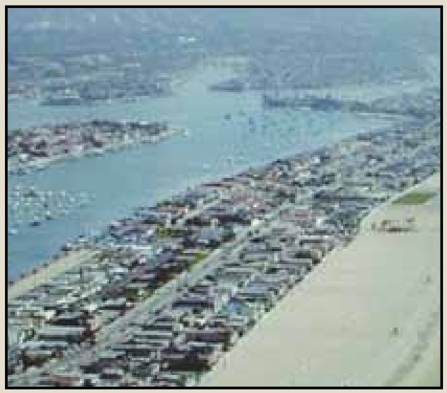
Phase 2 — June 2009

Central Orange County Integrated Regional and Coastal Water Management Plan







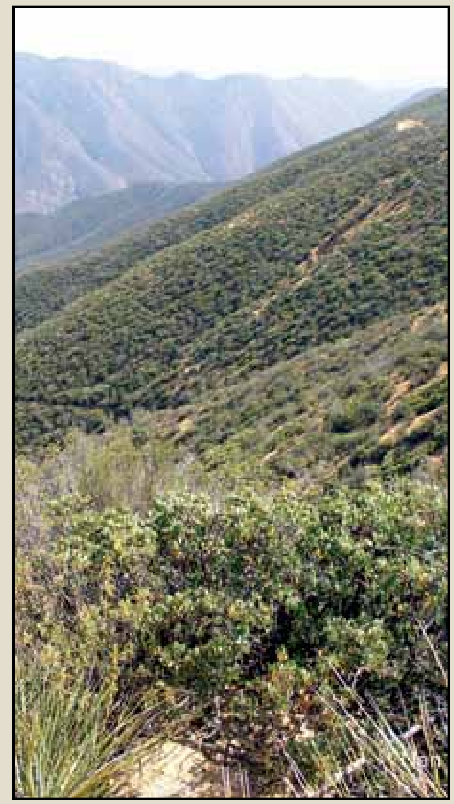



TABLE OF CONTENTS

PHASE 2: AUGUST 9, 2009

City of Newport Beach, California and County of Orange, California

Address comments to:
Bob Stein, City of Newport Beach
rstein@newportbeachca.gov, 949-644-3322.

ACKNOWLEDGEMENTS xi
FOREWORD xiii

EXECUTIVE STATEMENT 1
E.1 Plan Process and Features
E.2 Impacts and Benefits

CHAPTER 1: INTRODUCTION 9
1.1 Relationship to State Water Management Preferences
1.2 State Priorities
1.3 IRWM Plan Standards
1.4 IRCWM Plan Management Group
1.5 IRCWM Planning Approach
1.6 IRCWMP Planning Process
1.7 Governance of the IRCWM Plan

PART I: CONTEXT

CHAPTER 2: STRATEGIC DIRECTION 23
2.1 Problem Statement
2.2 Community Principles
2.3 Community Vision
2.4 IRCWMP Mission
2.5 Regional Goals
2.6 Relationship between the Regional Goals and Proposition 84 Project Elements

CHAPTER 3: REGIONAL DESCRIPTION 37
3.1 Overview of the Central Orange County Watershed Basin
3.2 Land Use
3.3 Demographics
3.4 Economic Trends
3.5 Water Resource Infrastructure

CHAPTER 4: DYNAMIC PLANNING APPROACH 131
4.1 Step 1: Regional Integration
4.2 Step 2: Local Project Integration
4.3 Step 3: Local Project Prioritization

4.4 Step 4: Regional Prioritization

4.5 Adaptive Management

CHAPTER 5: SCIENCE-BASED DESIGN 145

5.1 Physics

5.2 Chemistry

5.3 Biology

PART II: PLANNING

CHAPTER 6: WATER RESOURCES 153

6.1 Flood Management Regional Performance Objectives

6.2 Water Quality Regional Performance Objectives

6.3 Water Supply Regional Performance Objectives

6.4 Habitat Regional Performance Objectives

CHAPTER 7: ECONOMIC DEVELOPMENT.................................. 170

7.1 Real Estate Regional Performance Objectives

7.2 Business Regional Performance Objectives

7.3 Transportation System Regional Performance Objectives

7.4 Operations & Maintenance Regional Performance Objectives

CHAPTER 8: COLLABORATION 177

8.1 Governance

8.2 Social Networks

8.3 Data Management

8.4 Education and Outreach

CHAPTER 9: URBAN DESIGN 189

9.1 Land Use Planning and Design Scale

9.2 Environmental Justice

PART III: PROJECTS

CHAPTER 10: PROJECT INTEGRATION..................................... 209

10.1 Northern Foothills Planning Area

10.2 Southern Foothills Planning Area

10.3 Central Plain Planning Area

10.4 Urban Bay Planning Area

10.5 Bay/Coastal Planning Area

10.6 Coastal Canyons Planning Area

10.7 Project Strategy Summary

CHAPTER 11: PRIORITIZATION... 239

11.1 Comments on the First Proposed Formula for Project Scoring

11.2 New Proposed Scoring System

11.3 Project Benefit Factor (A)

11.4 Integration Types Factor (I)

11.5 Integration Planning Coefficient (C)

11.6 Management Strategy Types

11.7 Project Scores

11.8 Scoring Example

11.9 Provisional Project Rankings

11.10 Scoring Revisions based on the Project Work Plan

CHAPTER 12: NEXT STEPS FOR PLAN IMPLEMENTATION 251
12.1 Near Term Tasks
12.2 Longer Term Tasks

APPENDICES

APPENDIX A 257
A1 — Project Location Maps
A2 — Provisional Project Rankings
A3 — Category 1 Projects
A4 — Category 2 Projects
A5 — Category 3 Projects
A6 — Proposed Rollout Schedule for Key Projects (first four pages)

The above appendices plus the following appendices may be viewed at http://www.newportbeachca.gov/index.aspx?page=1333

APPENDIX A6
Proposed Rollout Schedule for Key Projects (complete)

APPENDIX B
Project Prioritization Complete Scoring Matrix
B1 — Project Information Form
B2 — Blank Project Scoring Spreadsheet, September 30, 2008
B3 — Project File Rankings, June 23, 2009

APPENDIX C
Orange County Flood Control District 7-Year Project Plan

APPENDIX D
Existing Local and Regional Plans, Documents and Programs:

APPENDIX E
Stakeholder Participants - Central OC IRCWM Plan

APPENDIX F
Sensitive Species Central OC IRCWMP Region:
Excerpted from 2005 Army Corps of Engineers San Diego Creek/Upper Newport Bay Feasibility Study, Appendix 7.1.

APPENDIX G
Sample Water Budgets
G1 Municipal Water District of Orange County Water Budget
G2 Excerpt from 2006 Newport Coast Seepage Study

APPENDIX H
Water Quality Regulatory Issues
Total Maximum Daily Loads and Related Strategies

APPENDIX I
Orange County Parks Strategic Plan
Nine Strategic Goals

APPENDIX J
Harbor Area Management Plan Summary

APPENDIX K
Previous Prioritization Chapter from April, 2008 Draft COC IRCWMP

APPENDIX L
Website Resources

APPENDIX M
Stakeholder Comments

M1 — Draft 1, Spring 2008

M2 — Draft 2, Fall–Winter, 2008–2009

FIGURES AND PHOTOS

EXECUTIVE STATEMENT

Figure E.1 Orange County three Watershed Management Areas 3

Figure E.2 Dynamic Planning Process Approach 6

CHAPTER 2

Figure 2.1 IRCWMP Planning Framework 23

Figure 2.2 NCPP Central Subrregion 10 year fire history 26

Figure 2.3 The 2007 Santiago Fire in relation to the Newport Bay watershed 27

Figure 2.4 Vision Framework 31

CHAPTER 3

Figure 3.1 Watershed activities 37

Figure 3.2 Vicinity map 38

Figure 3.3 Regional drainages and foothill retarding basins 39

Figure 3.4 Pollutant plume leaving Newport Bay 40

Figure 3.5 Geographical features 41

Figure 3.6 Subwatersheds of IRCWMP Region 42

Figure 3.7 Santa Ana River watershed 44

Figure 3.8 Drainage area and supply lines 47

Figure 3.9 Public meeting 50

Figure 3.10 Watershed Management Integration Framework 54

Figure 3.11 Central Orange County governance 55

Figure 3.12 Southern California Wetlands Recovery Project organizational chart 57

Figure 3.13 Plan relationships 58

Figure 3.14 Land Use— Newport Bay /San Diego Creek / Newport Coast 61

Figure 3.15 Intersection of Jamboree and Interstate 5 65

Figure 3.16 Disadvantaged communities within the Region 70

Figure 3.17 San Diego Creek subwatershed flood control facilities 73

Figure 3.18 Newport Bay subwatershed flood control facilities 74

Figure 3.19 Newport Coast subwatershed flood control facilities 79

Figure 3.20 Monitoring locations 81

Figure 3.21 Selenium concentrations in groundwater 91

Figure 3.22 Proposed Natural Treatment System locations..100

Figure 3.23 Water agencies in IRCWMP Region...................103

Figure 3.24 Orange County water supply agencies...............104

Figure 3.25 Irvine Subbasin groundwater............................112

Figure 3.26 Tustin groundwater plumes..............................114

Figure 3.27 Soils by infiltration capacity..............................116

Figure 3.28 Central and Coastal Subregion NCCP/HCP 122

Figure 3.29 Habitat vegetation in the Central and Coastal Subregion NCCP/HCP 123

Figure 3.30 Coast live oak woodland 124

Figure 3.31 Coastal sage scrub 125

Figure 3.32 Non-native grassland 125

CHAPTER 4

Figure 4.1 Dynamic Planning Approach...............................131

Figure 4.2 Types of regional integration 134

Figure 4.3 Types of local integraion....................................136

Figure 4.4 Planning Areas...138

Figure 4.5 The process of adaptive management 144

CHAPTER 5

Figure 5.1 Sediment in San Diego Creek 146

Figure 5.2 Erosion in Borrego Creek...................................147

Figure 5.3 Newport Boulevard bioswale 149

CHAPTER 6

Figure 6.1 Hicks Canyon Retarding Basin sediment levels 154

Figure 6.2 Great Park section of Agua Chinon (proposed) ...155

Figure 6.3 Borrego Channel near Alton and Barranca, Irvine 156

Figure 6.4 Serrano Creek restoration...................................156

Figure 6.5 Swale at Ladera Ranch, Orange County...............157

Figure 6.6 Neighborhood treatment wetlands.......................158

Figure 6.7 South Coast Ecoregion wildlife movement linkages 161

Figure 6.8 Regional and watershed wildlife linkages 163

Figure 6.9 Estuarine habitat, Upper Newport Bay 163

Figure 6.10 Light-footed clapper rail in cordgrass................163

Figure 6.11 Riparian and freshwater wetland 165

Figure 6.12 Terrestrial habitat...165

Figure 6.13 Wildland-urban interface fuel modification........166

CHAPTER 7

Figure 7.1 Portland, Oregon...170

Figure 7.2 Landscapes with drought-tolerant California native plants..172

CHAPTER 8

Figure 8.1 GIS Layers 181

Figure 8.2 Boy Scouts plant a California sagebrush 184

Figure 8.3 Peter and Mary Muth Interpretive Center.............184

Figure 8.4 Seminars held at nurseries 185

CHAPTER 9

Figure 9.1 "Two Percent Strategy" Opportunity Areas..........190

Figure 9.2. Open space connections — mountains to bay, Irvine 192

Figure 9.3 Bike path along San Diego Creek.........................193

Figure 9.4 Peters Canyon Regional Park Trail 193

Figure 9.5 Open space connections near Irvine Business Complex 194

Figure 9.6 Neighborhood vegetated swale...........................195

Figure 9.7 Streambed swale, Jeffrey Open Space Spine, Irvine 196

Figure 9.8 Non-invasive drought-tolerant garden 198

Figure 9.9 "California Friendly" Garden................................198

Figure 9.10 Irvine Business Complex proposed "Creekwalk", conceptual illustration 200

Figure 9.11 Irvine Business Complex proposed "Creekwalk" , plan view 200

Figure 9.12 Stormwater planter, Portland, Oregon 201

Figure 9.13 Curb cuts in parking lot median.........................201

Figure 9.14 Stormwater collection cells for under parking lots 201

Figure 9.15 Green roof at Ford Premium Automotive Headquarters, Irvine 202

Figure 9.17 Blight 203

Figure 9.18 Lively urban area — The Spectrum, Irvine 204

Figure 9.19 Lively urban area — Santa Ana 204

CHAPTER 10

Figure 10.1. Dynamic Planning Approach.............................210

Figure 10.2 IRCWMP Planning Areas 211

Figure 10.3 Tustin Legacy Open Space (proposed)..............215

Figure10.4. Natural treatment wetland, Irvine 216

Figure 10.5 Least Bell's vireo..217

Figure 10.6 Great Park and Great Park Neighborhoods........218

Figure 10.7 Great Park segment of proposed Wildlife Corridor..220

Figure 10.8 Erosion in Serrano Creek 221

Figure 10.9 Smart controller....222
Figure 10.10 Brown-headed cowbird trap....223
Figure 10.11 Dredging in Upper Newport Bay, Army Corps of Engineers restoration project....228
Figure 10.12 ROOTS restoration activity....229
Figure 10.13 Big Canyon Creek mouth....229
Figure 10.14. Lower San Diego Creek....230
Figure 10.15 San Joaquin Marsh....230
Figure 10.16 Bonita Canyon Creek....230
Figure 10.17 Newport Harbor....230
Figure 10.18 Robert E. Badham State Marine Sanctuary (Newport Beach ASBS) & Crystal Cove State Marine Sanctuary (Irvine ASBS)....232
Figure 10.19 Pelican Hills Golf Course....235
Figure 10.20 Morning Canyon Stabilization Project....236
Figure 10.21 Buck Gully Road Maintenance and Wetland Project....236
Figure 10.22 Public impact to tide pools in ASBS Marine Sanctuary....237

CHAPTER 11
Figure 11.1 Parameters of the new scoring system....241

LIST OF TABLES

CHAPTER 1
Table 1.1 Central Orange County Stakeholder List (Newport Bay Watershed Stakeholder Committee)....14
Table 1.2 Concepts or schools of planning....17

CHAPTER 2
Table 2.1 Proposition 84 issues and watershed goals....33

CHAPTER 3
Table 3.1 Central Orange County Municipalities....63
Table 3.2 Existing and projected city populations....66
Table 3.3 Population by race....67
Table 3.4 Population by age....67
Table 3.5 Educational attainment....67
Table 3.6 Household annual income....67
Table 3.7 Down-stream flow for San Diego Creek Reach 1....77
Table 3.8 Up-stream flow for San Diego Creek....77
Table 3.9 Stream flow for Peters Canyon Wash....77
Table 3.10 Wet weather flow data....78
Table 3.11 Dry weather flows per unit area....78
Table 3.12 Beneficial uses of water in Central Orange County IRCWM Region....82
Table 3.13 Sediment discharge from San Diego Creek to Newport Bay....86
Table 3.14 Summary of 2003 concentrations in San Diego Creek at Campus Drive....89

Table 3.15 Summary of Total Inorganic Nitrogen...................89
Table 3.16 Santa Ana Basin water quality objectives..............89
Table 3.17 Toxic pollutant TMDL concentrations 92
Table 3.18 Select groundwater concentrations in 2005..........94
Table 3.19 Selenium concentrations in groundwater sources...94
Table 3.20 Water quality projects defined in the State of the CCAs Report..98
Table 3.21 Retail agency water sources fiscal year 2005.....105
Table 3.22 Central Orange County water demand projections 106
Table 3.23 Central Orange County water supply projections 107
Table 3.24 IRWD wastewater & recycled water production...110
Table 3.25 Irvine groundwater aquifers...............................113
Table 3.26 Representative basin water budget.....................115

CHAPTER 4
Table 4.1 Types of Local Integration....................................137

CHAPTER 10
Table 10.1 Key Projects for each Planning Area...................212

CHAPTER 11
Table 11.1 Project Benefit Factors.......................................243
Table 11.2 Integration Type Factors 245
Table 11.3 Integration Planning Coefficients 246
Table 11.4 Top-rated projects..249
Table 11.5 Top-rated Category 1 projects.............................249
Table 11.6 Top-rated water supply projects 249

ACRONYMS

ACOE	Army Corps of Engineers
AMP	Allen-McColloch Pipeline
ASBS	area of special biological significance
BMP	best management practice
BPP	basin pumping percentage
CAS	California Aquifer Susceptibility assessment
CCA	critical coastal area
CC&Rs	covenants, conditions and restrictions (homeowner association)
CDFG	California Department of Fish and Game
CEDEN	California Environmental Data Exchange Network
CEIC	California Environmental Information Catalog
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
CUWCC	California Urban Water Conservation Council
CWTF	colored water treatment facility
DAMP	Drainage Area Management Plan
DFP	Diemer Filtration Plant
DWR	Department of Water Resources
EDC	endocrine disrupting compounds
EPA	Environmental Protection Agency
ETWD	El Toro Water District
FEMA	Federal Emergency Management Agency
GAMA	Groundwater Ambient Monitoring and Assessment Program
GIS	geographic information system
HATS	Harvard Avenue Trunk Sewer
HCP	Habitat Conservation Plan
IBC	Irvine Business Complex
ILP	Irvine Lake Pipeline
IRCWM	Integrated Regional and Coastal Watershed Management
IRWD	Irvine Ranch Water District
LEED	Leadership in Energy and Environmental Design
LID	low impact development
LLFA	Landscape Level Functional Assessment
LAFCo	Local Agency Formation Commission
LAWRP	Los Alisos Water Reclamation Plant
MCAS	Marine Corps Air Station
MCWD	Mesa Consolidated Water District
MSAA	Master Streambed Alteration Agreement
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
MWRP	Michelson Water Reclamation Plant
NBNF	Newport Beach Naturalists and Friends
NCCP/HCP	Natural Community Conservation Plan/Habitat Conservation Plan

NEPA	National Environmental Policy Act
NEV	neighborhood electric vehicle
NPS	California Non-Point Source Program Strategy and Implementation Plan 1998-2013
NPDES	National Pollutant Discharge Elimination System
NSMP	Nitrogen and Selenium Management Program
NTS	Natural Treatment System
OCEMA	Orange County Environmental Management Agency
OCFCD	Orange County Flood Control District
OCHBP	Orange County Harbors, Beaches, and Parks
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
PCB	polychlorinated biphenyl
PCP	pharmaceuticals and personal care products
RDMD	Resources and Development Management Department (OC Public Works)
RWQCB	Regional Water Quality Control Board (Santa Ana)
SCAG	Southern California Association of Governments
SAMP	Special Area Management Plan
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWQPA	State Water Quality Protection Area
SWRCB	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
TDS	total dissolved solids
TIN	total inorganic nitrogen
TMDL	total maximum daily load
TOD	transit oriented district
UCI	University of California, Irvine
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WEC	Watershed Executive Committee
WMA	watershed management area
WQMP	water quality management plan
WQT	water quality treatment
WUE	water use efficiency
WUI	wildland-urban interface

ACKNOWLEDGEMENTS

Funding Provided by:

California Department of Water Resources,
Natalia Deardorff, Project Manager

Central OC IRCWM Plan Prepared by:

Bob Stein, City of Newport Beach
Project Manager, Writer

Krista Sloniowski, Connective Issue
Plan Architect, Lead Writer

Nancy Heuler
Writer, Copy Editor, Graphics

William Whittenberg, Dudek
Project Figures, Prioritization

Lorraine Hornby, Expression Graphic Design
Graphic Artist, Layout

Agency Liaisons:

Carolyn Schaffer, County of Orange RDMD
Orange County Watersheds Liaison

Mark Tettemer, IRWD
Irvine Ranch Water District Liaison

Central OC IRCWM Plan Focus Group

Plan Reviewers:

Special thanks to the following people who participated in reviewing the plan through focus group meetings or provided written comments to the draft document. Written comments can be found in Appendix M.

Jack H. Gregg, California Coastal Commission
Steve McMasters, State Water Resources Control Board
Mark Adelson, Santa Ana Regional Water Quality Control Board
Erinn Wilson, California Department of Fish and Game
Jeff Stoddard, California Department of Fish and Game
Carolyn Schaffer, County of Orange, OC Watersheds Program
Mary Anne Skorpanich, County of Orange, OC Watersheds Program
Marilyn Thoms, County of Orange, OC Watersheds Program
Amanda Carr, OC Stormwater Program
Marsha Westropp, Orange County Water District
Michele Farmer, Orange County Sanitation District
Brent Galyon, Municipal Water District of Orange County
Mike Granada, Orange County Flood Control District
Dr. Geremew Amenu, Los Angeles County Department of Public Works
Mark Tettemer, Irvine Ranch Water District
Mike Loving, City of Irvine

Robert L. Woodings, City of Lake Forest
David Webb, City of Newport Beach
Dave Kiff, City of Newport Beach
Iris Lee, City of Newport Beach
Joe Palco, City of Santa Ana
Taig Higgins, City of Santa Ana
Alex Waite, City of Tustin
Dr. Peter Bowler, University of California, Irvine
Dr. William L. Bretz, University of California, Irvine
Roger Mallett, Newport Bay Naturalists and Friends
Irwin Haydock, Newport Bay Naturalists and Friends
Dennis Baker, Newport Bay Naturalists and Friends
Jack Keating, Newport Bay Naturalists and Friends

Central OC IRCWM Plan – Stakeholder Meeting Participants:

County of Orange

City of Costa Mesa
City of Irvine
City of Laguna Hills
City of Laguna Woods
City of Lake Forest
City of Newport Beach
City of Orange
City of Santa Ana
City of Tustin

Orange County Flood Control District
Irvine Ranch Water District
Mesa Consolidated Water District
Municipal Water District of Orange County
Orange County Water District
Orange County Sanitation District
Orange County Vector Control District

California Department of Fish and Game
Santa Ana Regional Water Quality Control Board

The Irvine Company

Connective Issue
Dudek
Fuscoe Engineering
Nossaman, Gunther, Knox, Elliott, LLP
RBF Consulting
Recupero and Associates
S4S, Inc.
Weston Solutions

Newport Bay Naturalists and Friends
Stop Polluting Our Newport
Environmental Coalition for the Great Park
Friends of Harbors, Beaches and Parks
Nature Reserve of Orange County
Southern California Wetlands Recovery Project
Orange County Coastkeeper
Surfrider Foundation

The Great Park Corporation
UC Irvine
UC Cooperative Extension – South Coast Research Station

FOREWORD — JULY 8, 2009

This Integrated Regional and Coastal Water Management Plan (IRCWMP) — Phase 2, was completed in October 2008 and was greeted with three points of view: those that supported it, those that preferred a return to a traditional approach, and those that questioned if the integrated, regional planning approach really is worth all the effort. There was general agreement among all parties on the list of top prioritized projects (see Appendix A). The most important concerns centered around the proposed regional performance objectives, agency responsibilities for moving each project forward, and the need to make the IRCWMP simpler and more linear. Stakeholder comments are included in Appendix M, available at **www.newportbeachca.gov/index.aspx?page=1333**.

Since the release of the Phase 2 IRCWMP, numerous meetings among the agencies and other concerned parties are still searching for the common ground. The most important development has occurred in the past month with the Central Orange County Executive Watershed Committee expressing interest in revisiting the idea of developing quantitative regional performance objectives for our water resources, something that has been rarely attempted for a highly urbanized watershed.

This new edition of the Phase 2 IRCWMP, while essentially unchanged, now includes the Acknowledgements Section. It also includes a copy of all stakeholder comments received since October 2008 (Appendix M). Aside from filling in missing information, correcting grammatical errors and tightening up the prose style, the only significant change in the text is in **Chapter 10: Project Integration**. This chapter is the guts of the plan as it lists priority and supporting projects for each Planning Area. In this new edition, Table 10.1, Key Projects for Each Planning Area, has been added. This table shows key projects for each of the six planning areas, broken down by the four water resource areas (hydrology/flood control, water quality, water supply, and habitat). Section 10.5 (Bay/Coastal Planning Area) has been supplemented to list additional local objectives and key projects, along with callouts that show the inter-linkages among projects.

Resolution of the remaining Plan deficiencies will have to be addressed in the next phase of the IRCWMP. Once quantitative performance objectives are formulated and approved by the Watershed Executive Committee, project prioritization scoring can be revised to reflect these performance objectives. The following text is from the original Foreword.

This Plan's primary purpose is to serve as a planning tool to effectively manage this region's water resources. To fulfill this purpose, the Plan establishes goals and objectives, identifies water resource projects, discusses ways to integrate a proposed project with other projects, and prioritizes projects on a regional basis. It is intended to have a regional perspective and to further develop the relationships and spirit of collaboration that exists in this watershed. This plan may also be used by local agencies to pursue grant funds from programs that require consistency with an adopted IRWM plan. Although the Plan has no regulatory authority, the State will expect that local agency stakeholders will formally adopt or accept it by board/council resolution.

Based on stakeholder comments, this Plan has been reformatted, extensively revised and now includes:

1. A Plan description that shows a strong nexus between this Plan and statewide priorities (Chapter 1)
2. An expanded chapter describing the Region (Chapter 3)
3. An expanded explanation on integrating projects (Chapter 4)
4. Regional Performance Objectives (Chapters 6, 7 and 8)
5. Specific project examples throughout the Region to establish a healthy and self-sustaining hydrologic system (Chapter 10)
6. A revised project scoring methodology tied to state priority issues (Chapter 11)

The plan process, the Dynamic Planning Approach, has been more tightly defined and a clearer explanation provided, and the tone of the plan has been revised to be more positive and goal directed. More photos and diagrams have been included and the bibliography has been expanded significantly.

While some effort has been made to keep this Plan compact, it is not a document that can be read in a single sitting. As a first pass, the reader may wish to first read the Executive Statement, then take a look at Figure 2.4 which shows the Plan's Principles, Vision, Mission and Goals. The 4-box figure in Figure 4.1, Dynamic Planning Approach, depicts how regional and local objectives inter-relate with Integration and Prioritization tasks. The sections following this figure provide useful explanations of this process. Then flip to Appendix A which lists project scores and rankings for over 130 water resource projects. The scoring process is described in Chapter 11.

EXECUTIVE STATEMENT

Note: Appendix M: Stakeholder Comments is located at the following website: **http://www.newportbeachca.gov/index.aspx?page=1333**

E.1 Plan Process and Features

As highlighted by the emerging drought conditions, it's likely that we'll see an increase in regulation of water resources. This not only includes water supply, but the related issues of water quality, flood control and habitat protection. New top-down regulations could inhibit the ability of local agencies to craft locally-based and locally-supported actions.

An intensive series of meetings with individual stakeholder agencies in the Central Orange County Region facilitated identification of over 130 projects addressing water-related challenges (flood management, water quality, water supply or habitat). A ranking methodology has been devised to identify those projects that will have the greatest impact toward re-establishing healthy, stable hydrologic conditions for our region.

Implementation costs for the 130 projects are roughly estimated to cost well in excess of $400 million dollars over the next 20 years. Assuming that a funding stream of about $20 million per year can be arranged, implementation of these projects would not only enhance our water resources and protect our quality of life, but would also be an important economic boost for our region. Central Orange County's wealth of university, professional consultant and entrepreneurial expertise could be mobilized to create new industries to address our watershed issues and could propel this region into a leadership position in green technologies.

