

Watershed-Wide Instream Flow Criteria for Carpinteria Creek

California Department of Fish and Wildlife
Instream Flow Program
Watershed Criteria Report No. 2025-03



California Department of Fish and Wildlife
Water Branch
Instream Flow Program
Watershed Criteria Report No. 2025-03

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Introduction

This *Watershed-Wide Instream Flow Criteria* report (Watershed Criteria Report) provides instream flow criteria for the Carpinteria Creek watershed, based on the best available scientific information, existing and new datasets, and analyses. Its intended audience includes agencies, water managers, non-governmental organizations, and the public.

The Carpinteria Creek watershed was identified in the “California Salmon Strategy for a Hotter, Drier, Future: Restoring Aquatic Ecosystems in the Age of Climate Change” as a priority stream for which California Department of Fish and Wildlife (Department) must complete an instream flow analysis (Office of Governor Newsom 2024). This directive is consistent with the identification of Carpinteria Creek as a watercourse for which minimum flow levels need to be established in order to ensure continued viability of stream-related fish and wildlife resources, in accordance with Public Resources Code section 10001.

This report presents stream assessments for five 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, are found in the Department's *Overview of Watershed-Wide Instream Flow Criteria Report Methodology (Overview)* document (CDFW 2024). Reviewing and understanding the information contained in the Overview document is essential to understanding flow 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 Watershed-Wide Instream Flow Criteria webpage (CDFW 2025).

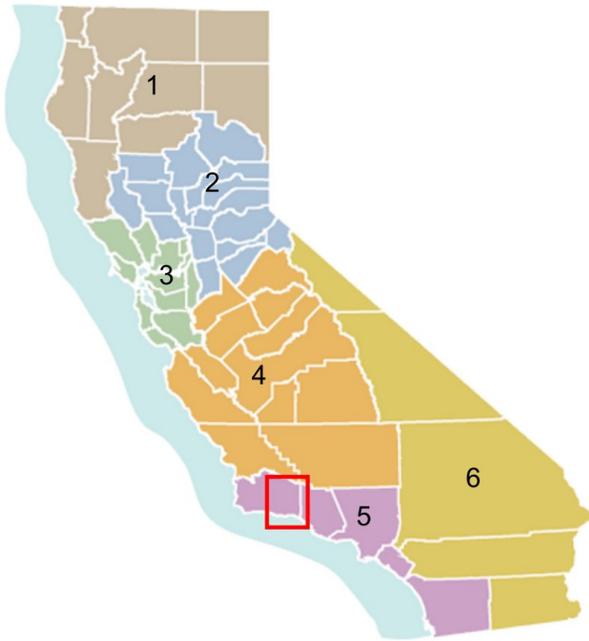
The Department provides this document as a tool for consideration in water management planning. It presents an analytical approach that can be implemented, if appropriate, under the specific circumstances of a watershed, stream, or informational need. This report and the Overview, in and of themselves,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



Carpinteria Creek

CARPINTERIA CREEK WATERSHED, SANTA BARBARA COUNTY

Carpinteria Creek Watershed



- Located in the Department's Region 5
- Within Santa Barbara county
- 16.7-square-mile (mi²) drainage area
- Supports Southern California steelhead

Figure 1. Map of the Department's Regions.



Gobernador Creek
CARPINTERIA CREEK WATERSHED, SANTA BARBARA COUNTY

This report presents streamflow analyses for five stream reaches within the Carpinteria Creek watershed (Figure 2). Instream flow criteria were developed for one numbered reach. The common identifiers (COMIDs) that correspond to the numbered reaches are listed in Appendix A.



Figure 2. Carpinteria Creek watershed map.

This watershed criteria report includes five distinct analyses (Figure 3). For more details on each analysis see the Overview, which can be found through the Watershed-Wide Instream Flow Criteria webpage (CDFW 2025).

