FINAL DOCUMENT submitted March 31st 2005

Below San Clemente Dam circa 2004 by Danica Zupic

CARMEL RIVER WATERSHED CONSERVANCY INC.

WATERSHED ASSESSMENT

AND

ACTION PLAN

Of the

CARMEL RIVER WATERSHED CALIFORNIA

2004

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Frank Emerson, CRSA member circa 2002

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Preface

The Carmel River Watershed Conservancy (CRWC) is a 501 C 3 non-profit corporation founded in May 2000 and acts as the financial arm of the Carmel River Watershed Council. The Carmel River Watershed Council is based on the Monterey Peninsula and meets from time to time on an as needed basis. It is governed by Consensus. The Council stakeholders are the officers & directors of CRWC. The formation of the Council came about as follows:

In January of 1999, Congressman Sam Farr, of 17th District, called a meeting in Carmel Valley Village in response to federal agency concerns about enforcing terms of the Endangered Species Act. At this time Steelhead (SH) in the Carmel River had been reduced to a few hundred fish and demands for water from the Carmel River by diversions or wells far exceeded availability.

Congressman Farr's goal was to bring together federal, state and local interests to develop a meaningful, enforceable policy based on a community response. Monterey County Fifth District County Supervisor David Potter was charged by Congressman Farr to help form a watershed council on the Carmel River. Such watershed councils have been effective elsewhere in California and in other states to develop community-based conservation policy and cooperation with regulatory agencies. Supervisor Potter then facilitated a series of public meetings, at various locations throughout the watershed. These meetings allowed citizens to participate in identifying stakeholders and to prioritize specific issues. The most important issues identified by the public outreach process included water quality and quantity, riparian habitat for native species, erosion, sediment transport, infiltration and runoff, communication, flooding/drainage, education, cultural resources, and quality of life. From those attending the meetings, individuals were selected to represent identified stakeholder groups. A steering committee of twelve persons was formed in December 1999, each representing one of the following interest groups; 1) the hospitality business 2) graziers, 3) agricultural growers, 4) organizations concerned with management & protection of natural lands, 5) environmental groups, 6) recreationists, 7) residential groups, 8) educational and cultural resource organizations, 9) riparian floodplain residents, 10) businesses including builders, developers and contractors, 11) The Cachagua Area of Carmel Valley, which includes National Forest Lands, a dam & reservoir, residences, ranches and vineyards., and 12) water (purveyors).

Mission Statement:

The primary mission of the Carmel River Watershed Council (CRWC) is protection of the natural resources that form the Carmel River Watershed. The council will balance environmental protection and the diverse needs of the Community. This will be accomplished by exemplifying integrity, inclusiveness, education and mutual respect.

Statement of Intent:

The CRWC is a nonprofit, community based organization founded in 2000 and built on a foundation of mutual understanding of and respect for the rights of "Stakeholders" in the Carmel River Watershed. The CRWC will work with local, state and federal agencies for improved management of the Carmel River Watershed. The CRWC's primary commitment for protection and restoration of the watershed is to ensure the health and viability of the Carmel River.

Project Background:

In 2001 CRWC filed an application with California State Water Control Board (CSWRCB) for a grant to conduct a Watershed Assessment and to develop an Action Plan for the Carmel River Watershed. In August 2002 the grant in the form of a contract between CSWRCB & CRWC for $198,200 was signed. As CRWC had very limited funds available to it the State made an advance of 25% as working capital. Without this generous offer this assessment could not have commenced. It was agreed that the advance should be repaid over four installments and the last payment to be effected on December 31st 2004.

Purpose of Assessment is to provide a Carmel River Watershed Management Plan (Plan) in which specific water quality goals will be defined through the planning process and implementation of management measures to achieve those goals will be the outcome of the Plan.

In March, 1999, the Carmel River was listed as one of North America's 10 most endangered rivers of 1999 by the group American Rivers. The nomination was based upon threats to the river that include over-pumping, non-point source pollution, continued development in the floodplain, the proposed development of a new dam on the river, and the need for greater public awareness of issues affecting the river. The most important issues identified by a public outreach process included issues such as water quality and the declining water quantity (**FLOWS**) and riparian habitat for native species, erosion, excessive sediment transport, infiltration and runoff, and flooding/drainage. The Carmel River is part of the South Central Steelhead Trout (SH), "*Oncorhynchus mykiss"* Evolutionary Significant Unit (ESU) and has historically supported a run of now federally listed steelhead. SH habitat in the Carmel River has been severely degraded due to historically significant levels of bank erosion and subsequent sediment loading. The CRWC is especially interested in improving conditions for the SH population that spawn in the watershed if winter **flows** are sufficient to breach sand berm at the mouth of the river. Stakeholders also identified a need for education about resource issues in the watershed, and for better communication with and between resource agencies.

Scope of Work

Collect existing historic and available current data and provide a science-based analysis of the river system. The goal of the assessment is to identify critical areas of the river and surrounding watershed areas needing restoration work. GIS maps produced will assist to better understand the existing conditions. This will provide the Council and landowners the tools they need to develop effective restoration and conservation measures.

In particular:

Conduct assessment of physical characteristics of the river channel, including flow regimes and sedimentation studies.
Conduct assessment of riparian functioning and conditions, of the Carmel River & the main tributaries using Properly Functioning Conditions (PFC) a process developed under collaboration with Bureau of Land Management (BLM), U.S. Forest Service & Natural Resources Conservation Service.
Conduct biological assessment of fish and amphibian populations.
Conduct assessment of water quality conditions in river and lagoon using existing data
Conduct benthic macroinvertebrate analysis of Carmel River. Collect benthic macroinvertebrate samples from three sites along the main stem and selected tributaries.
Produce GIS database and maps. All data layers will be supplied on CD-ROM in electronic GIS format. Maps in Poster form covering A) location of Carmel River; B) towns, roads & rivers; C) Land Use; D) Geology, E) Soils; F) Points of Interest.
Outreach. Conduct series of four workshops to educate stakeholders, resource managers and community members on the assessment process, development of the assessment and participation in the Action Planning process.
Prepare a Watershed Action Plan as a cooperative effort among Council Stakeholders, agency representatives and the general public. In all phases of this process the Council stakeholders, members & the Technical Advisory Team will review the drafts of the Action Plan.

Acknowledgements

The Carmel River Watershed Conservancy thanks Douglas P. Smith PH.D, Wendi B. Newman, Fred G.R. Watson PH.D, and J. Hameister of the Watershed Institute at California State University Monterey Bay;

AND Larry Hampson, the Project Manager, Beverly Chaney, Thomas Christensen, Dave Dettman, Cory Hamilton, Eric Sandoval, Paul Watters and Jessica Wheeler of the Monterey Peninsula Water Management District. Others on the staff, both past &

present made indirect contributions through their previous written work including Martin Canning, Greg James, and Nicole Nedeff.

AND two local interns Danica Zupic and Benjamin Eichorn, for their work on the Proper Functioning Conditions of the main tributaries of the Carmel River.

As the Project Manager I would like to add my thanks and appreciation to everyone for steering me through the labyrinth of piecing together a watershed assessment.

AND, our thanks to the members of the Technical Advisory Committee that first came together in 2002 and over the years has seen changes in its makeup. The current members are Joyce Ambrosius, NOAA, Thomas Christensen, MPWMD, Bob Costa, RCGC, Susanna Danner, BSLT, Dave Dettman, MPWMD, Frank Emerson, CRSA, Jessica Griffiths, VWA, Larry Hampson, MPWMD, Cynthia Holmsky, BSLT, Mike Hill, CDFG, Paul Kephart, Rana Creek Restoration, Vic Lewis, MCPWD, Geoff Malloway, Rec. Angler, Danny Maquis, NRCS, John Mckeon, NOAA, Nikki Nedeff, CRWC, Bill Philips, MWRD, Dawn Reis, Ecological Studies, Roger Root, USFWS, Doug Smith, CSUMB, Roy Thomas, CRSA, Paul Watters, MPWMD & Bob Zampatti, CRSA.

Project Consultants:

CRWC contracted the Physical & Hydrologic Assessment with the Watershed Institute, Division of Science & Environment Policy, California State University of Monterey Bay, 100 Campus Center, Seaside, CA 93955. Douglas Smith (Ph.D), Wendi Newman, GIS Specialist, Fred Watson (Ph.D) & Janna Hameister. (88 pages supported by Appendix AA 5 poster maps, 1) Sub-basins & Geography, 2) Major Geologic Units, 3) Land Cover, 4)Soils, 50 Base Map, Appendix B metadata for the maps in Appendix A, Appendix C -1 Miscellaneous Data Excerpts from the Carmel Valley Master Plan, Appendix C-2 Description of USGS Stream Gauges.)

http://science.csumb.edu/~ccows/pubs/reports/CCoWS_CRWC_CarmAssPhysHyd_041101.pdf

And the Environmental and Biological Assessment of Portions of the Carmel River Watershed with the Monterey Water Management District, 5 Harris Court, P.O. Box 85, Monterey,CA 93942-0085.Larry Hampson,Project Manager, David Dettman, Senior Fish Biologist, Thomas Christensen, Restoration, Eric Sandoval, Senior GIS Specialist, Beverley Chaney, Fish biologist, Cory Hamilton, Jessica Wheeler, & Paul Watters .

The Environmental and Biological Assessment of Portions of the Carmel River can be accessed in digital form at:

http://www.mpwmd.dst.ca.us/programs/river/watershed_assessment/watershed_assessment.htm

Please note that there are some extremely large PDF files at this location and they take time to open. MPWMD suggests that you right-click the URL and download them or if you prefer request MPWMD at larry@mpwmd.dst.ca.us to forward a CD.

Location has 248 pages including 5.0 Summary, 5.4.1,Assessment of Riparian Functions and Conditions, 5.5 Biological Assessment of Fish and Amphibian Populations, 5.5.1.1 Distribution Maps for Rearing and pawning Habitat between Lagoon and Headwaters, 5.5.1.2 Delineate Potential Rearing Habitat and Population Surveys For Juvenile Steelhead, 5.5.1.3 Population Counts of Adult Steelhead at Los Padres and San Clemente Dams, 5.5.1.4 Trend Analysis for Juvenile and Adult Steelhead,5.5.1.5 Distribution of Woody Debris and Its Role In Steelhead Ecology,5.5.1.6 Constraints and Limiting Factors for Steelhead Population and Potential Restoration Areas, 5.5.2.1 California Red-legged Frogs – Sightings Maps, 5.5.2.2 California Red-legged Frogs – Habitat Maps, 5.5.2.3 Limiting Factors for Red-legged Frog Populations, 5.6 Assessment of Water Quality Conditions in the Carmel River and Lagoon, 5.7 Assessment of Benthic Macroinvertebrate Community, Including Drift Feeders)

And Proper Functioning Conditions of the main tributaries of the Carmel River below Los Padres dam with two summer interns Danica Zupic, Benjamin Eichorn, local residents and the CRWC Project Manager.

Webpage: http://www.carmelriverwatershed.org/WA/pfc.html

The Carmel Watershed Conservancy WebPage at

http://www.carmelriverwatershed.org/WA/WAprop13.html contains in one location all of the salient features of the assessment and Action plan. There files and maps may be downloaded.

Executive Summary

Watershed Assessment Process

A watershed assessment studies the people, natural resources and changes that occur in a watershed.

