

Draft Carmel River Flow Threshold Study

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Executive Summary

Background and Purpose

The Monterey Peninsula Water Management District (MPWMD) Board of Directors directed staff to begin preparing an Environmental Impact Report (EIR) on a Water Supply Project (WSP) in first quarter of 2002. Through the process of receiving public and agency scoping comments on the EIR, the MPWMD was reminded that project effects on flows in the Carmel River and the effects of changing flows would be one of the critical factors in the water supply decision making process. Subsequently, the MPWMD decided to review the multiple past technical studies, biological impact analysis, and agency-developed flow requirements for the Carmel River to help determine what flows are required to sustain sensitive biological resources. Because of schedule constraints, the focus of the study was to establish flow thresholds that would be used to help assess impacts on these biological resources.

The purpose of the Carmel River flow study is to provide information that will be used to evaluate and determine the significance of impacts on Carmel River biological resources that may occur as a result of operating alternative water supply projects. The flow study was conducted in support of the Water Supply Project (WSP) Environmental Impact Report (EIR), and the results of the study will be used to help evaluate the impacts of some of the water supply alternatives that will be evaluated in the EIR. Although not the primary purpose of the study, the assessment methods and flow thresholds identified in the study may also be used to help assess the effects of future management programs on the Carmel River.

The flow thresholds were developed to assist in evaluating environmental impacts pursuant to the California Environmental Quality Act (CEQA). These minimum thresholds are not intended to prescribe flow requirements that must be met by existing or future water management efforts on the Carmel River. They also are not the sole criteria that will be used to assess impacts on sensitive biological resources in the WSP EIR. The thresholds are intended to be indicators of how project-related changes in river flows might affect steelhead trout and California red-legged frog (CRLF) populations and the general health of riparian vegetation along the river. The thresholds should not be interpreted as the flows required to improve conditions for, or ensure the recovery of, sensitive biological resources occurring in or along the Carmel River. Other recent studies of the Carmel River and its biological resources, including the National Marine Fisheries Service, a division of National Oceanic and Atmospheric

Administration (NOAA Fisheries) (2002) instream flow needs assessment, have been directed at prescribing flow management actions with the goal of conserving and restoring sensitive resources, including the steelhead trout. The flow recommendations in this study and the NOAA Fisheries study are not comparable and are designed for different purposes. While it is not the purpose of this study to compare the CEQA-related flow thresholds to historical flows or flow requirements that may be imposed by federal or state resource agencies, the general relationship of these various flow numbers is addressed to respond to public interest.

Resources Evaluated

The study focused on evaluating the sensitivity of biological resources to flows in the Carmel River. Three representative biological resources were selected and evaluated in the study. The resources evaluated are steelhead, CRLF, and riparian vegetation. The study area encompassed the reach of the Carmel River between Los Padres Dam and the Lagoon (Figure ES-1).

Steelhead and CRLF were evaluated because both are listed as threatened under the federal Endangered Species Act. Riparian vegetation was evaluated because the California Department of Fish and Game considers it a sensitive plant community. Other biological resources of interest, including birds and benthic invertebrates are not included in the study. However, the condition of birds, benthic invertebrates, and other animals can be associated with the condition of riparian vegetation and steelhead.

Assumptions and Limitations

The study was conducted based on certain assumptions and limitations. The primary study assumptions and limitations are:

- The evaluation of Carmel River flows is based on the past hydrologic record and does not attempt to project future conditions within the watershed. The study did not attempt to estimate the changes in hydrologic conditions that might occur as a result of future projects or natural physical changes in the environment, such as changes in operation of Los Padres or San Clemente Dam. Seven water year types were used in the flow analysis. The water year types were defined by the 12.5 percent exceedence frequency increments of unimpaired Carmel River Basin runoff.
- Annual Cal-Am demand was assumed to total 15,285 acre feet with 11,285 acre feet coming from the Carmel River;
- The quality of habitat along the Carmel River was assumed to be stable and the present condition of the river channel and substrate would not change.