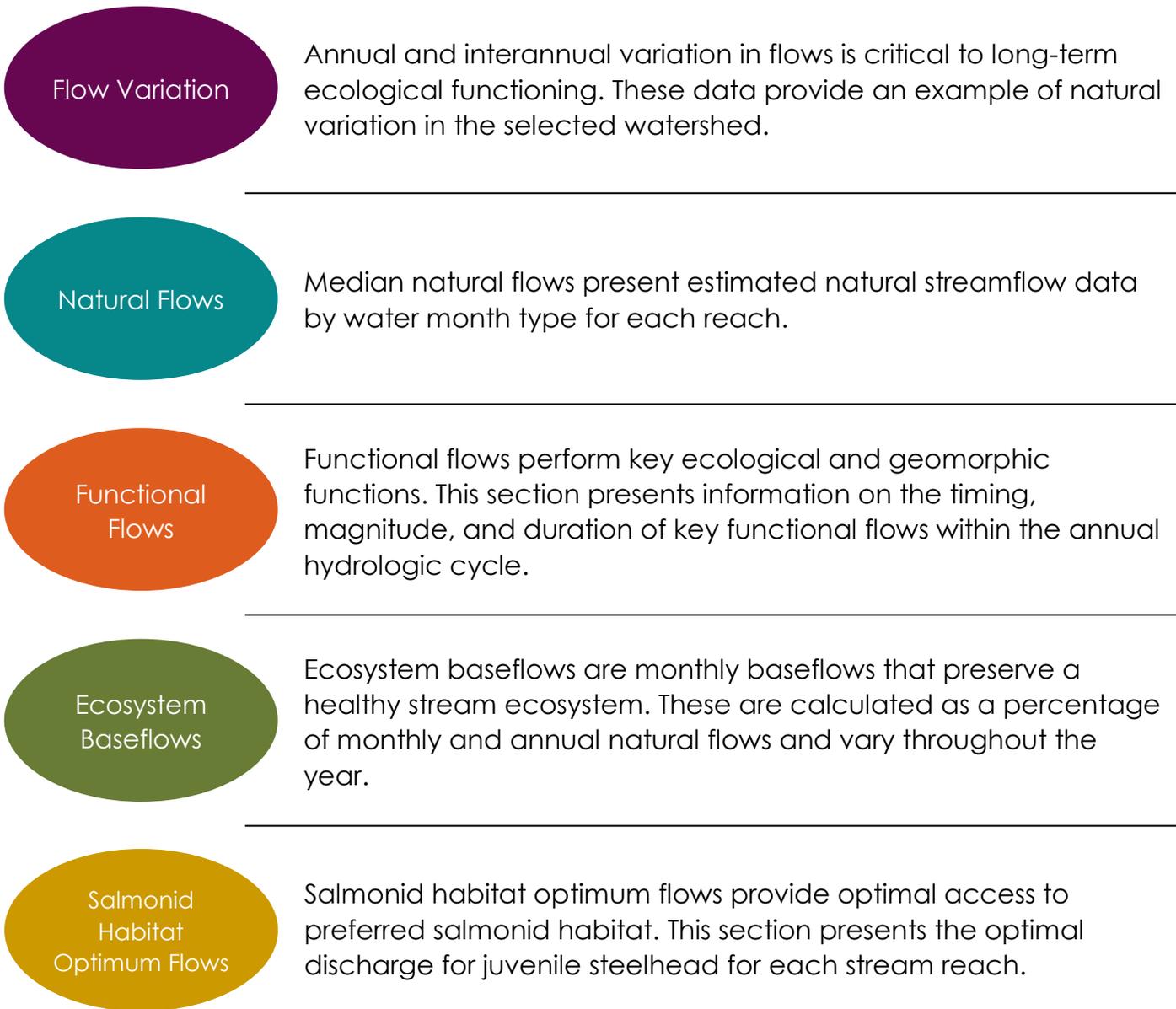


Figure 3. Watershed criteria analyses key.

Flow Variation

Flows in the Carpinteria Creek watershed are variable throughout the year and from year to year. The USGS gage used to visualize flow variation was selected because it is representative of hydrologic patterns in the Carpinteria Creek watershed (Figure 4). However, it is important to note that the Carpinteria Creek watershed has experienced decades of anthropogenic impacts, including land use changes and water diversions, which have resulted in changes in hydrologic patterns (Grantham et al. 2018).