The Stakeholders

The people who live in, work or use the watershed have for the last twenty years been embroiled in debates over alternative sources of water by enlarging existing dams, surface water storage, desalination plants, storage by well injection, seismic problems with San Clemente dam (with one of the highest fish ladders in the West), and a reservoir almost full of sediment, the Los Padres dam also with serious sediment problems. Add to this promotion of several above market housing developments both in the valley and on the lower slopes of the Santa Lucia Mountains that have had an effect on groundwater resources both in the Carmel Valley and on the main tributaries.

The Founding Stakeholders and their successors were determined early on that CRWC was not to take a position on whether the San Clemente dam should be retrofitted or demolished. At the current time the estimated population of the 256 square miles that make up the watershed is 13,000 to 15,000. The documents for the proposed Carmel Valley Township incorporation which encompasses the unincorporated parts of Carmel from Highway I to a mile below the Carmel Valley Village estimates a population of 12,000. The area is described as from ridgeline to ridgeline.

The watershed community is polarized on the subjects of water quantity and environmental concern, consequences of growth that is needed in economic terms and the availability of potable water, fish versus people etc. and the cost of an alternate water supply such as desalination plants. They are certainly in agreement over dam safety and yet concerned that demolition is much more costly than a safety retrofit of the existing structure. In the same vein conservationists agonize over the measures needed to ensure that the sediment behind the dam does not turnout to ruin the lower river for years to come. At the same time recognizing that in the long term it will be better to remove the dam.

We have and will continue to press for adequate funding for mitigation funds to clear sediment from behind the dam that may block entrance to tributaries in the lower river and fish passage up river. In the final analysis it is possible that little can be done to prevent massive sediment movement and subsequent covering of the spawning areas in

the lower main stem. The solution could be a brood-stock program which would be an expensive proposition if extended over many years and provided that a weir trap, re-location transport, and an ocean water rearing facilities were available. None of this would be necessary if a retrofit took place as long as the fish ladder at San Clemente was redesigned.

However, a research station between Potrero creek and highway one bridge would be a significant factor in collecting more information on the migratory behavior of SH covering the entire watershed.

We are however keeping an open mind and eagerly await a decision. This may take four to eight years. We have been assured that if an early resolution of the San Clemente dam occurs then CRWC may reopen and revise the Action Plan to include specific projects that will then become a priority. That decision may take years and in the meantime there is much to be accomplished.

Natural Resources and Changes that are occurring:

Guaranteeing surface flow in the Carmel River mainstem and its tributaries should be the single most important objective of the Carmel River Watershed Action Plan. [3] *Dealing with dams, erosion/sedimentation, water quality for aquatic life, public outreach, public access, riparian habitat restoration and recreational needs are irrelevant if the lack of surface flow continues to be a problem. The flow in the tributaries is especially impacted due to extraction via wells, an element that is without adequate regulation and monitoring but will certainly be a focal point of major importance and is sure to be politically volatile. No one denies the rights of property owners, riparian or otherwise. But those rights do not exclude the rights of those who live downstream or the needs of aquatic resources.*

It is clear that the demand for water exceeds the supply most of the time. For the Carmel River Watershed Action Plan to be meaningful and effective, local, state and federal resource and regulatory agencies have got to be determined in their purpose. But action must be taken immediately while we are still at a crossroads in watershed management. Further delay of action, or mismanagement of the watershed, will likely result in an "Endangered" listing for steelhead within a few years.
There is no way the Carmel River and its aquatic resources can be returned to their historic condition. However, a reasonable balance can be struck between human needs and the needs of our treasured natural resources. This will require sacrifice by the communities who utilize water from the Carmel River and its tributaries (in terms of water conservation measures coupled with a control over population growth and utilization of other water sources) and by those who stand to gain economically from future developments planned within the watershed (abandonment of proposed developments). This is an unfortunate reality and is something few want to hear, but the logic cannot be denied. Some special interest groups, anglers for example, have already been made to curtail their activities significantly over the past few decades (reduced bag limits, reduced seasons, gear restrictions, low flow closures, etc.). The economic impact of this is unknown, but it can be argued that steelhead do have an economic value to the local community.

[3] Contributed by Geoff Malloway, owner of a local fly fishing store, a conservationist member of the CRWC TAC who has made a major contribution to the existence of the Carmel River Steelhead by his efforts over the past ten years. This paper submitted to the Technical Advisory Team.

Once surface flow in the watershed is restored to a healthier level, other restorative projects will likely fall into place. Sedimentation, habitat and water quality are closely related to flow if not direct functions of flow. The presence of two significant and obsolete dams on the Carmel River cannot be ignored. They impact fish migration, sediment transport and habitat dynamics. A long term solution to these structures, whether it is upgrading or complete or partial removal has got to be in the best interest of the river and its aquatic resources. Education/public outreach has potential and is an important part in any plan, but I think those efforts thus far have not paid in dividends. Public access and recreation is not a major problem to my knowledge but there is room for improvement and I believe those improvements are relatively economical.
Finally, monitoring is the one element that must be represented throughout the plan. Otherwise, how would anyone know if the plan is accomplishing its intended purpose?

Physical & Hydrologic Assessment of the Carmel River Watershed

In his Executive Summary Professor Doug Smith states:

The Carmel Watershed has finite annual rainfall as its only water resource. That resource is currently stretched too thin, leaving new urban, suburban, rural, and industrial development in and around the watershed at odds with pre-existing water appropriation and environmental requirements (e.g., SWRCB, 1995a; 1995b). Certain kinds of common land-uses and road designs supply excess sediment above natural background rates.

Table 1: Physical attributes of the Carmel Watershed

Drainage area	656 km2 (256 mi2)
Axial trend	315°
Length	43 km (25.8 mi)
Highest peak (South Cone)	1514 m (4965 ft)
General divide elevation	1200 m (4000 ft)
Mouth elevation	Sea level at mouth of Carmel submarine canyon
Relief	1200 m (4000 ft)
Average slope	3%
Approximate Strahler stream order	
Network geometry	Dendritic
Dominant stream types (Rosgen, 1994)	Headwaters dominated by A, B, G Midslopes dominated by B, C, G, F Lowlands dominated by C, F Minor reaches of D (classification of Rosgen, 1994)
Land-use	Wilderness, grazing, viticulture, golf-courses, sparse residential, suburban, urban, and light industrial.
Vegetative Ecosystems	Dominated by chaparral, grasslands, and oak woodland. Local conifer and redwood forests present.
Soil Series	Wide range

Some of the major problems in the watershed are summarized below, in no particular order. [4]

Problems Natural and Man Made

[4] Physical and Hydrologic Assessment of the Carmel River Watershed Extracts from Chapter 1- pages 1-3 The document in its entirety may be downloaded from the CSUMB webpage at http://science.csumb.edu/~ccows/pubs/reports/CCoWS_CRWC_CarmAssPhysHyd_041101.pdf

• Demand for water far exceeds water supply, leading to many related subordinate problems, including diminished surface water for endangered steelhead trout.
• Extensive urbanization exists within the regulatory 100-year floodplain and in the dam-failure inundation zone.
• Excess sediment is generated from a very large number of dirt roads, some of which are abandoned, some of which out of compliance with grading ordinances, but most of which are clearly within regulations.
• Nearly all sub-road drainage culverts are undersized, leading to downstream erosion, whether related to dirt roads, paved roads, or highways.
• Excess sediment is generated by a great number of bare road cuts on dirt roads, paved roads, and highways.
• Excess sediment is generated in the Los Chupines and Sycamore Creek drainages by soil slip, gullies, unstable stream banks, and roads. Many of those issues are related to cattle impacts.
• Excess sediment is generated in a great number of incised streams that have tall, exposed banks.
• San Clemente Dam is unsafe owing to sediment burden and proximity to active faults.
• Decommissioning the San Clemente Dam will likely lead to a significant shift in river morphology and flood response, owing to the restoration of historic bedload transport rates.
• Los Padres Dam is rapidly infilling with sediment and is also close to active faults.
• Watershed impairment is the result of incremental, permitted, changes that have a large cumulative impact on the watershed.

We note that the large-scale negative impacts we describe in the Carmel Watershed mainly resulted from the cumulative effects of small, insignificant, permitted landscape or hydrologic alterations (e.g., Dunne et al., 2001). With that in mind, guidelines for sustainable resource use could begin with an agreed upon ultimate level of resource use, depletion, or degradation, beyond which, no further landscape or hydrologic alterations will be permitted. Using water supply as an example, the best strategy for sustainability is to determine the total cumulative resource usage, and then stop permitting further requests for resource use when the agreed upon cumulative impact is met—the concept of water rights appropriation. This same "cumulative impact" management strategy could be applied to other cumulative watershed impacts, such as total miles of dirt road per square mile of watershed area, or total area of impervious cover per square mile of watershed area. These strategies can be applied once a cumulative impact target has been established upon sound science, and codified by stakeholder agreement. Considering that the cumulative negative impacts in the watershed are the net result of innumerable, insignificant modifications, we can predict that innumerable, small positive restorative efforts in the watershed would eventually produce large positive impacts on watershed health including water quality and quantity.

Data Needs:

We have used available data to present a snapshot of the condition of the Carmel Watershed. We list below some of the key pieces of data that would be beneficial in a continuing effort to monitor watershed conditions, identify and quantify specific problems, and to assign specific water quality/quantity goals for the Carmel River and its tributaries. Of critical importance are regularly scheduled direct measurements of sediment transport from a few select sub-watersheds, so that when stakeholders agree

on target conditions, there will be some indication of the magnitude of watershed restoration that is required. Such a program could establish reference conditions for which stakeholders strive. We recognize several classes of sediment sources in this report, but we do not have enough data to prioritize them in terms of their relative impacts on watershed conditions. In the absence of more data, such prioritization will have to come from best professional judgment and broad stakeholder input. We identify the following data gaps.

- An institutionalized program of bedload and suspended load sediment measurements in major tributaries and main-stem river to improve baseline conditions and determine the effects (if any) of urbanization and various land-uses.
- Road inventory and restoration prioritization in most rural watersheds, with emphasis on improved stream crossings on active roads, and decommissioning rarely-used or abandoned, roads.
- Comprehensive inventory and prioritization of culvert problems on paved and dirt roads.
- Monitoring data showing seasonal and long-term trends in upland groundwater resources throughout the watershed.
- Improved understanding of the relationship between upland bedrock aquifers and the Carmel River water resources.
- Bedrock aquifer recharge area delineation.
- Public access to water use data.
- Recovery/restoration potential of various landscape settings. These data would come from establishing and monitoring demonstration restoration sites on various riparian and upland landscapes. Data on ecosystem/soil recovery rates following cattle exclusion would help develop grazing management strategies if cattle must be part of the watershed.
- Studies of the impact of cattle as a function of the number of head per season per acre.
- Improved understanding of climate averages, trends, and expected extremes.
- Improved measurements and modeling of water balance components, especially evaprotranspiration.