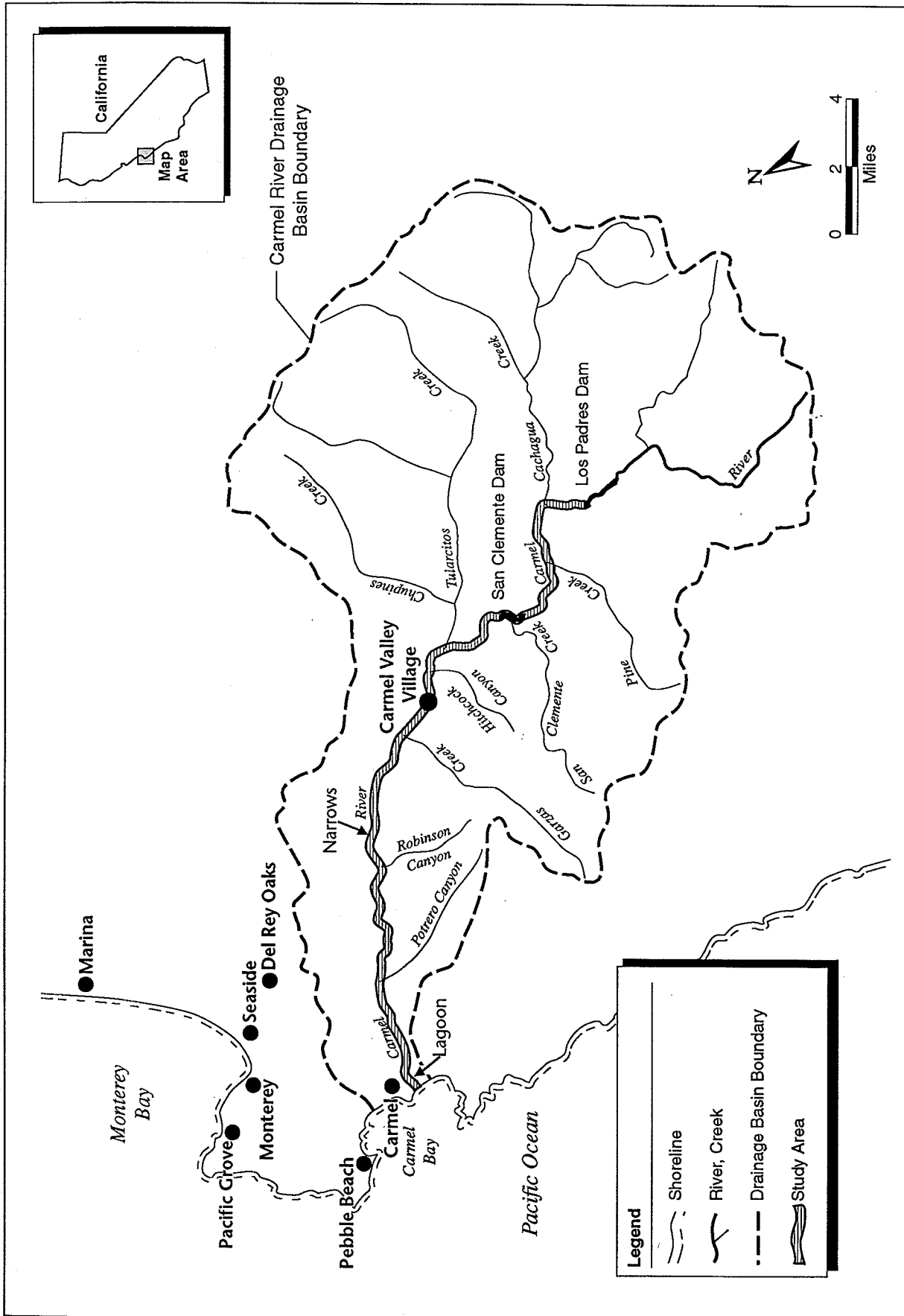


Figure ES-1
Carmel River Flow Threshold Study Area

- The study focused on developing impact thresholds for steelhead, CRLF, and riparian vegetation. The thresholds were developed relative to existing conditions.

Conclusions

Steelhead

The proposed flow thresholds for assessing impacts on Carmel River steelhead during critically dry, dry, below normal, normal, above normal, wet, and extremely wet years are summarized in **Table ES-1**.

Critically Dry Years

In critically dry years, steelhead production is primarily limited by the frequency and magnitude of winter flows needed for attraction and upstream migration of adults, and by the magnitude of flows for rearing and emigration of yearlings during the fall and spring.

Based on the flow threshold criteria, significant impacts associated with impaired conditions can be avoided by maintaining suitable attraction flows to the lagoon whenever an opportunity occurs (whenever inflows to Los Padres Reservoir are projected to meet the attraction criteria during the migration season). This requirement, in combination with "fair" passage (transportation) conditions and a "medium" risk of stranding following an attraction event, result in sufficient numbers of spawning adults to achieve "poor" levels of fry seeding in most years (assuming "fair" spawning and rearing capacity). This level of fry seeding, in combination with "fair" rearing and emigration conditions and a "medium" risk of juvenile stranding, was found to maintain adult populations at "poor" levels in all years, which is comparable to levels achieved under unimpaired conditions.

Dry and Below-Normal Years

In dry and below-normal years, flows during the fall and spring rearing and emigration period had the greatest effect on adult production relative to unimpaired flows. Flows associated with "fair" rearing and emigration conditions and a "zero" risk of juvenile stranding were found to maintain adult populations at "poor" to "fair" levels in dry years and at "fair" levels in below-normal years. These levels are comparable to those achieved under unimpaired conditions. Based on the flow threshold criteria, it was also concluded that winter flows should continue to maintain opportunities for attraction and upstream migration of adults whenever they occur. Therefore, the proposed flow thresholds for adult attraction and upstream migration in dry and below-normal years were established at the same levels proposed for critically dry years.

