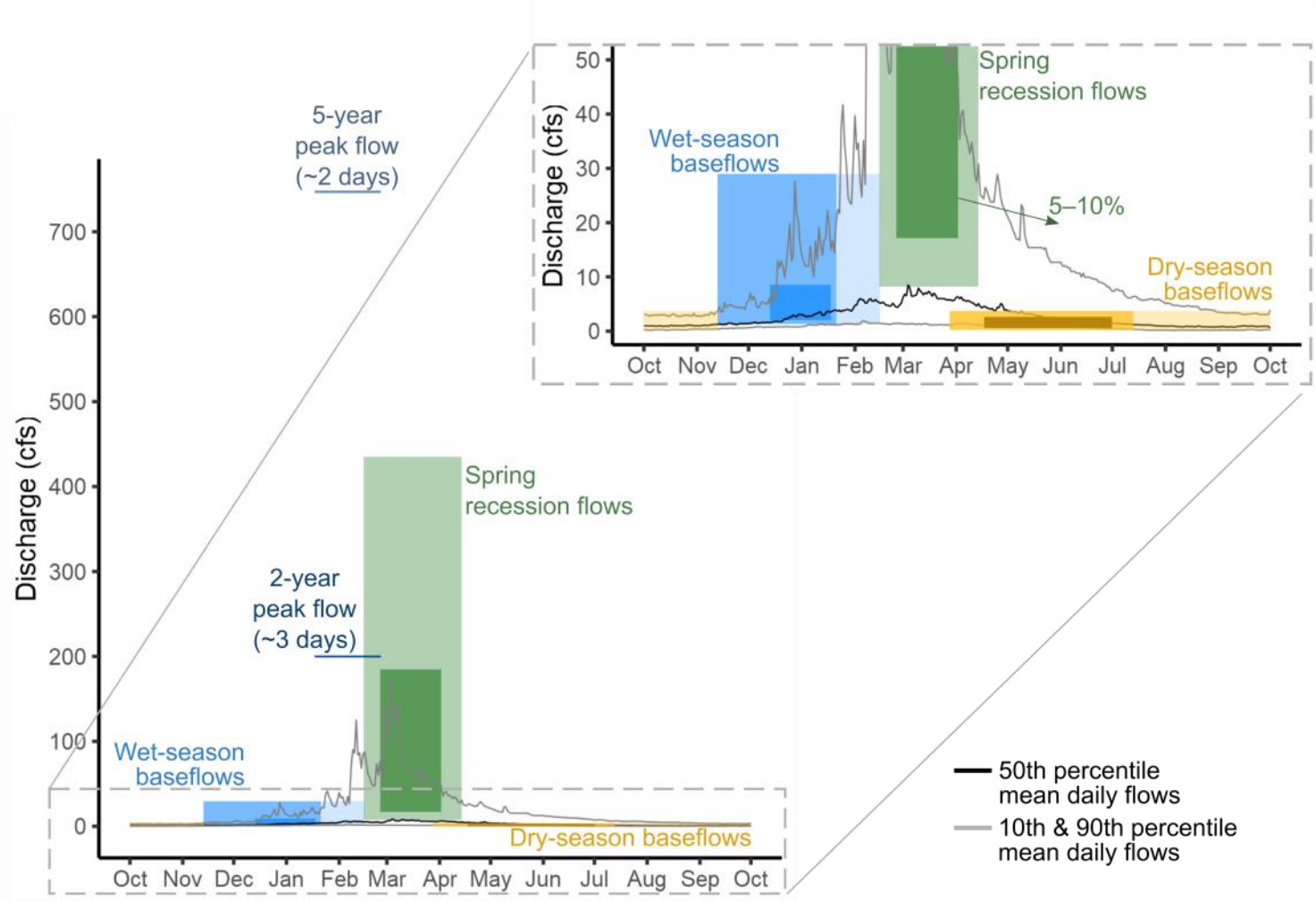


Figure 6. Timing and magnitude of NF Matilija Creek Functional Flows.