The wet season in the Carpinteria Creek watershed is predicted to become shorter, more intense, and more variable as climate change impacts intensify (Grantham et al. 2018; CA State Coastal Conservancy 2013). Furthermore, groundwater pumping resulted in groundwater levels in the Carpinteria basin falling below sea level by 1951 (CVWD 1996). Combined with shifting climate conditions, these impacts may have resulted in higher stress to the ecosystem. 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.

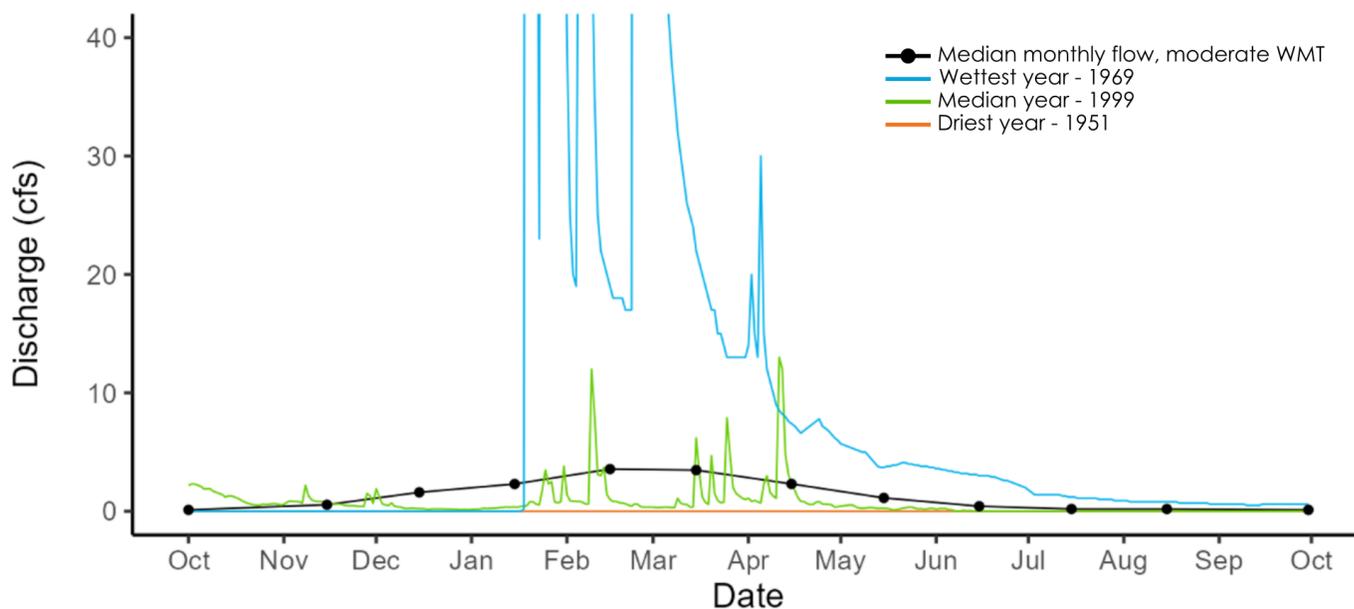


Figure 4. Variation in the Carpinteria Creek hydrograph. Mean daily Carpinteria Creek flows at the USGS gage 11119500, located in the Carpinteria Creek watershed, in the driest, median, and wettest water years on record between water years 1942 and 2024 (USGS 2024). Median monthly flow for a moderate water month type is also included.

Natural Flows

Natural flows are the stream flows (in cfs) that would be expected with no human influence (data from Zimmerman et al. 2023). This section presents median monthly natural flows for wet, moderate, and dry water month types for each Carpinteria Creek tributary and mainstem reach analyzed in this report (Table 1). The numbers next to each stream name correspond to the numbers found on the Carpinteria Creek watershed map (Figure 2).

Table 1. Median natural flows (cfs) by water month type (month type).

