CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL

FOURTH EDITION

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The Resources Agency
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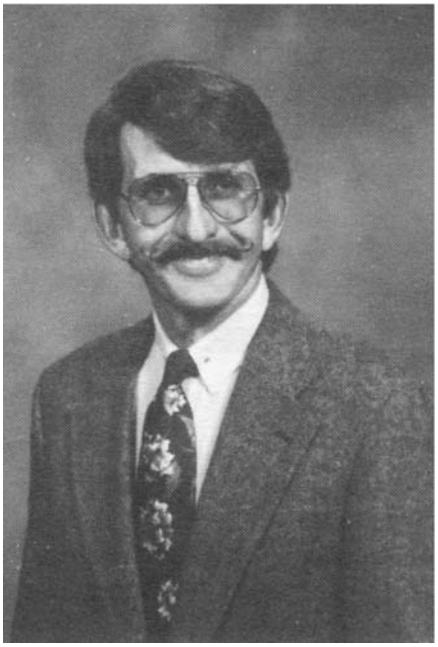
DEDICATION

to

Tim Curtis

1944 - 1996



The authors of the third edition of the ***California Salmonid Stream Habitat Restoration Manual*** wish to dedicate their work to **Tim Curtis**. Tim served with distinction with the California Department of Fish and Game as a fishery biologist, program supervisor, and patient mentor from 1971 to 1996. He was a pioneer in the Department=s modern salmonid habitat restoration program and a contributing author to the second edition of this manual. Tim died much too young at age fifty-one, October 19, 1996, after a courageous battle with brain cancer.

> Tim was a friend and motivational guide to all he came near. Although his life was brief he left his creative, inspirational mark on many. The third edition of this manual is part of his living legacy passed on through the present authors, and as such will continue to help improve the health of a resource he loved: the salmon and steelhead of California.

PREFACE

The first edition of this manual, written by Gary Flosi and Forrest Reynolds, and published in 1991, formally synthesized and described the Department of Fish and Game's approach and technical methods for anadromous salmonid habitat restoration. From 1991 through 1994 the first edition was broadly distributed and used as a "standard methods" text by many habitat restoration and resource inventory workers. As a result, many suggestions for improvement of the manual were received by the authors.

The second edition, by Flosi and Reynolds was supported by a team that included the authors of this third edition, and was published in October of 1994. The second edition included a number of revisions: 1) a reorganization of sections for project planning and project implementation; 2) the just then recently revised stream channel classification system developed by David Rosgen; 3) a new monitoring and evaluation section; 4) a listing of all databases used for resource inventory and analysis as presented in the manual; 5) a protocol for a large woody debris inventory; 6) a description of required environmental review processes and permits; 7) an expanded and updated listing of sensitive species; and 8) numerous editorial changes to text and data forms.

The third edition, like the second, incorporates changes recently developed in the practice of stream habitat inventory and restoration. The authorship list has changed with this edition to more accurately reflect the contributions of the writing team members. The manual is presented in binder form in this edition to more easily and economically incorporate future additions and developments as they evolve.

This fourth edition incorporates all changes, corrections, and revisions of this manual up to July 2010. The manual continues in binder form in this edition to easily and economically incorporate future additions and developments as they evolve.

The authors anticipate the continued widespread distribution and use of this manual will promote the implementation of the restoration techniques discussed. Additionally, in an effort to develop common methods for data collection and data storage of information, the authors encourage all anadromous salmonid resource assessment professionals to utilize protocols and database structures presented in this manual.

Readers should also be aware that computer data entry and data summary programs are available upon request for all data collection protocols presented in this manual. Updates to this manual are available on line at http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp.

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Special thanks go to David L. Rosgen for allowing us to freely use information contained in his work, *A Classification of Natural Rivers*, which establishes the methodologies used in this manual for stream channel classification; Evan Engber of BioEngineering Associates for his contributions about his bio-engineered erosion control; and Matt Smith of North Coast Fisheries for his innovative instream structure anchoring techniques.

Proposition 70 funds, through the support of the Proposition 70 Review Committee, provided the revenue to publish this manual, and deserve special recognition. Personnel funded by the Federal Sport Fish Restoration Act were instrumental in the production this edition.

FOREWORD

Over the past few decades, the field of fishery restoration has evolved into a full fledged specialty within the general context of environmental science. Writers on the subject have been prolific but the formal literature is broadly scattered and frequently contradictory. The Department of Fish Game has experienced an increasingly pressing need to define and explain its approach to fish restoration, and to describe acceptable and preferred methods. The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988 (Chapter 1545/88) made restoration of anadromous fish state policy and placed a high priority on the program. The level of concern for these fish was demonstrated by the urgency clause attached to the legislation and in many subsequent State and Federal documents and proclamations.

In August, 1997, Senate Bill 271, by Senator Mike Thompson, created the Salmon and Steelhead Restoration Account. This provided significant multi-year funding for projects dedicated to the restoration of California's coastal salmon and steelhead watersheds and streams. SB 271 also provides DFG with the ability to grant funds to assess and improve watershed conditions impacting salmonid streams regardless of a problem's location in the watershed. This allows the restoration effort to better address "key" watershed impacts to include upslope and/or non-point source erosion sites deleterious to fish habitat. Furthermore, the legislation provided funding for coordinated planning, evaluation, and monitoring of restoration projects. This legislation also contained an urgency clause and was signed as such by Governor Pete Wilson.

This manual formally explains and describes the DFG ground level approach to restoration of fishery resources, and standardizes our descriptive terminology and technical methods. Principal emphasis is on salmon, steelhead, and trout; therefore this manual is principally intended to be used to assist in restoration efforts for those species in California. Although the process of habitat evaluation and basic restoration techniques are generally similar for California salmonids, their habitat preferences are frequently dissimilar. Therefore, applications must be selected that are suitable for the specific target species and life stage. The basic habitat assessment techniques are applicable for any fluvial fish species.

Disclaimer: This manual describes many methods and techniques used with varying degrees of success by habitat restoration specialists. The methods and techniques described here represent only a starting point for project design and implementation. They are not a surrogate for, nor should they be used in lieu of, a project design that has been developed and implemented according to the unique physical and biological characteristics of the site-specific landscape.

The techniques and methods described in this manual are not a surrogate for acquiring the services of appropriate professionals, including but not limited to licensed professional engineers or licensed professional geologists, where such expertise is called for by the Business and Professions Code section 6700 et seq. (Professional Engineers Act) and/or section 7800 et seq. (Geologists and Geophysicists Act).