

Watershed-Wide Instream Flow Criteria for the Dos Pueblos Creek

California Department of Fish and Wildlife
Instream Flow Program
Watershed Criteria Report No. 2025-04



California Department of Fish and Wildlife
Water Branch
Instream Flow Program
Watershed Criteria Report No. 2025–04

Prepared by:

Alexander Milward¹, Environmental Scientist

Krista Van Der Velde, Environmental Scientist

Brionna Drescher², Senior Environmental Scientist, Supervisor

California Department of Fish and Wildlife, West Sacramento, CA



Suggested citation:

CDFW (2025). Watershed-wide instream flow criteria for the Dos Pueblos Creek. California Department of Fish and Wildlife, Instream Flow Program (CDFW), West Sacramento, CA.

¹ Project Lead, ² Quality Assurance Officer

Table of Contents

Introduction.....	6
Dos Pueblos Creek Watershed.....	7
 Flow Variation.....	10
 Natural Flows.....	11
 Functional Flows.....	12
 Ecosystem Baseflows.....	14
 Salmonid Habitat Optimum Flows.....	15
Flow Criteria.....	16
Acknowledgements.....	18
References.....	19
Appendix A.....	21

FIGURES

Figure 1. Map of the Department's Regions.....	7
Figure 2. Dos Pueblos Creek watershed map.....	8
Figure 3. Watershed criteria analyses key	9
Figure 4. Variation in the San Jose Creek hydrograph	10
Figure 5. Ecosystem baseflows and median natural flows.....	14
Figure 6. Juvenile steelhead optimum flows and median natural flows .	15

TABLES

Table 1. Median natural flows.....	11
Table 2. Dos Pueblos Creek functional flow metric values	13
Table 3. Ecosystem baseflows	14
Table 4. Juvenile steelhead optimum flows.....	15

Introduction

This *Watershed-Wide Instream Flow Criteria* report (Watershed Criteria Report) provides instream flow criteria for the Dos Pueblos 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 Dos Pueblos 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 the 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 the Dos Pueblos Creek watershed 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 four 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).

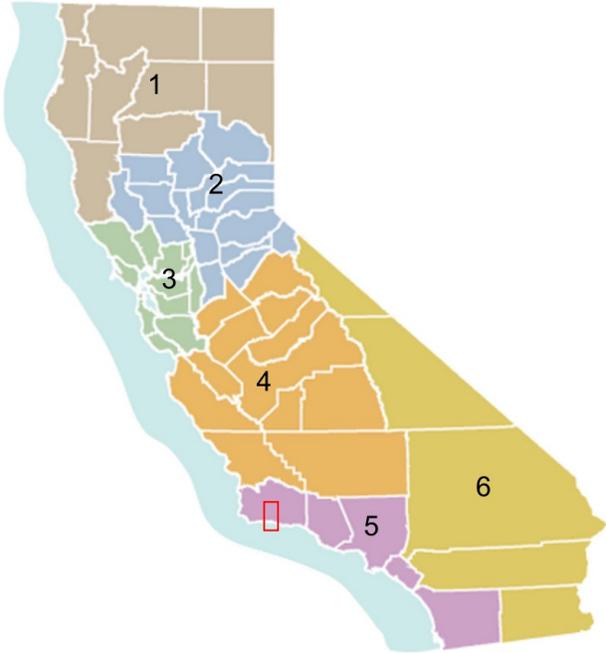
The Department provides this document as a tool for consideration in water management planning. It presents an analytical approach that can be implemented, if appropriate, under the specific circumstances of a watershed, stream, or informational need. This report and the Overview, in and of themselves,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



Dos Pueblos Creek

DOS PUEBLOS CREEK WATERSHED, SANTA BARBARA COUNTY

Dos Pueblos Creek Watershed



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

Figure 1. Map of the Department's Regions.



Dos Pueblos Creek
DOS PUEBLOS CREEK WATERSHED, SANTA BARBARA COUNTY

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



Figure 2. Dos Pueblos 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).