The State of California recognizes the need to guide and support local efforts to utilize water resources wisely. It has established the Integrated Regional Water Management Program to encourage local agencies to work cooperatively in managing local and imported water supplies for the purpose of improving the quality, quantity, and reliability of those supplies. One of the foundational elements is the local adoption of an Integrated Regional Water Management Plan (IRWMP) that promotes:

1. Meaningful stakeholder collaboration in selecting and prioritizing water resource projects based on meeting local and regional objectives,
2. A process to interlink the water resources projects so that the projects work together and promote long-term effective implementation, and
3. Work Plans to move projects forward to implementation.

Our Region's willingness to constructively grapple with these central issues may set us apart from previous planning efforts. The heart of our Plan is a new planning process called the Dynamic Planning Approach. It explicitly recognizes that a water resource plan must accommodate the regional as well as the local perspective:

- Local projects need to accommodate regional objectives, and
- Regional priorities must recognize local objectives.

Because of the complexity of the challenges in our Region, local expertise and control — in cooperation with regional support — is required to generate and maintain sufficient momentum to create a successful water resource management program.

Not only does our planning approach promote regional and local cooperation, it also explicitly encourages it through its project prioritization methodology, integration planning and project work plans. Furthermore, it promotes a linkage among planners, ecologists and engineers. Making the connection between planning and engineering is especially important because grant funding is primarily focused on implementing projects, and therefore, engineers will need to comprehend the over-arching planning objectives when writing the scope-of-work for proposed projects. Because of the importance of the Dynamic Planning Approach to our Plan, a summary of the process is provided here in the Executive Statement and then fully developed in Chapter 4.

One note on the title of our plan: As one of the significant considerations in our regional planning and project activities for the Central Orange County Region is our 12-mile long coastline, the Plan's title is the **Integrated Regional and Coastal Water Management Plan** (IRCWMP or Plan). Figure E.1 shows the Central Orange County Region.

Prioritizing Projects to Meet Local and Regional Objectives

While good IRWM plans have been prepared for "limited-issue" watersheds where regulation is the driving force (for example, protect the Coho salmon) or where the need is obvious (for example, improve water supplies), the State has not yet seen an example of a comprehensive water resource plan to address the complex inter-related water-resource issues in such a highly urbanized setting. The State realizes that it cannot simply promulgate regulations formulated in Sacramento and expect effective implementation at the local level. Rather, the State is looking to local stakeholders to devise a water resource plan that is feasible to implement, meets local objectives and accommodates state objectives. As a starting point for addressing regional and local coordination, we considered two examples that are now occurring in Central Orange County.

- The best example of innovative cooperation between regional and local agencies is the Nitrogen and Selenium Management Program (NSMP) facilitated by the Orange County Watershed and Coastal Resources Division, which is performing investigations and pilot studies to find ways to deal with selenium contamination. The NSMP stakeholder group has

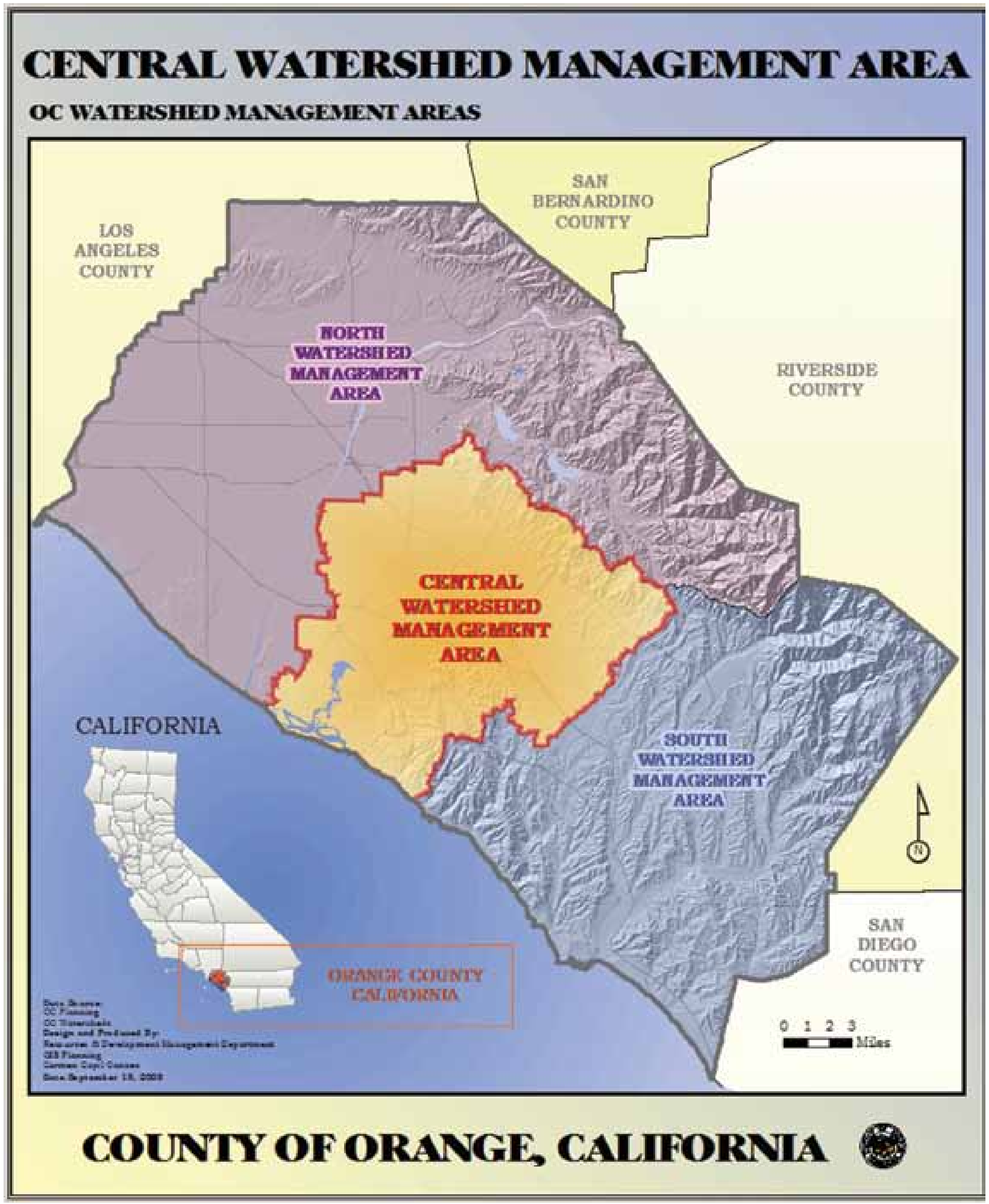


Figure E.1
Orange County Three Watershed Management Areas

forged an alliance with the California Regional Water Quality Control Board (Santa Ana Region) to support funding and development of a Selenium Total Maximum Daily Load (TMDL). The alliance is built upon an understanding that because the TMDL will be based on scientifically-defensible evidence, the parties will support the TMDL recommendations once they are developed.

- The other emerging example of cooperation between regional and local stakeholders is the planning for the Bight '08 coastal resource studies as focused on the Areas of Special Biological Significance (ASBS). This is an unprecedented proceeding where the Southern California Coastal Water Research Project (www.sccwrp.org) is facilitating discussion between the State Water Resources Control Board and the cities of Newport Beach, Laguna Beach, San Diego and Malibu, the County of Los Angeles, the US Navy, and the Irvine Company to develop a near-shore monitoring program. In this case, the geographically separated stakeholders have co-federated in order to address common challenges posed by ASBS issues. The parties agree that the results of this monitoring program will be the basis for discharge regulations for dry and wet-weather direct discharges to the ASBS.

These ground-breaking examples of regional/local consensus-building regarding water resource issues illustrate several important principles:

- Effective problem solving is fostered when local and regional experts cooperate to find approaches that will produce the best scientific results.
- For complex water resource problems, practical solutions require scientific, engineering, planning, environmental and economic perspectives.
- A stakeholder group that demonstrates an understanding of the scientific, engineering, planning, environmental and economic aspects of a water resource issue, and is collectively able to explain it effectively to a wide spectrum of interest groups, is most likely to achieve success.
- The very act of the various stakeholder groups meeting together helps each individual interest understand how the other interests think and speak.

This IRCWMP uses our prior watershed successes to assist in defining an effective stakeholder process where water resource planning, engineering, environmental, economic and political perspectives can be reconciled, and as such, this Plan represents a breakthrough toward comprehensive management of watershed resources.

The Newport Bay Watershed Executive Committee, established in 1983, will provide leadership in determining water resource priorities for this region. In 2008, the Executive Committee's role was formally expanded to include governance of the IRCWMP. This committee provides guidance for our watershed program, including reviewing and approving priority projects, directing staff on which grant programs to pursue, reviewing activities of the various watershed committees and directing staff to periodically update the IRCWMP (see Section 1.7). The actions of the Watershed Executive Committee, along with active and meaningful contributions from our spectrum of stakeholders, are key to the effectiveness of our watershed program.

Inter-linking Water Resource Projects

The State is still wrestling with the question of how to integrate projects in a watershed-wide manner and has asked local planning efforts to also tackle this question. To put this into the simplest terms, how does a proponent define a water resource project such that it helps build a healthy and self-sustaining watershed, supports other water resource projects, and does not harm other water resource efforts? The Central Orange County IRCWMP makes the first concerted attempt toward quantifying integration by defining four types of regional integration and thirteen types of local integration (Chapter 4). It also describes hydrologic and ecosystem-based processes that drive the system and thus must be considered when defining integration. (Chapter 5). Finally, it includes specific examples of proposed local projects as a foundation for future project integration.. (Chapter 10).

Watershed Work Plan

As a fundamental step toward moving projects off the "wish-list" category and into a position for funding consideration, each project proponent is required to prepare a Work Plan to delineate all the steps and a timeline needed for implementation including: the planning concept, integration planning, community support, funding options including leveraging local assets, environmental and construction documents, permits, monitoring, and operations and maintenance. As the Work Plan becomes better defined, the ranking of the project increases accordingly.

Watershed Vision and the Dynamic Planning Approach

Through a facilitated Watershed Stakeholder Committee visioning process (see Chapter 2 and Chapter 3.1.4), community stakeholders have defined this common Vision for our Region:

> "Public and private lands in the Central Orange County Watershed Management Area sustain healthy watershed ecosystems, protect critical habitat and species, and allow the community to enjoy its connection with nature; and at the same time safeguard the health and welfare of the community, maintain immediate and long-term reliability of water supplies, and protect the value of property."

A key idea that comes out of our Vision is that projects implemented in our watershed must work to support a healthy and self-sustaining ecosystem; in other words, our water resources, flood control, water quality, water supply and habitat systems are functioning well and in balance with each other.

To this end, this plan uses both a regional, top-down approach and a local, bottom-up planning approach. For the top-down perspective, the Plan uses the U.S. Army Corps of Engineers'

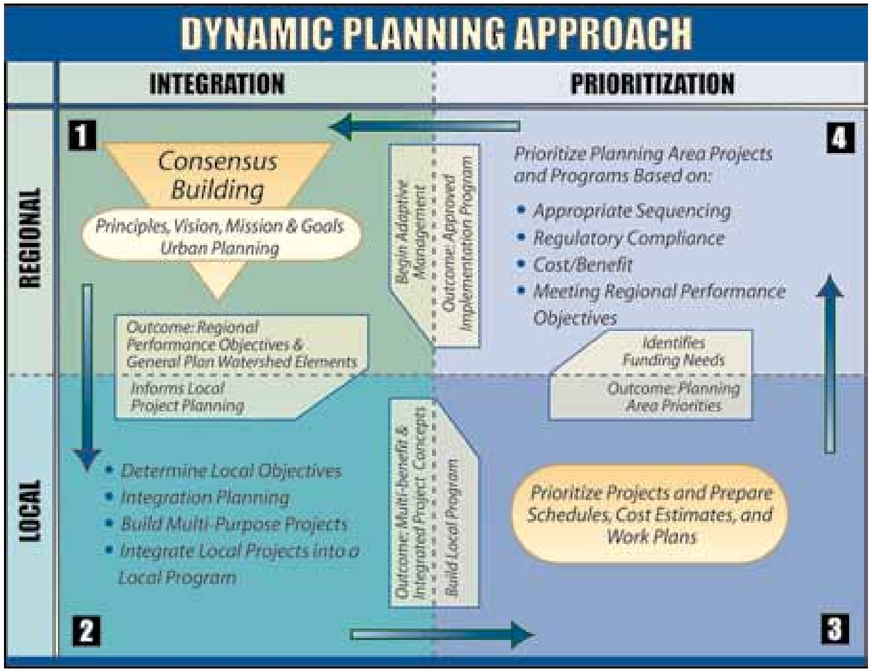


Figure E.2 Dynamic Planning Approach

"Watershed Systems Approach" that has been infused with both regional and local planning and engineering expertise. The Corps' Watershed Systems Approach is an ecosystem-based watershed planning methodology adapted in this Plan to provide a science-based planning methodology and form a connection with the federal approach to resource management. This was complemented by a concurrent bottom-up, stakeholder-driven project planning process that capitalizes on local expertise and gives voice to local concerns and objectives. These two processes are fused together through Regional Performance Objectives (Chapters 6, 7 and 8) that represent consensus-building toward the watershed Vision for the water resources of our hydrologic system. This balancing of regional versus local interests, and long-term versus immediate-term requirements, enables progress towards achieving the Vision. The efficiency and effectiveness of that progress depends on the quality and intensity of stakeholder collaboration.

Figure E.2, Dynamic Planning Approach, illustrates the linkages between regional and local perspectives and the integration and prioritization processes. Integration planning seeks inter-connections (spatial, temporal, funding, monitoring, etc.) between projects. Prioritization deals with determining an effective way to implement projects that includes consideration of evolving economic, political and community interests.

This Plan makes important advancements in water resource planning on a number of fronts, especially with regard to integration planning. In that regard, this Plan explicitly recognizes that the long-term success of our program depends on watershed objectives ultimately being incorporated into General Plans and other resource management plans. Long-term success of this Plan is supported by inclusion of a Regional Performance Objective to institute a watershed-wide science education program in our local high schools and colleges, so that we can home-grow the next generation of watershed scientists, planners, engineers, economists and ecologists.

One important aspect of water resource management that has not yet been addressed in the IRCWMP is how to inter-link planning efforts to adjacent regions. For South Orange County and Central Orange County, the inter-linkage is provided by the Orange County Watershed and Coastal Resources Division, which facilitates both plans. The potential inter-linkages between Central Orange County and the Santa Ana Watershed Project Authority (SAWPA) to the north are still being explored. While representatives from Orange County have participated in the SAWPA IRWMP process, due to staffing constraints there has only been marginal coordination among the project managers for the Central Orange County and SAWPA efforts. There are several important commonalities between the two Regions that at a minimum need to be addressed, including the groundwater basin managed by Orange County Water District and common habitat areas managed under the Natural Community Conservation Plan/Habitat Conservation Plan.

E.2 Plan Outcomes and Benefits

- This Plan has initially identified over 130 water resource projects that cover every area within our Region based on extensive conversations among the stakeholders (See Appendix A). The Plan highlights critical projects in each area of the Region. (Chapter 10).
- All identified projects have been scored and ranked based on the ability of a project to address multiple water resource issues in an integrated manner (Chapter 11). Concept-level work plans have been prepared for the top twenty ranked projects along with schedules.
- The Plan is based upon a breakthrough planning process, the Dynamic Planning Approach, an important step forward in encouraging local and regional coordination (Chapter 4).
- The Plan provides for the Watershed Executive Committee's enhanced role in directing the course of water resource planning in Central Orange County.
- The Plan promotes identification of potential water resource projects. It also provides a template for invigorating the consensus-building process within the Watershed Stakeholder Committee, which will aid in the identification of these projects.
- The Plan promotes effective project implementation by encouraging integration planning and the preparation of project work plans.
- The Plan makes important contributions toward integration planning by defining four regional and thirteen types of integration (Chapter 4).
- The Plan makes an important contribution toward defining priority projects in terms of Regional Performance Objectives (Chapters 6, 7 and 8).

References

- Southern California Coastal Water Research Project, Bight Regional Monitoring Project **www.sccwr.org/view.php?id=95**

1 • INTRODUCTION

The limits of water resources in California are becoming uncomfortably clear given the increasing growth and development in our state. This is especially true in Orange County where rapid growth since the 1960's has made the county's population in 2007 the second largest in the state. This has created water resource infrastructure needs for flood management, water supply, water quality and habitat restoration that could potentially run into billions of dollars.

State agencies are promoting a new approach to water resource management that requires integrated, multi-purpose and multi-benefit planning to foster the efficient use of limited water resources. The process the State has outlined for the implementation of this new approach is to require watershed regions to develop an "Integrated Regional Water Management Plan" or IRWMP. To make this planning process effective, meaningful coordination of all stakeholders and project proponents in a hydrologic area becomes an essential factor,. Communities are charged with determining a process to define watershed goals and identify projects that cross jurisdictional boundaries and agency mandates. This Plan represents a significant step forward in water resource planning for this region by taking a closer look at defining effective collaboration, meaningful integration and project prioritization based on the desired functioning of the watershed's hydrologic system. We think this new approach will provide a firm springboard for future advancements.

Recognizing the increasing challenges we face for water resource management, Central Orange County stakeholders are creating a framework for coordinated planning among all water managers to promote integration planning of water management activities. It is a roadmap to:

- Delineate an effective method for understanding and defining water resource issues.
- Bring all water resource projects in the watershed together.
- Seek solutions that satisfy and balance the requirements of all stakeholders.
- Implement cost-effective remediation and restoration measures.
- Define cost-effective ways to manage operations and maintenance costs.

The IRCWMP contains 12 chapters divided into three parts:

Part I

PART I describes the context of this Plan, which include the physical, stakeholder, and planning perspectives.

Part II

PART II presents the collaborative watershed planning and system level design processes and outcomes, focusing on the hydrologic system as a whole. It addresses the first function of this Plan, which is to define what integration means, and a methodology for how to achieve it.

Part III

PART III focuses on local level project integration and prioritization within the Planning Areas, which are project planning districts within the Region. This addresses the second function of this Plan, which is to identify and integrate the known water resource projects within the Central Orange County Region using the newly identified methodology.

1.1 Relationship to State Water Management Preferences

The IRWM program has preferences for implementation projects that are set by the California Water Code and implementing legislation. This Plan addresses the State preferences through the integrated planning process, and thus, the projects that come out of it. State preferences are included in this Plan through:

1) Project design that achieves multiple benefits by designing multi-purpose projects.
2) Multi-benefit projects that are enhanced through integration planning at the regional and local levels using seventeen discrete types of integration outlined in this Plan.
3) The support and improvement of water supply, water quality, impaired water bodies and sensitive habitats. This is made possible by the collaborative process that stakeholders engage in over the long-term as part of the development of the Desired State, in order to achieve consensus on hydrologic, water quality, water supply and habitat Regional Performance Objectives. Projects that implement these regional priorities support all of these functions at the same time.
4) The support of disadvantaged communities with the development of an urban design approach for integrating water infrastructure into the urban fabric as a tool for economic and social revitalization and sustainability. This approach integrates the urban context with IRWM planning.

1.2 State Priorities

The State of California has planning and implementation priorities that are established by a variety of state-wide planning initiatives. They are addressed in this Plan in the following ways:

1) The Desired State for water supply is to ultimately be completely reliant on local sources of water, rather than on imported water, except as an emergency source of supply. The goals of the CALFED Bay-Delta Program include water quality, water supply and ecosystem restoration improvements to the Bay-

Delta system. Eliminating the use of Delta water in this Region helps achieve all three of those goals for the Delta. Also, because it eliminates or severely reduces the use of imported water, it eliminates by default the conflict with other potential uses for imported water. Additionally, it contributes to Delta Water Quality Objectives by leaving more water in the Delta to be available to support other beneficial uses within the Delta.

2) The Regional Performance Objectives for water quality are currently defined to meet all existing water quality regulations. As stakeholders develop more specialized objectives to support the regional water supply and habitat performance objectives, these specialized objectives will facilitate and guide the implementation of:

   - Total Maximum Daily Loads,
   - Regional Water Quality Control Board (RWQCB) Watershed Management Initiative chapters, plans, and policies, and
   - State Water Resources Control Board's (SWRCB) Non-point Source (NPS) Pollution Plan.

   In addition, Chapter 9 outlines an approach to urban design to address the source of this pollution – urban runoff.

3) As discussed above, the urban design approach in this Plan integrates water infrastructure into the urban fabric as a tool for economic and social revitalization and sustainability. This connects the urban context with the IRWM process for mutual benefit to address issues such as environmental justice.

4) This plan implements the Floodplain Management Taskforce recommendations when it develops and implements the hydrologic Regional Performance Objectives, and through the various mapping and data collection activities that are called for. It implements the Water Desalination Taskforce recommendations as needed to meet the Regional Performance Objectives for water supply. It implements the Recycled Water Taskforce recommendations when it uses storm water and waste water as a water source for appropriate uses in order to meet the Regional Performance Objectives for water supply and habitat. Finally, this Plan implements the State Species Recovery Plan through coordination with California Department of Fish and Game on developing the Desired State for habitat, which local projects must support and implement.

1.3 IRWM *Plan Standards*

The State also has specific standards and criteria for what each IRWM plan must contain. This Plan is using a new approach to integrated resource planning, so some explanation of how it relates to the existing state IRWMP standards is needed. In order to meet the State's needs for review and evaluation, the locations of Proposition 84 Plan Standards within this Plan are summarized below:

Relationship to Statewide Water Management

This is provided here in **Chapter 1: Introduction**.

Regional Description

The "problem statement" for the Region is presented in **Chapter 2: Strategic Direction**. A full description of this Region is provided in **Chapter 3: Regional Description**.

Relationship to Local Water Planning

The relationship of this Plan to other local water planning activities is addressed throughout the document, but it is addressed most directly in **Chapter 3: Regional Description**.

Stakeholder Involvement

Chapter 3: Regional Description, discusses historical stakeholders' involvement in watershed planning. **Chapter 8: Collaboration** outlines stakeholder involvement in developing Regional Performance Objectives.

Technical Analysis

The State asks for the data, technical methods and analysis used to develop this Plan. In general this is more of a planning document than a technical document, focusing primarily on the development of a planning methodology. The planning methodology is presented in **Chapter 4: Dynamic Planning Approach**. The method for arriving at agreement on the technical Regional Performance Objectives is described in that chapter, and in **Chapter 5: Science Based Design**. At the project level, the technical information provided by project proponents was used to help determine prioritization in **Chapter 11: Prioritization**. Project information is presented in **Appendix A: Project Descriptions**.

Plan Performance

Tracking how this Plan performs over time is part of an adaptive management process. This Plan's adaptive management process is presented in **Chapter 4: Dynamic Planning Approach**.

Data Management

Data Management is an important tool in developing regional performance objectives, adaptive management and collaboration. It requires cooperation among government agencies, non-profit organizations and research institutions in respect to funding, compatible data collection, maintenance protocols and data accessibility. Strategies for using it as a tool to integrate regional planning are provided in **Chapter 4: Dynamic Planning Approach** and **Chapter 8: Collaboaration**.

Climate Change

Climate change is anticipated to significantly affect water resource management in this region both from the local agencies' need to reduce greenhouse gas emissions as well as changing hydrology that will broadly affect water supply, water quality, flood management, and in some locations, habitat. Implications of climate change are further discussed in **Chapter 2: Strategic Direction** and **Chapter 3: Regional Description**.

Coordination

Meaningful coordination among stakeholders is the cornerstone of an effective watershed program and is one of this Plan's three watershed goals. This goal is addressed throughout this Plan, but it is addressed most directly in **Chapter 8: Collaboration**.

Governance

Long-term governance of the Central Orange County Region is addressed here in **Chapter 1.7**, and in **Chapter 3: Regional Description**, **Chapter 8: Collaboration**, and in **Chapter 12: Implementation**.

Relationship to Local Land Use Planning

Land use planning and site design are tools for the spatial integration of the various functions within a community. Water resources are one of the many functions that can be integrated into community with these tools. This Plan has dedicated an entire chapter, **Chapter 9: Urban Design**, to the issue of how water resources and land use are related to each other, and how to approach this relationship from a design perspective.

Integration

Chapter 4: Dynamic Planning Approach, provides an overview between regional and project level integration. Chapter 4 also introduces eleven types of project level integration to be considered by a project proponent.

Chapter 5: S cience-Based Design discusses ecosystem level integration and **Chapter 10: Project Integration**, discusses integration at the planning area and subwatershed level.

Each goal area is outlined in Chapters 6 through 8. **Chapter 6: Water Resources**, **Chapter 7: Economic Development**, and **Chapter 8: Collaboration** describe integration in terms of the three watershed goals and the inter-relationships among the goals.

Chapter 9: Urban Design also discusses the physical integration of the three goal areas of this plan, which represent the environmental, economic and social aspects of the Region.

Objectives

This Plan has two kinds of objectives, Regional Performance Objectives and local objectives. **Chapter 6: Water Resources**, **Chapter 7: Economic Development** and **Chapter 8: Collaboration** identify the Regional Performance Objectives. **Chapter 10: Project Integration**, identifies the local objectives.

Project Review Process

The process of project review is first presented in **Chapter 4: Dynamic Planning Approach**. Consideration of specific projects for inclusion in the Plan occurs in **Chapter 10: Project Integration**. This chapter represents the design process that identifies the actions that will best enable the integration of the Region's water resources.

Water Management Strategies

This Plan considers all but two of the state's Water Management Strategies to be project implementation strategies rather than planning strategies. The two planning strategies are "Watershed Management" and "Land Use Management": they are both implemented by the entirety of this Plan and, more specifically, by **Chapter 4: Dynamic Planning Approach**, and **Chapter 5: Science Based Design**. **Chapter 10: Project Integration** identifies the project strategies that implement the objectives of this Plan, while **Chapter 11: Prioritization** identifies which of the state's strategies receive a higher priority for more immediate implementation.