Environmental and Biological Assessment of Portions of the Carmel River Watershed

Extracts from the Summary

Qualitative and quantitative methods were used to assess several indicators of the health and resiliency of the Carmel River main stem. This report provides a baseline of biologic data compiled in 2003 and early 2004 by the Monterey Peninsula Water Management District (MPWMD) from MPWMD records and other publicly available documents. Data and analysis are presented on stream functionality, riparian vegetation, California red-legged frogs (CRLF), steelhead, large wood, water quality, and insects in the channel bottom known collectively as benthic macroinvertebrates (BMI).
Detailed biologic information is sparse prior to the early 1980's, but data gathered since on steelhead numbers and habitat, channel form, water quality, and riparian vegetation are relatively robust. However, information on CRLF and the BMI community is limited, which makes analysis and observations of trends subject to a degree of uncertainty.

Relatively large data sets exist for the following:
- Adult steelhead population counts at San Clemente Dam (first report in 1954, some years missing until an automatic counter was installed in 1992)
- Adult steelhead population counts at Los Padres Dam (first report in 1949 and most years since)
- Main stem juvenile density (1973, 1974, most years after 1983)
- Water quality data at the lagoon, San Clemente Dam, and at Los Padres Dam (1991 to present)
- Water temperature data at 11 locations

Less extensive data sets that form a baseline include:

- Assessment of riparian functions (2003-2004)
- California red-legged frog sightings, surveys, and habitat mapping (1991 to present)
- Distribution of large wood in the main stem (2002 and 2003)
- Sampling data for benthic macroinvertebrates (1982 and 2000-2003)

Information about the main stem is regularly updated by MPWMD and there are other public and private agencies also gathering data in the watershed. Data presented in this assessment is from records in the possession of MPWMD and it is possible that more information on the topics presented here exists. Because many organizations and agencies continue to gather environmental data on the Carmel River Watershed, the information presented here should be considered a first step in understanding and assessing the watershed.

It is apparent that many reaches of the river can provide high quality, productive habitat for steelhead; however, the current steelhead population is below historic numbers for the Carmel River and is well below populations found in Northern California coastal streams. Likely factors contributing to this decline include habitat fragmentation and degradation, introduced non-native predator species, impaired fish passage, and water diversions that alter natural streamflows. Other contributing factors may include water and air pollution and events outside of the watershed such as changes in the ocean going steelhead population. However, the increasing density and abundance of the juvenile population since 1997, the sharp recovery of the juvenile population since the 1987 to 1991 drought, and strength of the juvenile population compared to other coastal, regional, and local streams indicates the population is resilient and recovering.

Another species of concern, California red-legged frogs, has recently begun to be studied intensively after its listing in 1996 as a threatened species under the Federal Endangered Species Act. This species is difficult to investigate and its life cycle and population in the watershed is only just beginning to be understood. Although these frogs are found in many areas within the watershed, it is unclear whether the population is growing, shrinking, or stable. Most of the information gathered about this species is from observations in the Carmel River lagoon, along the main stem, and at San Clemente Reservoir.

Surveys of riparian-wetland areas along the nine-mile reach upstream of Los Padres Reservoir show these areas are the least impacted by human influences and remain naturally sustainable. Between Los Padres Dam and the Narrows, a distance of approximately 15 miles, riparian areas appear to be in reasonably good condition, although channel degradation (incision into sediment deposits) immediately downstream of Los Padres Dam and San Clemente Dam has left the root structures of many streamside trees exposed to scour and erosion. In addition, the paucity of spawning-sized gravels and cobbles in these reaches renders portions of the habitat unsuitable for steelhead spawning in an area that should provide significant opportunity for spawning. Between the Narrows and the Pacific Ocean, a distance of approximately 10 miles, much of the riparian-wetland area is functionally impaired due to water extraction and development adjacent to the streambanks.

The cumulative effect of human influences has resulted in a fragmented environment in the lower 27 miles of the river that requires intensive management efforts. Between Los Padres Dam and the Narrows, flow releases from storage are required in summer to

maintain aquatic habitat. The lower 10 miles of the river (downstream of the Narrows), where the impacts from water extraction are concentrated, requires irrigation and maintenance of streamside vegetation, reconstruction of streambanks after high winter flows, annual CRLF and steelhead rescues, habitat enhancement activities, and extensive monitoring. Regulation of water extraction from the basin is in effect under orders from the California State Water Resources Board (Order No. 95-10 and subsequent related orders). A program to mitigate for the effects of water extraction on the main stem is carried out locally by the Monterey Peninsula Water Management District under its Mitigation Program.

Riparian (Streamside) Areas

The proper functioning condition (PFC) method for assessing the condition of riparian-wetland areas, which was developed by the U.S. Bureau of Land Management and U.S. Forest Service for use by land managers, was used to assess 37 sites along the main stem from the Carmel River Lagoon to the headwaters. These assessments, which were carried out during Fall 2003 and Spring 2004, confirm that many reaches are currently functioning properly between the Narrows at approximately River Mile (RM, measured from the ocean) 10 and the headwaters at RM 36. However, several reaches downstream of the Narrows are considered "functional at-risk," meaning that without actions to mitigate for the effects of water diversions, these reaches are at risk of becoming non-functional. A map showing the ratings and locations of these assessments is included in Section 5.4. "Assessment of Riparian Functions and Conditions." [5]

Since the mid-1980's, points of water diversion during summer and fall have gradually been shifted downstream into the lower river and groundwater extraction from reaches downstream of the Narrows has been increased. This has increased summer and fall surface flow in the 8.6-mile reach between the Narrows and San Clemente Dam, resulting in an increase in aquatic habitat quality, quantity, and diversity upstream of the Narrows. But increased groundwater extraction downstream of the Narrows may have increased vegetation stress in the lower river, resulting in the loss of streamside vegetation and an increase in bank instability.

Between 1986 and 2001, riparian wooded areas within the streamside corridor downstream of San Clemente Dam have increased from an estimated 299 acres (*McNeish, 1986*) to an estimated 438 acres (*Christensen, 2003*). This increase is due to natural recovery after an episode of bank erosion between 1978 and 1986 combined with increased surface flows and restoration work by a variety of groups including private property owners and public agencies.

An inventory of large wood (LW), which is defined as branches and pieces of trunks greater than six inches in diameter and five feet in length, was conducted in the channel bottom in 2002 and 2003 between the Carmel River Lagoon and Stonepine Resort at RM 16 (*Smith and Huntington, 2004*). The study, which documented 471 occurrences of

[5] Environmental and Biological Assessment of Portions of the Carmel River Watershed, The document in its entirety may be downloaded from the MPWMD webpage at http://www.mpwmd.dst.ca.us/programs/river/watershed_assessment/watershed_assessment.htm

LW, showed a considerable range in the frequency of single pieces and accumulations found in each reach, but the trend shows that frequency decreases in the downstream direction. LW in the lower river tended to be larger and more stable than in upstream reaches, a condition that is to be expected as winter streamflows normally increase in the downstream direction and wash smaller pieces out to the ocean. Almost 30% of wood was fostering pool habitat in the bed. About 70% of LW had no significant impact to lateral channel stability. Less than 4% was found to encourage bank erosion. About 7% of LW had been deliberately placed to enhance aquatic habitat.

In general, higher frequencies of LW were associated with higher densities of steelhead, although there were notable exceptions. In reaches where LW was relative abundant, but steelhead numbers were low, it is likely that the availability of LW was not a limiting factor and that other factors such as substrate condition, food availability, and water quantity and quality were more significant.

Proper Functioning Conditions and Review of the Primary Tributaries of the Carmel River

Preface

This creek assessment was performed to determine the current physical functioning of the riparian – wetland areas of the Carmel River Watershed. The Proper Functioning Condition (PFC) rating for each creek is determined based on observational data collected on the ground in 11 creeks of the Carmel River Watershed according to the guidelines set forth in the *Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas.* (San Jose Creek was assessed despite its location in another watershed because it is impacted by similar factors as those creeks assessed in this report). These creeks were assessed between June 1st and August 31st 2004. In addition to the PFC checklists of each creek, a summary and map of each creek and its reaches is provided. To enhance the reader's understanding of the summaries and checklists, a brief explanation of the checklist questions and a list of problems in the creeks that need to be remedied have been provided in the Quick Reference Guide to Checklist Questions and the Creek Problems Table.

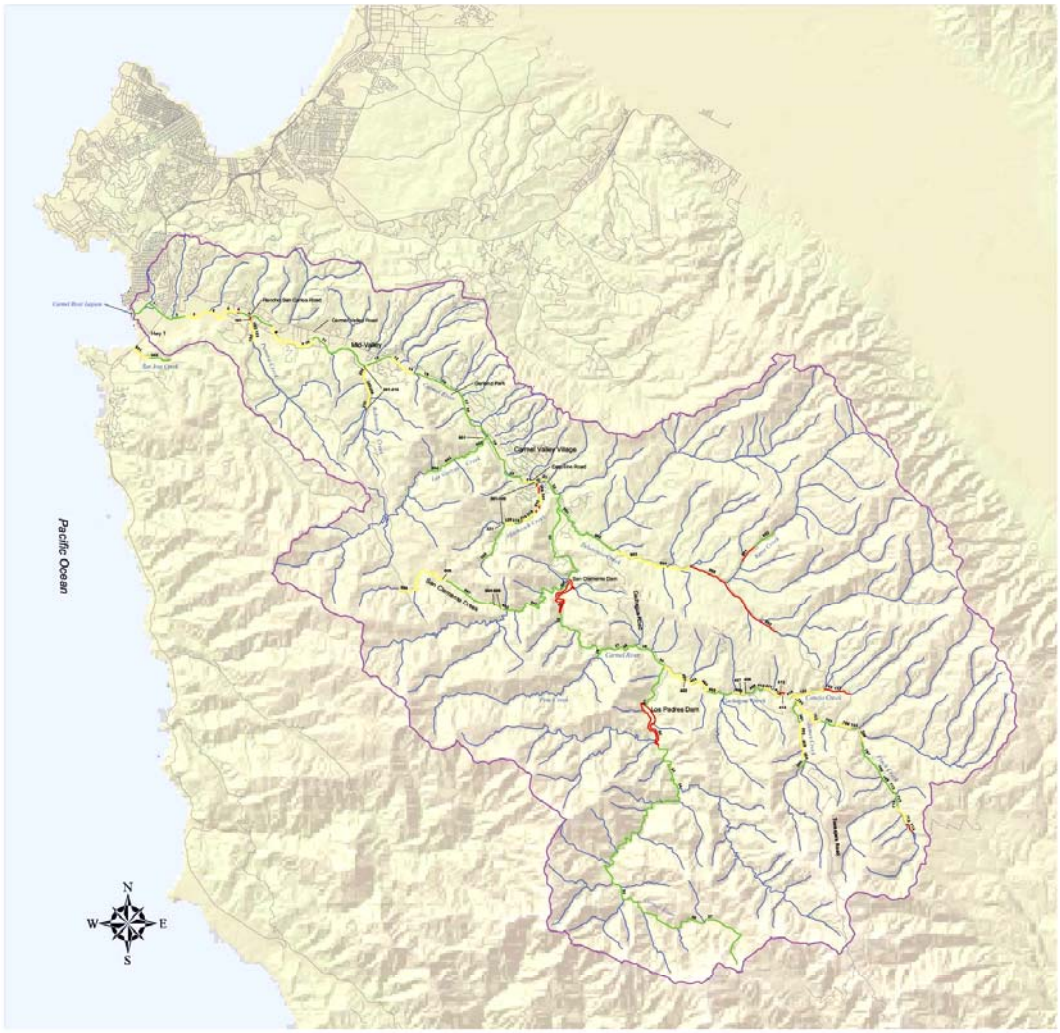
This is the first attempt to map conditions on the tributary creeks of the lower parts of the Carmel River. For many years, the fish ladder at San Clemente has not been an effective fish passage structure for steelhead trout as expected. As a result, an increasing number of returning adults have elected not to ascend the ladder but to spawn in the creeks that feed the lower river. For nine years, the Carmel River Steelhead Association (CRSA) has rescued "young of the year" & yearling steelhead from these creeks. CRSA volunteers in the last four years have observed the toll that development on the uplands of the valley has had, including increased levels of sediment deposition, a lowering of the water table and a loss of riparian habitat, especially trees like Willow & Alder.