Table ES-1. Proposed Flow Thresholds for Carmel River Steelhead

Life Stage	Period	Critically Dry Years	Dry and Below Normal Years	Normal and Above-Normal Years	Wet Years	Extremely Wet Years
ADULT MIGRATION Attraction	December 15- January 31	Daily flow of 200 cfs to Lagoon whenever inflows to Los Padres Reservoir meet flow criteria in Appendix A in Dettman 1993.	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years
	February 1- February 28	Daily flow of 100 cfs to Lagoon whenever inflows to Los Padres Reservoir meet flow criteria in Appendix A in Dettman 1993.	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years
	March 1- April 15	Daily flow of 50 cfs to Lagoon whenever inflows to Los Padres Reservoir meet flow criteria in Appendix A in Dettman 1993.	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years
Transportation	December 15- January 31	Daily flow of 60 cfs at Narrows and Lagoon for 25-50% of the days following attraction flow (apply to each period)	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years
Stranding	December 15- January 31	Daily flow of 40 cfs at Narrows and Lagoon for 50-75% of the days following attraction flow (apply to each period)	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years
SPAWNING	February 1- April 15	Average daily flow of 43-81 cfs at Narrows	Same as critically dry years	Same as critically dry years	Same as critically dry years	Same as critically dry years

Table ES-1. Continued

Life Stage	Period	Critically Dry Years	Dry and Below Normal Years	Normal and Above-Normal Years	Wet Years	Extremely Wet Years
REARING						
Rearing Capacity	June 1- December 31	Minimum monthly flow of 2-6 cfs at Narrows	Same as critically dry years	Same as critically dry years	Same as critically dry years	Minimum monthly flow of 6-20 cfs at Narrows
Stranding	October 1- March 31	Minimum daily flow of 1-5 cfs at Narrows following first storm event resulting in flows of 20 cfs or more at the Narrows (apply same threshold at Lagoon)	Minimum daily flow ≥ 5 cfs at Narrows following first storm event resulting in flows of 20 cfs or more at the Narrows (apply same threshold at Lagoon)	Same as below normal years	Same as below normal years	Same as below normal years
EMIGRATION/REARING						
	April 1- May 31	Average Apr-May flow of 20-39 cfs at Lagoon	Same as critically dry years	Average Apr-May flow of 40-99 cfs at Lagoon	Average Apr-May flow ≥ 100 cfs at Lagoon	Same as wet years

Normal, Wet, and Extremely Wet Years

In normal and wetter years, no major limitations resulting from impaired flows were identified. The proposed flow thresholds are based on the need to maintain conditions that allow the steelhead population to expand in response to good to excellent flow conditions that occur in these water years.

Riparian Vegetation

The growth, survival, and establishment of riparian vegetation along the Carmel River are associated with groundwater levels. The bed of the Carmel River may be dry from the Rancho Canada golf course at River Mile (RM) 2 to 6 miles upstream in critically dry years. The length and duration of the riverbed being dry varies by water year type. With the exception of extremely wet and some wet years, this length and duration is related to upstream flows and amount of groundwater pumping. Under existing conditions, riparian vegetation is maintained by irrigation in the area where the riverbed is periodically dry.

The following conclusions can be drawn about hydrologic effects on riparian vegetation:

- Any flow reduction that would lead to a lengthening of the area or time period that the channel is dry may lead to a significant effect on riparian vegetation that would require additional irrigation in excess of the irrigation that is applied under existing conditions.
- Any increase in the time period that groundwater declines exceed 1 foot/day may lead to a significant effect on riparian vegetation.
- Any increase in the time period that groundwater is more than 20 feet deep in riparian areas may cause a significant effect on riparian vegetation.
- During wet or extremely wet years with dispersal flows (e.g., flows in excess of 1,000 cubic-feet/second (cfs) in the March – May period), seed dispersal and seedling establishment are not limited by flows at least until May 31.

California Red-Legged Frog

The evaluation of CRLF indicated no correlation between water temperature and flow during June, the warmest month before tadpoles can potentially complete their development and thus move to cooler environments. Therefore, it may be that low flows would not significantly impact CRLF reproduction during most years, as long as flows were sufficient to maintain water temperatures in July and August below the thermal critical maximum for subadults and adults.

Review of data indicates that the Carmel River and off-channel CRLF reproductive sites are hydrologically connected. However, off-channel sites are

buffered from the high Carmel River flows that could result in the scouring and flushing of eggs and tadpoles. Successful reproduction in specific off-channel habitats was documented during the winter and spring of 1999 to 2000, when peak flows of 1,970 cfs at RM 24.8, 3,430 cfs at RM 10.8, and 3,040 cfs at RM 1.1 were recorded. This suggests that flows at or below these levels would not negatively affect CRLF reproduction in off-channel sites.

Bullfrog populations below the two dams are large and a threat to CRLF populations. Bullfrogs were found throughout the reach of the Carmel River below Los Padres Dam, in upper San Clemente Creek and Las Garzas Creek. Flows that change the seasonal nature of in-channel or off-channel habitats and make them perennial could allow for increases in bullfrog populations that could eliminate CRLF. This is particularly true if enough permanent water habitats are created to allow bullfrogs to migrate into areas they do not currently occupy. If bullfrog colonization of newly created permanent water habitats can be prevented, increases in Carmel River summer flows during normal years would benefit CRLF.