Table 1.1 Central Orange County Stakeholder List	
Entity	**IRCWM Plan Authority/Responsibilities/Support**
PUBLIC AGENCIES	
County of Orange	Land use, recreational facilities, stormwater protection, water quality
City of Newport Beach	Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality; planning and i mplementation of projects and programs to protect the CCAs and ASBSs; habitat protection and restoration
City of Irvine	Land use, recreational programs/facilities, economic and community development, stormwater protection, water quality
City of Costa Mesa	Land use, recreational programs/facilities, economic and community development, stormwater protection, water quality
City of Lake Forest	Land use, recreational programs/facilities, economic and community development, stormwater protection, water quality
City of Laguna Hills	Land use, recreational programs/facilities, economic and community development, stormwater protection, water quality
City of Laguna Woods	Land use, recreational programs/facilities, stormwater protection, water quality
City of Orange	Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality
City of Santa Ana	Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities, economic and community development; stormwater protection; water quality
City of Tustin	Land use; water service; water conservation; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality
Irvine Ranch Water District	Land use; potable and recycled water service; groundwater management; water conservation; wastewater collection and treatment; habitat protection and restoration; water quality
El Toro Water District	potable and recycled water service; water conservation; wastewater collection and treatment
Golden State Water Company	Water service; groundwater management; water conservation
East Orange County Water District	Water service; groundwater management; water conservation
Orange County Water District	Water resource planning; groundwater management
Orange County Sanitation District	Water resource planning (recycled); wastewater collection and treatment
Orange County Flood Control District	Land use; flood control; stormwater protection; water quality
Mesa Consolidated Water District	Water service; groundwater management; water conservation
Costa Mesa Sanitary District	Wastewater collection service
Municipal Water District of Orange County	Water resource planning; water conservation
The Great Park Corporation (City of Irvine)	Recreational programs/facilities; stormwater protection; water quality; wetlands/habitat enhancement
California Department of Fish & Game	Wetlands/habitat enhancement,
Santa Ana Regional Water Quality Control Board	Water quality

Table 1.1 Central Orange County Stakeholder List

Entity	IRCWM Plan Authority/Responsibilities/Support
Orange County Vector Control District	Wetlands/habitat enhancement
NON-GOVERNMENTAL ORGANIZATIONS	
Newport Bay Naturalists and Friends	Funding, volunteers and organizational support for programs for habitat protection in Upper Newport Bay, public education
Stop Polluting Our Newport	Support for water quality programs
Surfrider Foundation – Newport Beach Chapter	Funding, volunteers, and organizational support for programs related to coastal water quality
Orange County Coastkeeper	Funding, volunteers, and organizational support for programs for habitat protection in Upper Newport Bay, public education
Nature Reserve of Orange County	Manage open space areas within Central/Coastal Natural Community Conservation Plan/ Habitat Conservation Plan (NCCP/HCP)
Irvine Ranch Conservancy	Manage 50,000-acre Irvine Ranch Land Reserve
Friends of Harbors, Beaches, and Parks	Support for programs to improve harbors, beaches, and parks in Orange County
Latino Health Access	Programs and facilities related to health for disadvantaged communities (water quality, recreation)
University of California Cooperative Extension	Support for water quality/water conservation programs
Southern California Wetlands Recovery Project	Wetlands/habitat enhancement

Financing

The strategies for financing the various programs and projects identified in this plan are presented in **Chapter 12: Next Steps for Plan Implementation**. However, the expected funding sources for each project are included in the description of each project in Appendix A.

Impacts and Benefits

The Impacts and Benefits of this Plan are summarized in **The Executive Statement.**

1.4 IRCWM *Plan Management Group*

The agencies and organizations participating in the development of the Central Orange County IRCWM Plan are shown in Table 1.1, Central Orange County Stakeholder List The agencies have the authority to implement this plan and, with the inclusion of the non-governmental organizations, represent the group necessary to successfully achieve the Plan goals. The members of this group are becoming increasingly adept at collaborating on these regional water resource issues as demonstrated in the county-wide stormwater program, the Newport Bay/San Diego Creek Watershed Sediment Control Program, the Nitrogen and Selenium Management Program, and regional water conservation programs. The IRCWM planning process is an important step for the region's stakeholders in creating the stronger partnerships necessary for a viable and robust IRCWM Plan.

1.5 IRCWM Planning Approach

Various planning models have been described for watershed planning (Riley 1998). Table 1.2 summarizes strengths and weaknesses of those models (Shilling et al. 2004).

All of these planning approaches have significant drawbacks. For example, the Comprehensive planning approach is only appropriate for the smallest watershed: for example, this methodology was used for the 10 square-mile Newport Coast Watershed. To attempt to use this methodology for larger watersheds is impractical as the plan will be bogged down by the sheer volume of details and never get down to tackling the difficult problem of project integration. The other types of planning approaches, while more action oriented, potentially suffer from not being rigorous enough to tackle the most difficult problems that we face in our highly urbanized watershed.

Therefore, this plan has created a new approach called the **Dynamic Planning Approach** that represents a blend of planning, engineering, economic, biological and ecological thinking. Chapter 4 describes the Dynamic Planning Approach, the backbone of which consists of two coupled ideas:

- "High-level" regional planning needs to be balanced with local "in-the-trenches" planning.
- The vision of an integrated, ecological balance needs to be balanced with the evolving demands on the watershed.

This approach involves first creating a comprehensive framework using a modification of the Army Corps of Engineers' "systems approach" to systematically capture known information from both the regional and local perspectives. The local perspective is captured, not by using large stakeholder forums, but by a series of briefing meetings with each individual agency. The body of the plan is then filled in using a quantitative iterative approach to identify and collect missing information, and then tie the information together to create an increasingly robust and integrated plan. Chapter 4 walks through the details of this planning approach.

1.6 IRCWMP Planning Process

The IRCWMP planning process has centered on the Newport Bay Watershed Stakeholder Committee, a voluntary collaborative stakeholder group that has been integrally involved with watershed issues and related policy decisions for the past 20 years. This group has a broad representation, including elected officials and staff for county and city public agencies, water and sanitation districts, private companies, non-governmental

Table 1.2 Concepts or "Schools" of Planning (from Draft California Watershed Assessment Manual)

Type of Planning	Description	Planning Strengths	Planning Weaknesses
Comprehensive	Systematic, step-by-step setting of goals and objectives for a number of related mgt. needs, evaluation of alternatives, adoption of implementation measures; also called "rational planning"	Can recognize the interrelationships of many issues and disciplines; emphasis on science and data collection; logical process is appealing; used by many federal agencies; needs strong laws to implement	High costs; too broad and not site-specific enough; low implementation rates; often entails a top-down process, so little public support; may create illusion of scientific objectivity; planning is not a rational science but an art
Incremental	Developed and implemented gradually over time through a bargaining process; Focus is on specific problems or issues & short-term results, which over time address the larger problems	Results oriented with focus on what can be done; the public guides and makes the plan; small-scale solutions reduce risks; adopted now as "adaptive management"; little steps help map future steps	Actions may not address some of larger, more difficult issues; plans may proceed without adequate science & knowledge; implementation may or may not be coordinated; continual interaction required with clients for implementation
Consensus	Involves as many stakeholders in an area as possible; all players treated as equals; implementation based on negotiated political agreement	Implementation rates high due to political buy-in; can be successful in resolving difficult issues; helps communities build and learn; good strategy for attracting diversified funding sources	Process can be lengthy and perceived as too "time-consuming"; plan may be a package of diverse benefits to satisfy partners but not focused and integrated; very difficult individuals can derail the process
Advocacy	Citizens organize to advocate a position or action; plan used to strategically show alternative approach to a more traditional one	Can be politically empowering if coalition or consensus is developed; can help with community building across formerly disparate groups; can break political impasse	Technical content of plan may be professional but may not be representative of broader community; may lack integration with other disciplines; polarization may result if consensus not reached from advocacy
Action	Initiated by citizen groups, districts, and agencies to make something visible and positive happen on the ground in order to build public support and interest; a form of incremental planning	Builds public awareness for the difficult Big Picture needs and watershed-wide approaches; confers credibility on planning process; can develop credibility for government programs or expertise; helps develop new community leadership	Small action projects may or may not correctly apply science or restoration methodologies; plans may not develop enough integration, coordination, or expertise; monitoring may be lacking

Based on Riley 1998, From Principles of Integrated Planning in Watersheds, Integrated Planning Work Group, California Watershed Council, October 2004.

organizations, environmental groups, and the general public. The Stakeholder Committee, facilitated by the County of Orange, meets on a monthly basis to discuss water resource issues.

For the preparation of this Plan, a series of individual meetings with each of these agencies and organizations was instituted to define specific objectives and explore ideas for water resource projects. Over 150 region-wide projects were identified with this process.

Keeping in mind the local objectives and priority projects, the process for integrating these projects into a cohesive plan began first with the approach used by the County of Orange for its integrated watershed planning efforts begun in 2004. Under this process, the U.S. Army Corps of Engineers' "systems approach" provided the formal top-down framework, whereby the Plan Vision informs Mission, Goals and Regional Performance Objectives of the plan. The Plan Vision, Mission and Goals support the idea that all water resources need to be in a healthy state and in balance with each other in order to have a self-sustaining watershed.

The next step in the planning process is for stakeholders to formulate a formal process to connect the local objectives to the Regional Performance Objectives and, in doing so, connect the local water resource projects to the Watershed Vision of a healthy hydrologic system. This is the primary type of integration, guiding how our projects should work together. Three other types of regional level integration have also been defined and are discussed in Chapter 4: Dynamic Planning Approach.

The next step is for stakeholders to define different types of integration that project proponents could infuse into a project design. As opposed to projects that fulfill multiple purposes, local-level integration planning is a new kind of creative planning that seeks to find cross-connections among other projects, such as:

- spatially connected projects;
- downstream projects;
- sister projects in other watersheds;
- future community or regional projects;

as well as partnerships with financial partners, educational programs, disadvantaged communities, and green technology industries. Local level integration planning, along with regional level integration planning, is at the heart of the State's goal for integrated watershed plans. For highly urbanized regions such as Orange County, integration planning for our complex system may be the biggest challenge we face in preparing a successful long-term plan.

The final step, project prioritization, could be difficult because there is such a wide spectrum of water resource projects. Fortunately, stakeholders already recognize the top ten or fifteen projects that need to be implemented, providing direction on how to evaluate the other projects. To facilitate funding and implementation of the top priority projects, this step in the planning process includes preparing concept level work plans and schedules for these priority projects.

1.7 Governance of the IRCWMP

Plan Administration and Management

Orange County Public Works Department Watersheds Program Division will serve as the Central Orange County IRCWM Plan Administrator. Plan implementation will be in accordance with the proposed project priorities and schedule, as periodically amended, by each project proponent.

The County of Orange will hold quarterly IRCWM Plan meetings with the Watershed Management Committee (see below). Group members may expand or contract as appropriate from time to time. The quarterly meetings will focus on the status of the Plan and project implementation; project funding; monitoring, data management and reporting; and review and consideration of regional priorities and necessary refinement. The County will be responsible for drafting and distributing meeting minutes to the Watershed Management Committee members.

Executive Committee

The Newport Bay Watershed Executive Committee, which has had a key decision-making role for the past 25 years, will serve in the leadership role to oversee policy issues and budget decisions related to the Central Orange County IRCWM Plan. The committee is comprised of elected officials and staff representing the County; four cities (Lake Forest, Irvine, Newport Beach, and Tustin); RWQCB-Region 8; Irvine Ranch Water District; California Department of Fish and Game; and The Irvine Company. The committee meets on a quarterly basis.

The Watershed Management Committee carries out the work directed by the Watershed Executive Committee and is comprised of senior staff members of the following organizations: County of Orange/Orange County Flood Control District; cities of Irvine, Lake Forest, Newport Beach, and Tustin; Irvine Ranch Water District; Santa Ana Regional Water Quality Control Board; California Department of Fish and Game; The Irvine Company; United States Army Corps of Engineers; California Coastal Conservancy; United States Environmental Protection Agency; Farm Bureau, through the UC Cooperative Extension; and an environmental representative.

Benefits of Local Governance Approach

The approach to governance of the Central Orange County IRCWM Plan promotes partnership opportunities between county departments, cities, special districts, other stakeholders, and funding agencies. It facilitates ongoing and meaningful public and private stakeholder involvement, group participation and decision making, while focusing on one administering agency for coordination and management. As the administering agency, the County will be accountable to the IRCWM (Newport Bay/San Diego Creek & Newport Coast Watersheds) Stakeholder Group and the Executive Committee along with funding agencies that require regional applications and agreements.

References

- City of Newport Beach. 2007. Newport Coast Watershed Management Plan
- County of Orange. 2007. Central Orange County Integrated Regional and Coastal Watershed Management Plan. "IRCWMP Phase 1"
- www.ocwatersheds.com/watersheds/pdfs/CentralOC.IRCWMPlan_Aug202007.pdf
  www.irwd.com/AboutIRWD/IRCWMP.php
- County of Orange, Orange County Flood Control District, Cities of Orange County. 2003. Drainage Area Management Plan (DAMP).
- U.S. Army Corps of Engineers. 2005. Newport Bay/San Diego Creek Watershed Study.

PART I: CONTEXT

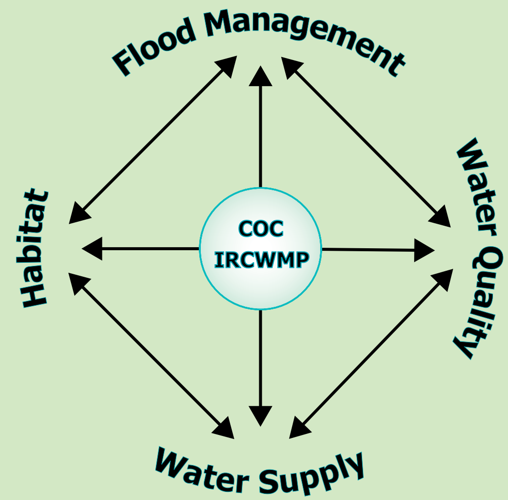
Part I of this IRCWMP defines the challenges, long-term vision and existing conditions of the Central Orange County Region, providing the context for this Plan.

Chapter 2: Strategic Direction, outlines the over-arching framework using the Army Corps of Engineers' "systems approach", within which the Vision, Mission and Goals for this plan are defined.

Chapter 3, Regional Description, describes the attributes of our watershed and our approaches to date for managing the following water resource areas:

- Flood Management
- Water Quality
- Water Supply
- Habitat

Chapter 4: Dynamic Planning Approach, outlines the Plan process that explicitly incorporates the coupled ideas of



regional/local objectives and project integration/prioritization. Because of the highly urbanized nature of this area and the important economic interests here, it is essential that this Plan utilize regional and local expertise in devising an integrated water resource plan that effectively and efficiently identifies priority projects for implementation.

Chapter 5: Science-Based Design, discusses some of the scientific fundamentals underlying water resource integration at both the local and regional scales.

2 • STRATEGIC DIRECTION

Good strategic guidance is easy to understand, straightforward and uncluttered. If confusion arises during the many complex planning processes that will follow, stakeholders can always refer back to these core ideas to regain clarity. This chapter presents the problems the Region is facing and the high-level strategic thinking stakeholders have developed to address them. This thinking includes Principles, Vision, Mission and Goals that form the foundation for the decision-making process throughout the rest of this Plan. The Planning Framework Diagram below illustrates where these elements fit within the larger IRCWMP planning structure.

2.1 Problem Statement

There are two overarching challenges with regard to water resources in this Region.

- First, the current planning processes in the Region that focus on managing individual water resource issues do not provide a template for integrated planning through cross-linking of projects. A new model is needed.
- Second, the capacity for hydrologic sustainability in this Region is constrained by the less-than-optimum relationships between the environmental, economic and social processes. In this Region, as in most places, environmental, economic and social processes tend at times to work against each other, limiting the potential of each. To create a more self-sustaining watershed, these processes must be brought into alignment with each other in order to create a synergy, where mutually beneficial outcomes make the whole greater than the sum of its parts.

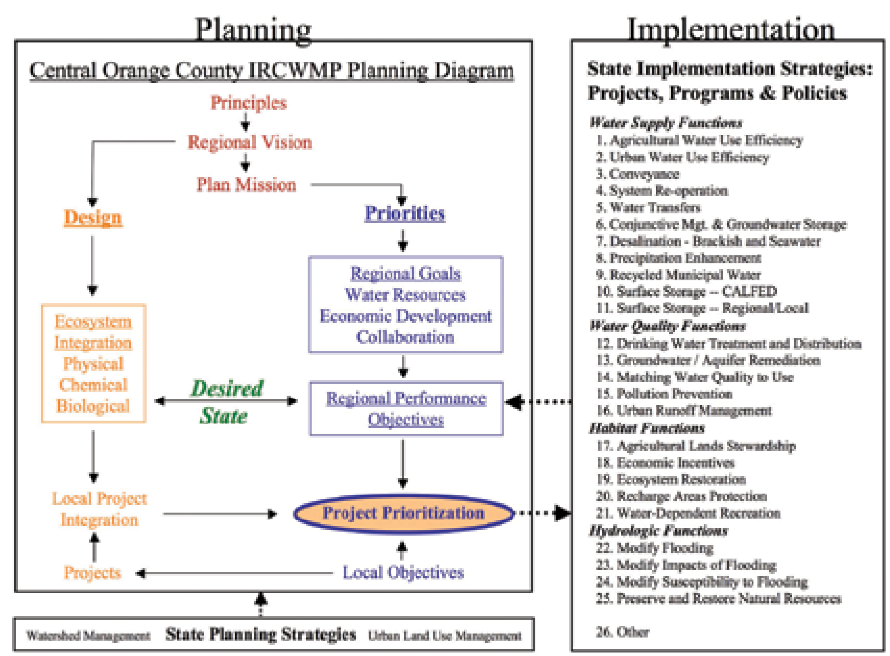


Figure 2.1 IRCWMP Planning Framework

With regard to the first challenge, the management of water resource issues falls into the four main categories of flood management, water quality, water supply and habitat. This Region has issues in each of these areas. The issues include contaminated sediment and groundwater, erosion, habitat fragmentation and degradation, wildfires, sediment deposition in Newport Bay, toxic pollutants entering the bay and its coastal areas, reliance on imported water, flooding risks in various places, and the expected escalation of many of these issues due to climate change. These issues are all interrelated and require a planning template that addresses these issues together through multipurpose land use, integration planning to identify linkages among projects, and water resource design.

With regard to the second challenge, Regional Performance Objectives are defined to create mutually beneficial relationships between the environmental, economic, and social elements of this Region. Objectives are specific, quantifiable and track-able outcomes. Next, strategies or projects for the implementation of these objectives are identified and implemented. Results are measured and then compared to the original objective.

The following lists challenges and issues in our watershed for which long-term Regional Performance Objectives need to be defined. The list is divided into three categories: Environment, Economy and Society. These categories correspond to Chapters 6, 7 and 8.

Environment

SOIL & GROUNDWATER CONTAMINATION: The central, low-lying area of this Region, formerly the Swamp of the Frogs, accumulated high levels of selenium in its soils. When the land was converted to agricultural uses, high levels of pesticides and commercial fertilizers also accumulated in the soils. When this area urbanized, some of the industrial and military activities added additional contaminants, such as volatile organic compounds (VOCs), to the soil. Today, when water moves through these soils, it picks up these contaminants and carries them into the groundwater, local streams and Newport Bay where they cause a variety of negative impacts to the local habitat.

INCREASED RUNOFF: When it rains, stormwater rinses the land and carries everything it picks up into local streams. In dry weather, excess irrigation runs off of lawns and carries things like pathogens, fertilizers, herbicides and pesticides into streams. Everything that water picks up from lawns, parks, roads and sidewalks is carried into local streams. These pollutants have impaired the water resources in this Region, and are addressed through regulations such as TMDLs, NPDES stormwater requirements, and the state's Non-point Source Pollution Plan. A variety of structural and non-structural best management practices are needed. In areas of higher urban density the opportunities for implementing BMPs are limited.

HABITAT DECLINE: With urbanization, there has been a decline in the quantity and quality of the habitat in this Region as habitat has been destroyed, degraded or fragmented. Areas of native habitat that remain suffer from a variety of pressures such as invasive species (plant and animal) and encroachment from surrounding urban areas. For example, The Upper Newport Bay Ecological Reserve and the two coastal marine sanctuaries are heavily impacted by poor water quality from upper watershed runoff and by habitat degradation due to heavy recreational use, invasive plants and animals, and degraded water quality. This has allowed weedy, non-native, flashy fuel grasses and forbs to take hold in place of the once-dominant coastal sage scrub, riparian and native bunch grass plant communities. The loss of native habitat and loss of connectivity among isolated patches of habitat has reduced the ability of sensitive and endangered animal species to survive here as well.

WILDLAND FIRE: The native upland habitat of Orange County is naturally adapted to fire. However, due to a combination of altered plant communities, fire suppression and human-induced fire ignition, fires have been more intense and frequent within the watershed. This challenges the ability of the native landscape to recover after a fire and favors opportunistic non-native plant communities. Furthermore, the increase fire frequency impacts downstream hydrology by exposing the underlying soil to increased erosion and sediment transport after a fire. The 2007 Santiago Fire destroyed much of the habitat and wildlife in the NCCP/HCP Central Reserve wildlands, including Limestone Canyon, Whiting Ranch, Loma Ridge, and the El Toro Reserve. There are 19,944 acres in the Central Reserve, and according to the latest fire area map, 13,348 acres were destroyed by the fire. These burn areas contributed a significant load of sediment to nearby streams and foothill sediment basins in 2008. In 2008, an improved fire management and recovery plan was developed by the Nature Reserve of Orange County (NCCP administrator) and a group of fire, water and wildlife agencies.

ENDANGERED SPECIES: Habitat degradation from development, fragmentation, introduced invasive plants and animals, grazing, and increased fire frequencies have led to the decline, extirpation or extinction of many native plants and animal species from the watershed. These factors have also resulted in a type-conversion of the once dominant coastal sage scrub plant communities to a weedier, non-native grassland habitat and the loss of a significant percentage of the natural wetland and riparian habitats from the watershed. As previously stated, the loss of native habitat and habitat patch isolation reduces the ability of native species, including threatened and endangered plant and animal species, to persist in the watershed.

CHANGING HYDROLOGY: The watershed is approaching build-out. With development comes impervious surfaces such as roads, roofs, sidewalks and parking lots. This results in increased stormwater runoff, which increases in-stream flow velocities, stream bank erosion and flooding. Development in flood plains creates impediments to hydrological function by restricting natural stream meander and infiltration. When water doesn't slow down and meander in the wider steam channels of a flood plain, not only does it restrict groundwater recharge, the sediment that water carries with it from the mountainous slopes does not settle out. Instead, it continues on until the water

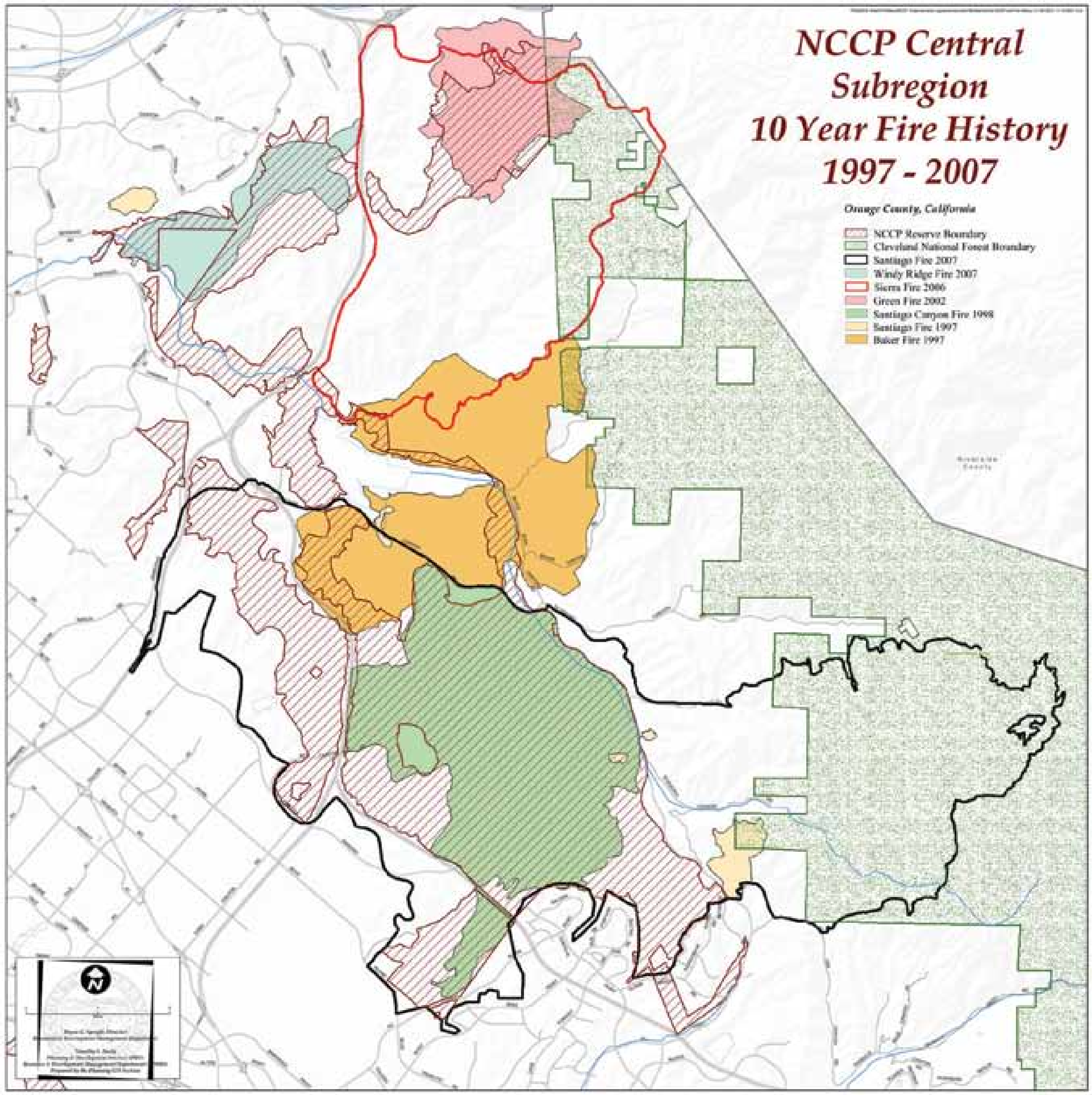


Figure 2.2 Much of the NCCP Central Subregion has burned twice within the past 10 years, which leaves the native vegetation communities vulnerable to type-conversion to weedy flashy-fuel grassland. (Source: Nature Reserve of Orange County)

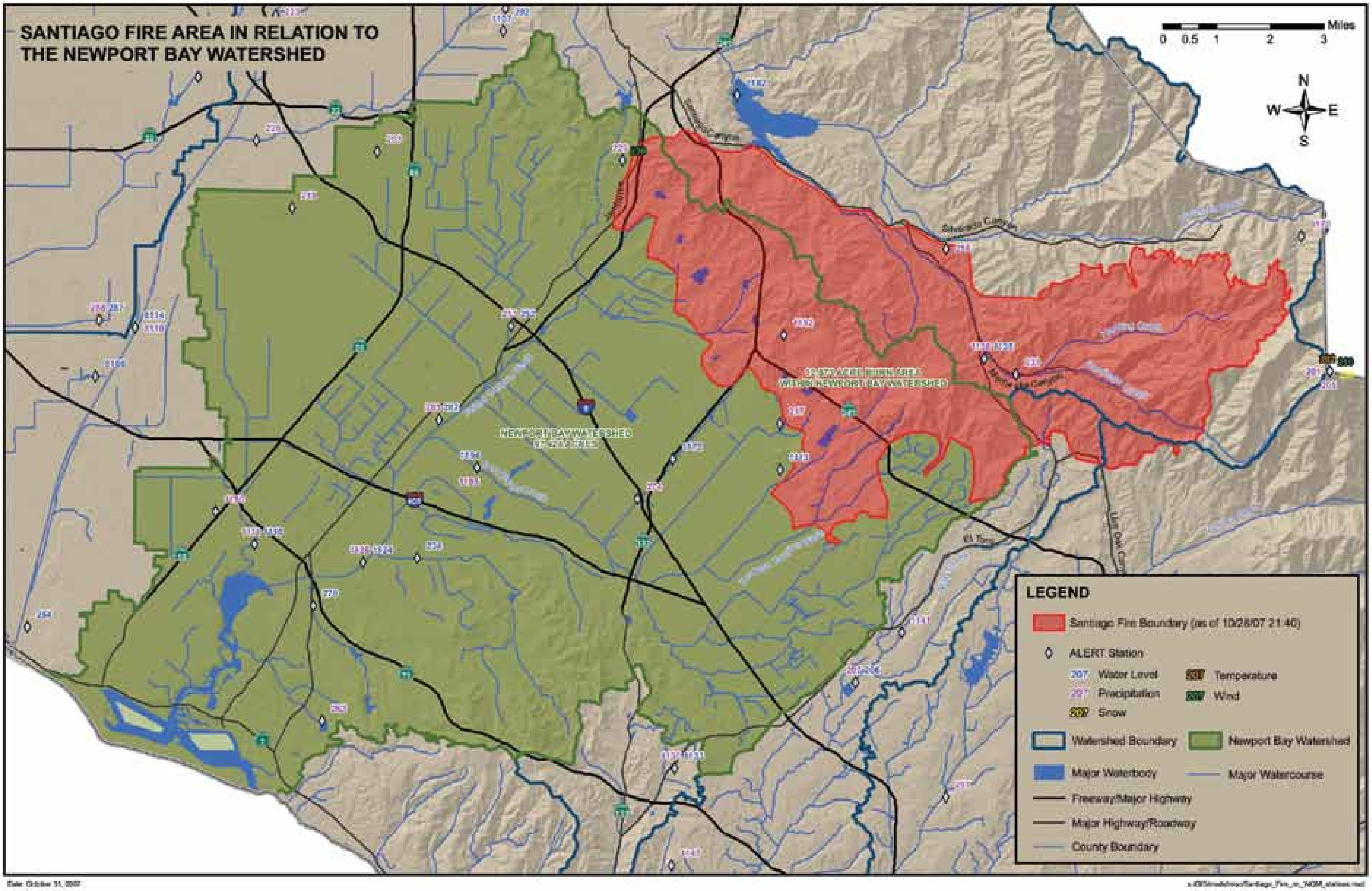


Figure 2.3 The 2007 Santiago Fire in relation to the Newport Bay watershed. (Source: Nature Reserve of Orange County)

finally does slow down in Newport Bay, where it settles out and slowly fills in the bay's estuary environment.