Table 3. NF Matilija Creek Functional Flow metric median values (10th–90th percentile in parentheses).

Metric	Start Timing (in wet years)	Duration (total days per year, when present)	Magnitude (cfs)	Frequency (events per year, when present)	Rate of Change (percent per day)
Wet-season baseflows	Jan 3 (Nov 13–Jan 21)	-	4 (1–29)	-	-
2-year peak flow	-	3 (1–11)	199	1 (1–4)	-
5-year peak flow	-	2 (1–3)	746	1 (1–2)	-
10-year peak flow	-	2 (1–4)	1,344	1 (1–3)	-
Spring recession flows	Mar 8 (Feb 15–Apr 13)	98 (41–166)	58 (8–434)	-	7 (5–10)
Dry-season baseflows	May 12 (Mar 28–Jul 12)	172 (115–266)	1 (0.3–4)	-	-

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

Ecosystem Baseflows

In wet water month types, median monthly discharge (MMD), derived using Natural Flows (data from Zimmerman et al. 2020), meets or exceeds Ecosystem Baseflows (Tessmann 1980) February through September.

For moderate month types, median Natural Flows are below Ecosystem Baseflows year-round (Figure 7). This pattern is similar for all sub-watersheds in the Ventura River watershed.

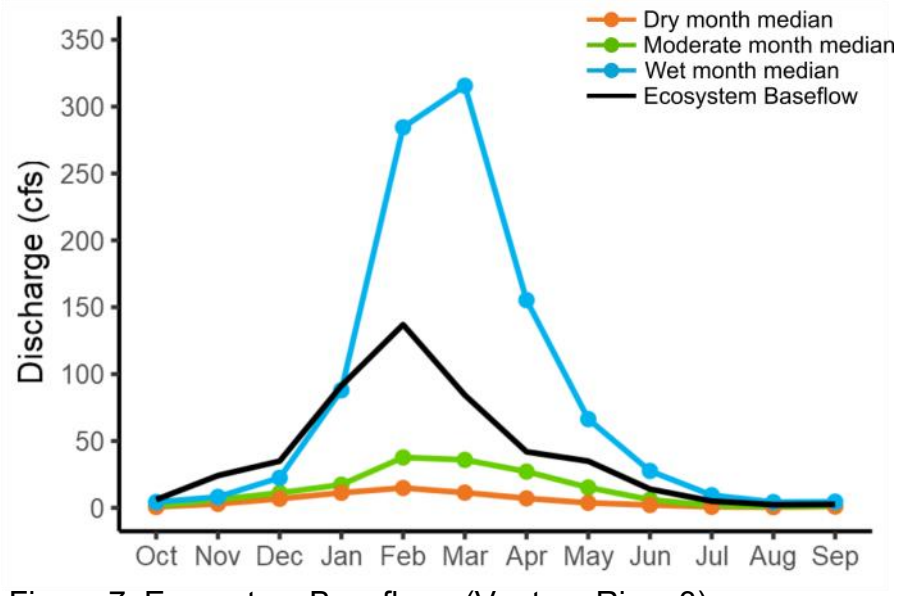


Figure 7. Ecosystem Baseflows (Ventura River 3).

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

Ecosystem Baseflows

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

Table 4. Ecosystem Baseflows.

1) Ventura River 1 225.6 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	98	147	95	45	37	15	6	3	3	8	26	38

2) Ventura River 2 214.3 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	98	148	92	44	37	14	5	2	3	7	26	37

3) Cañada Larga Creek 19.3 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	6	10	5	3	2	1	<1	<1	<1	<1	2	2

4) Ventura River 3 188.5 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	91	137	84	42	35	14	5	2	3	6	24	35

5) Coyote Creek 1 43.5 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	18	30	16	7	6	3	1	<1	1	1	4	7

6) Ventura River 4 141.6 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	71	108	70	36	28	12	4	2	2	5	20	28

7) San Antonio Creek 1 50.7 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	22	34	20	10	8	3	1	<1	1	2	6	8

8) Ventura River 5 90.0 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	44	72	48	26	19	9	4	2	2	3	12	19