Five of the creeks have their source on, or a major portion of the streams flow through, a large private land holding known as the Santa Lucia Preserve. Inside the preserve is a development of upscale market homes on plots in excess of 5 acres. Water for 300

homes, irrigation for a golf course, clubhouse & equestrian center is drawn from wells that are situated near these creeks.

Over the years “Take” of steelhead trout (as described under the NOAA 4D Rules) have occurred on Las Garzas Creek, resulting in actions taken by NOAA and the CSWRCB. The developers of The Preserve have been penalized and, in spite of remedy after remedy, it does not appear to have alleviated the consequences to the Public Trust below. As we write this assessment report on Dec 30, 2004, Potrero Creek had less than 1cfs even though we’ve had 30-year record flows in the Carmel River during the past three days. Potrero had so little flow in 2003-04 water year that no adults appear to have entered the creek and spawned.

Proper Functioning Condition Assessment of the Carmel River and Tributaries



Carmel River and Tributaries

PFC Rating

- Unrated
- Proper Functioning Condition
- Functional at Risk
- Non-functional
- Carmel River Watershed Boundary
- Roads

37 PFC ID number

0 1 2 4 6 8 Miles

Paul Joseph Watters
Field Biology Assistant
Monterey Peninsula Water Management District
5 Harris Court Building G
Monterey, CA 93940

Monterey Peninsula Water Management District

Proper functioning condition (PFC) is a qualitative method developed by the U.S. Bureau of Land Management and U.S. Forest Service to assess the condition of riparian-wetland areas based on hydrology, vegetation, and erosion/deposition (soils) attributes. A total of 17 "yes/no" questions are posed about the characteristics of the stream, resulting in one of three ratings that reflect stream resiliency: (1) proper functioning condition; (2) functional-at-risk; or (3) non-functional. A rating of "proper functioning condition" means that a stream is resilient, i.e., the riparian-wetland area is stable during most high-flow events. A resilient stream produces desired values such as high quality fish and bird habitat. "Functional-at-risk" means the stream reach is currently functional, but is at risk of becoming non-functional due to an observed condition that could impact the reach in the future. "Non-functional" indicates that there is a condition in the reach or watershed interfering with the natural functions of the stream.

These PFC assessments were performed by two interdisciplinary teams with local, on-the-ground experience in the quantitative sampling techniques that support the PFC checklist. The 37 PFC assessments for the Carmel River were performed by Monterey Peninsula Water Management District (MPWMD), and 95 tributary assessments were performed by the Carmel River Watershed Conservancy.

The above map can be found on the CRWC webpage at www.carmelriverwatershed.org/ and is an interactive PDF file that can zero-in with greater detail on the reach of the creek in question.

CRWC organized two workshops to explain how to conduct a PFC review of a rivers and creeks. Over 30 people attended the workshops. It was decided that those people with connections to property owners, or the landowners themselves, would conduct the PFC while others would join the project manager and handle the remaining creeks with public access or by arrangement with the property owners. We prepared an agreement to allow access on private property to conduct PFC's. The review information gathered would only be part of the assessment if the landowner agreed. In May 2004, we visited the executive director of the Santa Lucia Preserve to discuss our PFC project and to enquire if we could conduct a review of these five creeks. We also invited the Executive director to join the Council as a stakeholder representative of the Natural Lands group. We were not asked to help with the PFC review but we were asked to send the Bureau of Lands Management manuals and instruction material to the preserve, which we were pleased to provide.

There was obviously a high level of reluctance on the part of our landowner stakeholders to honor their commitment to the Conservancy as in the final analysis only one landowner invited us to conduct a PFC and permitted us to include all of the findings in the assessment. The General Manager of a large operation and a director of the Conservancy provided their review which was used as a demonstration in our workshops. The others did not submit any of their findings to CRWC, if they did in fact review the creeks running through their lands. For a variety of reasons only two people out of those attending the workshops were able to participate in the review. This was due in part to the delay in getting landowner consents & by the time we started the review the summer temperatures had arrived.

Finally, we hired two local interns and provided them with a crash course in the principles of Proper Functioning Conditions. Our report follows. Obviously, we have only accomplished a part of what we set out to do. However, our findings so far tie in with the observations of the CSUMB Watershed Institute and the Monterey Peninsula Water Management District for the watershed as a whole.

Extracts from the Executive Summary

The beauty and resources of the Carmel River and its tributary creeks have inspired poets, artists and writers and drawn fishermen, wine makers, cattlemen, residents and tourists to its banks and vistas for years. Unfortunately, this beauty is increasingly at risk as the resources it provides to the local watershed must be spread thinner and thinner each year as urban and rural development continue to increase. In 1999 the Carmel River was cited as one of America's top ten endangered rivers (*America's Top Ten Endangered Rivers*, 1999). The necessity to improve the health and stability of this watershed has become even more important since the listing of two threatened species, the Red-legged Frog (*Rana aurora draytonii)* and the Anadromous Steelhead Trout (*Onchorynchus Mykiss).*

This report is part of the complete Carmel Watershed Assessment being compiled by the **Carmel River Watershed Conservancy.** We have focused on the functionality and stability of the tributary creeks to the Carmel River and the quality of steelhead spawning habitats that lie within these same creeks. The functionality and stability of these creeks is important to local landowners whose homes could be severely affected by flooding and/or erosion. The quality of fish spawning habitats has a direct

and important impact on threatened Anadromous Steelhead Trout populations both inside and outside of this watershed.

This assessment found that the many of the creeks in the Carmel River Watershed are not functioning properly. The majority of the creeks assessed lacked adequate vegetation, landform or large woody debris (herein after LWD) to properly dissipate high water flow energies, filter sediment, reduce erosion, and develop root masses to stabilize stream banks. While some of the contributions of creek non-functionality are part of the normal ecological process (such as naturally eroding hillsides), the added impacts by urban, rural and agricultural development are more than the system can handle, which leads to degradation in riparian-wetland area stability. There are many concerns in the creeks of the local sub-basin that need to be addressed and remedied in order to improve the functionality of local creeks, enhance biodiversity and help to ensure the stability of the creek banks of local landowners and homeowners. Some of the major problems encountered on the assessed creeks in the Carmel River Watershed are listed here. A chart of important and manageable creek problems and their location can be found at the end of this report.

- Lack of adequate vegetative cover or mature, deeply rooted trees to stabilize banks and reduce bank erosion.
- Excessive sediment deposits in most creeks due to bank erosion, dirt slides, eroding hillsides, dirt-cut roads, cattle trails and land cleared for construction.
- The degradation of fish habitat due to the filling of pools and covering of gravel and cobbles necessary for trout spawning and rearing habitats.
- Degradation due to cattle that includes: increased mud and cow manure in creek beds, eroding banks due to cattle trails, bare floodplains, inaccessible floodplains, lack of small vegetative recruits.
- Failing bank stabilizers (such as sandbags, tires and concreted buttresses).
- Dumping of yard waste and construction waste in the creek beds.
- Lack of canopy provided by large trees to support greater biodiversity or provide the proper water depth and/or water temperature necessary for proper fish habitats.
- Impediments to fish migration in the form of undercut bridges, retired summer dams, undercut abutments and culverts and other structures laid in the creek bed that act as barriers to fish passage.
- Lack of large woody debris, rocks, or boulders to aid in the dissipation of high energy flows.
- Lack of water in many of the creeks, and the signs of over pumping in many creeks as many of the trees and shrubs encountered exhibited signs of stress.

Hopefully through the education of the public of the importance of vegetative cover, the presence of large well rooted trees and large woody debris, the necessary removal of fish impediments, proper disposal of yard and construction waste along with good stewardship practices will bring about a marked improvement in the functionality and stability of the creeks in the Carmel River Watershed. The erosion, bank instability, and much of the sediment contributions have been accelerated by development of the land for residential and agricultural purposes, but proper landscaping and restoration of

the riparian-wetland habitat could help to mitigate these impacts. A recommendation for the full mitigation of these impacts and the restoration of these creeks to a properly functioning condition has not been provided as the following studies and data are needed for a comprehensive analysis by a Riparian-Wetland specialist.

Studies and data needed

- Water quality analysis of each creek;
- Assessments of the remaining creeks and reaches in the Carmel River Watershed;
- Geologic study of the interconnectedness of the aquifers in the watershed to help decipher the downstream and upstream impacts of over pumping;
- Study of sediment transport in the major creeks and the level of sediment deposits that render a reach to have an extreme excess of sediment.

This completes the Assessment portion. All of the CRWC field work will be found on the Carmel River Watershed Conservancy web pages at

http://www.carmelriverwatershed.org/WA/WAprop13.html

And that of the California State University of Monterey Bay at

http://science.csumb.edu/~ccows/pubs/reports/CCoWS_CRWC_CarmAssPhysHyd_041101.pdf

And the Monterey Peninsula Water Management District at

http://www.mpwmd.dst.ca.us/programs/river/watershed_assessment/watershed_assessment.htm

ACTION PLAN Executive Summary

We have adopted an Action Plan format derived from that used by the Morro Bay CCMP and State Coastal Conservancy plan for the Stakeholders in the Morro Bay National Estuary Program. Ideally a plan should reflect the duration, cost & benefit analysis of each action contemplated. However, in this instance scope of work, allocation of funds and limited volunteer staff and time available made this impossible.

We have identified eight Action categories in order of sequence to the Watershed. These are **Flows, Groundwater, Habitat, Sedimentation, Steelhead, Education, Public Safety, and Water Quantity**.

We have not as yet tried to establish priorities within each of the categories. We have the conviction that conservation efforts should be managed on a watershed basis if that geographic unit has the people and organizations capable of adopting adaptive management techniques. CRWC has found local agency support for forming a Watershed Working Group. We would hope that other conservationist groups would participate. From that group we should not only be able to set priorities within our Action Plan but to ensure one specific activity would not cause problems elsewhere in the system. Again there is the question of allocating resources and grant monies to the best use to the watershed.

Newton Harrison in an Opening Lecture on December 11th 2004 at the College of Santa Fe, New Mexico on "Santa Fe Watershed: Lessons from the Genius of Place" stated, " A fresh look and a more holistic vision emerge from bringing together, landscape architects, ecologists, hydrologists, granting agencies, scientists and community members in a dialogue about the future of the river. Water is a key to our future. Unfortunately, our urban water budgets are frequently broken into disconnected pieces that focus on single solutions instead of an integrated system that mimics and cooperates with the world's most successful engineer---Nature."

Recognizing that many of the problems are related we also introduced a Cross Cutting Category (CC) that consists of 14 items. All in all there are 57 actions. All Action items are summarized and will be found on pages 16 through 22 in table form. The page reference in the final column in the table relates to this Action Plan page number and not to the Watershed Assessment. Where necessary on the tables we have cross referenced action items that cover more than one important concern.