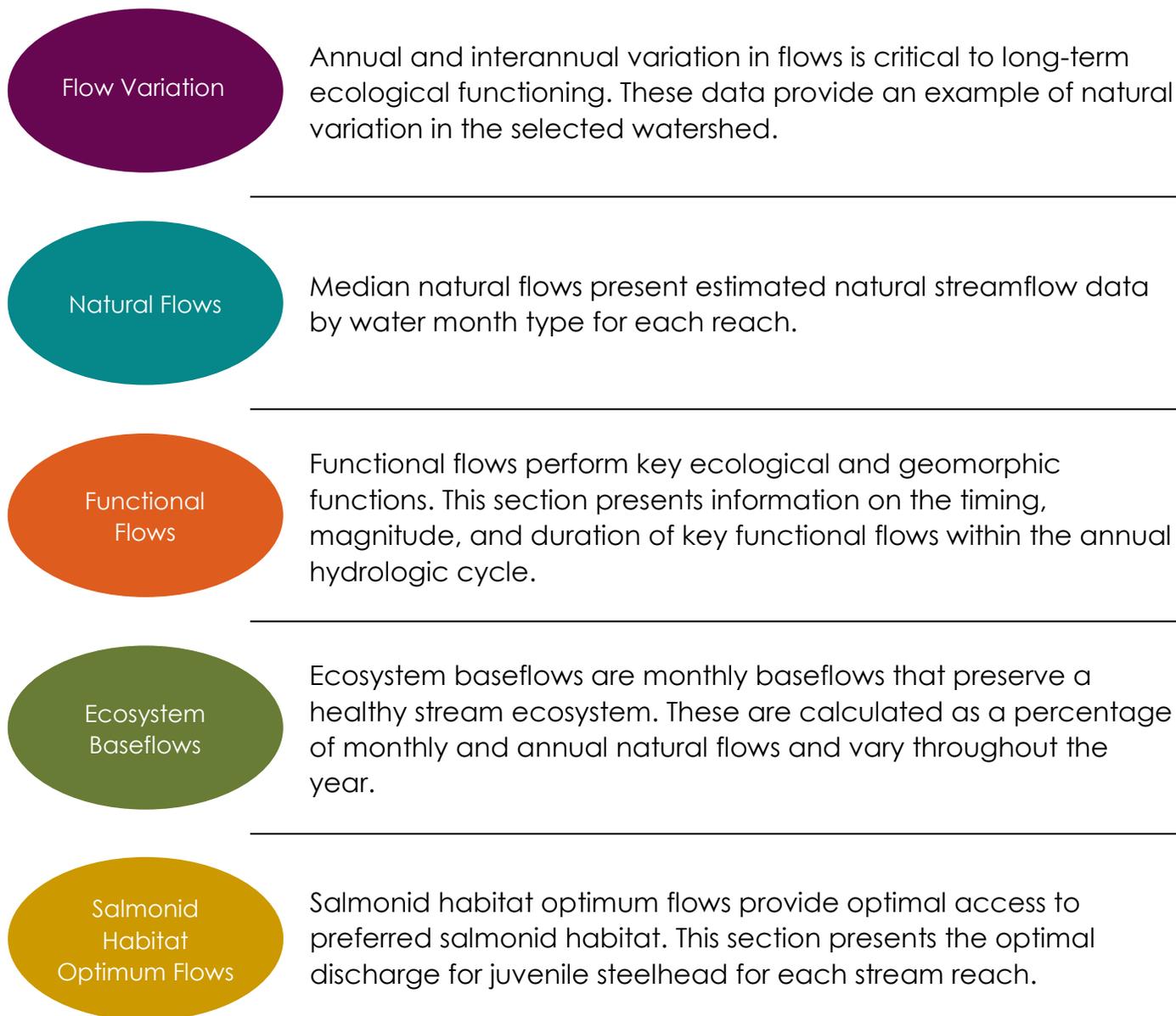


Figure 3. Watershed criteria analyses key.

Flow Variation

Flows in the Dos Pueblos Creek watershed are variable throughout the year and from year to year. The USGS gage used to visualize flow variation was selected from nearby San Jose Creek because the Dos Pueblos watershed does not contain a stream gage. San Jose Creek is in a nearby watershed of similar drainage area and orientation, therefore it is considered representative of hydrologic patterns in the Dos Pueblos watershed (Figure 4). While the magnitude of daily flows may differ between watersheds, the seasonal and interannual patterns are likely similar.