9) Coyote Creek 2 13.1 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	8	13	7	3	3	1	1	<1	<1	1	2	3

10) Lion Canyon Creek 12.8 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	7	11	6	3	2	1	<1	<1	<1	<1	2	3

11) San Antonio Creek 2 33.9 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	14	23	13	7	6	2	1	<1	1	1	4	6

12) Ventura River 6 80.3 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	37	62	43	24	17	12	6	4	3	4	11	17

13) Ventura River 7 74.0 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	35	60	41	24	16	12	7	5	3	4	11	16

14) Matilija Creek 1 54.6 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	26	46	33	20	13	12	9	5	5	4	10	13

15) NF Matilija Creek 16.1 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	9	15	9	5	4	3	2	1	1	1	3	4

16) Matilija Creek 2 44.7 mi^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	26	41	28	18	12	8	5	3	2	3	9	12

Sensitive Period Indicators

Sensitive Period Indicator flows derived using the Wetted Perimeter Method (CDFW 2020d) are provided in Table 5 for Ventura River tributary and mainstem reaches with site-specific field data. There is one value for each reach, which applies across all months and years. The numbers next to each stream name correspond to the numbers on the Ventura River watershed map (Figure 2). Results presented here are the mean of results for all sites within a reach. The cross-channel transect profiles and wetted perimeter vs. discharge curves used in the analysis for each site are located in Appendix B (CDFW 2020c). When the Sensitive Period Indicator flows are not met, the ecosystem is likely to be particularly sensitive to additional flow reductions and other stressors (CDFW 2017c).

Table 5. Sensitive Period Indicators (by drainage area).

Stream	Drainage Area (mi^2)	Number of Sites	Wetted Perimeter Sensitive Period Indicators (cfs)
11) San Antonio Creek 2	33.9	3	5
7) San Antonio Creek 1	50.7	3	4
6) Ventura River 4	141.6	2	15
4) Ventura River 3	188.5	2	14
2) Ventura River 2	214.3	2	16

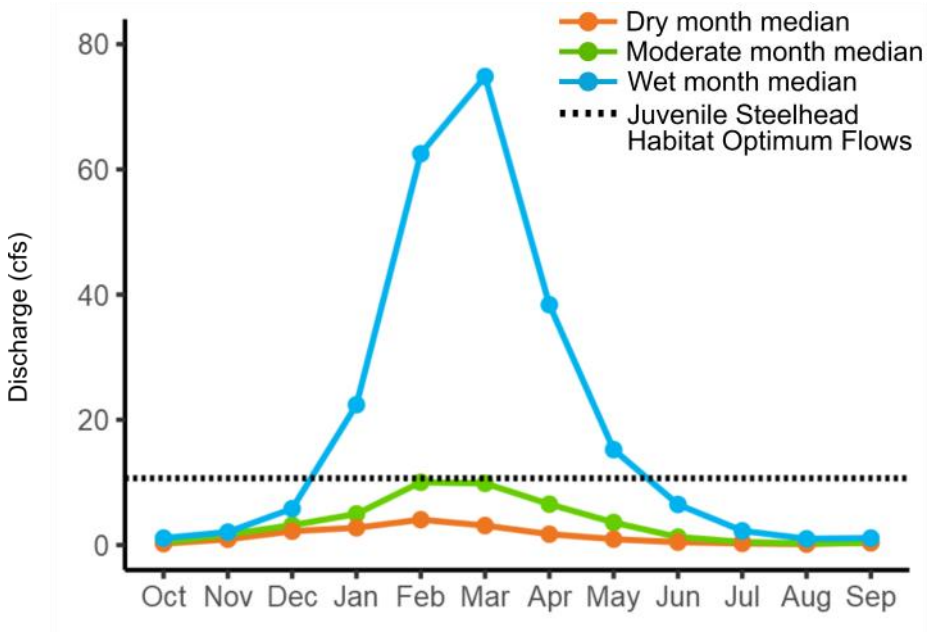
Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

Steelhead Habitat Optimum Flows
By Monthly Duration

Figure 8 displays flows that maximize usable habitat for juvenile steelhead (Hatfield and Bruce 2000) along with median monthly Natural Flows (data from Zimmerman et al. 2020). Study reaches are organized into two groups based on when steelhead flows are met in wet and moderate water month types (Ventura River & Matilija Creek vs. other tributary streams). In reaches with altered flow, the period of flow below the juvenile Steelhead Habitat Optimum Flows (Optimum Flow) may have a longer or shorter duration than shown here.