The Action Plans are based on scientific studies, mission statement objectives and input from our prospective partners and the Public.

Description of the Concerns:

The Watershed Assessment that precedes this Action Plan describes and documents all of our concerns in the watershed and those areas where serious problems exist. Our sense is that our public is well informed about the environmental needs but many have apprehension about the motives of their fellow stake holders, whatever group they may

be from. However, it was quite apparent that many in our public workshop audiences appreciate the need for watershed assessments. Their written and oral questions and suggestions, many of which are incorporated in our action plans certainly confirm this.

As one would anticipate many of the problems relate to sediment deposits and are natural occurrences primarily due to the geological formation. However, as more than two-thirds of the Carmel River runs through the Carmel Valley it has been much affected by urban influences and to some extent by agricultural practices of the past. Home owners have ignored or are perhaps unaware of county planning requirements that extend to building or extending structures and supports over or in the creeks. Further they do not appreciate that NOAA and CDFG have regulations over in stream work. Perhaps the county does not have the resources to make this advice available in the rural areas above the Carmel Valley. There is an opportunity here to continue monitoring conditions in the watershed through a broad education program in which land & home owners will be invited to participate. There do not seem to be any guidelines to preclude people from construction in areas that are from time to time flooded. What is apparent is that stream banks are eroding and that in some cases home foundations are collapsing. Much of the trees and bushes that provide some protection against erosion of the stream bank have been removed or not replaced. Much of this puts property & people at risk.

Action # CC-13 PUB-4

The National Resource Conservation Service Salinas & King City (NRCS) has indicated to the watershed reviewers that local farmers and ranchers are adopting best operating procedures and that water quality plans on 12 ranches covering 50,000 acres have been developed. They are monitoring for residual dry matter (RDM) as well as stream turbidity, temperature and presence of nitrates and documenting their results. They are modifying their paddock management. Water developments in close proximity to water courses have changed behavioral occupation of riparian areas. We did find evidence in the Cachagua creek area that cattle were occupying the creek bed for much of a reach.

This activity on their part is all to the good but it is disappointing that only one large land owner responded to our requests for a Proper Functioning Condition review either to be done by them or by CRWC. Further, some stakeholders and their constituents who had agreed to participate in our creek review in various parts of the watershed backed out. The result is that most of the creeks on the uplands on the eastern part of the watershed are not included. We can only hope that one of these days the records they are keeping will be made available to the Conservancy to complete the assessment.

Action # CC-2 HAB-2

Drilling for Groundwater

Land slide at San Clemente Dam

Erosion on Robinson Canyon Rd

Garden trash in creeks

Problems Natural and Man Made

Fish ladder & trap

By Douglas P. Smith PhD. CSUMB, David P. Dettman, Senior Fish Biologist, Larry Hampson, Water Resources Engineer, Thomas C. Christensen Riparian Projects Coordinator at MPWMD, Monterey & C.R. Sanders Project Manager, CRWC

Pictures from WI Physical & Hydrologic Assessment, MPWMD Environmental & Biological Assessment & CRWC Proper Functioning Conditions of Carmel River Tributaries see map on page 15

San Clemente reservoir sedimentation

Floor supports in the creek bed

S.C. fish ladder needs a fix

Fish passage impediment

Foundation erosion

Foundations in creek bed

Dam with seismic problems

Creeks dry up requiring fish rescues

Threatened species RLFrog

Threatened species Steelhead

Lagoon management problems

Fish passage

Trash after floods


Cattle grazing steep slopes


Conejo Creek, Carmel Valley Rd.


Culverts

Problems Natural and Man Made

- Demand for water far exceeds supply **Action # WQ-1-2**
- Flows from watershed sources are being impacted by **heavy groundwater extraction** **Action # GW-1**
- The Public Trust habitat, Steelhead & RL Frogs are subject to severe stress as creek **flows** come under pressure in the lower reaches from **groundwater extraction** from the uplands **Action # GW-2**
- Extensive urbanization exists within 100-year flood plain & in the dam-failure inundation zone **Action # CC-5-7 CC-9**
- *Excess **sediment** from dirt roads
- *Sub-road drainage culverts are undersized & badly placed causing erosion
- *Excess **sediment** is generated by bare road cuts on roads
- *Excess **sediment** is caused by soil slip, gullies, unstable stream banks & roads
- ***Action # SED 3-4, 7-9**
- San Clemente Dam is unsafe due to **sediment burden & proximity to active faults** **Action # PS-1**
- Fish Ladder at San Clemente needs a retrofit **Action # SH-1 SH-4**
- Decommissioning of San Clemente will likely lead to significant shift in river morphology & flood response, owing to the restoration of historic bedload transport rates **Action # CC-3 SH-6**
- Los Padres Dam is **infilling with sediment** and as storage diminishes continuation of flows will be impaired
- Watershed impairment is result of incremental, permitted changes that have a large cumulative impact on the watershed
- **Steelhead population is below historic levels** for the Carmel River and well below Northern California coastal streams **Action # SH-2 HAB-10-11**
- Steelhead & Red-Legged Frogs listed as threatened species in 1996 places a heavy burden on watershed residents & landowners to ensure the wellbeing of these species **Action # SH-2**
- Reviews of environmental problems in the Carmel River have led to a general understanding of the principal factors associated with the historical **Steelhead population decline** in the Carmel River Basin, including the following factors:

1) Inadequate **passage facilities** for adults and juveniles at Los Padres Dam. (Partially taken care of by a CRSA & CDFG fish ladder & trap in 1999.) **Action # FLOWS 7 SH-3**

2) Dry season **surface diversions** at San Clemente Dam.

3) **Subsurface diversion** of percolating streamflow and groundwater. **Action # GW-1-2**

4) A **reduction in the extent and diversity of streamside vegetation**, a reduction of the number of trees and the canopy in the riparian forest, and reduced amounts of large wood in the active channel downstream of Robles del Rio. **Action # HAB-4**

5) **Retention in main stem reservoirs of cobbles** and gravel sediment that is beneficial to steelhead and benthic macroinvertebrates (insects in the river bottom). **Action # HAB-1**

6) Chronic and episodic bank erosion in tributaries and the main stem that introduces fine sediments into spawning and rearing habitats. **Action # SED-1-2 SED5-6**

7) **Sand deposition** in the Lagoon that reduces habitat for adults during the winter, for smolts during the spring, and for juveniles during the summer and fall months. **Action # CC-6 CC14 HAB-3**

8) Changes in dry season (late spring to fall) water quality, including increased water temperature, reduced oxygen levels, and higher salinity levels (Lagoon only). **Action # CC-6 CC-14**

9) **Loss of surface storage** in Los Padres Reservoir due to **sedimentation.**

- **Cumulative effect of human influences** has resulted in a fragmented environment in the lower 27 miles of the river that requires **intensive management efforts** **Action # CC-1 HAB-4**
- Between the Los Padres Dam and the Narrows **flow** releases from storage are necessary in summer to maintain aquatic habitat. **Action # FLOWS 1-6**
- The lower 10 miles of the main stem (downstream of the Narrows, where the impacts from water extraction are concentrated requires irrigation & maintenance of streamside vegetation & reconstruction of stream banks after high winter flows **Action # FLOWS 1-6**
- **Rescues of steelhead fry & juveniles** are required from the main tributaries
- Several reaches of the main stem below the narrows are **considered functional at risk**, meaning that without action to mitigate the effects of water diversions, they are at risk of becoming non-functional **Action # HAB-5**
- Large Wood found in the main stem, Stonepine Resort to the mouth (LW also known as Large Woody Debris LWD) **lessens in frequency** downstream and in general higher frequencies were associated with higher densities of Steelhead **Action # HAB-3-4 CC-3**
- Watershed 2004 was the first attempt to map conditions on the tributary creeks of the lower parts of the Carmel River. **Many creeks were not functioning properly**. The majority lacked adequate vegetation, landform & LWD to properly dissipate high water flow energy, filter sediment, reduce erosion and develop root masses to stabilize stream banks **Action # HAB-5-9**
- While some of the contributions to non-functionality were normal ecological process, the **added impacts by urban, rural & agricultural practices** are more than the system can handle **Action # CC-1 CC-5**

FLOWS and GROUNDWATER

"Guaranteeing surface flow in the Carmel River main stem and its tributaries should be the single most important objective of the Carmel River Watershed Action Plan.[6] *Dealing with dams, erosion/sedimentation, water quality for aquatic life, public outreach, public access, riparian habitat restoration and recreational needs are irrelevant if the lack of surface flow continues to be a problem. The flow in the tributaries is especially impacted due to extraction via wells, an element that is without adequate regulation and monitoring but will certainly be a focal point of major importance and is sure to be politically volatile. No one denies the rights of property owners, riparian or otherwise. But those rights do not exclude the rights of those who live downstream or the needs of aquatic resources in the Public Trust.*

This will require continued sacrifice by the communities who utilize water from the Carmel River and its tributaries (in terms of water conservation measures coupled with a control over population growth and utilization of other water sources) and by those who stand to gain economically from future developments planned within the watershed (abandonment of proposed developments).

In 2002 Jim Edmonson, Conservation Director of Cal Trout wrote,

USGS Western States Groundwater Atlas can be found at

http://**ca.water.usgs.gov/groundwater/gwatlas/summary/withdrawls.html**

"Today, there are over 1,200 reservoirs that capture and hold surface water in California, and the flows of all but one major river are interrupted by dams. Yet, surface water meets only about 70% of California's water demand. The rest comes from groundwater. Groundwater is pumped from underground aquifers for agricultural and other uses.

The combined process of diverting water from both ground and surface sources has resulted in less water being available for fish. This decrease in water availability has had a substantial impact on California's fisheries. Historically, California hosted the most biologically diverse and productive wild trout and steelhead fisheries in the United States. Now, due to water diversions and groundwater pumping, California leads the nation in the number of extinct or imperiled aquatic species."

Jim Edmondson's article may be read at the Carmel River Watershed Conservancy webpage at

http://www.carmelriverwatershed.org/newsletter/JimE.html

[6] Contributed by Geoff Malloway, owner of a local fly fishing store, a conservationist member of the CRWC TAC who has made a major contribution to the continued existence of the Carmel River Steelhead by his efforts over the past ten years. This paper submitted to the Technical Advisory Team.

Highlights from Jim Edmondson's article:

- California state population growth figures will rise to over 50 million people in the next 25 years
- Groundwater will likely be California's main source of additional water
- California currently has no regulations on ground water
- Without regulations, unfettered use of groundwater could further threaten California's already-damaged wild trout habitat, and several coastal watersheds such as the Gualala River and the Carmel River
- Under California's regulatory scheme, there are three categories of water:
- 1) stream surface flows; and two types of groundwater,
- 2) percolating groundwater that nourishes deep underground aquifers,
- And 3) subterranean streams that flow below the surface and contribute to springs or near-surface river habitats.
- The third category, subterranean streams, plays a critical role in permanently sustaining stream flows during low flow periods or droughts. Yet, the State Water Resources Control Board (SWRCB), the primary state water regulations agency, has not regulated subterranean stream flow protection
- There is no rational basis for making any distinction between surface and subterranean waters, and no reason for applying a different rule to the two classes. Such sources should be considered a common supply.
- The State Board has groundwater pumping jurisdiction, but has not adequately utilized its authority to manage, and thus protect, California's water resources

The State Water Board realized the need to re-examine its role in groundwater and in 2000 hired Joe Sax, a well-credentialed water professor at UC Berkley, to evaluate the State Water Board's legal authority. The report prepared by Professor Sax provides an important basis to support Cal Trout's position for the coordinated regulatory management of groundwater underflows. Unfortunately, State Water Board leaders have dismissed the findings of the Sax report and continue to refrain from regulating groundwater.