WATER SUPPLY RELIABILITY: The water demand in the Region is projected to grow. New sources of water to supply this growth have become harder and harder to come by. Regional water supply comes from a mix of local groundwater and imported water. Certain areas of the groundwater basin contain nitrates, selenium, high total dissolved solids, toxic plumes, and colored water. Legacy pesticides, nitrates and concentrated selenium levels in the soil threaten local habitat as well as groundwater sources for human consumption. Dependence on imported water is also a problem, given the increasing water needs for both human and natural purposes throughout the state and the southwest. In addition, pumping and distributing water is the largest single source of energy demand in the state. Not only does this contribute to climate change, it competes with other potential energy uses.

CLIMATE CHANGE: Central Orange County has a mild sunny Mediterranean climate with most of the rain falling in winter. Although light rain is more common, heavy rainstorms occur mostly during the winter and early spring. Precipitation averages around 12" to 13" per year, but series of drought years occur periodically. Many of the streams are seasonal, but some streams contain year-around water due to dry season irrigation runoff.

Climate change could broadly affect water supply, water quality, flood management, and in some locations, habitat. Resulting laws regulating greenhouse gas emissions could affect urban planning decisions, especially in regard to sprawl and transportation. Climate change models suggest the possibility of decreased storm frequencies, increased storm intensities and more precipitation variability (DWR, 2006). This would increase the area that could potentially flood during the largest storm event in a 100-year period. The 2009 California Climate Change Center Report (Pacific Institute) predicts that climate change could result in up to a four-foot (1.4 m) mean sea level rise world-wide by 2100, which could flood parts of Balboa Peninsula and other low-lying areas around the bay, submerge ASBS tide pools and beaches, and possibly cause increased bluff erosion. It could also alter the ecology of the Upper Newport Bay estuary (CCA) and possibly send salt water up into lower San Diego Creek as far as the freshwater marsh areas (San Joaquin Marsh and UCI Reserve) during a 100-year storm event.

At present, Central Orange County depends on imported water for approximately one-third of its potable water (COCIRCWMP Phase 1, 2007). As the Sierra snowpack and Colorado River supplies shrink and the population grows, the amount of potable water available per capita will shrink. Furthermore, increased temperatures also result in increased evapotranspiration rates for landscape plants, increasing the demand for irrigation water. This will increase the need for water use efficiencies, recycled water, and aquifer recharge. Higher temperatures and altered rainfall patterns could also contribute to increased wildfires and habitat type-conversion. This would result in species extirpation or extinction, as species that could adapt, move elsewhere and those that couldn't adapt or move, die off.

Economy

REAL ESTATE: Growth and development is vital to the economy of the Region. However, it is also in conflict with the health of local ecosystems, which are also an important component of the economy. One of the important reasons for this is that land use planning does not normally include the hydrologic ecosystem in its design processes. As local water resources degrade, they detract from the attractiveness of a community and help drive down its value over time.

BUSINESS: Tourism and coastal recreation drives a significant amount of the economic activity in this Region. Without a healthy ecosystem, the beaches and intertidal areas do not provide the same amenity value. However, human activity in the coastal area has put pressure on this ecosystem in the form of water pollution, sedimentation, invasive species and intertidal ASBS degradation. In addition, a wide spectrum of local industries tend to have negative impacts on air, land and water in one way or another. This Region has a relatively healthy business community. Many companies choose to be here because of the high standard of living. As that standard of living is degraded by environmental problems, one of the important reasons for locating here is also weakened.

TRANSPORTATION: Transportation infrastructure is an important tool for directing the impact of development, business and residential stakeholders on land and water resources.. It provides the physical backbone for movement around the Region, which determines how people interact with the space around them. The suburban-scale development pattern that is common throughout this Region uses a large amount of land and water per resident. The style and uniformity of transportation infrastructure here encourages a relatively exclusive use of that land use pattern.

Society

CROSS-SECTORAL GOVERNANCE: This Region already has a high level of collaboration; however, many mechanisms for further coordination still need to be developed in order to enable the multidisciplinary management needed. For example, water resource data may be collected redundantly by a variety of agencies but not cross-referenced for consistency. Mitigation is not implemented in a coordinated way throughout the Region. Research on the ecosystem itself is not pulled into any one organization and considered as a unit. Better formal mechanisms for pooling money to accomplish multipurpose tasks are needed. There is no one entity whose official mission is the management of water resources as a whole in the Region, so the establishment of formal management mechanisms across institutions and sectors is important.

SOCIAL NETWORKS: For all the policies, engineering, regulations, public reports and data sets about the water resources in this Region, much of what happens still comes down to human relationships. Free circulation of ideas and opportunities for mutual benefits depend on people communicating with each other. Finding creative ways to avoid negative impacts, while meeting the needs of various stakeholders requires collaboration and a willingness to work together. In this Region, there is a greater level of collaboration than most; however, there are also long-standing differences of opinion. Many people are also simply unfamiliar with what they could be doing to help advance integrated water resource management.

DATA MANAGEMENT: Convenient access to accurate data is crucial to making informed decisions and coordinating adaptive management. At present, water resource data exists in the scattered records of agencies, private companies, cities and non-profit organizations. This makes it difficult to compile an accurate picture of the hydrologic system's function as a whole. A more coordinated method of collecting, updating, storing and disseminating watershed data is needed.

EDUCATION AND OUTREACH: Public engagement through informed stewardship, advocacy and volunteerism can go a long way toward improving watershed function, water use efficiency and regulations. Volunteer monitoring and restoration activities can leverage funding needs and inspire a more conscientious, informed use of resources.

2.2 Community Principles

Principles are values that guide all current and future decision-making processes and actions. They are the fundamental underlying values the community holds to be important and true. When an issue arises that has not been addressed by anything else in the strategic planning process, the community can look to the principles as a guide for determining which course of action is most closely aligned with its fundamental values. Because principles play such a long-term and pervasive role in guiding everything else, it is important that they come from the community itself. The following principles were taken from the Vision statement that was developed as part of the Newport Bay Watershed Stakeholder Committee's visioning process, facilitated in 2004 -2005 by the National Parks Service:

INTEGRATION: The Newport Bay Watershed will be a sustainably and holistically managed ecosystem when natural resources, water uses and economic development are balanced.

ECOSYSTEM FUNCTION: Restoring the watershed's stream system to function more naturally will achieve beneficial uses and support native plant and animal species.

RECREATION: Open space, park land and trail networks sustain the livability of our communities.

ENGAGEMENT: The watershed is best managed when the full range of watershed stakeholders, including the general public, are actively engaged.

2.4. Vision Framework

ACCOUNTABILITY: Stakeholders must be aware of, and accountable for, the impact their daily actions have on the watershed.

DECISION-MAKING: Issues and conflicts are best resolved through collaboration and consensus-building, rather than adversarial means.

REGULATION: Permit compliance efforts are most effective when they are a part of the larger stakeholder participation process, and support watershed goals and planning activities.

2.3 Community Vision

A vision statement declares what a community wants to be at some point in the future and defines an outcome toward which planning and implementation activities are aimed.. It is meant to be a simple concept that is easy to understand so that it can guide decision makers when situations and circumstances become complicated along the way. It grounds the variety of concepts and ideas that exist in our society to one specific place, where stakeholders must administer their interactions and implementations in such a way so as to create this one outcome. It is important that a vision statement include as broad an understanding of the watershed and its stakeholders as possible in order to encompass the full range of issues that exist within the region. As a key community-based watershed advocacy organization within the watershed, Newport Bay Naturalists and Friends worked with stakeholders to develop a vision statement and has proposed the following:

"Public and private lands in the Central Orange County Watershed Management Area sustain healthy watershed ecosystems, protect critical habitat and species, and allow the community to enjoy its connection with nature; while at the same time safeguarding the health and welfare of the community, maintaining immediate and long-term reliability of water supplies, and protecting the value of property."

2.4 IRCWMP Mission

While a vision describes what the community wants itself to be in the future, a mission describes what general approach a specific plan will take to achieve the Region's vision over the long term. It guides the actions that are taken through the IRCWMP planning and implementation processes.

During the initial visioning process, one of the main concerns was that the local cities were not engaged enough in the process. Clearly the cities will play a pivotal part in achieving any watershed vision because, by law, each city has jurisdiction over how the land within its boundaries is used. In order to ensure that this Plan is consistent with city regulations and procedures, the following mission statement for this Plan has been proposed by the City of Newport Beach:

The mission of this Integrated Regional and Coastal Water Management Plan is to bring together all water-related projects and programs in the Region in a collaborative manner among watershed partners by:

- Identifying projects and activities that collaboratively meet state priorities, regulatory requirements and local preferences.
- Delineating a more effective way to come to a mutual understanding of the region's water systems.
- Seeking solutions that correctly balance the requirements of all stakeholders through a thorough deliberation process with our watershed partners.
- Exercising fiscal responsibility through efficient and effective use of funding.
- Proposing and implementing cost-effective remediation and restoration measures.
- Defining cost-effective ways to manage operations and maintenance costs.

2.5 Regional Goals

The IRCWMP Goals have been defined in terms of three broad elements of sustainable development: environment, economy and society, that were developed in the 2005 Watershed Stakeholder Committee visioning process.

1. **INTEGRATED WATER RESOURCES:** Coordinate, integrate and balance the hydrologic functions of flood protection, water quality, water supply and habitat.
2. **ECONOMIC DEVELOPMENT:** Integrate economic development with water-related programs and watershed restoration efforts.

Table 2.1 Proposition 84 Elements and Watershed Goals		
Prop 84 . Issue No	**Prop 84 Project Elements**	**COCIRCWMP Goals**
		GOAL 1: Resource Requirements: **A)** Hydrology, **B)** Water Quality, **C)** Water Supply and **D)** Habitat **GOAL 2:** Economic Requirements **GOAL 3:** Collaboration Requirements
1	Water Supply Reliability, Conservation and Use Efficiency	Goal 1C – Water Supply
2	Storm Water Capture, Storage, Cleanup, Treatment and Management	Goal 1A - Hydrology • Goal 1B – Water Quality
3a	Removal of invasive non-native species	Goal 1D – Habitat
3b	the creation and enhancement of wetlands	Goal 1D – Habitat
3c	Acquisition of Open Space and Watershed Lands for Habitat Connectivity	Goal 1D- Habitat • Goal 3 – Collaboration
3d	Restoration of Open Space and Watershed Lands or Expanded Habitat Reserve	Goal 1D – Habitat
4	Non-point source pollution reduction, management and monitoring	Goal 1B– Water Quality
5	Groundwater recharge and management projects	Goal 1B - Water Quality • Goal 1C – Water Supply
6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	Goal 1C – Water Supply
7	Water Banking, Exchange, Reclamation and Improvement of Water Quality	Goal 1C – Water Supply • Goal 3 – Collaboration
8	Planning and implementation of multipurpose flood management programs	Goal 1A – Hydrology • Goal 2 - Economic
9a	Watershed Protection and Management (Fire)	Goal 1D – Habitat and Goal 2 – Economic Protection Goal 3 - Collaboration
9b	Watershed Protection and Management (Public Access)	Goal 3 – Community Support
9c	Watershed Protection and Management (Education)	Goals 1A, B, C & D – All Resource Requirements, and Goal 2 – Economic training • Goal 3 - Collaboration
9d	Watershed Protection and Management (Land Use Planning)	Goals 1A, B, C & D – All Resource Requirements Goal 3 – Collaboration
9e	Watershed Protection and Management (Economic Planning)	Goal 2 – Economic Planning
10	Drinking Water Treatment and Distribution	Goal 1C – Water Supply
11a	Ecosystem Restoration (Canyon Stabilization)	Goal 1A – Hydrology • Goal 1D – Habitat Goal 2 – Economic (property protection)
11b	Ecosystem Protection (Habitat)	Goal 1D – Habitat

3. **COLLABORATION:** Build and sustain effective relationships among watershed agency, landowner and community stakeholders to achieve common goals through positive collaboration and communication.

(For Goal 1, water supply includes water use efficiency practices , and surface runoff is part of the flood protection and water quality categories.)

With limited stakeholder input, initial specific, measurable and achievable Regional (watershed-wide) Performance Objectives have been proposed to support each goal. These proposed performance objectives should only be considered placeholders until the performance objectives have been thoroughly vetted by stakeholders. Refining these objectives through the process of adaptive management will be an ongoing process as watershed situations change. Objectives are implemented using specific strategies or by constructing projects.

Chapter 3 summarizes the existing state for each of the integrated water resources. In Chapter 6, Regional Performance Objectives for Goal 1 are presented for each of the four water resource areas. The Regional Performance Objectives for Goals 2 and 3 are discussed in Chapters 7 and 8 respectively

2.6 Relationship between the Regional Goals and Proposition 84 Project Elements

The 2008 Proposition 84 guidelines identify eleven project elements that reasonably create a framework for issues to be addressed in a water resource management plan. These Proposition 84 project elements (listed in California Public Resources Code Section 75026) are:

1. Water supply reliability, water conservation and water use efficiency
2. Stormwater capture, storage, clean-up, treatment, and management
3. Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands
4. Non-point source pollution reduction, management and monitoring
5. Groundwater recharge and management projects
6. Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users
7. Water banking, exchange, reclamation and improvement of water quality

8. Planning and implementation of multipurpose flood management programs
9. Watershed protection and management
10. Drinking water treatment and distribution
11. Ecosystem and fisheries restoration and protection

Table 2.1 shows the relationship between the Proposition 84 project elements and our three watershed goals.

References

- County of Orange. 2007. Central Orange County Integrated Regional and Coastal Watershed Management Plan. "IRCWMP Phase 1" www.ocwatersheds.com/watersheds/pdfs/CentralOC.IRCWMPlan_Aug202007.pdf
- Heberger, Matthew, Heather Cooley, Pablo Herrera, Peter H. Gleick, Eli Moore of the Pacific Institute. March 2009. The Impacts of Sea Level Rise on the California Coast (draft), California Climate Change Center Report Series, California Energy Commission PIER Program.

  Watershed Committee's Strategic Framework -10-18-2005. Newport Bay Watershed Visioning Document

3 • REGIONAL DESCRIPTION

A watershed is a hydrologic region that drains to a common point, as defined by topography. All land is part of a watershed because it all ultimately drains to a lake, river, wetland or ocean. Mountain ranges and ridges of higher elevation form the natural boundaries between watersheds because on one side of the ridge water will flow towards one destination, and on the other side it flows towards another.

"Watersheds have proven to be an effective organizing unit for managing natural resources. Because no single agency or other entity alone can effectively manage watersheds, it is in the state's interest to develop and support a statewide watershed program that will promote and conduct effective stewardship of natural resources in a watershed context.."
(State of California, February 2008)

Land and water provide the base materials for the primary production of energy within plants, which is the basis of an ecosystem's food chain. The given amount of land and water within a watershed supports a given amount of biological activity. A watershed's physical and hydrologic characteristics directly define the unique structure of the ecosystem within it. This makes a watershed the appropriate focus for natural resource management.

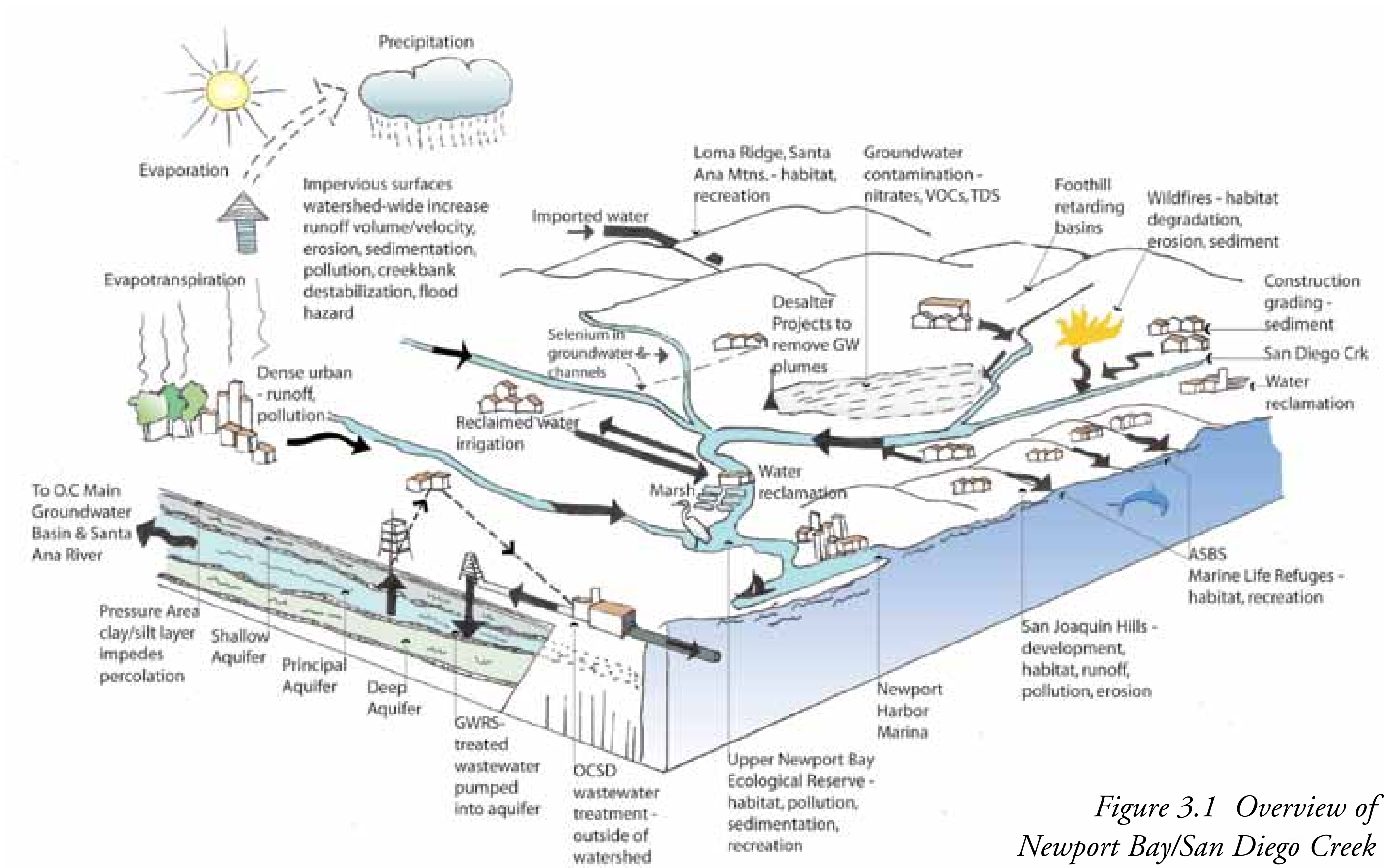


Figure 3.1 Overview of Newport Bay/San Diego Creek watershed activities.

3.1 Overview of the Central Orange County Watershed Basin

The Central Orange County IRCWM Region (Region) includes the Newport Bay Watershed and the Newport Coast Watershed, approximately 160 square miles in total. It is located in the middle of Orange County approximately 40 miles south of Los Angeles and 70 miles north of San Diego.

Figure 3.2 Vicinity Map

The stakeholders in this Region share a strong history of political and technical collaboration dating back to the 1970s. It has three Critical Coastal Areas (CCA), two of which are also Areas of Special Biological Significance (ASBS), and a functioning estuary designated as a State Ecological Reserve. There are currently four Total Maximum Daily Load (TMDL) restrictions in force, with more anticipated.

The Newport Coast Watershed is included as part of the Region because the CCAs and ASBSs along that coast are also in the receiving waters of the Newport Bay Watershed. Whatever happens in the Newport Bay Watershed directly impacts these important habitats, and therefore, these watersheds are best managed in relationship to each other.

The Newport Bay Watershed is bounded in the northeast by the Loma Ridge foothills and the Santa Ana Mountains. The southern edge is bounded by the San Joaquin Hills. Between the Santa Ana Mountains and the San Joaquin Hills lies the flat, alluvial Tustin Plain. The lowest area of this Plain is the historic location of the Swamp of the Frogs. Runoff originating in the northern hills now flows south through flood control channels, into the San Diego Creek Channel, through the Tustin Plain, and then into the Upper Newport Bay estuary. On the other side of the San Joaquin Hills is the Newport Coast Watershed, which consists of a series of coastal canyons draining directly to the ocean.

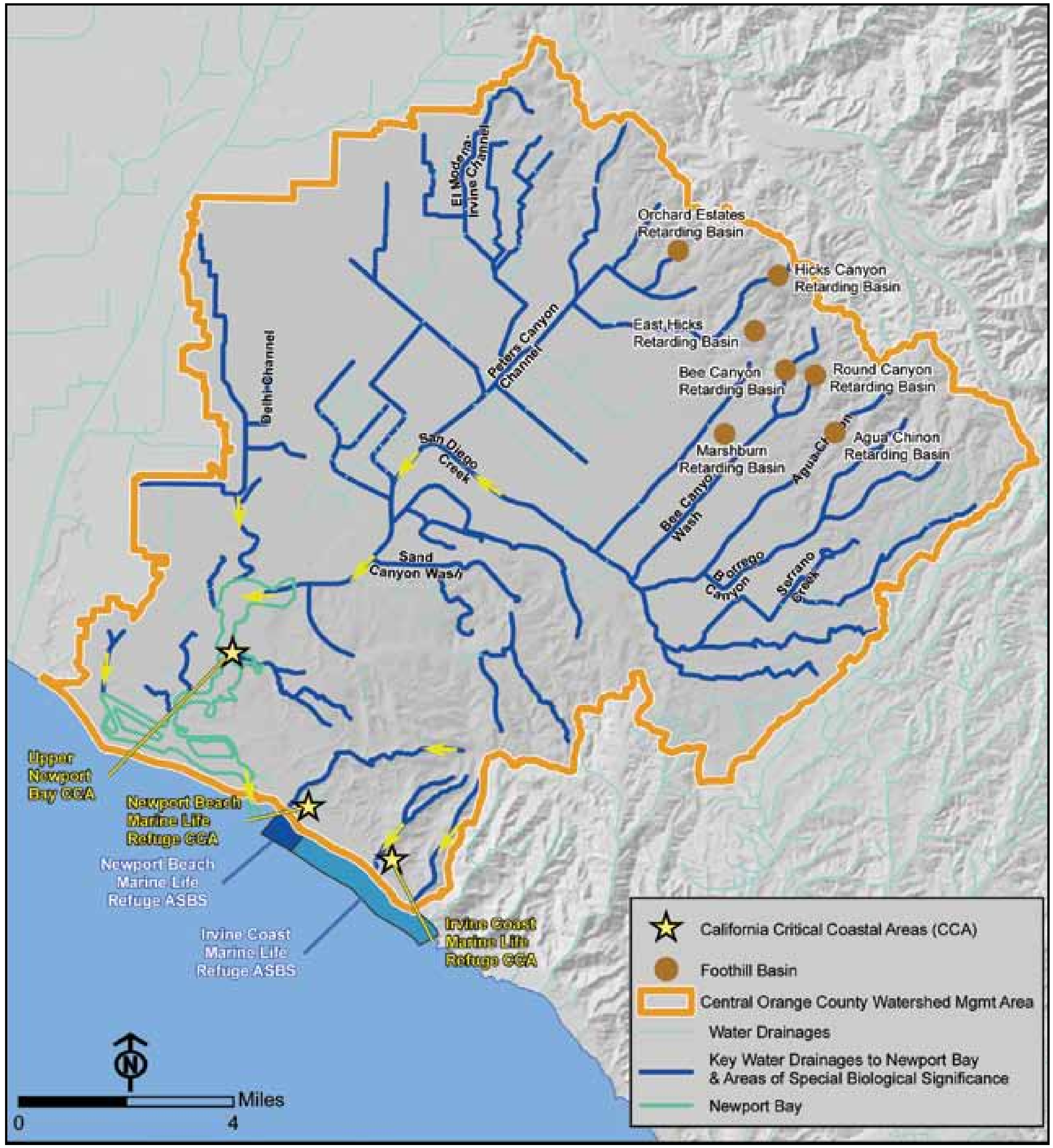


Figure 3.3 Regional Drainages and Foothill Retarding Basins. Map of main water features: Show the Newport Bay Watershed and Newport Coast Watershed boundaries, the San Diego Creek, Peters Canyon Wash, the Santa-Delhi channel, the Newport Bay Ecological Reserve area, the CCAs, the ASBSs.