1) Carpinteria Creek 1 16.7 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	7	23	24	14	5	2	1	<1	<1	<1	1	2
Moderate	2	4	3	2	1	<1	<1	<1	<1	<1	1	2
Dry	2	2	2	1	<1	<1	<1	<1	<1	<1	<1	1

2) Carpinteria Creek 2 5.3 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	8	7	4	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

3) Gobernador Creek 7.9 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	4	14	16	9	3	2	1	1	1	<1	1	1
Moderate	1	2	2	1	1	1	<1	<1	<1	<1	<1	<1
Dry	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1

4) Eldorado Creek 2.5 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	4	7	3	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

5) Steer Creek 3.7 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	3	7	10	5	2	2	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

Functional Flows

This section presents examples illustrating functional flows in the Carpinteria Creek watershed (data from Qiu et al. 2021 and CEFWG 2021). The functional flow metric data are representative of the mainstem Carpinteria Creek watershed as well as its tributaries (Table 2 and Table 3). Functional flow timing throughout the watershed is likely consistent, but magnitudes differ between reaches (Rodríguez-Iturbe and Valdés 1979).

The Carpinteria Creek watershed is composed of two major stream classes: 1) Perennial Groundwater and Rain (PGR) for mainstem Carpinteria Creek, and 2) Flashy, ephemeral rain for the tributaries in the upper watershed (Lane et al. 2018). Functional flow metrics in the Carpinteria Creek watershed are estimated using the modeling approach described in Grantham et al. 2022. There are certain limitations in the approach that potentially affect the applicability of modeled functional flow metrics to the Carpinteria Creek watershed, including poor representation of intermittent streams and streams highly dependent on groundwater interactions among reference gages used in the modeling effort (Grantham et al. 2022). Due to the modeling limitations of this approach and the highly seasonal and episodic precipitation patterns of the transverse range, which results in long periods of low-flow interrupted by moderate to high discharge events, the annual occurrence of a spring recession is uncertain (Stillwater Sciences 2014). Therefore the spring recession flow magnitude has been omitted.



Carpinteria Creek

CARPINTERIA CREEK WATERSHED, SANTA BARBARA COUNTY

Table 2. Carpinteria Creek (reach 1) functional flow metric median values, 10th–90th percentile in parentheses. Results are based on modeled functional flow metrics for Carpinteria Creek and are provided by water year type (i.e., wet, moderate, and dry).

Metric	Wet Years	Moderate Years	Dry Years
Fall pulse flow magnitude (cfs)	11 (2–51)	7 (1–29)	4 (1–20)
Fall pulse flow duration (total days per year, when present)	4 (2–9)*	4 (2–9)*	4 (2–9)*
Fall pulse flow start timing	Nov 8 (Oct 13–Nov 30)	Nov 13 (Oct 12–Dec 2)	Nov 12 (Oct 3–Dec 1)
Wet-season baseflow magnitude (cfs)	2 (1–6)	1 (<1–2)	<1 (<1–1)
Median wet-season flow magnitude (cfs)	13 (4–39)	2 (1–6)	1 (<1–2)
Wet-season duration (days)	88 (51–129)	81 (46–127)	108 (36–176)
Wet-season start timing	Dec 30 (Dec 10–Jan 19)	Jan 8 (Nov 21–Jan 30)	Dec 5 (Oct 30–Jan 23)
2-year peak flow magnitude (cfs)	138 (74–332)	138 (74–332)	138 (74–332)
2-year peak flow duration (total days per year, when present)	3 (1–10)*	3 (1–10)*	3 (1–10)*
2-year peak flow frequency (events per year, when present)	2 (1–5)	2 (1–5)	2 (1–5)
5-year peak flow magnitude (cfs)	508 (282–1,070)	508 (282–1,070)	508 (282–1,070)
5-year peak flow duration (total days per year, when present)	1 (1–4)*	1 (1–4)*	1 (1–4)*
5-year peak flow frequency (events per year, when present)	1 (1–2)*	1 (1–2)*	1 (1–2)*
Spring recession flow duration (days)	44 (21–114)	65 (20–143)	62 (20–157)
Spring recession flow start timing	Mar 21 (Mar 6–Apr 10)	Mar 25 (Feb 23–Apr 25)	Mar 27 (Feb 19–May 9)
Spring recession flow rate of change (%)	7 (4–15)*	7 (4–15)*	7 (4–15)*
Dry-season baseflow magnitude (cfs)	1 (<1–1)	<1 (<1–1)	<1 (<1–1)
Dry-season duration (days)	226 (151–286)	194 (123–266)	181 (108–253)
Dry-season start timing	May 12 (Apr 2–Jul 13)	May 28 (Apr 6–Aug 7)	Jun 20 (Apr 17–Aug 29)

* indicates a metric with inferred ranges that was not modeled by water year type

Table 3. Gobernador Creek (reach 3) functional flow metric median values, 10th–90th percentile in parentheses. Results are based on modeled functional flow metrics for Gobernador Creek and are provided by water year type (i.e., wet, moderate, and dry).