The dry season in the Dos Pueblos Creek watershed is predicted to become longer with reduced flows in the spring and summer, while the wet season is expected to become increasingly variable (Grantham et al. 2018). These shifts, combined with ongoing surface 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.

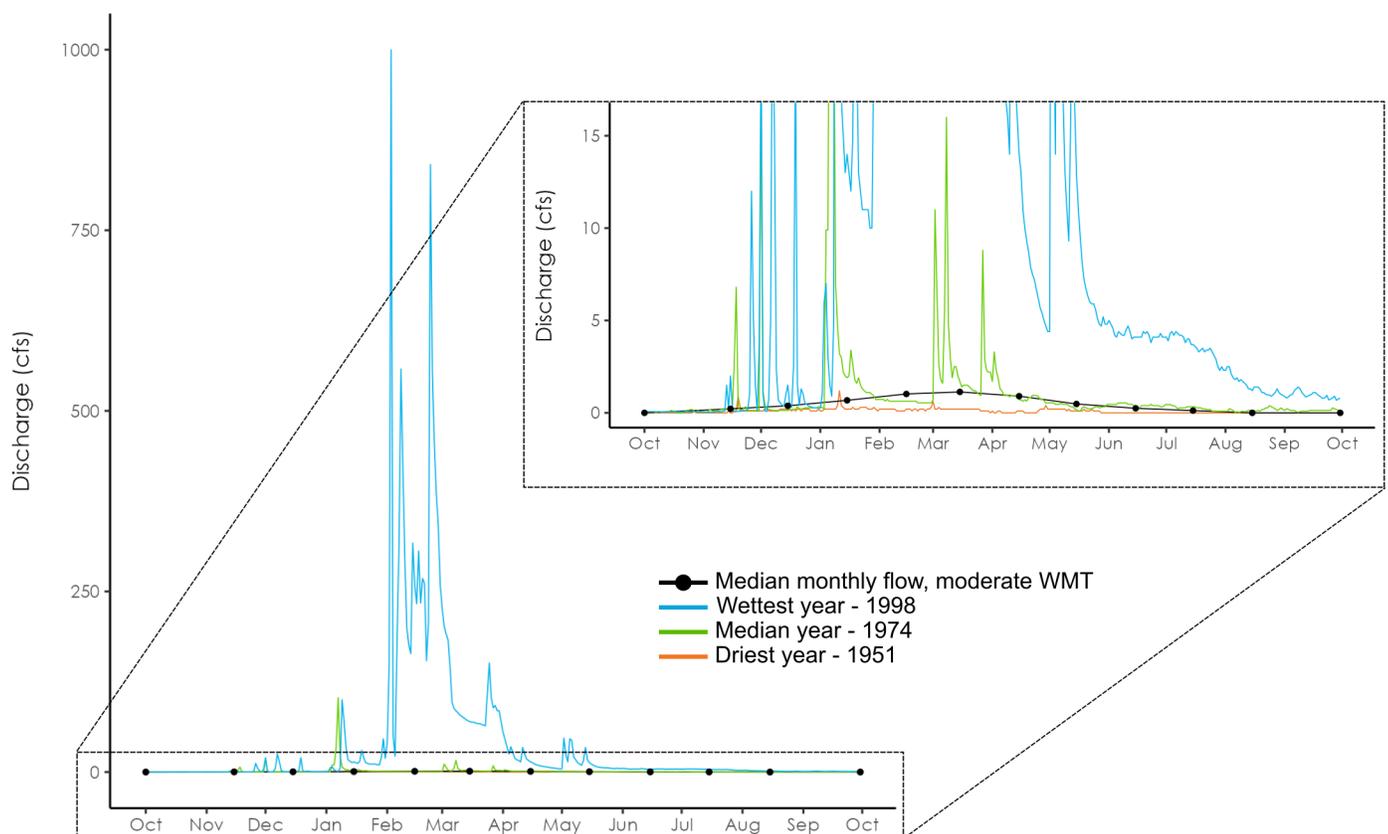


Figure 4. Variation in the San Jose Creek hydrograph. Mean daily San Jose Creek flows at the USGS gage 11120500, located in the San Jose Creek watershed, in the driest, median, and wettest water years on record between water years 1950 and 2014 (USGS 2024). Median monthly flow for a moderate water month 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 Dos Pueblos 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 Dos Pueblos Creek watershed map (Figure 2).