Whilst it does not seem appropriate for the Conservancy to include in its Action Plan a proposal that the grantor of contract funds for the Assessment namely, the State Water Board be taken to task for not using its authority to regulate groundwater pumping, nevertheless, we request the State Water Board to re-open the question and review it in the light of current events. We also trust that grass root watershed groups affiliated with the California Watershed Council and conservationist non-profits interested in working with watershed councils such as the Planning and Conservation League will support the notion that groundwater must be regulated and press the State Water Board on this issue. This is very much a Statewide issue not just a problem in the Carmel River Watershed.

Extracts from Watershed Assessment Task 5.5.1.6 by David H. Dettman Senior Fish Biologist MPWMD

Streamflow Restoration and Supply Augmentation – As highlighted and referenced throughout the assessment, steelhead and other native aquatic species in the Carmel River depend on adequate levels of streamflow. For the Carmel River, this is important

because the existing annual diversions exceed inflow in several months of most years, resulting in drying of the lower river. Addressing this impact at the annual level of 10,700 acre-feet as required by the SWRCB will require development of a relatively large alternative source, which is likely to take at least several more years. In the meantime, significant restoration of aquatic habitats could be realized by one or more projects. For example, expansion of MPWMD's Pilot Aquifer Storage and Recovery Project in the Seaside Basin, which utilizes excess/surplus winter, flows from the Carmel River Basin as a source of recharge in the Seaside Coastal Aquifer. This project, though relatively small at the present time, could be expanded to divert up to ~1,000 to 1,500 acre-feet per year. This quantity of stored water in the Seaside Basin, if made available at nominal rate of 2-3 cfs during the dry season, could obviate the need for Cal Am pumping upstream of Schulte Bridge in most years and extend aquatic habitats downstream by an additional one to three miles depending on the water year. Dredging at Los Padres Reservoir, particularly if instituted as a long-term maintenance/restoration project would augment surface storage in a system that depends on storage for creating perennial flow in the reach upstream of the Robinson Canyon.

Action # FLOWS #-1-7 GROUNDWATER #-1-2 & and C.C.5 C.C.6 C.C.9 C.C.10 W.Q.-1

HABITAT

by David H. Dettman Senior Fish Biologist, MPWMD and Larry Hampson Water Resources Eng. MPWMD & Thomas C. Christensen, Riparian Projects Coordinator, MPWMD

Barrier Modification and Habitat Expansion – *A thorough, detailed survey needs to be completed of all potential barriers to steelhead migration. Nonetheless, there are several known locations where modification of barriers would result in expansion of spawning and rearing habitats for steelhead, including Danish and Black Rock Creeks, where natural barriers limit the passage of adult steelhead. In addition, man-made partial barriers, many road culverts, and some stream crossings in many tributaries could be modified to improve passage and expand spawning habitats. Specific locations are known on Tularcitos, Potrero, Garzas, San Clemente, and Cachagua Creeks, and Hitchcock Canyon.*

Large Woody Debris Restoration and Management – *Steelhead adults and juveniles rely on woody debris as critical habitat components in freshwater. Small-scale restoration projects to increase the smaller sized fraction of this material can result in direct improvements to steelhead habitats, although by nature, the smaller sized material tends to scour and wash away with high flows. While CDFG has tended to not fund small-scale projects, because the material is not permanent, this logic should be reevaluated in light of widely published literature documenting that the mobility of this material does not lessen its importance in maintaining ecological function for steelhead and other sensitive macroinvertebrates. By its nature, the small sized fraction of LWD is more abundant and although it moves through alluvial systems more rapidly, it is important in the energy budget and habitat forming processes. A major advantage is that it can be added to large-scale restoration projects at a very moderate cost because it does not need to be anchored. For these reasons, and the fact that historical efforts to remove living riparian vegetation may have affected the abundance, distribution and diversity of smaller sized fractions, it is important to implement a range of projects to*

increase the abundance of all sizes of LWD. Fortunately, this is relatively easy to do with small tool/hand cutting and placement and is ideally suited to groups of volunteers.

Lagoon Restoration and Water Levels – *The California Department of Parks and Recreation recently completed Phase I of a project to expand the quantity of aquatic habitats at the Carmel River Lagoon. Depending on how the expanded lagoon interacts with surrounding groundwater and subsurface seeps, the quality of the new and original habitats may be improved. The CDPR should monitor water quality in the lagoon and adaptively manage the situation to maintain improved environmental conditions for steelhead and other sensitive species, notably the California red-legged frog. Other projects to increase surface inflow during critical periods should be investigated and implemented, if feasible. This includes the CAWD's concept of discharging tertiary treated water onto the surrounding wetland habitats and the CDPR's temporary, emergency discharge from their wells near the Highway One Bridge. Another project worthy of implementation would be a surface drain on the lagoon to allow a moderate level of control on the water surface elevation during late fall and early winter, when it becomes necessary to breach the river mouth for flood protection. Operation of a drain could effectively forestall the need to open the lagoon too early, when steelhead juveniles are not adapted to seawater and it could be used to somewhat regulate salinity levels by preferentially releasing highly, saline bottom water.*

Enhancement of Benthic Macroinvertebrate Production – *Increasing the abundance and diversity of aquatic insects species will enhance benthic macroinvertebrate production and lead to higher growth rates and production in the juvenile steelhead population and other species that feed on the invertebrates. This can be accomplished by implementing three projects specifically designed to improve steelhead habitats, including restoration of gravel deposits, planting riparian vegetation along the stream edge and in the floodplain terraces, and direct placement of smaller sized fraction of LWD into the stream. The latter two projects are especially important in sandy reaches downstream of the Robinson Canyon where overhanging vegetation and LWD function as critical habitats for steelhead and the insects that form the base of the food chain. Enhancement of benthic production in these areas functions to provide higher food resources for steelhead in habitats where the water temperature is outside of the optimal range for growth and dampens the detrimental effects of warmer water.*

HABITAT & RIPARIAN CORRIDORS by David H. Dettman Senior Fish Biologist MPWMD, Larry Hampson Water Resources Engineer, MPWMD, & Thomas C. Christensen Riparian Projects Coordinator MPWMD

It is apparent that many reaches of the river can provide high quality, productive habitat for steelhead; however, the current steelhead population is below historic numbers for the Carmel River and is well below populations found in Northern California coastal streams. Likely factors contributing to this decline include habitat fragmentation and degradation, introduced non-native predator species, impaired fish passage, and water diversions that alter natural stream flows. Other contributing factors may include water and air pollution and events outside of the watershed such as changes in the ocean going steelhead population. However, the increasing density and abundance of the juvenile population since 1997, the sharp recovery of the juvenile population since the 1987 to 1991 drought, and strength of the juvenile population compared to other coastal, regional, and local streams indicates the population is resilient and recovering.

Another species of concern, California red-legged frogs, has recently begun to be studied intensively after its listing in 1996 as a threatened species under the Federal Endangered Species Act. This species is difficult to investigate and its life cycle and population in the watershed is only just beginning to be understood. Although these frogs are found in many areas within the watershed, it is unclear whether the population is growing, shrinking, or stable. Most of the information gathered about this species is from observations in the Carmel River lagoon, along the main stem, and at San Clemente Reservoir.

Surveys of riparian-wetland areas along the nine-mile reach upstream of Los Padres Reservoir show these areas are the least impacted by human influences and remain naturally sustainable. Between Los Padres Dam and the Narrows, a distance of approximately 15 miles, riparian areas appear to be in reasonably good condition, although channel degradation (incision into sediment deposits) immediately downstream of Los Padres Dam and San Clemente Dam has left the root structures of many streamside trees exposed to scour and erosion. In addition, the paucity of spawning-sized gravels and cobbles in these reaches renders portions of the habitat unsuitable for steelhead spawning in an area that should provide significant opportunity for spawning. Between the Narrows and the Pacific Ocean, a distance of approximately 10 miles, much of the riparian-wetland area is functionally impaired due to water extraction and development adjacent to the stream banks.

The cumulative effect of human influences has resulted in a fragmented environment in the lower 27 miles of the river that requires intensive management efforts. Between Los Padres Dam and the Narrows, flow releases from storage are required in summer to maintain aquatic habitat. The lower 10 miles of the river (downstream of the Narrows), where the impacts from water extraction are concentrated, requires irrigation and maintenance of streamside vegetation, reconstruction of stream banks after high winter flows, annual CRLF and steelhead rescues, habitat enhancement activities, and extensive monitoring. Regulation of water extraction from the basin is in effect under orders from the California State Water Resources Board (Order No. 95-10 and subsequent related orders). A program to mitigate for the effects of water extraction on the main stem is carried out locally by the Monterey Peninsula Water Management District under its Mitigation Program.

Action # HAB-1-11 CC -1-2 CC-8 CC-11 CC-13--14

STEELHEAD by David H. Dettman Senior Fish Biologist MPWMD

Lagoon Restoration and Water Levels – *The California Department of Parks and Recreation recently completed Phase I of a project to expand the quantity of aquatic habitats at the Carmel River Lagoon. Depending on how the expanded lagoon interacts with surrounding groundwater and subsurface seeps, the quality of the new and original habitats may be improved. The CDPR should monitor water quality in the lagoon and adaptively manage the situation to maintain improved environmental conditions for steelhead and other sensitive species, notably the California red-legged frog. Other*

projects to increase surface inflow during critical periods should be investigated and implemented, if feasible. This includes the CAWD's concept of discharging tertiary treated water onto the surrounding wetland habitats and the CDPR's temporary, emergency discharge from their wells near the Highway One Bridge. Another project worthy of implementation would be a surface drain on the lagoon to allow a moderate level of control on the water surface elevation during late fall and early winter, when it becomes necessary to breach the river mouth for flood protection. Operation of a drain could effectively forestall the need to open the lagoon too early, when steelhead juveniles are not adapted to seawater and it could be used to somewhat regulate salinity levels by preferentially releasing highly, saline bottom water.