Metric	Wet Years	Moderate Years	Dry Years
Fall pulse flow magnitude (cfs)	6 (1–28)	4 (1–14)	2 (1–9)
Fall pulse flow duration (total days per year, when present)	4 (2–9)*	4 (2–9)*	4 (2–9)*
Fall pulse flow start timing	Nov 10 (Oct 14–Nov 28)	Nov 12 (Oct 17–Dec 2)	Nov 12 (Oct 4–Nov 30)
Wet-season baseflow magnitude (cfs)	1 (<1–4)	1 (<1–1)	<1 (<1–1)
Median wet-season flow magnitude (cfs)	9 (3–23)	1 (1–4)	1 (<1–1)
Wet-season duration (days)	82 (54–123)	84 (48–129)	108 (42–172)
Wet-season start timing	Dec 29 (Dec 12–Jan 13)	Dec 23 (Nov 20–Jan 28)	Dec 21 (Nov 6–Jan 29)
2-year peak flow magnitude (cfs)	129 (63–277)	129 (63–277)	129 (63–277)
2-year peak flow duration (total days per year, when present)	3 (1–10)*	3 (1–10)*	3 (1–10)*
2-year peak flow frequency (events per year, when present)	2 (1–5)	2 (1–5)	2 (1–5)
5-year peak flow magnitude (cfs)	345 (228–634)	345 (228–634)	345 (228–634)
5-year peak flow duration (total days per year, when present)	1 (1–4)*	1 (1–4)*	1 (1–4)*
5-year peak flow frequency (events per year, when present)	1 (1–2)*	1 (1–2)*	1 (1–2)*
Spring recession flow duration (days)	50 (24–105)	68 (24–136)	67 (24–133)
Spring recession flow start timing	Mar 22 (Mar 5–Apr 10)	Mar 25 (Feb 22–Apr 20)	Mar 21 (Feb 24–May 2)
Spring recession flow rate of change (%)	7 (4–15)*	7 (4–15)*	7 (4–15)*
Dry-season baseflow magnitude (cfs)	1 (<1–2)	<1 (<1–1)	<1 (<1–<1)
Dry-season duration (days)	221 (153–277)	189 (131–265)	179 (115–248)
Dry-season start timing	May 15 (Apr 6–Jul 7)	Jun 8 (Apr 6–Jul 28)	Jun 16 (Apr 18–Aug 7)

* indicates a metric with inferred ranges that was not modeled by water year type

Ecosystem Baseflows

In wet water month types, median monthly discharge (MMD), derived using natural flows (data from Zimmerman et al. 2023), meets or exceeds ecosystem baseflows (Tessmann 1980) for approximately ten months of the water year for most reaches in the Carpinteria Creek watershed.

For Carpinteria Creek (reach 1) in moderate water month types, median natural flows may not exceed ecosystem baseflows for the water year (Figure 5). This pattern is similar for most reaches in the Carpinteria Creek watershed.