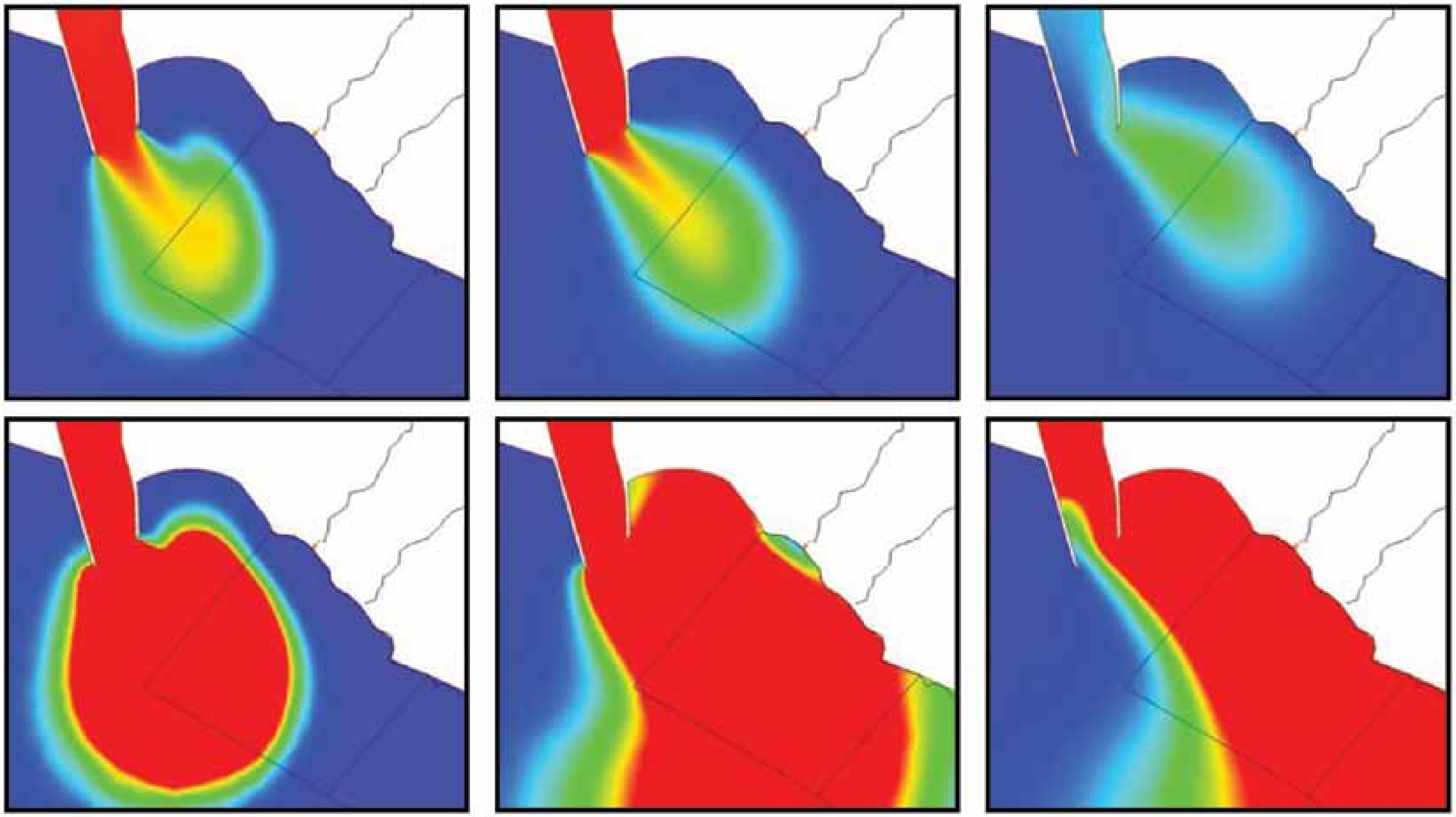


Figure 3.4. Pollutant Plume leaving Newport Bay. The top row depicts the evolution of a pollutant plume exiting Newport Harbor during normal tidal flushing. The first two panels show the plume exiting the harbor during an ebb tide. Panel 3 shows the plume being drawn toward the shoreline during the flood tide. The lower row shows the plume evolution during a storm event.

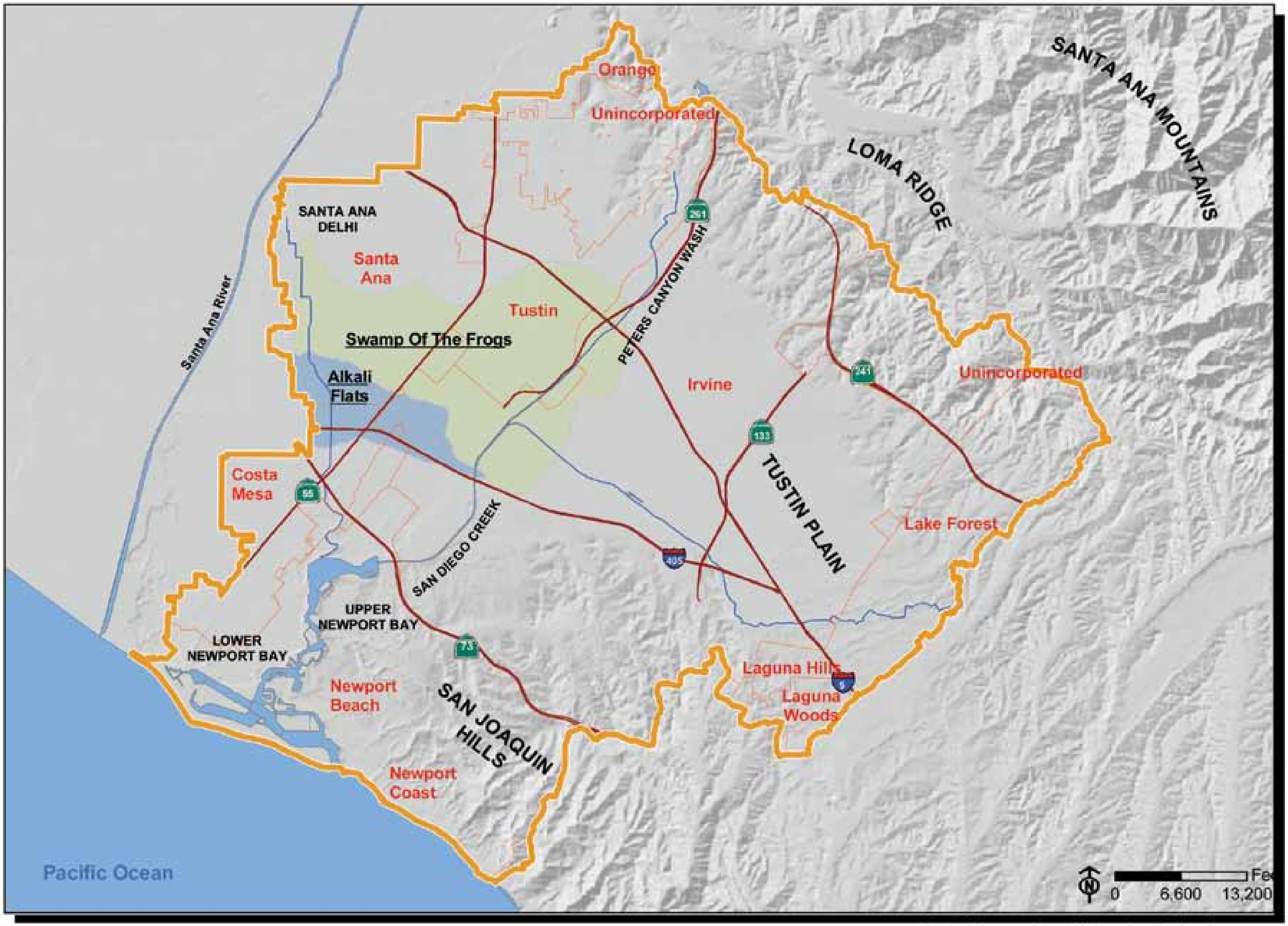


Figure 3.5 Geographical Features

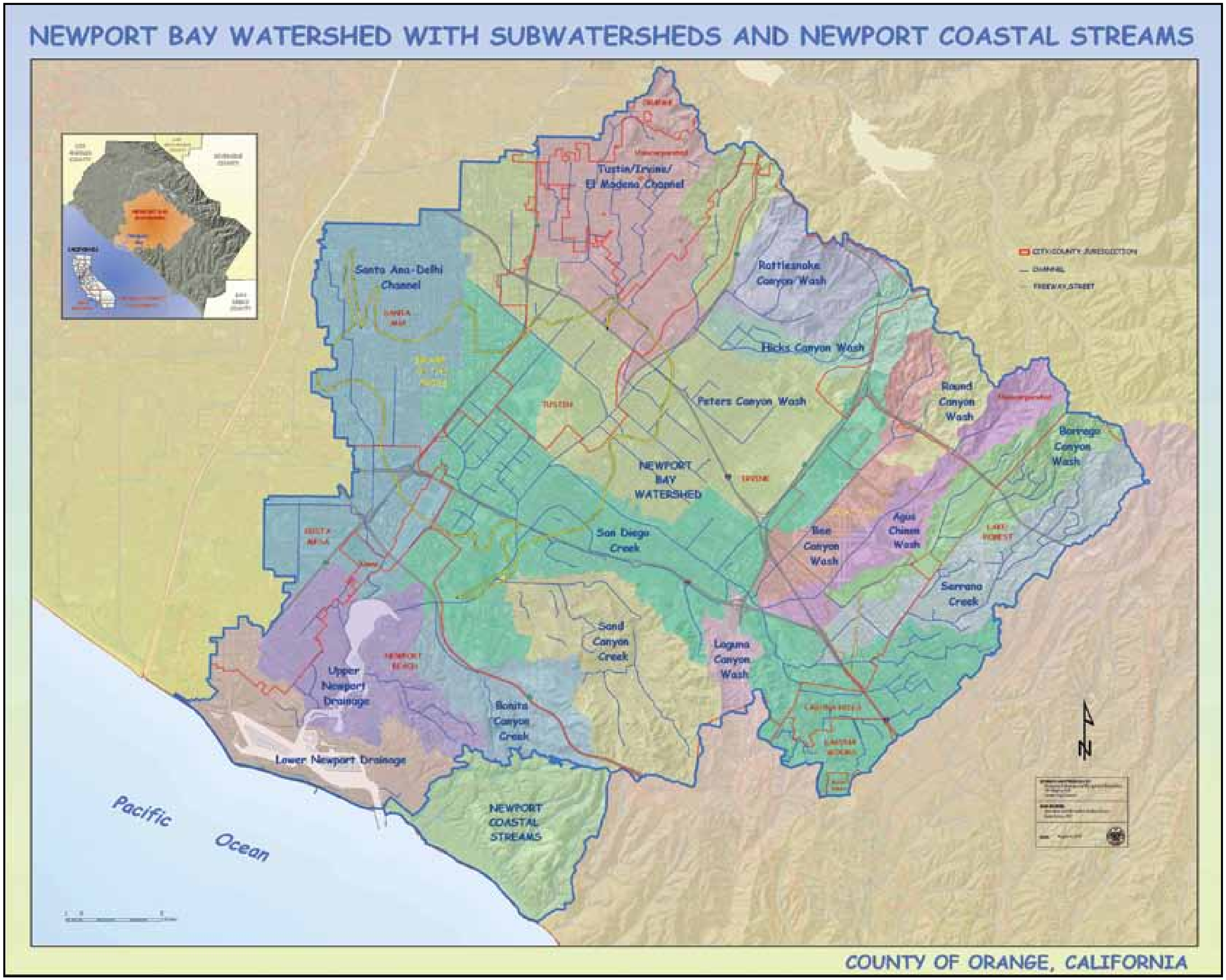


Figure 3.6 Subwatersheds of IRCWMP Region

The upper and middle area of the Newport Bay Watershed includes a group of small subwatersheds draining to the San Diego Creek and eventually to Upper Newport Bay. The area has been divided into as many as 57 subwatersheds, including the two main subwatersheds, San Diego Creek and Peters Canyon Wash, and smaller subwatersheds, including Serrano Creek, Borrego Canyon Wash, Bee Canyon Wash, El Modena-Irvine Channel, and Sand Canyon Wash.

Upper Newport Bay, approximately 1,000 acres in size, is approximately 2 miles long. The Upper Newport Bay State Ecological Reserve is one of only a few remaining estuaries in Southern California and is the home to numerous species of mammals, fish, invertebrates, and native plants, including several endangered species (Newport Bay Naturalists and Friends, 2007). Additionally, it is an important stopover for migratory birds and is a key nature park for the community. The lower portion of Upper Newport Bay includes the Upper Newport Bay State Marine Park. Lower Newport Bay, approximately 752 acres in size, consists of Newport Harbor and recreational and navigational channels. Federally-listed endangered and threatened species, including the brown pelican and potentially the least tern, are found in Newport Harbor.

Water resources within the Region include groundwater, surface water, recycled water, and imported water. Water supplies come from groundwater, recycled water and imported water. The area overlies the southern end of the Orange County Groundwater Basin and has major infrastructure systems for groundwater production and treatment, imported water, wastewater collection and treatment, and recycled water delivery, all of which provide regional benefits. The beneficial uses of surface waters are currently ecosystem processes and recreation, rather than municipal or industrial uses.

3.1.1 Hydrologic History

Historically, Newport Bay was a part of the Santa Ana River Watershed, which is the largest watershed in Southern California. During the Pleistocene era, the Santa Ana River emptied into Newport Bay, which at the time was a deep coastal canyon. Over time, the Santa Ana River filled this canyon in with sediment, creating the estuary conditions that exist today. About 10,000 years ago, the Santa Ana River changed course, flowing north into both Los Alamitos Bay and the Bolsa Chica wetlands at various points in time. Ultimately, the Santa Ana River mouth moved south again, to just north of what had then become the present-day Newport Bay Watershed.

Up until 1920, there was still some relationship between Newport Bay and the Santa Ana River along the coast. Just before the Santa Ana River reached the ocean, it formed a sand bar at the coast and flowed south between the sand bar and land until it reached the mouth of Newport Bay, where both bodies of water then emptied into the ocean. This water from the Santa Ana River had no connection to the land within the bay's watershed, but it did have an impact on the bay itself by providing an additional source of fresh water to the tidal influence within the bay. In 1920, the Santa

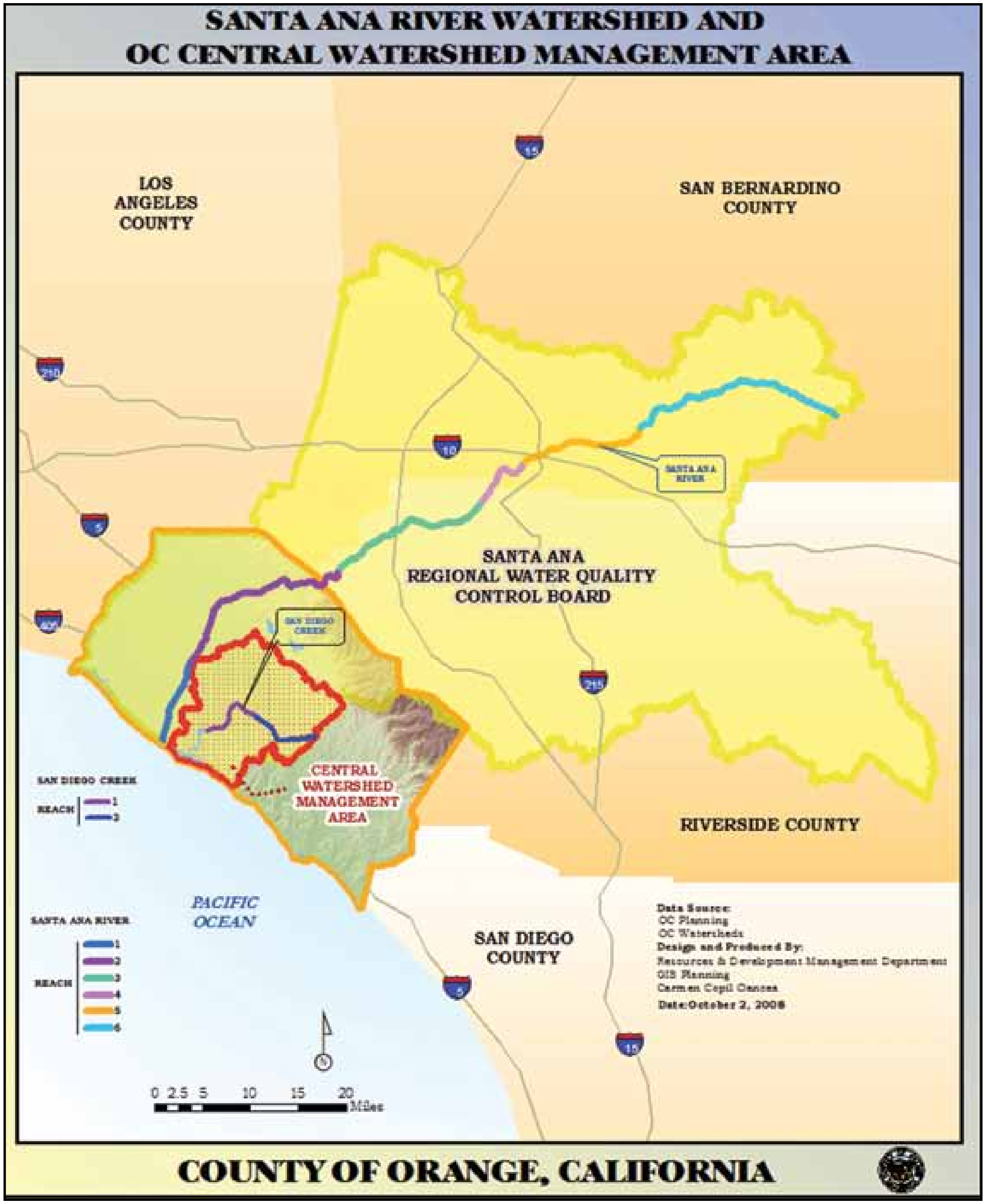


Figure 3.7
Santa Ana Regional Water Quality Control Board Jurisdiction Area

Ana River was completely separated from Newport Bay when it was channelized to flow directly into the ocean between the cities of Newport Beach and Huntington Beach, where it enters the ocean today.

3.1.2 Agriculture and Urbanization

Before 1900, land in the watershed was primarily grazing land or open space. The Newport Bay Watershed was much smaller than it is today. Today the largest subwatershed flowing into the Bay is the San Diego Creek subwatershed. However, 150 years ago, this creek did not flow into Newport Bay. Instead, it drained into a marshland then known as the Swamp of the Frogs, located in the Tustin Plain in the vicinity of the former Tustin Marine Corps Air Station (Figure 3.5, Geographical Features). This swamp drained slowly into the Santa Ana River, connecting it to that watershed (USACOE, 2005). This marshland had historically acted as a sink for selenium which had been mobilized from other locations. The marsh's wet, hydric (anoxic) soils trapped passing soluble selenium into an insoluble reduced form that remained immobilized as long as the marsh soil remained permanently flooded and thus, anoxic.

At the turn of the last century, land use shifted from grazing to agriculture and a system of drainage channels was constructed, including the connection of Peters Canyon Wash to upper Newport Bay. As a result of this drainage system, the water table dropped by an average of 33 feet by 1928 (Hoag, 1983).

With the lowered the groundwater table, the selenium-rich soil was now periodically dried out and then rewetted with oxygenated water (rainwater or irrigation water). The selenium in the sediments became soluble and was transported to the drainage channels or groundwater.

Continued development in the watershed converted the agricultural land to urbanized uses. A major change to watershed hydrology occurred in the early 1960's when San Diego Creek was channelized and connected to Peters Canyon Wash. This resulted in a direct discharge of San Diego Creek waters through the historic marshland into Upper Newport Bay. And in the 1980's, additional drainage measures for housing projects were implemented within the central watershed area, increasing the area where selenium-rich soil was wetted, thus releasing additional selenium into the drainage channels."

Furthermore, another source of soluble selenium has been emanating from the coastal canyons. In this case, it is hypothesized that runoff from over-irrigation practices has infiltrated into the Monterey formation, mobilizing selenium.

At present, land use data for 2002 show that the Newport Bay Watershed is currently comprised of approximately 75 percent urban development, less than 5 percent agriculture, and approximately 20 percent open space, located mainly in the foothills and headland areas

Increased development with impermeable surfaces has increased the volume and rate of runoff and thus, the volume and velocity of stream flows during storm events. This has led to stream erosion problems throughout the Region. This and sediment runoff from construction activities have discharged sediment into the estuary. As a result, sediment capture basins were constructed near the bottom of the San Diego Creek and in the foothills to control the increased sediment flowing into Upper Newport Bay (ACOE 1999). Channel erosion is most evident along Serrano Creek, where recent estimates of flow velocities are about 30 cubic feet per second (Watershed and Coastal Resources Division 2007).

Aside from selenium, additional contamination from various land uses has accumulated over time in soils throughout this Region. Farming resulted in the use of pesticides, herbicides and commercial fertilizers that remain as contaminants in the soil and groundwater to this day. Urbanization brought with it a variety of other industrial contaminants, including contamination from the military bases located in the Region. The current drainage pattern leaches these contaminants into groundwater and into the Newport Bay habitat. Erosion exacerbates this problem by depositing the contaminated soil directly into the Bay.

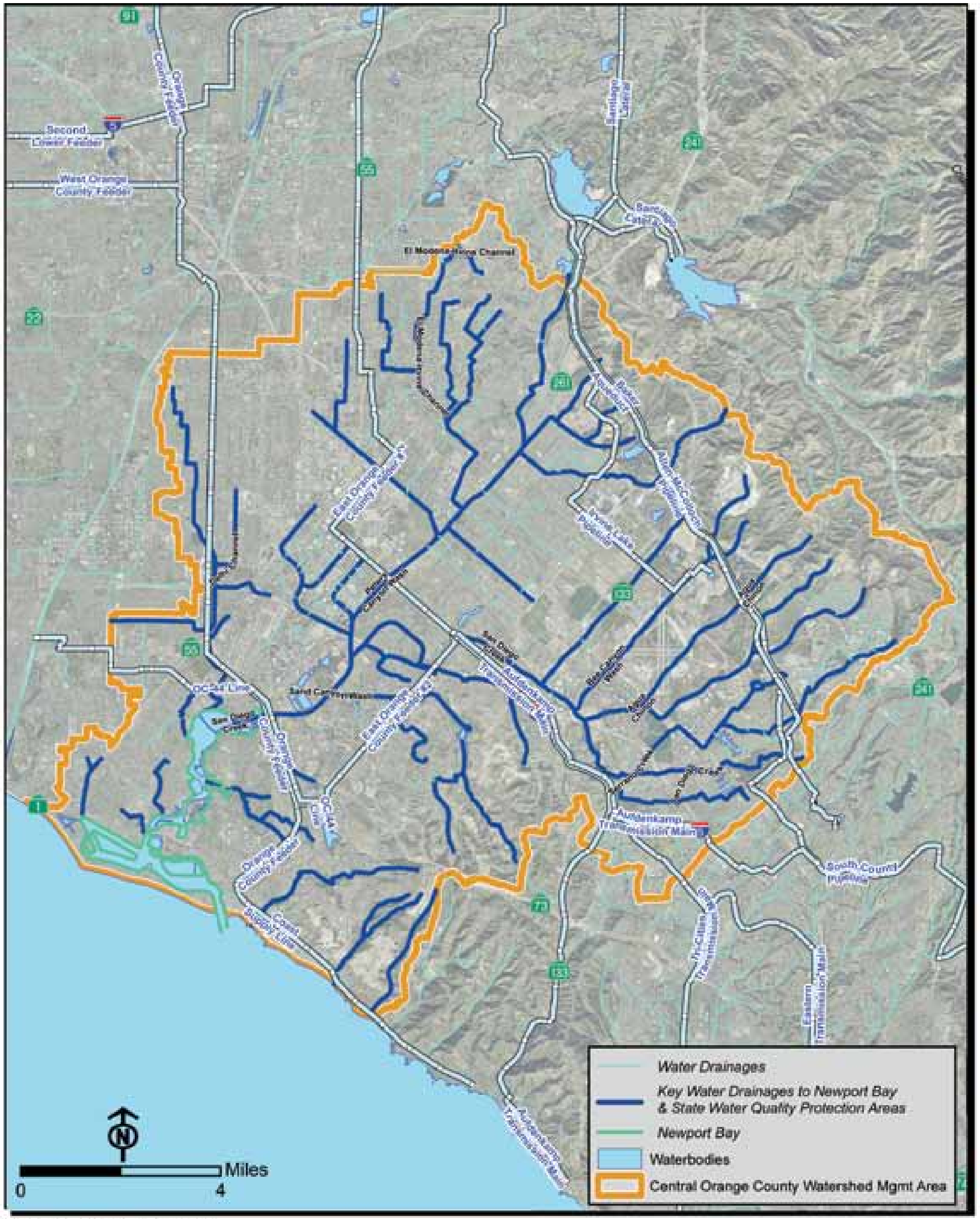
Lower Newport Bay, including Newport Harbor, has additional water quality issues associated with metals used in boat paints. The Rhine Channel, located in the western end of Lower Newport Bay, has been surrounded by industrial uses such as canneries, metal plating companies, and shipyards since the 1920s (Anchor Environmental 2006). Rhine Channel is a dead-end channel where toxic pollutants have accumulated in the sediment.

San Diego Creek, Peters Canyon Channel, Upper and Lower Newport Bay, and the Rhine Channel are listed on the EPA's 303(d) list as impaired with fecal coliform, organochlorine pesticides, polychlorinated biphenyls (PCBs), metals, and sediment toxicity. The EPA and the Santa Ana Regional Water Quality Control Board (RWQCB) have implemented Total Maximum Daily Loads (TMDLs) for San Diego Creek and Newport Bay for toxicity (including pesticides and metals), sediment, and nutrients. Additionally, a TMDL for fecal coliform has been established for Newport Bay. The TMDLs have been prepared in order to improve water quality in San Diego Creek and Newport Bay and to preserve the natural resources in Newport Bay and along Newport Coast.

3.1.3 Hydrologic Boundaries

The USGS is responsible for mapping the United States, and has historically created the maps of record for this Region. They have mapped water resources in the U.S. and divided this information into four successively smaller levels of hydrologic units: regions, sub-regions, accounting units, and cataloging units. Each hydrologic unit is identified by a hydrologic unit code (HUC) which consists of two digits for each level, giving every place in the U.S. an eight-digit HUC.

The IRCWMP Region is located within the California hydrologic



Source: RDMD 2007, AirPhoto USA 2006

Figure 3.8 Drainage Area and Supply Lines.

region (18), the Southern California Coastal sub-region (07), the Santa Ana accounting unit (02), and the Newport Bay cataloging unit (04); thus, the HUC for this Region is 18070204.

3.1.3.1 Newport Bay Watershed

The Newport Bay Watershed, excluding the San Diego Creek Subwatershed, covers about 13 square miles and is located along the coast of Central Orange County. It extends along the Pacific Coast south of Costa Mesa and north of Corona del Mar in Newport Beach. Upper Newport Bay is a designated CCA (CCA No. 69). The Newport Bay Watershed is bordered on the north by the Talbert Watershed, on the northeast by the San Diego Creek Subwatershed, and on the south by the Newport Coast Watershed.

The following present or potential beneficial uses have been designated within Newport Bay by the Santa Ana RWQCB: water contact recreation; non-contact water recreation; commercial and sport fishing; wildlife habitat; rare, threatened, or endangered species; spawning, reproduction, and development; marine habitat; and shellfish harvesting. The present or potential beneficial use of navigation is also designated in the Basin Plan for Lower Newport Bay. The present or potential beneficial use of preservation of ASBSs and estuarine habitat is also designated in the Basin Plan for Upper Newport Bay.

San Diego Creek Subwatershed

San Diego Creek forms the largest subwatershed of the Newport Bay Watershed. It is approximately 139 square miles and includes the entirety of the Cities of Irvine and Tustin, as well as portions of the Cities of Costa Mesa, Laguna Hills, Laguna Woods, Lake Forest, Newport Beach, Orange, and Santa Ana. The main tributaries within the San Diego Creek Watershed are San Diego Creek and Peters Canyon Wash. Smaller tributaries include Serrano Creek, Borrego Creek, Agua Chinon Wash, Bee Canyon Wash, Sand Canyon Wash, Bonita Canyon Creek, and the Santa Ana Delhi Channel. The San Diego Creek Subwatershed is bordered on the north and east by the Santa Ana River Watershed, on the west by the Newport Bay and Newport Coast Watershed, and on the south by the Laguna Canyon and Aliso Creek Watersheds.