Tributary Streams: 1–51 mi^2

Natural Flows in most tributary streams are typically above the Optimum Flow for **3-5 months** of the year in wet water month types.



Ventura River & Matilija Creek: 45–226 mi^2

Natural Flows for Ventura River and Matilija Creek are typically above the Optimum Flow for **2-3 months** of the year for moderate water month types, and **6-7 months** of the year for wet water month types.

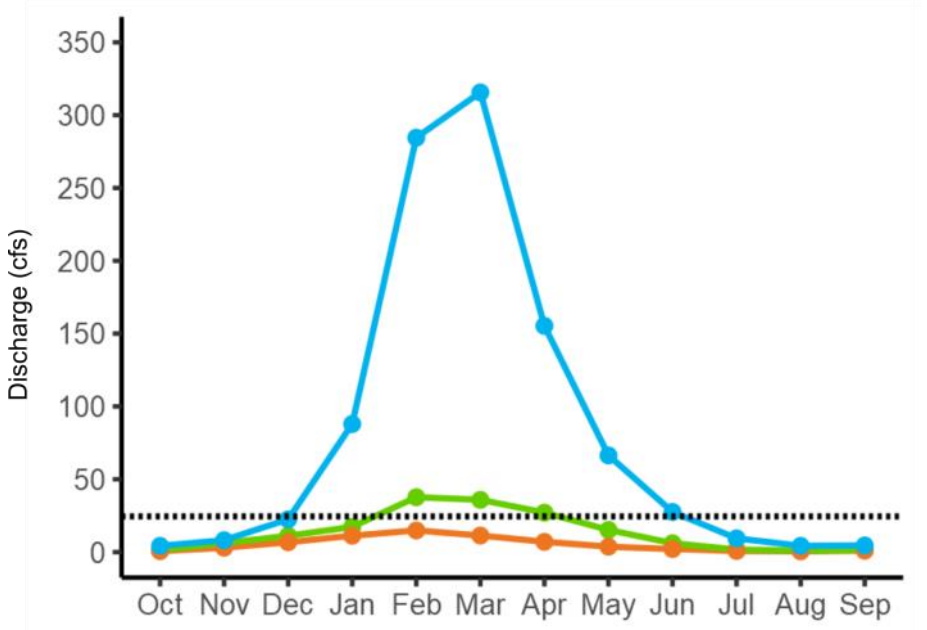


Figure 8. Juvenile steelhead Optimum Flows.

Steelhead Habitat Optimum Flows
By Drainage Area

Generally, the surface flow required to meet juvenile steelhead Optimum Flows increases as the drainage area increases. Table 6 presents Optimum Flows for tributary streams and reaches on Ventura River & Matilija Creek. The numbers next to each stream name correspond to the numbers found on the Ventura River watershed map (Figure 2).

Table 6. Juvenile steelhead Optimum Flows (by drainage area).

Tributary Streams

Stream	Area (mi^2)	Optimum Flows (cfs)
10) Lion Canyon Creek	12.8	5
9) Coyote Creek 2	13.1	6
15) NF Matilija Creek	16.1	7
3) Cañada Larga Creek	19.3	5
11) San Antonio Creek 2	33.9	8
5) Coyote Creek 1	43.5	9
7) San Antonio Creek 1	50.7	11

Ventura River & Matilija Creek

Stream	Area (mi^2)	Optimum Flows (cfs)
16) Matilija Creek 2	44.7	13
14) Matilija Creek 1	54.6	14
13) Ventura River 7	74.0	16
12) Ventura River 6	80.3	16
8) Ventura River 5	90.0	17
6) Ventura River 4	141.6	22
4) Ventura River 3	188.5	25
2) Ventura River 2	214.3	26
1) Ventura River 1	225.6	26