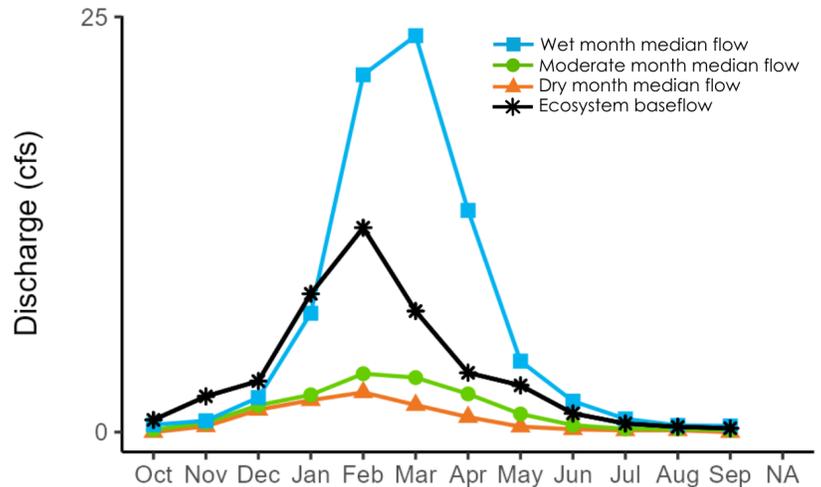


Figure 5. Ecosystem baseflows and median natural flows for wet, moderate, and dry water month types for reach 1) Carpinteria Creek 1.



Gobernador Creek

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Ecosystem baseflows are monthly flows unique to each Carpinteria Creek tributary and mainstem reach analyzed in this report (Table 4). The numbers next to each stream name correspond to the numbers found on the Carpinteria Creek watershed map (Figure 2).

Table 4. Ecosystem baseflows (cfs).

Stream	Drainage Area (mi ²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1) Carpinteria Creek 1	16.7	9	13	8	4	3	1	1	<1	<1	1	2	3
2) Carpinteria Creek 2	5.3	3	4	2	1	1	<1	<1	<1	<1	<1	1	1
3) Gobernador Creek	7.9	5	7	4	2	2	1	1	<1	<1	<1	1	2
4) Eldorado Creek	2.5	2	3	2	1	1	<1	<1	<1	<1	<1	1	1
5) Steer Creek	3.7	2	4	2	1	1	1	1	<1	<1	<1	1	1



Salmonid Habitat Optimum Flows

Salmonid habitat optimum flows (optimum flows) maximize usable habitat for juvenile steelhead (Hatfield and Bruce 2000). Each stream analyzed has one optimum flow value, and while these values may vary between streams, the overall patterns in the watershed are the same. Natural flows often meet or exceed optimum flows during the winter months in wet conditions, while natural flows typically remain below optimum flows during the summer and fall months across all water month types (Figure 6).

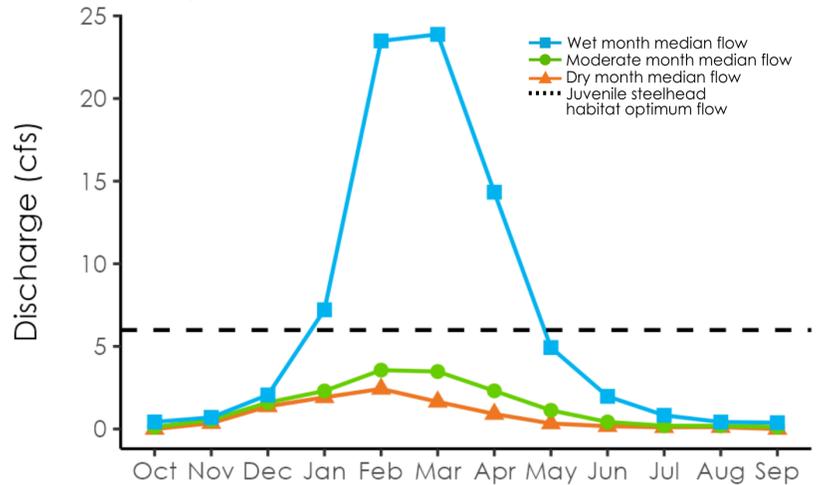


Figure 6. Juvenile steelhead optimum flows and median natural flows for wet, moderate, and dry water month types for Carpinteria Creek (reach 1).

In drainages with altered flow, the time period when flows are below the juvenile steelhead optimum may be shorter or longer than shown here.



Generally, the surface flow required to meet the juvenile steelhead optimum flows increases as the drainage area increases. This section presents juvenile steelhead optimum flows by drainage area (Table 5). The numbers next to each stream name correspond to the numbers found on the Carpinteria Creek watershed map (Figure 2).