The following present or potential beneficial uses are designated by the Santa Ana RWQCB in the Basin Plan for the San Diego Creek Reach 1 and San Joaquin Freshwater Marsh: water contact recreation; non-contact water recreation; warm freshwater habitat; and wildlife habitat. The present or potential beneficial use of preservation of ASBSs and rare, threatened, or endangered species are also designated by the Santa Ana RWQCB in the Basin Plan for San Joaquin Freshwater Marsh. The following intermittent beneficial uses are designated by the Santa Ana RWQCB in the Basin Plan for the San Diego Creek Reach 2, Bonita Creek, Serrano Creek, Peters Canyon Wash, Hicks Canyon Wash, Bee Canyon Wash, Borrego Canyon Wash, Aqua Chinon Wash, Laguna Canyon Wash, Rattlesnake Canyon Wash, Sand Canyon Wash, and other tributaries to these creeks: groundwater recharge; water contact recreation; non-contact water recreation; warm freshwater habitat; and wildlife habitat.

3.1.3.2 Newport Coast Watershed

The Newport Coast Watershed encompasses approximately 11 square miles and is located between Corona del Mar and Laguna Beach. The northern portion of the watershed (approximately 7.8 square miles) falls within the Santa Ana RWQCB (Region 8), and the southern portion falls within the jurisdiction of the San Diego RWQCB (Region 9). Only the northern portion of the watershed, within the Santa Ana RWQCB, is included in the Central Orange County IRCWM Plan. The southern portion is included in the South Orange County IRWM Plan.

The Newport Coast Watershed consists of nine small coastal channels (listed from north to south): Buck Gully Creek, Morning Canyon Channel, Pelican Point Creek, Pelican Point Middle Creek, Pelican Point Waterfall Creek, Los Trancos Creek, Muddy Canyon, Moro Canyon (located south of the IRCWM Plan study area), and Emerald Bay Channel (located south of the IRCWM Plan study area). All surface water in this coastal watershed drains to the Pacific Ocean via overland flow and storm drain systems. It is bordered on the north by the Newport Bay Watershed, on the northeast by the San Diego Creek Watershed, and contoured on the east and south by the Laguna Coastal Streams Watershed.

The following near-shore-zone present or potential beneficial uses have been designated within the Newport Coast Watershed by the Santa Ana RWQCB in the Basin Plan: navigation; water contact recreation; non-contact water recreation; commercial and sport fishing; wildlife habitat; rare, threatened, or endangered species; spawning, reproduction, and development; marine habitat; and shellfish harvesting. The near-shore-zone present or potential beneficial use, the preservation of ASBSs, is also designated for the area from Poppy Street in Corona del Mar to the southeast regional boundary (see Table 2.1).

Two CCAs and two ASBSs are located in the Newport Coast Watershed: Newport Beach (Robert E. Badham) Marine Life Refuge (ASBS No. 32/CCA No. 70) and Irvine Coast Marine Life Refuge (ASBS No. 33/CCA No. 71).

3.1.4 Stakeholders

Federal, state, and local agencies have jurisdiction within the Central Orange County Region. On a federal level, the region is within the EPA's Region 9, which covers the entire Pacific Southwest. On a state level, the region is within the Santa Ana RWQCB and the Department of Water Resources (DWR) Southern District. Under the California Department of Fish and Game (CDFG), the Central Orange County region is within CDFG's South Coast Region, and the Newport Beach Marine Life and Irvine Coast Marine Life Refuges are within CDFG's Marine Region. CDFG also has jurisdiction over the Upper Newport Bay State Ecological Reserve. The California Department of Parks and Recreation has jurisdiction over other areas, including Corona del Mar State Beach and Crystal Cove State Park.

On a local level, several cities, the County of Orange, and special districts have jurisdictional boundaries with authority for land use, water resources, habitat protection, water quality, flood control, and recreation facility management.

Stakeholder Involvement

Stakeholders have been involved in the development of this IRCWMP through a variety of avenues. Communication with the public occurred primarily though the Newport Bay Stakeholder Committee. Limited staff time initially constrained involvement from a number of smaller agencies who didn't have the resources to engage in this committee or the IRCWMP. Therefore, a series of one-on-one meetings with these individual entities were held to obtain detailed information on concerns, needs, potential projects and priorities. These meetings provided needed input for development of the integration and prioritization methodologies, and boosted involvement in the Stakeholder Committee meetings.

Figure 3.9 September 25, 2007: Public meeting to discuss projects for the planning area (OCRDMD).

During the development of this Plan, the following formal public events were held to present information and to request input from stakeholders:

1. The first public meeting was held on August 1, 2007 at the Muth Interpretive Center to outline and discuss a new planning process that was being developed for this IRCWMP effort.
2. On August 16, 2007 the Steering Subcommittee met with the Newport Beach Bay/Coastal Water Quality subcommittee to present the planning process. At this meeting, the subcommittee brainstormed ways to make the integration and prioritization process more meaningful at the watershed and subwatershed levels. It also had many practical ideas for clarifying the proposed process, outlined in greater detail in Chapter 4: Dynamic Planning Approach.
3. A formal presentation on the planning process was given to the Stakeholder Committee on August 31, 2007.
4. A five hour public meeting was held at the Newport Beach

Public Library on September 25, 2007 to discuss the projects that would be included in the IRCWMP. Attendees included representatives from county departments, seven cities, the RWQCB, California Department of Fish and Game, Irvine Ranch Water District, Newport Bay Naturalists & Friends, the Nature Reserve of Orange County, etc. Maps were prepared for different areas of the Region showing known projects. Attendees were asked to provide any additional information about the mapped projects or provide input on projects that were not yet on the maps. These maps were laid out on a table, while each set of planning area stakeholders gathered around to identify additional projects, issues and opportunities. At the end of the process, over 200 projects had been identified, along with some potential relationships between projects. It also became apparent that three areas in particular included a high density of projects clustered together. The project clusters form the nucleus of our project level integration efforts discussed in detail in Chapter 10: Project Integration.

5. On September 27, 2007, a presentation on the planning process and project data needs was made at the monthly Orange County chapter meeting of the Southern California Wetlands Recovery Project. This was an important opportunity to coordinate our efforts with the Wetland Recovery Project and to request information about their projects so that they could be included in these regional integrated planning activities.
6. The Steering Subcommittee took the project information that had been collected for the Upper Newport Bay planning area to use as an example of an integrated project plan using the new planning process. On October 17th, this first attempt at demonstrating an integrated project plan was presented at the monthly Stakeholder Committee meeting. A conceptual master schedule was also prepared to demonstrate how projects might be prioritized. The response from stakeholders was used to help refine the methodology.
7. In March and April of 2008, Orange County facilitated meetings with the agencies and organizations that represent the four categories of water resources management in the Region: flood, water quality, water supply and habitat. These meetings introduced the idea of the Desired State to the relevant agencies.
8. The City of Newport Beach and its consultants released the first draft of the IRCWMP to selected stakeholders for review and comment on March 19th, 2008.
9. An experimental website, http://newportbay.s4s.com, was created to manage on-line collaboration in the Region and formally launched on March 19th, 2008.
10. After a 30-day comment period, a meeting was held for stakeholders to provide any last-minute public feedback on the draft IRCWMP.
11. On April 30th, 2008, the Watershed Management Committee held a meeting to provide input on the prioritization methodology presented in the draft IRCWMP.
12. A revised version of the integration process was presented to the Stakeholder Committee on July 16th, 2008, and a follow up Management Committee meeting to review the revised prioritization methodology was held in August 2008.

13. The IRCWMP Final Draft document was released on October 2, 2008, followed by a 60-day comment period.
14. The Final IRCWMP document was submitted to the Executive Committee for review in December, 2008.
15. After a second round of stakeholder comments early in 2009, minor corrections were made and the present document is the result.

3.1.5 Regional Collaboration & Governance

Public collaboration in this Region began in the 1960s when a group of local environmentalists mobilized to preserve the Upper Newport Bay, which was being encroached upon by private land owners. This led to the land being protected and turned over to the California Department of Fish and Game. Since that time, local agencies also began to form formal collaborative relationships to address issues in Newport Bay. The biggest issue agencies began dealing with was increased sediment loads coming into the bay after Lower San Diego Creek was channelized in the early 1960s.

In 1972, Section 208 of the Clean Water Act authorized the preparation of area-wide regional plans for the control of non-point source pollution. The EPA designated the Southern California Association of Governments (SCAG) as the regional coordinator for these Section 208 planning activities. In 1975, the joint powers agency, Newport-Irvine Waste Management Planning Agency (NIWA), was established as the sub-regional planning agency for Newport Bay, its watershed, and related sedimentation issues.

NIWA consisted of representatives from the Irvine Ranch Water District, The Irvine Company, California Department of Fish & Game, County of Orange Harbors Beaches & Parks department, County of Orange, Orange County Flood Control District, Orange County Sanitation District, and the cities of Irvine, Newport Beach, Orange, Santa Ana and Newport Beach. Supervisor Thomas Riley from the 5th District was chosen as the chair of the NIWA Board of Directors.

In the late 1970s, SCAG requested that NIWA prepare the draft for the sedimentation element of the Section 208 area-wide plan for Newport Bay. To accomplish this, NIWA established a Technical Advisory Committee (TAC) consisting of representatives of each member agency, with the member from the County of Orange as the Chair. This committee oversaw the development of what became the "Comprehensive Storm Water Sedimentation Control Plan" by the City of Irvine, the City of Newport Beach and SCAG, as requested by the EPA.

Due to lack of supporting funds for a formal agency, NIWA was dissolved in the early 1980s. Then, in 1983, Supervisor Riley led the formation of a less formal committee structure to oversee the Section 208 planning efforts, specifically the implementation of the Sedimentation Control Plan. This was called the Upper Newport Bay Sediment Control Executive Committee and the Upper

Newport Bay Technical Advisory Committee.

These committees have evolved over time through a series of **COOPERATIVE AGREEMENTS:**

- The first Cooperative Agreement was signed in **1983** by the County of Orange, Irvine, Newport Beach, The Irvine Company, and the California Department of Fish & Game. They agreed to cooperatively implement the components of the Sedimentation Control Plan, and to discuss and evaluate implementation efforts in an Executive Committee forum. They also agreed to create additional project implementation agreements to execute the projects needed to implement the Sedimentation Plan. Two such project implementation agreements were made for sediment control construction and maintenance projects in 1984, and two more agreements were made for monitoring programs in 1985 and 1987.
- The original Cooperative Agreement was first amended in **1985** in order to include the City of Tustin.
- In **1998**, the Cooperative Agreement was amended a second time to 1) add the Orange County Flood Control District, the City of Lake Forest, the Santa Ana Regional Water Quality Control Board and the Irvine Ranch Water District and 2) expand the scope of the agreement beyond sediment to include nutrient impairments and "other common issues that will enhance Newport Bay and its watershed" as determined by the Executive Committee. Because of this expanded scope, the Executive Committee changed its name to the Newport Bay Watershed Executive Committee. The Technical Advisory Committee became the Watershed Management Committee, an informal group of agency staff and community advocates who come together to share information about ongoing projects, plans and regulations related to the bay.

Around this time, the regulatory focus of the Regional Water Quality Control Board shifted away from the Section 208 planning process and toward the National Pollution Discharge Elimination System (NPDES) permit, which requires compliance with pollution limits for stormwater discharges under Section 402 of the Clean Water Act. The County of Orange directed its efforts away from the Sediment Plan and towards the development of the Drainage Area Management Plan (DAMP), as specified by the NPDES program. Each city in Orange County is a partner in the DAMP; each city's role is to develop a Local Implementation Plan for how it will implement the DAMP within its municipality. In addition, each city is required to develop a watershed plan that will outline how it will address non-point source pollution together with the other cities within its watershed.

However, in order to deal with the sediment issues, Orange County and the Watershed Executive Committee had already initiated an Ecosystem Restoration project with the U.S. Army Corps of Engineers to study solutions for the sediment that was filling in Newport Bay and altering the local estuarine habitat. Around the time this study was completed and a bay dredging project authorized, the County initiated the Newport Bay/San Diego Creek Watershed Feasibility Study as a second follow-up study. Among other issues, the watershed study looked into ways to stabilize sediment transport throughout the entire Newport Bay Watershed.

The first outcome of the watershed study was the release of the 2005 Army Corps of Engineers Newport Bay Watershed Management Plan. Among other things, it contained recommendations for the governance of the Region. It proposed the following management goal: "Coordinate and integrate management across stakeholders in order to create the capacity for a more strategic, appropriate and effective response to the multi-jurisdictional, multi-disciplinary and cross-sectoral nature of watershed problems and issues." To implement this goal, it suggested a management framework consisting of a Watershed Agency for executive policy, a Watershed Council for agency collaboration and a Watershed Foundation for funding coordination and implementation. These groups would have distinct, but mutually supportive purposes (Figure 3.10).

- In 2004, Orange County internally reorganized County water resource management according to geographical location. It formed the Northern, Central and Southern Orange County Watershed Management Areas based on hydrologic boundaries. Then, in 2008, Orange County facilitated the adoption of a

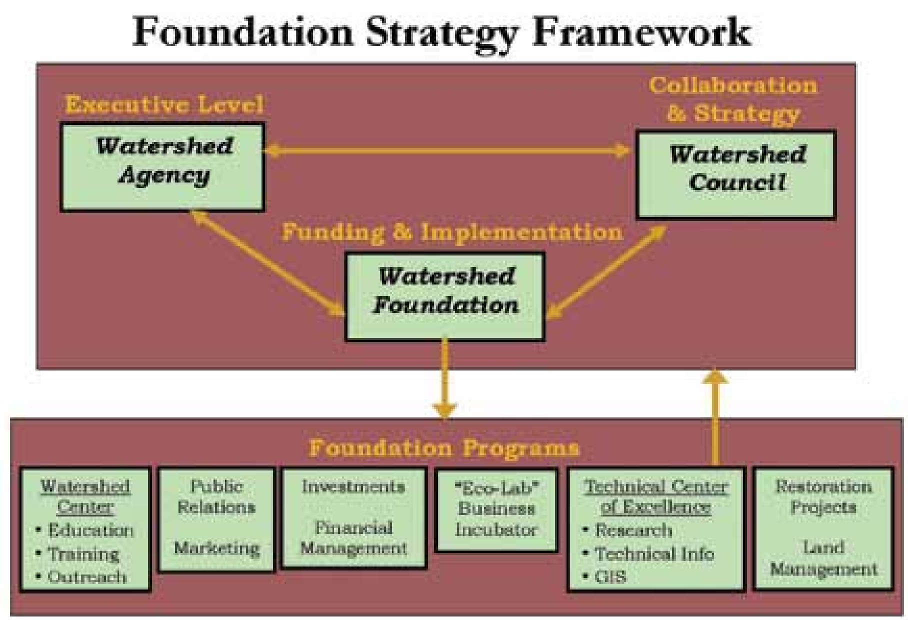


Figure 3.10 Watershed Management Integration Framework (Source: US Army Corps of Engineers 2005 Newport Bay/San Diego Creek Watershed Management Plan)

new Cooperative Agreement in support of the move toward watershed-based resource management. In this Agreement, the Management Committee was divided into a Management Committee and a Stakeholder Committee (Figure 3.11). The new Management Committee is composed of local agencies that coordinate on various infrastructure projects. The Stakeholder Committee is a forum for public engagement and planning input. This Agreement also:

- added representation from the cities of Santa Ana, Costa Mesa, Orange and Laguna Woods.

- expanded the management area of the Watershed Executive Committee beyond the Newport Bay Watershed to include the Newport Coast area, thereby covering the entire Central Orange County Watershed Management Area. This is also the planning Region for this IRCWMP.
- increased the frequency of Watershed Executive Committee meetings.

Through the evolution of these Cooperative Agreements, the Watershed Executive Committee has expanded its membership and scope. The original Technical Advisory Committee first became the Management Committee, which was then later divided into a Management Committee for agencies, and a Stakeholder Committee for public involvement and community stewardship.

Other formal management groups involved in the governance of this Region include:

The Newport Bay Watershed Sediment Control Monitoring and In-Channel Maintenance Program is funded by a cost-sharing agreement among the County of Orange, Orange County Flood Control District, Lake Forest, Irvine, Tustin, Newport Beach and The Irvine Company. In response to the Sediment TMDL, it monitors sediment loads and maintains in-channel basins.

The Nitrogen and Selenium Management Program and other TMDL programs are supported and funded on a cost-sharing basis by 25 watershed agencies, cities, developers and other stakeholders.

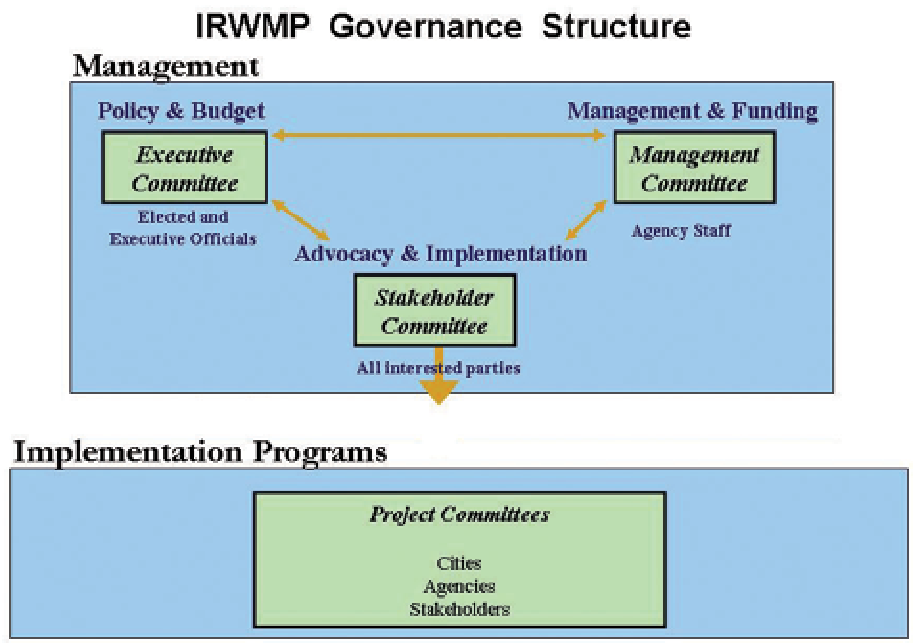


Figure 3.11 Central Orange County Governance as per the 2008 Cooperative Agreement.

Negotiations for the renewable agreements are facilitated by Orange County Public Works staff.

The Orange County Stormwater Program was formed to fulfill the requirements of the area-wide municipal NPDES permit. It authored the 2003 Drainage Area Management Plan (DAMP), the Model Municipal Activities Program, a Best Management Practices (BMP) program and a public education program. Each city in the County is a permittee and participant.

The six-member City Engineers Flood Control Advisory Committee (CEFCAC) has been meeting annually since 1966 to advise the

Orange County Flood Control District (OCFD) on the flood control needs and projects within each city. Five members, one from each supervisorial district, represent the cities in each district and one member represents Orange County.

The Upper Newport Bay Restoration Team, led by the Newport Bay Naturalists and Friends, meets regularly with California Department of Fish and Game, the County, the Coastal Commission ROOTS restoration program and others, in order to coordinate habitat restoration efforts around the bay.

The Coastal Commission's ROOTS program organizes volunteers to work on habitat restoration projects around Upper Newport Bay.

3.1.6 Inter-Watershed Governance Models

Governance in the Region will continue to evolve over time as we refine our ability to effectively manage the interrelated environmental, social and economic components of this community. Cross connections are already occurring with watershed programs in South Orange County (Newport Coast issues), North Orange County (issues dealing with groundwater and coordination with OCSD), San Diego County (ASBS issues), and Santa Ana Water Project Authority (SAWPA) (regional water supply issues).

Other examples of effective inter-watershed governance models from around the country include the Delta Vision Bay/Delta management effort in Northern California, as well as the Chesapeake Bay Program that includes Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia, and the entire District of Columbia. The award-winning Tri -State Water Quality Council includes Washington, Idaho and Montana (www.tristatecouncil.org). This is an organization established in the 1990s to look at the big picture and come up with programs, policies and projects that would address water pollutant problems across the whole basin. Four and a half years of negotiation led to numeric targets that all agreed to meet. The Council also obtains grant funding, conducts monitoring activities and educational outreach, makes regulatory recommendations and creates partnerships.

The Southern California Wetlands Recovery Project organizational chart has another governance structure that could also be adapted locally to increase collaboration.

3.1.7 Local Water Resources Planning

The role of this Plan is not to replace the planning efforts of local groups or agencies, but rather, to enhance them by bringing common desired goals and outcomes into better focus, thus creating a greater degree of integration among them at the planning level. This Plan does not have projects of its own; instead, it integrates and prioritizes projects from other organizations, within the larger watershed unit. In some cases, project designs could change based on opportunities identified during the integration process, but in other cases, they would remain the same. These projects would then be implemented through the sponsoring agency.

The previous planning efforts in the Region that bear on this Plan include: (see also Appendix D: Existing Local and Regional Plans)

1. **CENTRAL ORANGE COUNTY IRCWMP – PHASE 1:** The County of Orange, along with IRWD and the City Newport Beach, responded to the Proposition 50 (Round 2) funding opportunity by developing an integrated plan as defined by the State Water Plan. Due to the level of detail required for this kind of planning effort, it was separated into phases. Phase I is the Central Orange County IRCWMP, completed August 1, 2007, focusing on projects from the Newport Bay Watershed directly related to Areas of Special Biological Significance (ASBS) within the receiving waters along Newport Coast.

   The present document, Phase 2, expands the watershed planning on a number of fronts:

   - The Steering Committee has been expanded from three agencies to ten.
   - There has been an emphasis on one-to-one meetings with individual agencies and watershed groups for defining stakeholder issues.
   - The number of projects identified in the Plan has increased to 130 projects.
   - The watershed Vision plays a more central role in developing a plan that is hydrologically healthy and stable.
   - Significant attention has been paid to defining "integration". At the regional level, four types of integration have been defined. At the local level, thirteen types of integration have been defined. Additionally, integration now plays an explicit part in the project prioritization process.

2. **STAKEHOLDER COMMITTEE VISIONING:** In 2004, the Newport Bay Watershed Stakeholder Committee began a collaborative stakeholder visioning process that was facilitated by the National Park Service and Orange County. This process was never formally completed; however, valuable information was collected and has been incorporated into this IRWMP document in a number of ways.

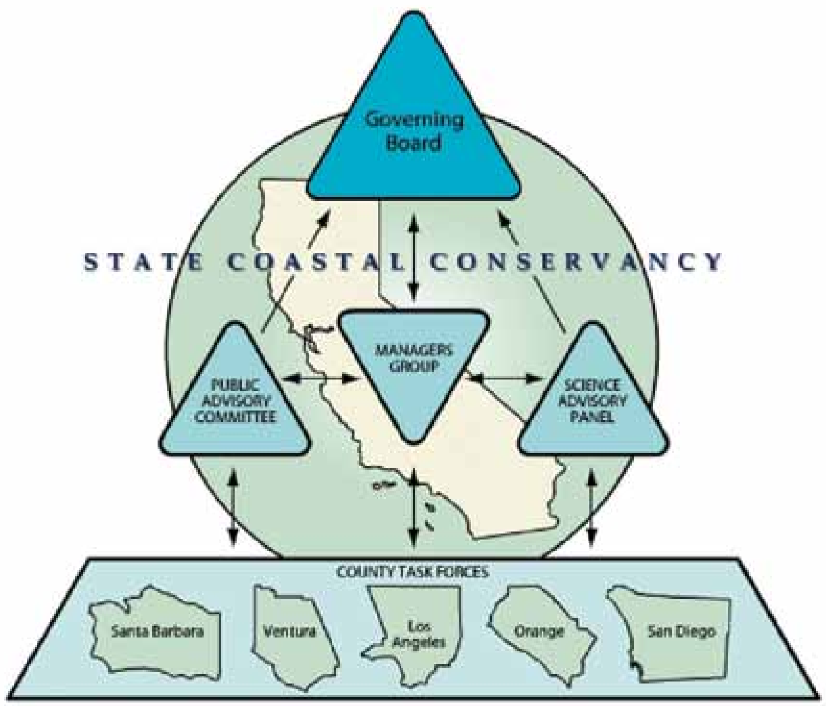


Figure 3.12 Southern California Wetlands Recovery Project Organizational Chart

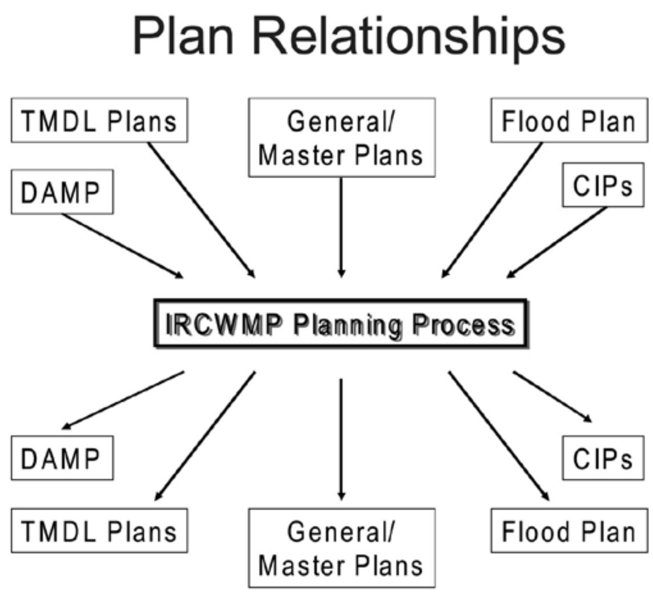


Figure 3.13 Plan Relationships

3. **DESIRED STATE:** In the summer of 2007, IRWD and the Newport Bay Naturalists and Friends began developing the 'Desired State' for the Region's resources, including development of preliminary Regional Performance Objectives.

4. **NEWPORT COAST WATERSHED MANAGEMENT PLAN:** Completed in late 2007 as part of the Newport Coast Watershed Program, this plan provides specific restoration recommendations for each of the coastal streams, with attendant ecological benefits for intertidal and subtidal communities in the ASBSs (See IRCWMP Phase 1, p.2-73).

5. **HARBOR AREA MANAGEMENT PLAN (HAMP):** The HAMP is a planning tool for managing issues on the "water side" of Lower Newport Bay. Critical issues include sediment management, water quality, dredging, eel grass restoration and public use projects (See Appendix J)

6. **NCCP/HCP:** The Nature Reserve of Orange County (NROC) manages the land in the Region's Natural Communities Conservation Plan/Habitat Conservation Plan areas. NROC has been involved in the planning activities for the IRCWMP and has provided input into the Desired State and project planning activities as they relate to their own land management plans.

7. **U.S. ARMY CORPS OF ENGINEERS WATERSHED FEASIBILITY STUDY:** In 2005, The Army Corps of Engineers Civil Works Division completed a Watershed Feasibility Study that evaluated potential ecosystem restoration project areas throughout the watershed. As part of the study, it also completed the Newport Bay Watershed Management Plan, which identified a wide range of management strategies that could be used by local stakeholders in a coordinated way to implement a more multipurpose management of the Newport Bay Watershed.