Steelhead Trout in NF Matilija Creek
VENTURA RIVER WATERSHED, VENTURA COUNTY

Steelhead Passage Flows

Steelhead Passage Flows are displayed in Table 7 for adults and juveniles. These Passage Flows provide connectivity between mesohabitat units for steelhead. Adult steelhead flows are included as a variation to the Overview document. The numbers next to each stream name correspond to the numbers found on the Ventura River watershed map (Figure 2). The number of sites column conveys the number of transects analyzed for each reach to determine Passage Flows. Results presented here are the mean of results for all sites within a reach. Sites that did not meet QC standards were omitted; ommissions are documented in the QC log stored at the Department's Headquarters office and further discussed in Appendix B (CDFW 2020c).

Table 7. Adult and juvenile steelhead Passage Flows (by drainage area).

	Drainage Area (mi^2)	Number of Sites		Steelhead Passage Flows (cfs)	
		Juvenile	Adult	Juvenile	Adult
11) San Antonio Creek 2	33.9	4	2	7	24
7) San Antonio Creek 1	50.7	1	-	8	-
6) Ventura River 4	141.6	3	1	23	44
4) Ventura River 3	188.5	2	2	12	33
2) Ventura River 2	214.3	3	3	16	40

Ventura River
VENTURA RIVER WATERSHED, VENTURA COUNTY

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All photos in this document were taken by Department Staff. Cover photos from left to right are San Antonio Creek, Ventura River, and Ventura River (all in Ventura River watershed, Ventura County).

Appendix A
Supplemental Analysis

The tables below present the results of additional analyses using USGS gage data. These analyses are consistent with the Overview, which can be found on the Department's Instream Flow Program webpage (CDFW 2020b). However, in place of the Natural Flows Database, these analyses use the synthetic least-impaired USGS gage Ventura R NR Ventura + Div 11118501 based on the period of record 1965–2007. This gage is located in the lower Ventura River (reach Ventura River 3) with a drainage area of 187.6 mi^2.

USGS Gage Data

	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gage Data (cfs)	Wet	32	131	299	142	71	44	29	21	18	15	15	18
	Moderate	16	21	28	23	19	16	13	11	9	8	7	12
	Dry	7	11	12	12	11	9	7	5	4	3	3	4

Ecosystem Baseflows

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecosystem Baseflows (cfs)	74	131	93	38	33	26	17	12	11	10	20	33

Steelhead Habitat Optimum Flows

Juvenile Flows (cfs)	24

Addendum
05-12-2020

Instream Flow Regime Criteria on a Watershed Scale: Ventura River (Version 2, filename VenturaWCR_Version2_05122020_accessible.pdf) was updated to meet the requirements of Web Content Accessibility Guidelines (WCAG). This document now complies with WCAG requirements for making web content more accessible to people with disabilities, per state and federal law at time of report issuance, and replaces the original document.

The following updates have also been made within the document:

- Page 5: the title of the forthcoming San Antonio report was corrected so that it matches the citation in the references list: “Instream flow evaluation: Steelhead adult spawning and juvenile rearing in San Antonio Creek, Ventura County” (was previously listed as “Instream flow evaluation: Juvenile and adult steelhead spawning and rearing in San Antonio Creek, Ventura County”)
- Page 11, Table 1:
  - Ventura River 7 Moderate March was corrected to 18 (was previously 19)
  - Ventura River 7 Moderate June was corrected to 6 (was previously 5)
  - Lion Canyon Creek Dry April was corrected to <1 (was previously 1)
  - Lion Canyon Creek Dry December was corrected to 1 (was previously <1)
- All drainage area numbers were updated to include one decimal place. Previously, where the tenth place was equal to zero, it was omitted. For example, Ventura River 7 drainage area was previously listed as 74 mi^2 in Table 5, and now is listed as 74.0 mi^2.