Action # SH-1-6 CC-1 CC-3 CC-14

SEDIMENT by David H. Dettman Senior Fish Biologist MPWMD

Erosion Control and Sediment Management – *Embryos, fry and juvenile steelhead depend on relatively clean substrate to complete their lifecycle phases in freshwater habitats and are sensitive to small changes in the quality of substrate, especially the degree of sedimentation on the streambed. For a myriad of reasons, projects that are designed to reduce soil erosion at the source, or lessen the risk that fined-grained sediment, once mobilized, deposits on the streambed, will have direct beneficial effects on steelhead and other sensitive aquatic species. Based on a review of the results outlined in the chapters on Hydrology and Geology, it is appropriate to focus on small to medium scale erosion control projects in several main tributaries and sub-basins including Tularcitos, San Clemente, Hitchcock, Conejo and Cachagua Creeks. A primary challenge in the near term will be managing the sediment flux through San Clemente Reservoir as it fills with sediment and a seismic retrofit project proceeds. It is likely that the alternative which allows the most flexibility in controlling transport and release of fine-grained sediment at the retrofitted dam and deposition in the river below the dam will be the most successful in restoring and maintaining critical habitats for steelhead sensitive species. It is beyond the scope of this biological assessment to fully evaluate this situation and recommend the best retrofit project.*

Gravel/Substrate Management – *Projects that are designed to improve passage and transport of coarse-grained sediment around or through both of the dams will directly improve the quality and quantity of spawning habitats for steelhead. While the MPWMD's spawning gravel restoration project has improved spawning habitats below both dams and fish have utilized much of the material added, continuing observations of spawning adults and data from the juvenile population surveys indicates that addition of larger quantities of gravel would benefit steelhead. This is especially the case below San Clemente Dam, where many "restored" gravel patches were perched above the lower water channel by floods in 1995 and 1998, and the material added since that time has moved only a short distance downstream.*

Sediment Traps *by Clive Sanders, Project Manager*

The PFC reviews of the tributaries found that under the auspices of the predecessor to the National Resources Conservation Service (NRCS) land owners in areas where the there is substantial land slip and heavy movement of sediment during torrential rainfall were encouraged in past years to setup sediment

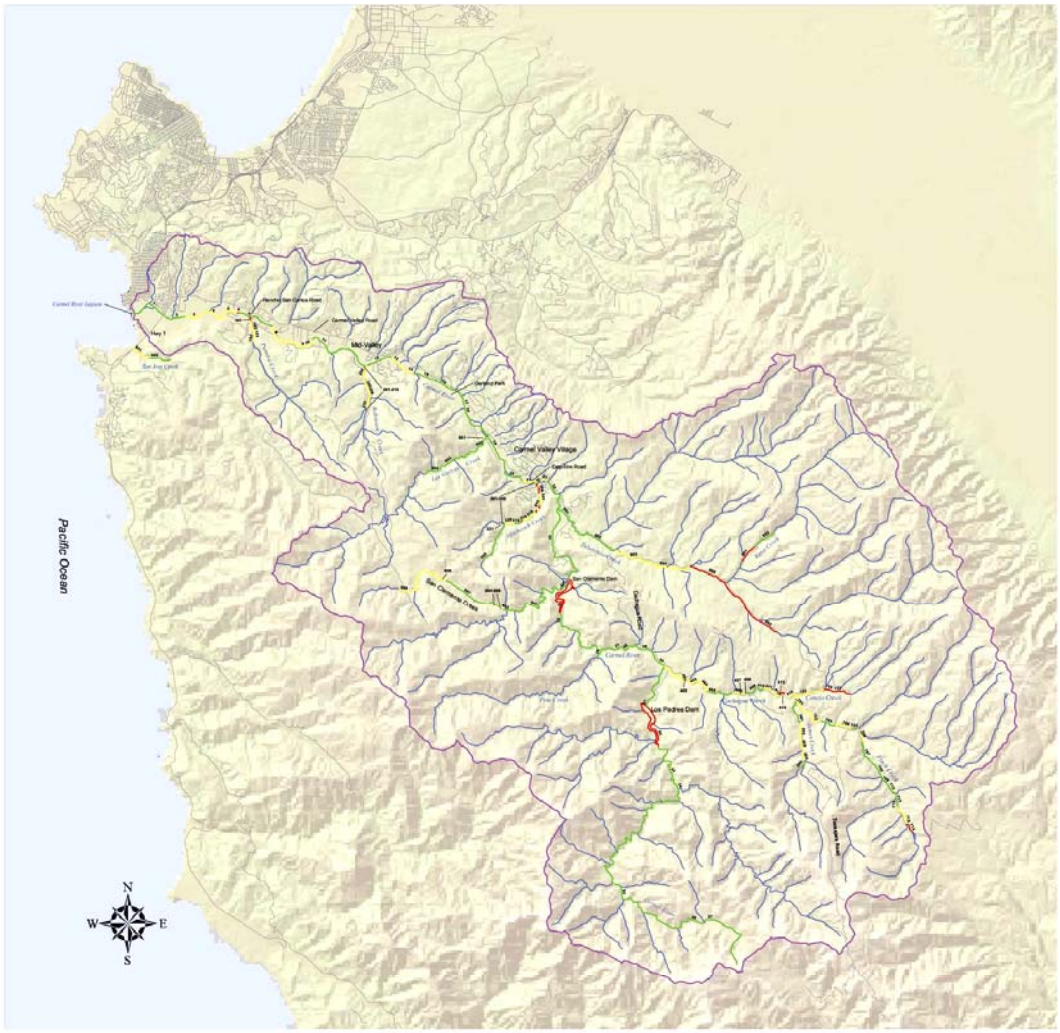
traps. Landowners have used the materials mined from the traps for their construction work. It seems at a time of acute shortages of aggregates in the county that landowners might be encouraged to resume the practice. CRWC will contact the NRCS in Salinas to determine if this something that would be covered by their programs.

Action # HAB-1 CC-3 SD-4-6

WATER QUALITY by David H. Dettman Senior Fish Biologist MPWMD

Water Temperature Management – *The need to manage water temperature will become more important as Los Padres Reservoir fills with sediment. Currently, the water released during late summer and early fall is often too warm good growth of steelhead and may affect the abundance and distribution of benthic macroinvertebrates. Compounding the high temperature water is the tendency to release hydrogen sulfide laden water, especially just prior to the fall turnover in the reservoir. One project for effectively dealing with these problems is to increase reservoir storage, but this could be time consuming and take several decades to implement. An alternative project to manage water quality would be construction and operation of a "cooling tower" similar in concept and design to the tower used by the MPWMD to cool intake water at Sleepy Hollow Steelhead Rearing Facility. This device would be very efficient in cooling water, especially in the hotter, drier climate at Los Padres Dam and would eliminate the problem with hydrogen sulfide and accompanying low dissolved oxygen.*

Proper Functioning Condition Assessment of the Carmel River and Tributaries



Carmel River and Tributaries

PFC Rating

- Unrated
- Proper Functioning Condition
- Functional at Risk
- Non-functional
- Carmel River Watershed Boundary
- Roads

37 PFC ID number

0 1 2 4 6 8 Miles

Paul Joseph Watters
Field Biology Assistant
Monterey Peninsula Water Management District
5 Harris Court Building G
Monterey, CA 93940

Monterey Peninsula Water Management District

Proper functioning condition (PFC) is a qualitative method developed by the U.S. Bureau of Land Management and U.S. Forest Service to assess the condition of riparian-wetland areas based on hydrology, vegetation, and erosion/deposition (soils) attributes. A total of 17 "yes/no" questions are posed about the characteristics of the stream, resulting in one of three ratings that reflect stream resiliency: (1) proper functioning condition; (2) functional-at-risk; or (3) non-functional. A rating of "proper functioning condition" means that a stream is resilient, i.e., the riparian-wetland area is stable during most high-flow events. A resilient stream produces desired values such as high quality fish and bird habitat. "Functional-at-risk" means the stream reach is currently functional, but is at risk of becoming non-functional due to an observed condition that could impact the reach in the future. "Non-functional" indicates that there is a condition in the reach or watershed interfering with the natural functions of the stream.

These PFC assessments were performed by two interdisciplinary teams with local, on-the-ground experience in the quantitative sampling techniques that support the PFC checklist. The 37 PFC assessments for the Carmel River were performed by Monterey Peninsula Water Management District (MPWMD), and 95 tributary assessments were performed by the Carmel River Watershed Conservancy.

The above map can be found on the CRWC webpage at www.carmelriverwatershed.org/ and is an interactive PDF file that can zero-in with greater detail on the reach of the creek in question.

ACTION PLAN #	Action Plan Description	PAGE #
CC-1	**Habitat: Acquire or otherwise protect lands that provide valuable habitat that are beneficial to Steelhead** spawning and rearing in particular, and to the benefit of both aquatic & terrestrial species. Consider acquisition of land to create meander belts. This will occur in cooperation with the Land Trusts and public and private landowners who seek to improve their stewardship of the land.	7 13
CC-2	CRWC in cooperation with appropriate local agencies to seek funding for watershed wide habitat restoration projects including, permanent California red-legged frog (CRLF) habitat, restoration of riparian areas, and upland habitat. Funding should address development of a monitoring plan for CRLF and other benchmark species. (WA-MPWMD-5.5.2.1-2.3)	3 10-12
CC-3	Stream Geomorphology & Water Quality: Maintain, restore and enhance natural stream functions & features to provide high quality habitat for Steelhead & CRLF. (WA-MPWMD-5.4.2.1)	6-7 13
CC-4	**Volunteer Activities: Expand & maintain the existing** network of volunteers in the Carmel River Basin to provide planning, labor, outreach, and mapping services throughout the watershed.	6
CC-5	**CRWC will seek agreement for a regional approach to watershed management and** development of collaborative / partner projects among the agencies and conservation groups of the watershed.	7 8-10
CC-6	**Create a Carmel River Watershed Working Group to** assure local involvement in large and small-scale restoration projects such that all agencies & stakeholders are integral to the successful outcome of watershed projects. This group should function as advisors for large scale projects to review and provide input that reflects local priorities, creates cooperative management strategies, and incorporates local experience to help identify potential problems & solutions, e.g. the Carmel Lagoon events 2004.	6 7 8-10
CC-7	**Continue MPWMD's conservation program** which includes rebates for low flow fixtures & encourages drought tolerant landscaping. Using this model expand the program to County areas within the watershed boundary and outside the District Boundary if it does not already exist.	PUB-4
CC-8	**Encourage the County to enforce its turf area** requirements for developing & existing lots.	6 10-12
CC-9	**Inline with CC-5-7 CRWC should explore** with the Peninsula cities & rural communities the advantages of one water management district having jurisdiction over the water supply in the entire watershed.	6 8-10
CC-10	**In the absence of a timetable to update the Watershed** Assessment we recommend that updating be based on an event-driven basis, such as completion of the San Clemente Dam retrofit or demolition, large floods, major droughts, fire, or landslide. In the absence of a significant event then every five to ten years.	8-10
CC-11	**Monitor the level of predators both invasive** macroinvertebrates and non-native species of flora and fauna resident in the watershed and seek funds for mitigations as appropriate.	10-12
CC-12	**Storm Drains; Seek cooperation of Cal- Am Water** Company to send out an annual reminder in their quarterly newsletter that storm drains flow to streams and the ocean and that they should not be used for illegal disposal.	PUB-2
CC-13	River Access: Seek support and funding to expand river access for senior & handicapped persons.	3 10-12
CC-14	Lagoon Restoration and Water Levels, the California Department of Parks & Recreation recently completed Phase I of a project to expand the quantity of aquatic habitats at the Carmel River Lagoon. The CDPR in conjunction with MPWMD's current lagoon monitoring program should monitor water quality in the lagoon and adaptively manage the situation to maintain improved environmental conditions for SH & other sensitive species, notably the CRLF. Other projects to increase surface flow during critical periods including but not	6-7 10-12 13

	limited to CAWD's concept of discharging tertiary water onto the surrounding wetlands; if tertiary treated water is unavailable explore the use of secondary treated water into the wetlands as is done in other California counties ; CDPR's emergency discharge from their wells; and consider a surface drain to the ocean to manage high salinity levels and to avoid the need for an early breaching of the sand-bar.	
CC-14		