8. **U.S. ARMY CORPS OF ENGINEERS SAN DIEGO CREEK SPECIAL AREA MANAGEMENT PLAN (SAMP) & CALIFORNIA DEPARTMENT OF FISH AND GAME MASTER STREAMBED ALTERATION AGREEMENT (MSAA):** These are plans that both agencies are developing for their regulatory activities in the San Diego Creek subwatershed of the Newport Bay. They enable a permitting process based on system-wide impacts, rather than simply site-based considerations. The IRCWMP is not a regulatory document, but it is consistent with the watershed-based objectives of these regulatory activities.

9. **DRAINAGE AREA MANAGEMENT PLAN (DAMP):** This is a joint plan between the County of Orange, and all of the cities within the county, to implement the National Pollutant Discharge Elimination System (NPDES) stormwater regulation requirements. It is updated every five years and requires that each city adopt its own Local Implementation Plan for implementing the DAMP at the municipal level. In the 2008 update, the DAMP was expanded to include low impact development BMPs for land use, as well as county-wide efforts for managing particular constituents of concern, such as selenium and organochlorine pesticides.

10. **GENERAL PLANS:** So far, watershed concerns have not been significantly addressed by any of the municipal General Plans in this Region. However, each municipality within the DAMP boundaries is required to develop a Local Implementation Plan (LIP) outlining how it intends to implement the DAMP. In addition, the County and various advocacy groups will be working with cities to find ways to integrate water resource considerations into General Plans. The next NPDES permit update in 2009 will include MS4 requirements for low impact development, which will necessitate some management of runoff at the site level. The IRCWMP helps to provide guidance to municipal planning departments as they look for consistent water resource information to use in their efforts. It also forms a link between urban planning and water resource planning that can create synergies for mutual benefit.

11. **TMDL:** Orange County is coordinating the development of TMDL compliance plans. These planning efforts are a source of some of the project ideas and opportunities that have been included in this IRCWMP. They also help guide the Regional Performance Objectives that are part of the Desired State for the Region.

12. **FLOOD CONTROL MASTER PLAN:** Orange County Flood Control District is currently undergoing an update of their 7-Year Strategic Plan (See Appendix C). This effort provides the information necessary to help guide development of the flood-related Regional Performance Objectives. It also identifies project opportunities that will be incorporated into the project integration process over time.

13. **WATER SUPPLY:** Orange County Water District (OCWD) and the Urban Water Management Plans of Municipal Water District of Orange County (MWDOC), IRWD, El Toro Water District, Mesa Consolidated Water District, East Orange County Water District, City of Tustin, City of Newport Beach,

14. **GROUNDWATER:** OCWD Groundwater Management Plan and related documents (http://www.ocwd.org).

15. **SEDIMENT:** Boyle Engineering has been conducting ongoing monitoring operations and has been providing recommendations since the 1980s.

16. **FRIENDS OF HARBORS BEACHES AND PARKS GREEN VISION MAP:** Under Measure M, “an Environmental Oversight Committee (EOC) was established in November 2007 to create the process by which properties can be acquired and restored as mitigation

for the freeway project impacts. At the May 2008 meeting, the EOC adopted FHBP's Green Vision Map as a way to begin identifying potential acquisition sites. Currently, the EOC is considering criteria for establishing the process by which properties are ranked and then later acquired. OCTA will be working with FHBP and others to document other potential sites." (www.fhbp.org)

17. **ORANGE COUNTY PARKS STRATEGIC PLAN:** See Appendix I.

Other plans include the San Diego Creek Master Plan and the Serrano Creek Collaborative Use Plan.

3.2 Land Use

The Interstate 5, 405 and 55 Freeways, and several toll roads, crisscross the Region. Its land use jurisdictions include Orange County in the unincorporated areas and part or all of nine cities: Irvine, Tustin, Santa Ana, Costa Mesa, Newport Beach, Orange, Lake Forest, Laguna Hills and Laguna Woods.

3.2.1 Land Use Jurisdictions

City of Irvine

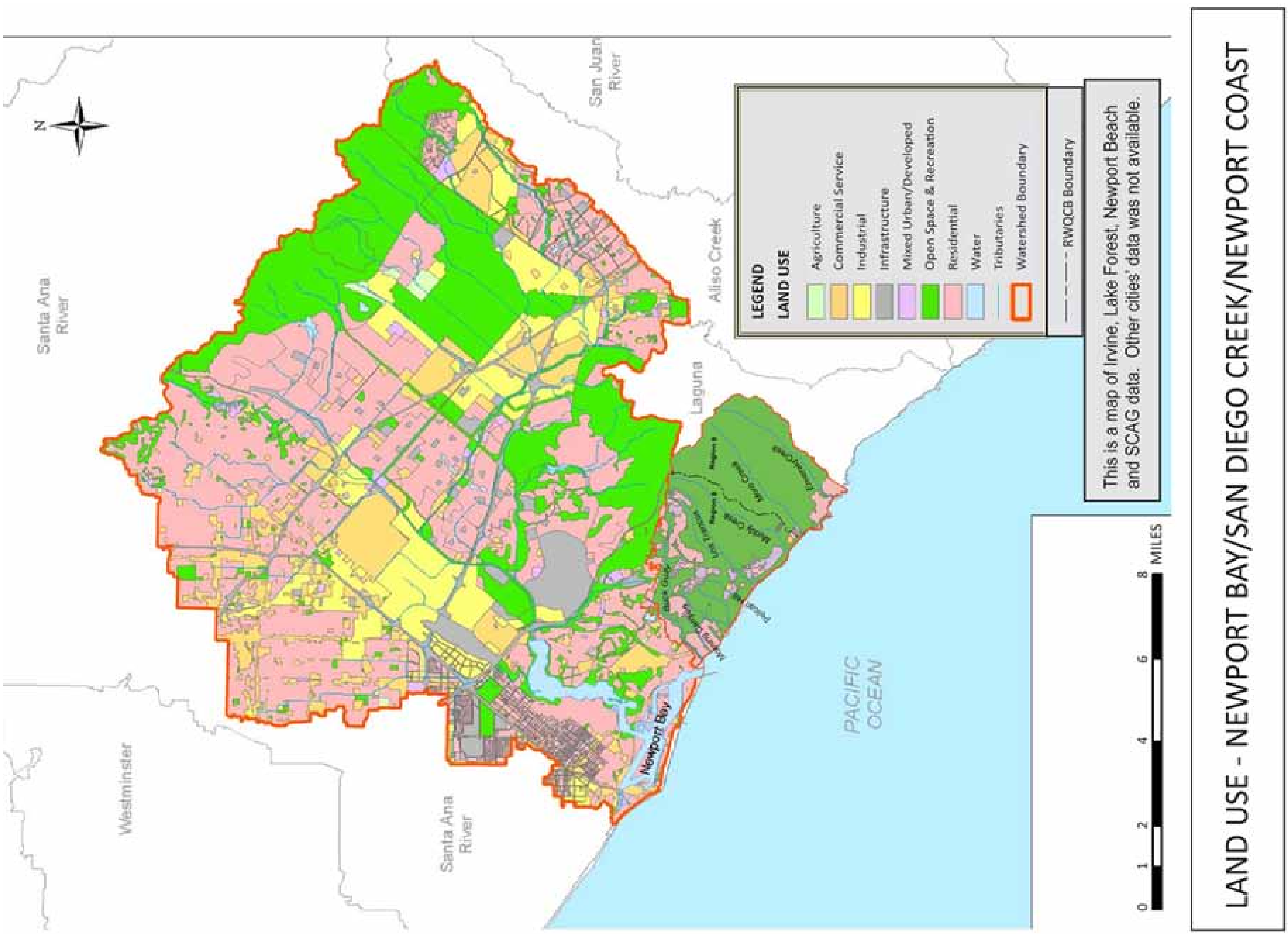
IRCWM IMPLEMENTATION AUTHORITY: Land use, recreational programs/ facilities, economic and community development, stormwater protection, water quality.

The City of Irvine encompasses more than 55 square miles and has a 2009 population of over 212,000 residents. There will be significant growth over the next decade with the development of Heritage Field's Great Park Neighborhoods on the former 4,700-acre MCAS–El Toro site, redevelopment in the Irvine Business Complex from commercial/industrial to high-density mixed use, and build-out of large master-planned communities by The Irvine Company. The MCAS El Toro site will also be the location of the 1,347-acre Orange County Great Park, a large regional park that will be designed based on sustainability and connectivity for communities as well as habitat. Irvine is the largest city within the IRCWM region in terms of area and the entire city lies within the Newport Bay/San Diego Creek Watershed.

City of Newport Beach

IRCWM IMPLEMENTATION AUTHORITY: Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality; planning and implementation of projects and programs to protect the CCAs and ASBSs; habitat protection and restoration.

The City of Newport Beach, on the Pacific Coast, covers an area of 25.2 square miles with a population of just over 86,000 residents. In 2002, the city annexed the Newport Coast area so that the city now lies within both the Newport Bay/San Diego Creek Watershed



3.14 Land Use Jurisdiction Map:

and the Newport Coast Watershed. Diverse land uses range from residential and commercial uses to the Newport Harbor and Upper Newport Bay Ecological Reserve. The three Critical Coastal Areas (CCAs) are within, and the two Areas of Special Biological Significance (ASBSs) are adjacent to, the city boundaries. Because the entire Newport Bay/San Diego Creek Watershed drains to Newport Bay, the city provides leadership within the IRCWM planning area for water quality programs and watershed planning.

City of Tustin

IRCWM IMPLEMENTATION AUTHORITY: Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality.

The City of Tustin covers an area of approximately 11 square miles with nearly 75,000 residents. The entire city lies within the Newport Bay/San Diego Creek Watershed. The former 1,600-acre MCAS-Tustin helicopter base is located within the city boundaries and is being redeveloped as Tustin Legacy. Tustin Legacy includes master-planned communities along with commercial, institutional, and industrial uses and will be the site of a new regional park.

City of Costa Mesa

IRCWM IMPLEMENTATION AUTHORITY: Land use, recreational programs/ facilities, economic and community development, stormwater protection, water quality.

The City of Costa Mesa covers an area of 16 square miles with a population of approximately 113,000 residents. The eastern half of the city lies within the Newport Bay/San Diego Creek Watershed adjacent to Upper Newport Bay.

City of Laguna Hills

IRCWM IMPLEMENTATION AUTHORITY: Land use, recreational programs/ facilities, economic and community development, stormwater protection, water quality.

Covering an area of approximately 6.6 square miles, the City of Laguna Hills has a population of approximately 34,000 people. A small portion of the northern part of the city lies within the Newport Bay/San Diego Creek Watershed.

City of Laguna Woods

IRCWM IMPLEMENTATION AUTHORITY: Land use, recreational programs/ facilities, stormwater protection, water quality.

The City of Laguna Woods is approximately 4.4 square miles with 18,500 residents. The majority of the city lies within a gated senior community. A small portion of the northern part of the city lies within the Newport Bay/San Diego Creek Watershed.

City of Lake Forest

IRCWM IMPLEMENTATION AUTHORITY: Land use, recreational programs/ facilities, economic and community development, stormwater protection, water quality.

Table 3.1 Central Orange County IRCWMP Municipalities

ENTITY	TOTAL SQ MI (1)	SQ MI WITHIN WATERSHED (1)	% OF CITY LAND AREA IN WATERSHED (2)	TOTAL POPULATION (3)	ESTIMATED POPULATION IN WATERSHED (4)
Costa Mesa	15.56	7.58	48.71	110,700	53,927
Irvine	46.15	45.07	97.66	157,500	153,814
Laguna Hills	6.63	1.17	17.65	33,800	5,965
Laguna Woods	3.05	1.91	62.62	16,800	10,521
Lake Forest	16.80	11.56	68.81	76,600	52,708
Newport Beach	27.74	16.61	59.88	72,500	43,411
Orange	23.33	1.6	6.86	132,900	9,114
Santa Ana	27.35	16.34	59.74	343,700	205,340
Tustin	11.09	11.09	100.00	69,100	69,100
County of Orange	86.85	28.19	32.46	122,534	39,772
Total	264.55	141.12	--	1,136,134	643,673

Source: Cooperative Watershed Program Funding Plan, Newport Bay Watershed, June 24, 2009

Exhibit 1, Cost Share for Urban Component of NSMP

Based on NPDES Funding Formula, Original Agreement, D99-128

This matrix uses FY 2008-2009 data. The values in this exhibit are updated annually, and thus subject to change.

Replicated Exhibit B, Cost Share for Urban Component Based on NPDES Funding Formula, Original Agreement, D99-128, 09/18/03.

(1) Source: NPDES Stormwater Permit Implementation Agreement D02-048. Includes Land Area Deductions from Agreement Exhibit A-1

*(2) Percentage of City Land Area in Watershed = Square miles within Watershed/Total Square Miles * 100*

(3) Taken from NPDES budget, which is derived from California State Dept. of Finance Data

*(4) Estimated Population in Watershed = Total Population * Percentage of City Land Area in Watershed/100*

The City of Lake Forest has a population of approximately 80,000 residents within 17 square miles. Significant development is occurring in the northern end of the city with the development of Baker Ranch, a master-planned community that will drain into Serrano Creek. Approximately two-thirds of the city lies within the Newport Bay/San Diego Creek Watershed.

City of Orange

IRCWM IMPLEMENTATION AUTHORITY: Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities; economic and community development; stormwater protection; water quality.

The City of Orange covers an area of approximately 38 square miles with a population of 140,000 residents. A very small portion of the city lies just within the northern boundary of the Newport Bay/San Diego Creek Watershed.

City of Santa Ana

IRCWM IMPLEMENTATION AUTHORITY: Land use; water service; water conservation; sanitary sewer service; groundwater management; recreational programs/facilities, economic and community development; stormwater protection; water quality.

The City of Santa Ana is approximately 27 square miles with a population of over 355,000 residents. Approximately two-thirds of the city lies within the Newport Bay/San Diego Creek Watershed. This area includes the Santa Ana Delhi Channel, a major flood-control facility that drains to Upper Newport Bay.

County of Orange

IRCWM IMPLEMENTATION AUTHORITY: The County of Orange has jurisdiction over land use in unincorporated areas, and is responsible for management of County-owned parks and drainage facilities. The County is also responsible for managing stormwater programs in compliance with the NPDES stormwater permit, monitoring water quality and providing for flood protection.

Orange County Public Works, or Resources and Development Management Department (www.ocrdmd.com), coordinates regional services such as flood control (through the Orange County Flood Control District), water quality enhancement, recreation amenities, and agricultural services in order to manage water resources. Public Works oversees the OC Watersheds Program (www.ocwatersheds.com). The OC Watersheds Program includes the Stormwater Program and also serves as the County administrative partner of this Plan.

The County has municipal land use authority for the following unincorporated areas within the Central Orange County IRCWM planning area:

- **North Tustin:** The unincorporated community of North Tustin, located in the upper Newport Bay/San Diego Creek Watershed, is approximately 7.2 square miles with an estimated population of 23,500 residents. This area is predominantly single-family residences with a large number of parcels still on septic systems.

- **SANTA ANA HEIGHTS:** The unincorporated community of Santa Ana Heights is located between Costa Mesa and Newport Beach, directly adjacent to the Upper Newport Bay Ecological Reserve. This area contains residential and commercial land uses, as well as recreational facilities.
- **MORRO CANYON:** A small area of undeveloped land in Morro Canyon is unincorporated and under County jurisdiction.

3.2.2 Land Use Pattern

The urbanized areas tend to have the most intensive land uses in the northern part of the watershed, becoming less dense farther south. However, there are also a number of large open space areas, which present the possibility for linkages through habitat corridor development.

The predominant land use pattern is the single family home within a suburban style community. This type of land use pattern tends to have the most impermeable surface area (roofs, roads, parking lots) per resident. Because of large city blocks, this development scale also tends to discourage pedestrian activity.

Southern California is known for being a multi-nodal metropolitan area. This means that there isn't any one central urban downtown area, as in Manhattan or London, but, rather, many smaller areas

Figure 3.15 Intersection of Jamboree and Interstate 5, Tustin.

of increased density scattered among an otherwise uniform pattern of low-density development. These areas of higher density are usually located around transportation corridors or civic institutions; thus, they could become the focus of further densification needed to support vibrant urban hubs, transportation infrastructure, and reduction of population impacts on local natural resources.

3.3 Demographics

Population within the Central Orange County IRCWM Region will increase significantly over the next 25 years due to build-out of remaining developable lands, redevelopment and infill, and increases in the number of persons per household in certain urban areas. The growth projected for the cities and unincorporated areas is shown below in Table 3.2: Existing and Projected City Population. Within Santa Ana, density levels are currently near 13,000 persons per square mile, while future growth will further increase the pressure on environmental resources. Thus, effective collaboration is imperative in order to ensure the sustainable management of water resources, including issues affecting water quality, habitat, water supply, runoff and recreational amenities.

The Central Orange County Region benefits from a diverse population in terms of race, age, education, and household income. These attributes are summarized in Tables 3.3 through 3.6.

Ninety percent of the region's Hispanic and Latino populations live in Santa Ana, Costa Mesa, and Tustin. Approximately 70 percent of the region's Asian and Pacific Islander population reside in Irvine and Santa Ana.

Median age by city ranges from 26 in Santa Ana to 78 in Laguna Woods, which contains a significant senior population.

3.2 Existing and Projected City Population

City	2000	2005	2010	2015	2020	2025	2030	Overall Increase
ENTIRELY WITHIN IRCWM REGION								
Irvine	143,965	169,600	192,186	195,740	198,689	201,491	203,965	60,000
Newport Beach	76,170	83,585	89,527	91,147	92,365	93,488	94,167	17,997
Tustin	68,032	76,164	82,470	84,774	86,580	88,270	88,788	20,756
Unincorporated Areas	25,469	25,629	25,789	25,949	26,109	26,269	26,429	26,589
PARTIALLY WITHIN IRCWM REGION1								
Costa Mesa	109,402	113,874	117,492	121,166	124,070	126,802	129,098	19,696
Laguna Hills	32,275	33,516	34,150	34,734	35,200	35,637	35,833	3,558
Laguna Woods	17,842	18,534	18,782	19,046	19,261	19,470	19,590	1,748
Lake Forest	76,512	79,077	80,604	81,401	82,044	82,645	82,943	6,431
Orange	129,637	139,859	146,899	149,208	151,032	152,760	153,522	23,885
Santa Ana	337,997	350,625	359,823	364,049	368,026	370,196	370,130	32,133
TOTAL	1,017,301	1,090,463	1,147,722	1,167,214	1,183,376	1,197,028	1,204,465	212,793
Avg Annual Growth Rate		1.44%	1.05%	0.34%	0.28%	0.23%	0.12%	10%

Source: Southern California Association of Governments 2004 projections. Estimates reflect population for entire city.

3.3 Population by Race					
	White	Hispanic/ Latino	Asian/ Pacific Islander	Black/ African American	All Others
Total Region	44%	40%	12%	2%	2%

Source: 2000 U.S. Census

3.4 Population by Age				
	0-19 yrs	20-44 yrs	45-64 yrs	65 and older
Total Region	30%	41%	19%	10%

Source: 2000 U.S. Census

3.5 Educational Attainment		
	High School Graduate or Higher	Bachelor's Degree or Higher
Total Region	71%	63%

Source: 2000 U.S. Census

3.6 Household Annual Income				
	To $49,999	$50,000 to $99,999	Over $100,000	Median Income
Total Region	44%	32%	24%	$57,264

Source: 2000 U.S. Census

The highest educational attainment levels are in Irvine and Newport Beach; the lowest levels are reported in Santa Ana, where 43.2 percent of the population over age 25 have a high school degree or higher, and 9.2 percent have a bachelor's degree or higher.

Household median income ranges from a low of $43,412 in Santa Ana to a high of $96,230 in the unincorporated area of North Tustin.

These demographics show that the most densely populated cities, such as Santa Ana, tend to have a large Hispanic population with young families, less education and the lowest income levels in the Region. This is not the case in many of the other communities throughout the Region. Each community's demographics will influence the circumstances within which water resource improvements can be made.

3.4 Economic Trends

Central Orange County has benefited from a relatively healthy economy. Up until 2008, the long-term economic outlook has been generally positive, based on a diverse business community, high land values and low unemployment rates. However, with the 2008-2009 recession, the short and medium-term economic outlook is now less certain.

There are some underlying factors that pose a risk to the economic efficiency of the Region over the long term. Even with the housing downturn, the continuing high cost of housing is a significant barrier to business growth because it prohibits potential employees from living here or requires them to commute long distances, contributing to traffic congestion. Although the median price of housing in Orange County has returned to 2004 levels, as of summer, 2009, housing costs in Orange County are still higher than those of the Inland Empire and much of the country.

This is an economic problem for a number of reasons. Because there are more jobs here than housing, the high level of commuter traffic congests the roads and freeways, taking time and productivity away from local residents and businesses and decreasing the quality of life. Numerous public surveys consistently list traffic as a top problem in the area. Providing the infrastructure to support this level of traffic, the amenities businesses rely on, and the services that maintain high residential real estate values, is all very expensive for public agencies. A percentage of these costs are not covered by the income generated from the jobs here because so many of the Region's employees spend their income in the places they live, rather than here. This can lead to the need for local government to raise taxes in order to maintain the infrastructure and amenities needed to support the current standard of living, which only further exacerbates the affordability for businesses and residents.

In this cycle, the cost of real estate drives the initial decision to work here and live elsewhere. One way to reduce the cost of property is to densify, increasing supply to meet demand, thereby bringing the prices down. However, increasing density is a risky proposition because, along with it, comes increased costs for providing infrastructure and public services. If these things are not provided, quality of life begins to suffer.

In addition to these longer term concerns over the local economy, there are also some near term concerns on the national level that are affecting this Region. The slow-down in housing markets all over the country, the increasing cost of living, and the performance of the U.S. economy are leaving Americans strapped for cash. Because of this, state and municipal governments and agencies, with the possible exception of the public transportation agencies, are also finding themselves with less income to provide needed services.

With the passage of Proposition 13 in 1978, ad valorem property taxes were limited to 1 percent of assessed value. This is not enough to pay for local government, so agencies rely on other means to collect revenue, such as sales tax, user fees, property-related fees, regulatory fees, and development impact fees. Several of these require voter approval for initiation and increase, making their adoption unlikely. If present economic conditions continue, securing adequate funding for public services and programs will only become more difficult.

At the same time, the costs of achieving water quality improvements, protecting coastal resources, and improving local water supply reliability are escalating. In some cases, there is no dedicated funding source available to implement projects and programs where there is no nexus with provision of direct services. The agencies within the Central Orange County Region are progressive in their approach to this challenge, using tiered rate structures to encourage water conservation, building capital funding needs into their rate structures, and pursuing grant funding where available.

Implementation of this IRCWM Plan requires a significant investment of public funds. The IRCWMP identifies potential project costs, which allows agencies to factor these costs into budgetary planning. Cost-sharing agreements among stakeholders have been developed for some ongoing programs, such as the county-wide Nitrogen and Selenium Management Program (NSMP). Agencies can also examine options for reducing costs, using integration planning ideas outlined in the Plan, such as leveraging existing financial resources and integrating projects with other agency projects.

Disadvantaged Communities

Within the Central Orange County Region, there are several areas determined to be disadvantaged communities, with median household incomes of less than $39,579 (Phase 1, 2.4.2). These communities are within the cities of Costa Mesa, Irvine, Santa Ana, Tustin, and Laguna Hills. Per the 2000 U.S. Census, these areas have a combined population of 148,065 residents. The area in Irvine surrounding the University of California campus is comprised mostly of students and Laguna Woods is comprised primarily of seniors. However, the other communities identified are comprised of working families with a high percentage of Hispanic residents. These communities are served by the same water supply and wastewater systems as other areas within the Region. However, access to recreation and open spaces can be limited in these communities. Poor people move into these areas over time because the lack of natural amenities is part of a combination of factors that makes them less desirable and thus, cheaper, places to live. Around the country, cities have been able to improve the quality of life by improving their landscapes. Tree planting, improved streetscape design, bike trails, pocket parks, and restored waterways have added a greater sense of calm to the urban context and created a more humane environment.

Newport Bay, Corona del Mar State Beach, Crystal Cove State Park, and other area beaches and regional parks are important regional recreation areas for these communities and are used heavily year around. These recreational areas are accessible via public transit and often do not charge an entrance fee for walk-in visitors, making these sites ideal options for inexpensive quality recreational, educational, and cultural experiences for both local residents and those from nearby disadvantaged communities. Impaired water quality in these areas significantly impacts the recreational opportunities available to all residents in the Region.

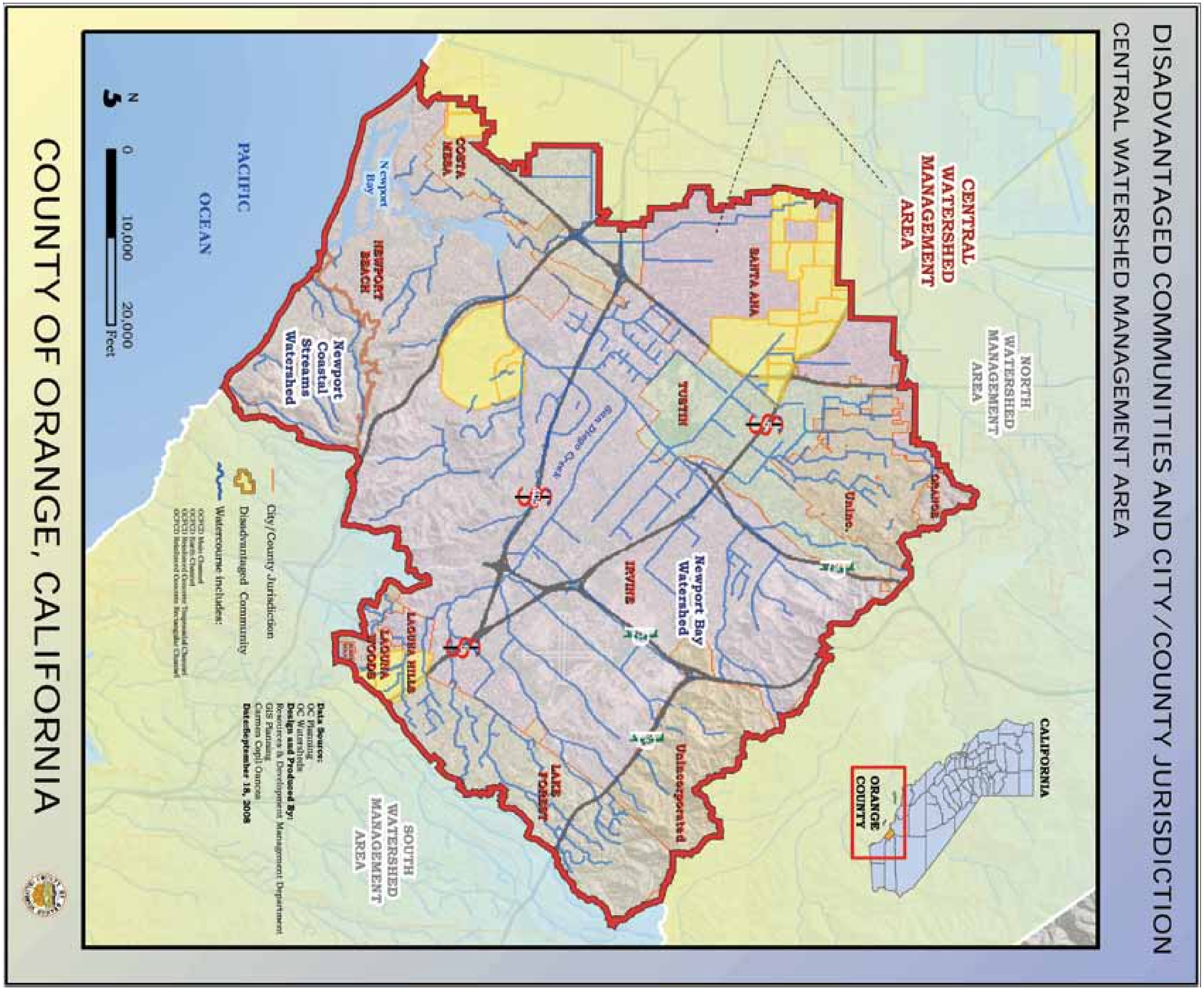


Figure 3.16 Disadvantaged Communities within the Region.