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

1) Dos Pueblos Creek 1 8.4 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	2	8	8	4	2	1	<1	<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

2) Dos Pueblos Creek 2 5.2 mi²

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

3) Unnamed Tributary 1.8 mi²

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

4) Dos Pueblos Creek 3 2.6 mi²

Month Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	1	4	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

Functional Flows

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

The Dos Pueblos Creek watershed is composed of two major stream classes: 1) Perennial Groundwater and Rain (PGR) for mainstem Dos Pueblos Creek, and 2) Flashy, ephemeral rain for the tributaries in the upper watershed (Lane et al. 2018). Functional flow metrics in the Dos Pueblos 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 Dos Pueblos 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.



Dos Pueblos Creek

DOS PUEBLOS CREEK WATERSHED, SANTA BARBARA COUNTY

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

Metric	Wet Years	Moderate Years	Dry Years
Fall pulse flow magnitude (cfs)	3 (1–22)	2 (1–10)	1 (<1–7)
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 12 (Oct 11–Dec 1)	Nov 7 (Oct 3–Nov 30)
Wet-season baseflow magnitude (cfs)	1 (<1–2)	<1 (<1–1)	<1
Median wet-season flow magnitude (cfs)	5 (1–12)	1 (<1–3)	<1 (<1–1)
Wet-season duration (days)	87 (48–127)	91 (48–134)	100 (38–169)
Wet-season start timing	Dec 27 (Dec 9–Jan 14)	Dec 31 (Dec 17–Jan 18)	Dec 4 (Nov 2–Jan 22)
2-year peak flow magnitude (cfs)	47 (9–121)	47 (9–121)	47 (9–121)
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)	261 (130–340)	261 (130–340)	261 (130–340)
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)	43 (23–100)	57 (23–123)	59 (21–137)
Spring recession flow start timing	Mar 24 (Mar 5–Apr 8)	Apr 2 (Mar 9–Apr 30)	Mar 20 (Feb 19–May 8)
Spring recession flow rate of change (%)	7 (4–15)*	7 (4–15)*	7 (4–15)*
Dry-season baseflow magnitude (cfs)	<1	<1	<1
Dry-season duration (days)	230 (168–292)	200 (135–256)	193 (119–274)
Dry-season start timing	May 12 (Apr 3–Jun 24)	May 30 (Apr 19–Jul 23)	Jun 16 (Apr 3–Aug 5)

* 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 eight months of the water year for most reaches in the Dos Pueblos Creek watershed.

For Dos Pueblos Creek (reach 1) in moderate water month types, median natural flows may exceed ecosystem baseflows for approximately one month of the water year (Figure 5). This pattern is similar for most reaches in the Dos Pueblos Creek watershed.

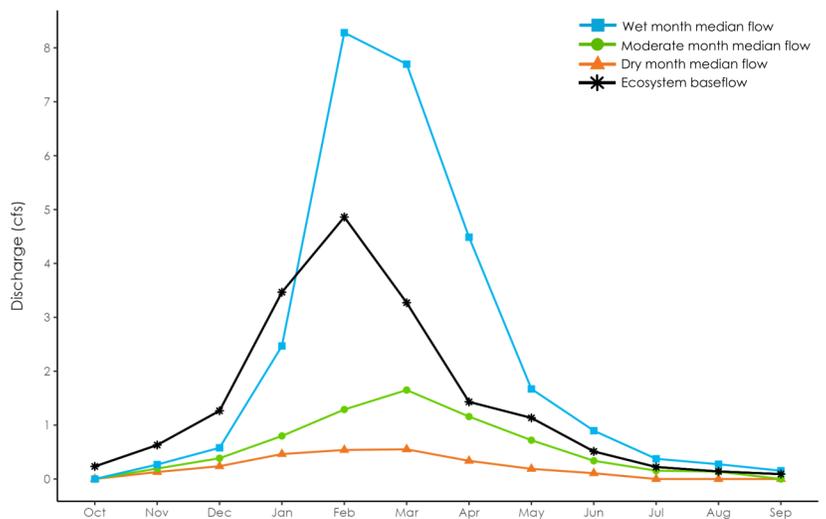


Figure 5. Ecosystem baseflows and median natural flows for wet, moderate, and dry water month types for Dos Pueblos Creek 1 (reach 1) .