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

Carpinteria Creek

Stream	Drainage Area (mi ²)	Juvenile Steelhead Optimum Flows (cfs)
1) Carpinteria Creek 1	16.7	6
2) Carpinteria Creek 2	5.2	3
3) Gobernador Creek	7.9	4
4) Eldorado Creek	2.5	2
5) Steer Creek	3.7	3



Flow Criteria

Flow criteria provide a set of flow values that may be used to develop a flow regime for a location within a watershed. Using results from the functional flows section of this Watershed Criteria Report, flow criteria have been developed for Carpinteria Creek (reach 1). While the flow criteria presented in this section were developed for specific locations within the Carpinteria Creek watershed, patterns and timings of flows throughout the watershed are consistent, and a similar process to the one outlined below could be followed to develop criteria for other locations within the watershed. Flow criteria presented below are provided as a tool for consideration in water management planning. While criteria are not formal flow recommendations, they may be used to develop flow recommendations. These criteria should not be relied upon for legal compliance and do not ensure project success. The Department may revise instream flow criteria for the Carpinteria Creek watershed and its tributaries based upon any new scientific information that may become available.

Flow criteria were developed for one location within the Carpinteria Creek watershed using functional flow results from Table 2 as well as life history flow considerations for Southern California steelhead. This location was selected based on CDFW Region 5 priorities.

Due to the watershed's small drainage area and flashy hydrology, minimum instream flow targets for Carpinteria Creek on a seasonal timestep may not be achievable at all times under natural conditions. The aquatic and riparian ecosystems depend on the watershed's natural hydrologic variability, and therefore flow criteria for Carpinteria Creek are intended to protect water for fish and wildlife whenever it is naturally available in the watershed. Protecting pulse and peak flow events is critically important for species and ecosystem functions, and protecting natural flows during the dry season is essential for aquatic and riparian species' survival (Naiman et al. 2008).

Instream flow criteria for Carpinteria Creek:

- During the wet season of October through April, maintain a wet-season baseflow of at least 13 cfs in wet years, at least 2 cfs in moderate years, and at least 1 cfs in dry years. Allow full natural flows if these metrics cannot be met.
- In moderate and wet years, allow natural baseflow recession from March through May, where the daily rate of change of flows should not exceed 7%.
- For the dry-season baseflow, allow full natural flow to pass through the system unimpaired from June through October.
- Allow fall pulse flows of at least 4 cfs occurring from October through November to pass through the system unimpaired.
- Every two years, allow two peak flow events of 138 cfs.
- Approximately every five years, allow one peak flow event of 508 cfs.

The timing of the wet season was approximated using the median start dates for each water year type (i.e., wet, moderate, dry) using functional flow results from Table 2. The wet-season baseflow magnitudes represent flows between storm events; however, following peak flow events (e.g., winter storms), flows should be much higher than the criteria. Additionally, 2- and 5-year peak flow events, respectively, should be allowed to pass through the watershed. Refer to Table 2 for specific recommended frequencies and durations of these peak events for each water year type. The end of the wet season for each water year type was determined by the median start date of the spring recession.

The dry-season baseflow magnitude was used to establish flow criteria for the dry season. Baseflows will likely be higher at the beginning of the dry season than at the end of the dry season, but the median flow over the entire dry season should match the listed criteria. Additionally, fall pulse events should occur annually in October. Specific magnitudes and durations by water year type for the fall pulse flows can be found in Table 2. The end of the dry season for each water year type was determined by the median start date of the wet season.



Carpinteria Creek

CARPINTERIA CREEK WATERSHED, SANTA BARBARA COUNTY

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All photos in this document were taken by Department Staff. Cover photo is of Upper Gobernador Creek (Carpinteria Creek watershed in Santa Barbara County).



Appendix A

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.¹ The COMIDs were used to identify and download natural flow estimates for each selected reach.

Table A-1. Reach delineation.

Stream	COMID
1) Carpinteria Creek 1	17596159
2) Carpinteria Creek 2	17596157
3) Gobernador Creek	17595475
4) Eldorado Creek	17595437
5) Steer Creek	17595435

¹ USEPA and USGS (2012). National Hydrography Dataset Plus (NHDPlus) medium resolution version 2. U.S. Environmental Protection Agency (USEPA) and the U.S. Geological Survey (USGS). Accessed: October 2024.