ACTION PLAN #	Action Plan Description	PAGE #
FLOWS-1	**Support implementation of a water supply project** that minimizes the export of water from the Carmel River basin that causes the chronic reduction in flow. SWRCB order 95/10.	7
FLOWS-2	**Support development of a project to maintain** or preferably increase surface water storage at Los Padres Dam Reservoir (LPD) including but not limited to dredging or excavation to remove sediment upstream of the dam.	7
FLOWS-3	**Study the feasibility of installing a rubber dam** at LPD to temporarily increase water storage during the spring of each year. This would slow in a normal water year, the drying up of the lower reaches of the river.	7
FLOWS-4	**Support improvements to the MPWMD's Aquifer Storage and Recovery (ASR) Project** to reduce the amount of water extracted from the Carmel River Basin during summer months.	7
FLOWS-5	**Support a moratorium on upland water well development in bedrock aquifers** because there is a probable connection between that resource and the flow of tributaries feeding surface water and groundwater to the Carmel River/aquifer system. This action will likely reduce the impacts of drought on tributary and main-stem river systems. See Physical & Hydrologic Assessment WI 2004-05/2, p 74 ≠≠ 8.1.	7
FLOWS-6	**Encourage County and City planners and permitters to recognize the high probability of severe regional drought** when assessing applications for further water use in the watershed and broader regions that influence water extraction from the Carmel Watershed water budget. See Physical & Hydrologic Assessment WI 2004-05/2, p 73-74 ≠≠ 8.1.	6-7
FLOWS-7	**Monitor the Carmel River & tributaries twice** annually (during the in-migration & out-migration) to insure that no barriers to fish passage go unnoticed. Mitigate as appropriate.	6

ACTION PLAN #	Action Plan Description	PAGE #
GROUNDWATER-1	**Foster an understanding among stakeholders that groundwater and surface water are inextricably linked resources; perhaps even in bedrock aquifers** so that a holistic water budget can be derived before bedrock aquifer resources are over appropriated. The actions listed here are to maintain surface water for watershed function, so they are closely aligned with the actions listed under "FLOWS." SWRCB order 95/10 and Physical & Hydrologic Assessment WI 2004-05/2, p 31-33, p.74, and Executive Summary.	5-6 8-10
GW-2	**Develop water budgets for the entire watershed** so that the full resource system can be better quantified and managed for sustainability of human use and the broader diverse ecosystem. Foremost in this assessment is the analysis of how upland bedrock aquifer withdrawals impact the resources of the lower valley. The budgets should attempt to quantify rainfall, surface flow, evaporation, transpiration, and groundwater.	5-6 8-10

ACTION PLAN #	Action Plan Description	PAGE #
HABITAT-1	**Recommend as part of the MPWMD Mitigation program to extend** the program of periodic injections of gravels and cobbles downstream of Los Padres and San Clemente Dams to a level that restores the channel bottom to a condition similar to areas upstream of Los Padres Reservoir (LPD)	6 10-12
HAB-2	**Engage the help of the Californian Conservation Corps** to assist CRSA & CRWC volunteers in clearing log jams, fish passage impairments, land slides and other items like ironwork grills over culverts in residential areas that can become blocked & cause flooding. Work to remove large pieces of metal work, old machinery, frames and automobile bodies from Hitchcock Canyon, Conejo, Tularcitos, Potrero and Cachagua creek.	3 6
HAB-3	**In concert with CRSA renegotiate with State Parks a** Large Woody Debris (LWD) agreement to obtain redwood root balls from either the park system or logging firms and with donations improve the Carmel river lagoon habitat by placing the secured root balls in the main channel & the South arm. This will provide shelter to steelhead from predators and create scouring pools.	6-7
HAB-4	**Pursue MPWMD and CRWC LWD location study** and obtain grant funds to secure Redwood & Douglas fir root balls in those reaches of the river that would most benefit from the introduction of LWD.	6-7
HAB-5	**Continue MPWMD's program of planting open stream bank areas** on the Carmel river with riparian vegetation native to Carmel Valley. Request MPWMD to extend this practice where needed to those areas on tributaries at the confluence with the Carmel river.	7
HAB-6	**CRWC and partners to begin planting open stream bank areas** with riparian vegetation native to Carmel Valley on the tributaries within the Carmel River Watershed.	7
HAB-7	**Enhance habitat appropriate for CRLF along the main stem, as well as in tributary drainages and upland locations.**	7
HAB-8	**Encourage land managers** such as Forest Preserves, park agencies & golf course owners to strategically place large broken tree limbs from windstorms in the Carmel River for LWD habitat.	7
HAB-9	**Encourage agricultural operations,** golf courses, commercial, & private residences to use native grasses & riparian vegetation as a buffer to the main stem & tributaries.	7
HAB-10	**With concerns on adequate food supplies for Steelhead & other species,** with the increased prevalence of invasive & predator Macroinvertebrates we recommend that MPWMD expand its current monitoring program to additional reaches and to include steps to curtail expansion of the invasive taxa. (MPWMD/EBA p 7 of 10)	6
HAB-11	**Seek funds to implement monitoring** for a variety of terrestrial wildlife in areas where riparian vegetation has been restored**.**	6

ACTION PLAN #	Action Plan Description	PAGE #
SED-1	**Dress back and replant the incised reaches of tributaries and main stem areas including:** Conejo Creek, Finch Creek, James Creek & Tularcitos Creek.	6-7 13-14
SED-2	**Seek funding for a broad range of restoration projects** for the upper tributaries including but not limited to excluding cattle from riparian areas and streambeds. Review the Carmel River system and tributaries for impediments to fish passage.	7 13-14
SED-3	**Seek funding for a broad range of restoration projects in Hitchcock Creek and sub-basin,** to stabilize stream banks, inform the residents and property owners on the issues of in-stream home construction tree, riparian cover removal and impediments to fish passage. See CRWC reviews of Tributary PFC's CRWC http://www.carmelriverwatershed.org/WA/WAprop13.html GPS Begins N36.27.407 W121 44.504 Ends N 36.28.434 W 121.43.589	6 13-14
SED-4	**Establish a sediment transport volunteer monitoring program** in concert with the surface flow monitoring program of MPWMD for the main stem and tributaries. Thus, providing decision makers with the key to quantify the problems and assessing future changes. See Physical & Hydrologic Assessment WI 2004-05/2, p 76 ≠≠ 8.2.	3 6 13-14
SED-5	**Identify and map existing sediment basins** and constructed sediment traps to evaluate their effectiveness & in order to determine the appropriate locations for installation of new traps or removal (restoration).	6-7
SED-6	**Erosion prevention to reduce sediment deposition** throughout the watershed including the main tributaries and the main stem.	6-7 13-14
SED-7	**Review with the County Public Works Department (PWD) the need for replacement or enlargement of culverts** on Carmel Valley road. Work with the property owners and grant donors. See Physical & Hydrologic Assessment WI 2004-05/2, (Fig 50A & 50B p 59-60 ≠7.2.3 GPS Begins N36.23.580 W 121.34.090 Ends N 36.23.457 W 121.35.733)	6 13-14
SED-8	.Review with County PWD **stream bank stabilization and dirt road management strategies** for the upper Cachagua Creek and replacement or enlargement of bridges/culverts on Southbank road, Hitchcock creek. See CRWC reviews of Tributary PFC's at http://www.carmelriverwatershed.org/WA/WAprop13.html GPS Begins: N36.23.457 W121.35.733 Ends N36.24.127. W 121.39.573	6 13-14
SED-9	**Seek funds to conduct a watershed wide assessment** of culverts & dirt roads to determine their impacts on streambed stability, sediment load, & fish passage. See Physical & Hydrologic Assessment WI 2004-05/2, p 1-3 Executive Summary.	6 13-14

ACTION PLAN #	Action Plan Description	PAGE #
SH-1	**Seek grant funds to evaluate methods to count fish** at monitoring stations to determine incoming & outgoing adult steelhead, smolts making the outgoing journey from the upper river above LPD.	6 12-13
SH-2	**Seek funds to pay for temporary hired help on** watershed restoration and steelhead rescue projects when volunteer help is unavailable.	6 12-13
SH-3	**Seek funding for a watershed-wide assessment of culverts & fish barriers** including an estimate of the replacement cost of non functioning units. CRWC PFC reviews of the main tribs indicated many problems.	6 12-13
SH-4	**Seek funds for design & construction of a fish screen** at the entry to the outlet at LPD.	6 12-13
SH-5	**In concert with SH-1 investigate feasibility and cost of installing a weir trap** between Mallorca bridge and Highway One bridge to catch incoming adults. Weir can be designed to collapse when flow reaches flood levels. Additionally with the use of "fyke" nets kelts & smolts moving downstream can be collected.	13
SH-6	**Seek funding or a partnership with other agencies to evaluate** the feasibility of a program to sort, store, and discharge a portion of the coarse-grained sediment stored in San Clemente Reservoir to the lower Carmel River. This will benefit critical steelhead spawning habitat areas, increase the diversity and abundance of aquatic benthic macroinvertebrates, and add physical complexity to the riparian areas downstream of the existing San Clemente Dam.	6

ACTION PLAN #	Action Plan Description	PAGE #
PUBLIC -1 OUTREACH EDUCATION	**Establish a volunteer water quality monitoring program** to tie into the MPWMD program and to include all the main tributaries with students from the Carmel Middle and High Schools, and participants in the NOAA supported Snapshot & First Flush program. It is important that in the process we develop stewardship values through involvement in any restoration activities. This monitoring program will provide decision makers with a complete mapping of the watershed sub-basins on an annual basis.	7 CC-4
PUB-2	**MPWMD and CRWC to actively promote Stewardship concepts** and projects among river & creek front property owners through peer to peer groups and multi-media outreach (newspaper, television, internet and mailings, etc.)	6
PUB-3	**Develop a conservation education** program for residents & landowners	3 6
PUB-4	**Develop an ad hoc committee of local** residents, land owners and recreational group representatives to create a plan for "managed" public access that considers local concerns for appropriate use and other issues related to parking, access for seniors & the handicapped.	3 CC13

ACTION PLAN #	Action Plan Description	PAGE #
PUBLIC-1 SAFETY	**Discourage the use of large dams on the Carmel River** because of the enormous seismic risk in the regions, and the very large sediment supply, which limits the life of large reservoirs. Bring the Valley development into compliance with the dam-break inundation regions.	6
PS-2	**CRWC encourages planners and permitters to discourage urban development in the "100 year" floodplain of the Carmel River and along its banks, by** aligning any development with the Carmel Valley Master plan, recognizing that the best long-term, sustainable, reduction of risk to life and property will come through appropriate land-use planning, and enforcement of existing land-use codes.	3

ACTION PLAN #	Action Plan Description	PAGE #
WATER-1 QUANTITY	**Support change to MPWMD boundary to,** include the entire watershed. This is important if Carmel Valley achieves incorporation status. It is noteworthy that the proposed area of the CV town includes all the land from the mouth of the valley to east of the village and from ridge-top to ridge-top.	6 8-10
WQ-2	The public has the sense that large public & commercial water users are not participating in the conservation program. While the conservation program (rationing by price controls) remains in place CRWC seeks the cooperation of all large water users to work collaboratively to develop an information program to report beneficial outcomes of specific projects the users have adopted to conserve water. This can be achieved through the CRWC website www.carmelriverwatershed.org	6