Ecosystem baseflows are monthly flows unique to each Dos Pueblos Creek tributary and mainstem reach analyzed in this report (Table 3). The numbers next to each stream name correspond to the numbers found on the Dos Pueblos Creek watershed map (Figure 2).

Table 3. Ecosystem baseflows (cfs).

Stream	Drainage Area (mi ²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1) Dos Pueblos Creek 1	8.4	3	5	3	1	1	1	<1	<1	<1	<1	1	1
2) Dos Pueblos Creek 2	5.2	3	4	2	1	1	<1	<1	<1	<1	<1	1	1
3) Unnamed Tributary	1.8	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4) Dos Pueblos Creek 3	2.6	1	2	1	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).

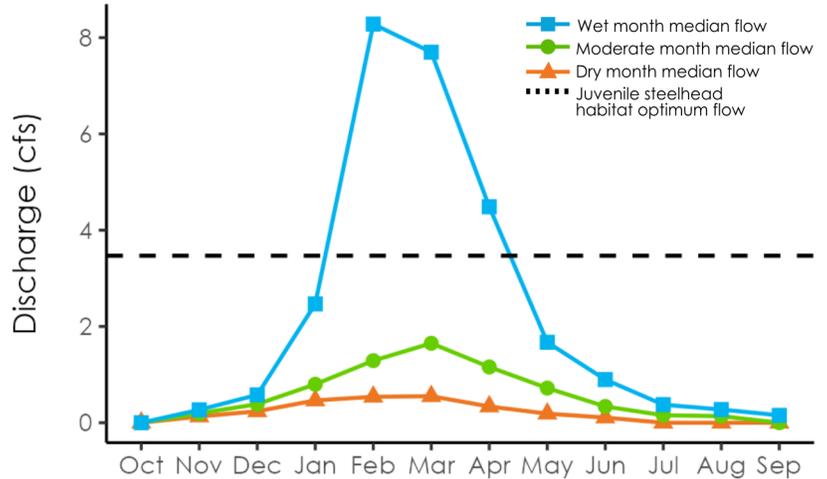


Figure 6. Juvenile steelhead optimum flows and median natural flows for wet, moderate, and dry water month types for Dos Pueblos Creek (reach 1).

In drainages with altered flow, the time period when flows are below the juvenile steelhead optimum may be shorter or longer than shown here (Figure 6, Table 4).

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 size category (Table 4). The numbers next to each stream name correspond to the numbers found on the Dos Pueblos Creek watershed map (Figure 2).

Table 4. Juvenile steelhead optimum flows (by drainage area).

Dos Pueblos Creek

Stream	Drainage Area (mi ²)	Juvenile Steelhead Optimum Flows (cfs)
1) Dos Pueblos Creek 1	8.4	3
2) Dos Pueblos Creek 2	5.2	3
4) Dos Pueblos Creek 3	2.6	2
3) Unnamed Tributary	1.8	2

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 Dos Pueblos Creek (reach 1). While the flow criteria presented in this section were developed for specific locations within the Dos Pueblos 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 Dos Pueblos Creek and its tributaries based upon any new scientific information that may become available.

Flow criteria were developed for one location within the Dos Pueblos 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 Dos Pueblos 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 Dos Pueblos 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 Dos Pueblos Creek:

- During the wet season of October through April, maintain a wet-season baseflow of at least 1 cfs in wet 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 1 cfs occurring from October through November to pass through the system unimpaired.
- Every two years, allow two peak flow events of 47 cfs.
- Approximately every five years, allow one peak flow event of 261 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 magnitude represents flows between storm events; however, following peak flow events (e.g., winter storms), flows should be much higher than the criteria presented. 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 any naturally occurring flows throughout the dry season should be allowed to remain instream. Additionally, fall pulse events should occur annually in October or November. 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.



Dos Pueblos Creek

DOS PUEBLOS CREEK WATERSHED, SANTA BARBARA COUNTY

Acknowledgements

Thank you to the following Department Water Branch staff for their assistance with this report: Lillian McDougall, Ian Ralston, and Gabrielle Obkirchner.



Dos Pueblos Creek

DOS PUEBLOS CREEK WATERSHED, SANTA BARBARA COUNTY

References

- CDFW (2024). Overview of watershed-wide instream flow criteria report methodology, Version 3. California Department of Fish and Wildlife, Instream Flow Program (CDFW), West Sacramento, CA. Available: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=177832&inline>.
- CDFW (2025). Watershed-wide instream flow criteria webpage, California Department of Fish and Wildlife, Instream Flow Program (CDFW). Available: <https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/Watershed-Criteria>.
- CEFWG (2021). California Natural Flows Database: Functional flow metrics v1.2.1. California Environmental Flows Working Group (CEFWG). Available: <https://rivers.codefornature.org>. Accessed: October 2024.
- Grantham, T. E. W., D. M. Carlisle, G. J. McCabe and J. K. Howard (2018). Sensitivity of streamflow to climate change in California. *Climatic Change* 149(3-4): 427-441.
- Grantham, T. E., D. M. Carlisle, J. Howard, B. Lane, R. Lusardi, A. Obester, S. Sandoval-Solis, B. Stanford, E. D. Stein and K. T. Taniguchi-Quan (2022). Modeling functional flows in California's rivers. *Frontiers in Environmental Science*: 103.
- Hatfield, T. and J. Bruce (2000). Predicting salmonid habitat-flow relationships for streams from western North America. *North American Journal of Fisheries Management* 20: 1005-1015.
- Lane, B. A., S. Sandoval Solis, E. D. Stein, S. M. Yarnell, G. B. Pasternack and H. E. Dahlke (2018). Beyond metrics? The role of hydrologic baseline archetypes in environmental water management. *Environmental Management* 62(4): 678-693.
- Naiman, R. J., J. J. Latterell, N. E. Pettit and J. D. Olden (2008). Flow variability and the biophysical vitality of river systems. *Comptes Rendus Geoscience* 340(9-10): 629-643.
- Office of Governor Newsom (2024). California Salmon Strategy for a Hotter, Drier Future: Restoring Aquatic Ecosystems in the Age of Climate Change. State of California.
- Qiu, L., N. Patterson and M. Parekh (2021). Functional Flows Calculator. GitHub. Available: <https://github.com/leogoesger/func-flow>.
- Rodríguez-Iturbe, I. and J. B. Valdés (1979). The geomorphic structure of hydrologic response. *Water Resources Research* 15(6): 1409-1420.
- Stillwater Sciences (2014). Matilija Dam removal, sediment transport, & Robles Diversion mitigation study hydrologic assessment, Task 2.1 by Derek Boot (PhD PE PG Stillwater Sciences) On June 3, 2014. Technical Memorandum.
- Tessmann, S. A. (1980). Environmental assessment, technical appendix E, Reconnaissance elements of the western Dakotas region of South Dakota study. South Dakota State University, Water Resources Research Institute, Brookings, SD.

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).

USGS (2024). National Water Information System data available on the World Wide Web (USGS Water Data for the Nation). U.S. Geological Survey. Available: <http://waterdata.usgs.gov/nwis/>. Accessed: October 2024.

Zimmerman, J. K. H., D. M. Carlisle, J. T. May, K. R. Klausmeyer, T. E. Grantham, L. R. Brown and J. K. Howard (2023). California Unimpaired Flows Database v2.1.2. The Nature Conservancy, San Francisco, CA. Available: <https://rivers.codefornature.org/>. Accessed: October 2024.

Mailing address:

California Department of Fish and Wildlife, P.O. Box 944209, Sacramento CA 94244-2090

All photos in this document were taken by Department Staff. Cover photo is of Dos Pueblos Creek (Dos Pueblos 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) Dos Pueblos Creek 1	17595317
2) Dos Pueblos Creek 2	17595173
3) Unnamed Tributary	17595151
4) Dos Pueblos Creek 3	17595149

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.