3.5 Water Resource Infrastructure

The four water resource areas are:

1. Flood Management
2. Water Quality
3. Water Supply
4. Habitat

Each of these areas is discussed in the following sections.

3.5.1 Flood Management

The following quote from the 2002 California Floodplain Management Task Force report summarizes recent state laws that address flood management:

"Flood management is an overarching term that encompasses both floodwater management and floodplain management. AB 1147, which authorized the creation of the California Floodplain Management Task Force, provides significant financial incentives for multi-purpose flood management projects that also address ecosystem and recreational needs. The Safe Drinking Water, Watershed Protection, and Flood Protection Act of 2000 (Proposition 13) funded projects that combine flood protection with agricultural conservation and ecosystem protection. The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Proposition 50) contains additional incentives for watershed-based management approaches." (2002. California Floodplain Management Task Force).

The Orange County Flood Control District (OCFCD), established May 23rd,1927, under authorization of the Orange County Flood Control Act, Chapter 723 of the State of California Statutes of 1927, was created to provide for control of flood and stormwaters of the district (delineated by the Orange County boundary) and of streams flowing into the district (e.g., the Santa Ana River or San Juan Creek); to mitigate the effects of tides and waves; and to protect the harbors, waterways, public highways and property in the district from such waters.

The authority of OCFCD was expanded in a series of amendments to the California Water Code. Appendix 36 of the Water Code states that the purposes of the Orange County Flood Control Act "are to provide for the control of the flood and stormwaters of the district, …and to conserve those waters for beneficial and useful purposes by spreading, storing, retaining, and causing them to percolate into the soil within the district, … or to save or conserve in any manner all or any of those waters and protect from damage from those flow or store waters, the harbors, waterways, public highways and property in the district."

Chapter 36 also states that "the Orange County Flood Control District is hereby declared to be a body corporate and politic and has all the following powers:

- "(5) To acquire, or contract to acquire, lands, rights-of way, easements, privileges and property of every kind, and to construct, maintain and operate any and all works or improvements within or outside the district necessary or proper to carry out any of the objects or purposes of the act, and to complete, extend, add to, repair, or otherwise improve any works or improvements acquired by it as authorized on this act."
- "(14) To monitor, test, or inspect drainage, flood, storm, or other waters within the district for the purpose of recording, determining, and report the quality of the waters to appropriate regional water quality control boards."
- "(16) To carry on technical and other investigations, examinations, or tests of all kinds, make measurements, collect data, and make analyses, studies, and inspections pertaining to water supply, control of floods, use of water, water quality, nuisance, pollution, waste, and contamination of water, both within and outside the district."

The Orange County Flood Control District, administered by Orange County Public Works (OC Public Works), is governed by the Orange County Board of Supervisors. OCFCD is a political entity that has no employees, but owns land and assesses an annual benefit on all taxable real property in Orange County (not to exceed $0.20 on each $100 of assessed value or 0.2 percent of collected real property tax). Because OCFCD has no specific employees, the District and its property are administered, maintained, and operated by OC Public Works staff. Jurisdiction over flood control infrastructure in the Region is based on who built the infrastructure. In most cases, these projects were implemented by the Orange County Flood Control District (OCFCD). However, in some cases, the Army Corps of Engineers or a local municipal jurisdiction has implemented a project, and now has operations and maintenance responsibility.

The Region's flood control and surface water conveyance infrastructure defines how and where water moves through this hydrologic region. It defines the physical relationship between land and water, which supports all other ecological processes. In natural conditions, when it rains, a large percentage of that water soaks into the ground, reducing the amount of water that runs downhill into the nearest stream channel. As land becomes paved over with impermeable surfaces such as roads, roofs and parking lots, it can no longer absorb its share of the water, so greater amounts of water flow into the stream channels. In addition, drainage requirements for real estate development require grading practices that drain this water into nearby channels as fast as possible. This means that, not only is more water flowing directly into stream channels without getting absorbed into the ground, it's flowing into those channels at one time. This concentrated surge of water causes streams to flood and banks to erode, thus increasing the need to reinforce the banks and replace riparian habitat with concrete drainage channels. However, within the aforementioned forces at play within the hydrologic system, this response has been dealing with the symptoms and not the cause. Canyon erosion, sediment accumulation, loss of habitat, and water quality problems are all symptoms that the components of our watershed's basic hydrology are out of balance with each other.

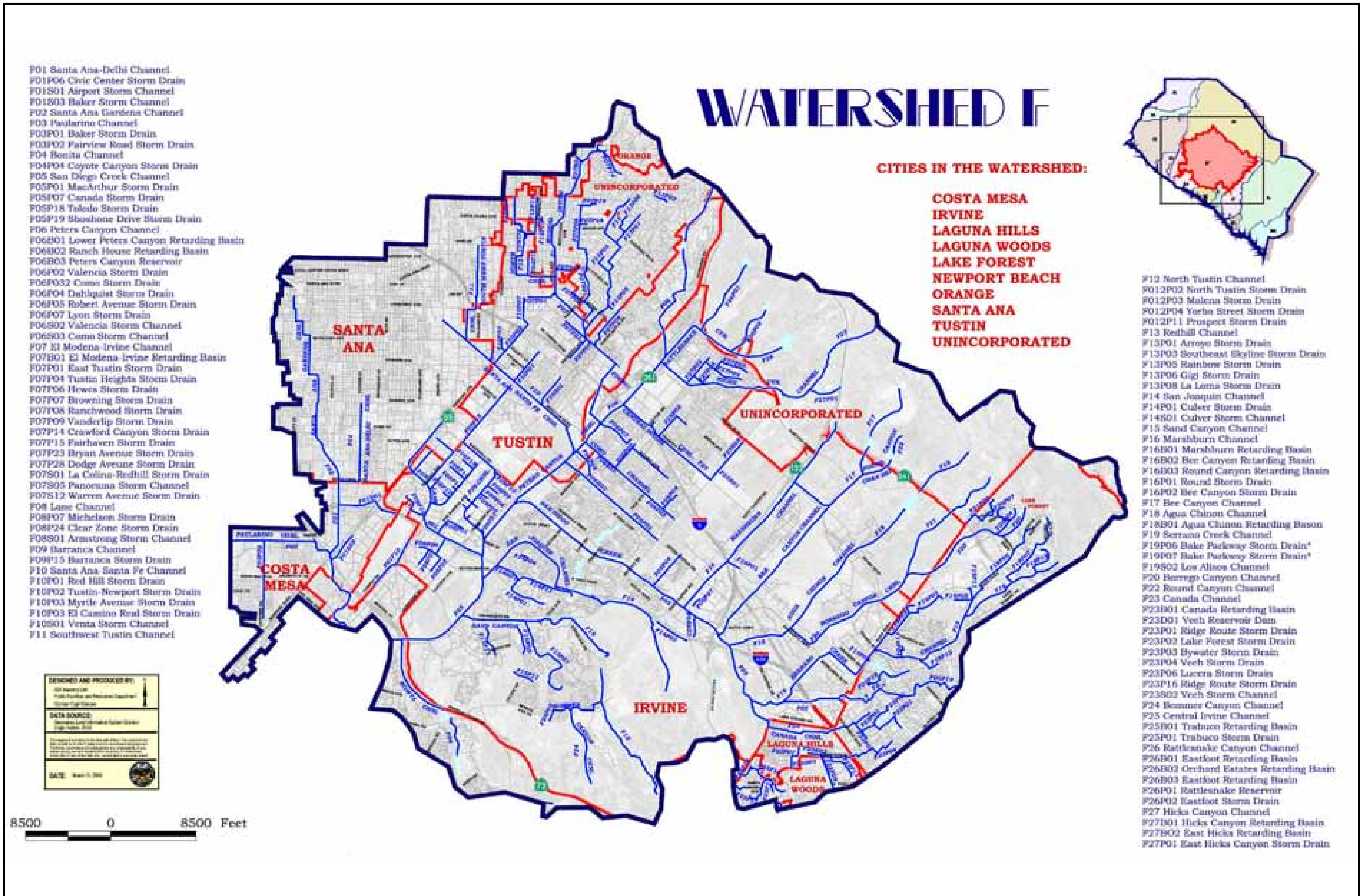


Figure 3.17 San Diego Creek Subwatershed. Flood Control Facilities – Major County Structures. (Orange County Flood Control District)

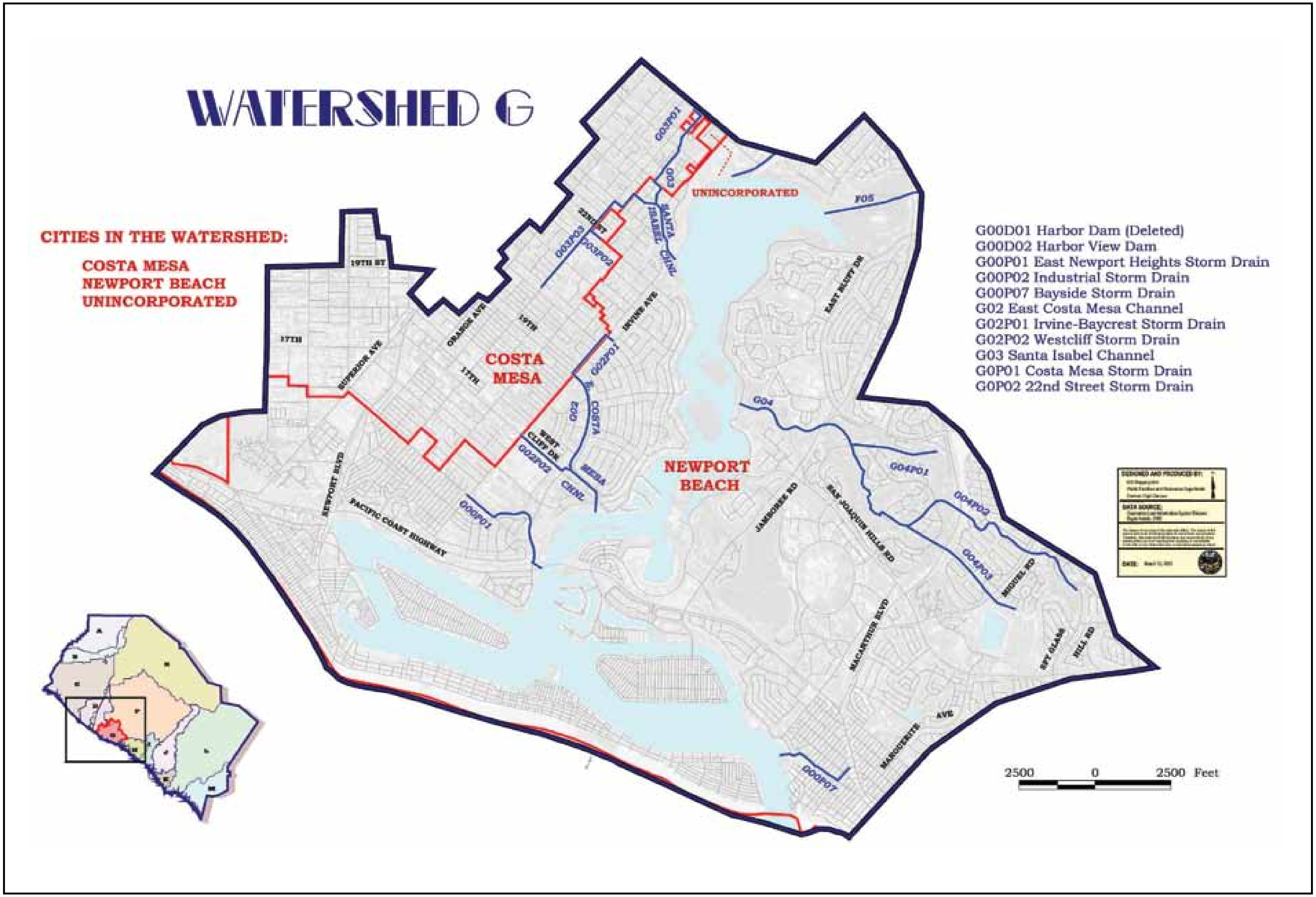


Figure 3.18 Newport Bay Subwatershed. Flood Control Facilities - Major County Structures. (Orange County Flood Control District)

To achieve a healthy equilibrium, a more multipurpose approach is needed for effectively dealing with the way water moves over land and through natural and man-made drainage systems.

In order to create a physically balanced and stable hydrologic system, the design objective for storm channels changes from increasing channel flow to establishing a stable sediment transport within a naturalized, multipurpose channel. Protecting surrounding land from flooding becomes a process of reducing flows into the channel that would destabilize its sediment transport or cause flooding elsewhere along that channel. This can be achieved with stormwater retention and reuse facilities, and to some extent, by establishing stormwater capture and management requirements and design strategies for private land.

This is consistent with the new Municipal Separate Storm Sewer System (MS4) requirements that are a part of the Regional Water Quality Control Board's National Pollutant Discharge Elimination System (NPDES) program requirements. The MS4 requirements include the implementation of low impact development strategies (LID), which are site-level and neighborhood-level design strategies that reduce the runoff coming from each parcel of land. Just as land owners currently have to demonstrate that water is being drained off their land before they can get permission from local land use jurisdictions to develop, land owners will instead be required to effectively manage a percentage of runoff on-site or within the neighborhood before they can get the green light to begin the construction process.

If climate change forecasts are realized, more extreme weather patterns will have a dramatic impact on stormwater infrastructure. In Southern California it is anticipated that storms may become more intense, less frequent and that there will be longer periods of dry weather and drought. Adapting to this will require increasing the capacity to handle larger storm flows. There are many ways to do this, such as increasing the size of the conveyance channels, increasing on-site stormwater retention capacities, and improving bank stabilization to withstand the larger flows. With hotter and drier conditions, fires will become more likely, which could result in greater erosion and sediment transport. This makes designing stream and flood channels with slope and flow velocities for balanced sediment transport rates even that much more critical.

3.5.1.1 Newport Bay / San Diego Creek Watershed Surface Water

Upper Newport Bay receives flows from San Diego Creek, Santa Ana-Delhi Channel, Santa Isabel Channel, Bonita Creek, and Big Canyon Wash (EPA 1998). The Lower Newport Bay receives flows from the Costa Mesa Channel and smaller surrounding storm drain channels. The two largest tributaries to Newport Bay are San Diego Creek (including Peters Canyon Channel) and the Santa Ana-Delhi Channel.

San Diego Creek accounts for approximately 80 percent of freshwater entering the bay and Santa Ana-Delhi Channel accounts for approximately 15 percent (ACOE, 2000). Most of the remaining 5 percent comes from minor tributaries such as Big Canyon Creek, Costa Mesa Channel and large storm drains such as the Arches Channel.

San Diego Creek's largest tributary is Peters Canyon Wash. Its other tributaries include Serrano Creek, Borrego Creek, Agua Chinon Wash, Bee Canyon Wash, Hicks Canyon Wash, Rattlesnake Canyon Wash, Round Canyon Wash, Trabuco Channel, Sand Canyon Wash and Bonita Canyon Creek. San Diego Creek is approximately 14 miles long, stretching from Newport Bay to its headwaters. It is divided into upstream and downstream reaches based on differences in beneficial uses and corresponding water quality objectives along the creek. Downstream, Reach 1 extends from the mouth of San Diego Creek at Upper Newport Bay to Jeffrey Road. Upstream, Reach 2 extends from Jeffrey Road to the headwaters of San Diego Creek.

The County of Orange has located San Diego Creek stream flow gauges at Campus Drive and further upstream at Culver Drive. Other flow gauges are located at: Peters Canyon Wash (at Barranca), El Modena Channel (at Michelle Drive), and Santa Ana-Delhi Channel (at Irvine Boulevard). In addition, two USGS gauges are located at Bonita Canyon Creek (at MacArthur Boulevard) and Agua Chinon Channel (at Irvine Boulevard). Flow rates in San Diego Creek Channel Reach 1 are monitored at the Campus Drive monitoring station. Table 3.7 presents stream flows for the 2004-2005 season. Mean daily flow rates varied from a low of 6.13 cubic feet per second (cfs) in August 2004 to a high of 427 cfs in February 2005 (County of Orange RDMD, 2005).

3.5.1.2 Newport Coast Surface Water

The other watershed within this Region is the Newport Coast Watershed. This 11-square mile watershed covers a much smaller area and has significantly smaller lower stream flow volumes. Five groups of coastal canyon drainage areas, defined by their canyon creeks, are included in the Newport Coast Watershed for this IRCWM Plan, including:

1) Buck Gully: Reaches 1, 2, and 3
2) Morning Canyon: Reaches 1 and 2
3) Pelican Point, Pelican Point Middle Creek, Pelican Point Waterfall Creek
4) Los Trancos Creek (and Crystal Cove Creek)
5) Muddy Creek.

Most of the canyon creeks in the upper portions of the drainage areas are steep natural channels. Several are developed in both the upper and lower portions and contain concrete storm drain outlets. Unpaved access roadways and hiking trails exist in several canyons but are generally not maintained. The lower portions of the steep canyon creek channels have been subject to erosion from increased and longer sustained peak flows. These flows are a result of increased

Table 3.7 Down-Stream Flow for San Diego Creek Reach 1: Mouth of San Diego Creek at Upper Newport Bay to Jeffrey Road (measured at Campus Drive)

MFR (cfs)	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
2004–2005	7.10	6.13	7.31	230	35.2	104	339	427	38.3	45.7	24.7	13.9

Source: County of Orange RDMD Hydrologic Data Report 2004–2005 Season, Section 2

MFR = Mean Flow Rate • cfs = cubic feet per second

Table 3.8 Up-Stream Flow for San Diego Creek Reach 2: Jeffrey Road to Headwaters (measured at Lane Road)

MFR (cfs)	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
2004–2005	.98	.87	1.17	80.5	8.40	37.9	128	176	10.5	14.6	7.85	2.66

Source: County of Orange RDMD Hydrologic Data Report 2004–2005 Season, Section 2

MFR = Mean Flow Rate • cfs = cubic feet per second

Table 3.9 Stream Flow for Peters Canyon Wash (measured at Barranca Parkway)

MFR (cfs)	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
2004–2005	3.64	5.13	4.78	79.1	6.17	38.7	141	127	15.5	14.0	10.6	7.07

Source: County of Orange RDMD Hydrologic Data Report 2004–2005 Season, Section 2

MFR = Mean Flow Rate • cfs = cubic feet per second impervious surfaces, irrigation runoff, introduction of invasive/exotic species of vegetation, and greater number of channelized/piped flows into the canyons. Flow data from the Newport Coast Flow and Water Quality Assessment study completed in 2006 are shown in Table 3.10, Wet Weather Flow Data, and Table 3.11, Dry Weather Flows per Unit Area (Weston, 2006).

Table 3.10 Wet Weather Flow Data

Station ID	Unit Modeled Flow (cfs)
BUCK GULLY	
BG1	1.18
BG2	1.08
BG3	1.03
BG4	0.89
BG5	0.69
BG6	0.46
BG7	0.29
MORNING CANYON	
MCD	0.36
Pelican Point	
PP1	0.02
PPM	0.22
PPW	0.13
LOS TRANCOS CANYON	
LTD*	1.10
Muddy Canyon	
MCC	0.93
EL MORRO CANYON	
EMD*	2.00

**Dry weather flows are diverted at these sites*

3.5.2 Water Quality

Water quality is regulated for health purposes and for the purposes of preserving its 'Beneficial Uses', as defined by the Clean Water Act. The Santa Ana Regional Water Quality Control Board (RWQCB) has designated beneficial uses for surface waters within the Region.

Table 3.11 Dry Weather Flows Per Unit Area

Station ID	Unit Modeled Flow (cfs)
BUCK GULLY	
BG1	0.43
BG2	0.39
BG3	0.37
BG4	0.32
BG5	0.25
BG6	0.17
BG7	0.10
MORNING CANYON	
MCD	0.13
PELICAN POINT	
PP1	0.01
PPM	0.08
PPW	DRY
LOS TRANCOS CANYON	
LTD*	
MUDDY CANYON	
MCC*	
EL MORRO CANYON	
EMD	0.72

**Dry weather flows are diverted at these sites*

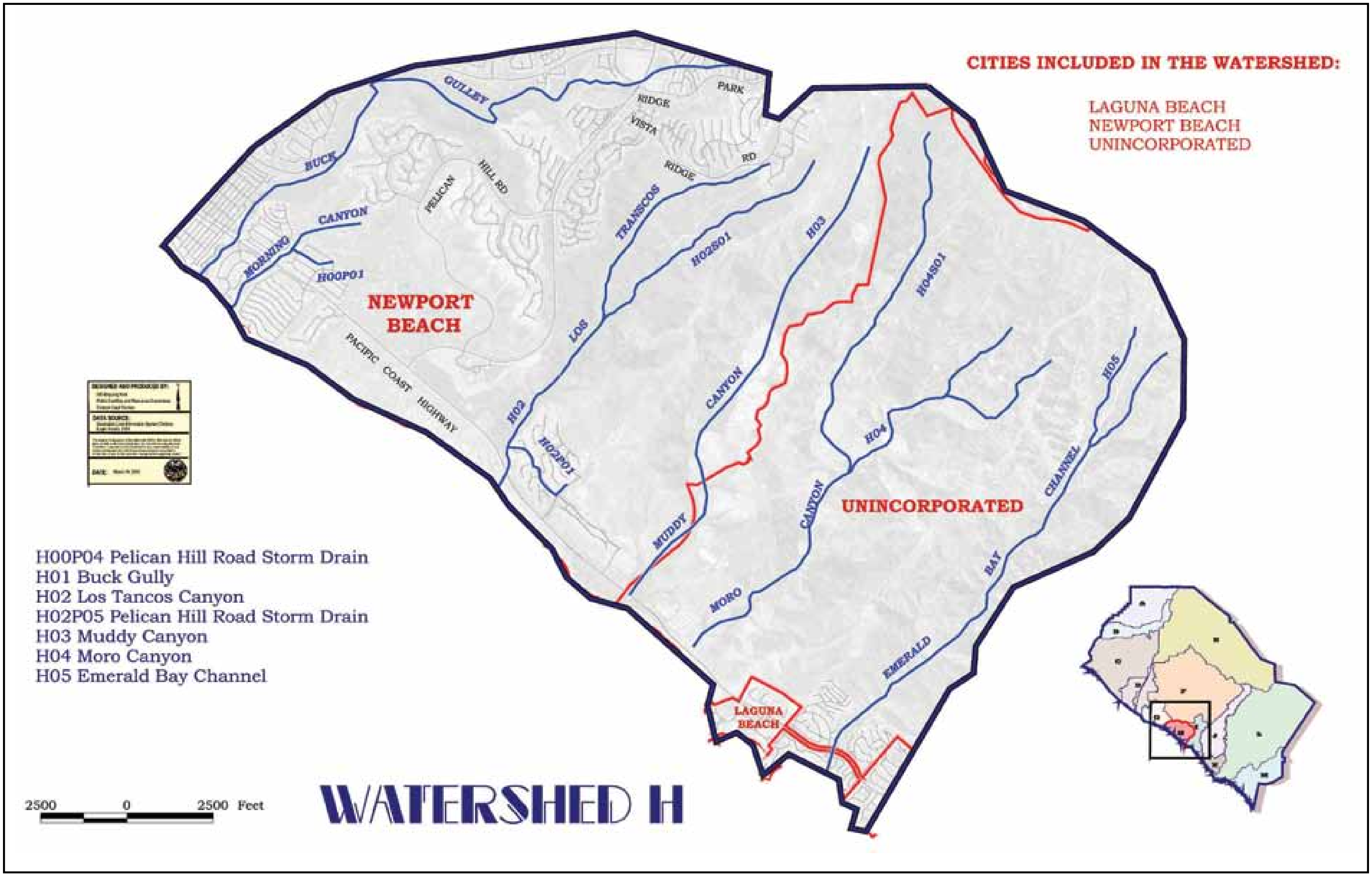


Figure 3.19 Newport Coast Subwatershed. Flood Control Facilities – Major County Structures. (Orange County Flood Control District)

At this time, surface waters in this Region are not used as a potable water supply. When impaired water quality does not allow for one of the designated beneficial uses, agencies imposes regulations on the contaminants. Water quality related agencies in this Region include:

1) SANTA ANA REGIONAL WATER QUALITY CONTROL BOARD

The Central Orange County IRCWMP Region is entirely within the jurisdiction of the Santa Ana Regional Water Quality Control Board. Both above-ground and below-ground water quality has been degraded by polluted runoff from urban and natural areas. Eight water segments in central Orange County are listed as Section 303(d) impaired water bodies and there are five Total Maximum Daily Load (TMDL) limits established for nutrients, fecal coliform, sediment, toxics and organophosphate pesticides, with more TMDLs pending. For more details regarding Total Maximum Daily Loads (TMDLs), see Appendix H, Water Quality Regulatory Issues - Total Maximum Daily Loads and Related Strategies and http://www.ocwatersheds.com/watersheds/tmdls.

2) **COSTA MESA SANITARY DISTRICT** provides wastewater collection service.

3) **THE COSTA MESA SANITARY DISTRICT** provides sanitary sewer service to a 16-square-mile area which includes most of the City of Costa Mesa, a portion of the City of Newport Beach, and some unincorporated areas.

4) **ORANGE COUNTY SANITATION DISTRICT** collects and treats wastewater, and engages in recycled water resource planning.

The Orange County Sanitation District (OCSD) manages wastewater collection and treatment for approximately 471 square miles in central and northwest Orange County, which includes 21 cities, 3 special districts, and 2.5 million residents. OCSD's system consists of 581 miles of sewer lines and 16 off-site pumping stations. It utilizes Reclamation Plant No. 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach to treat a combined daily average of 238 million gallons of wastewater. OCSD partners with the Orange County Water District for the Groundwater Replenishment System that provides purified wastewater for recharge use. Within the Central Orange County IRCWM Region, OCSD provides service for Santa Ana and Costa Mesa and portions of Tustin and Newport Beach. During the winter, it takes IRWD sanitation overflows that are not recycled.

5) **ORANGE COUNTY HEALTH CARE AGENCY**

The Orange County Health Care Agency is highly involved with water quality in the region and is responsible for monitoring water quality at over 150 locations along the Orange County coastline.

In compliance with RWQCB requirements, the map in Figure 3.20 shows the water quality monitoring stations throughout the Region.

3.5.2.1 Beneficial Uses of Water within the Region

The Water Quality Control Plan for the Santa Ana River Basin lists both Upper and Lower Newport Bay as tributaries to the

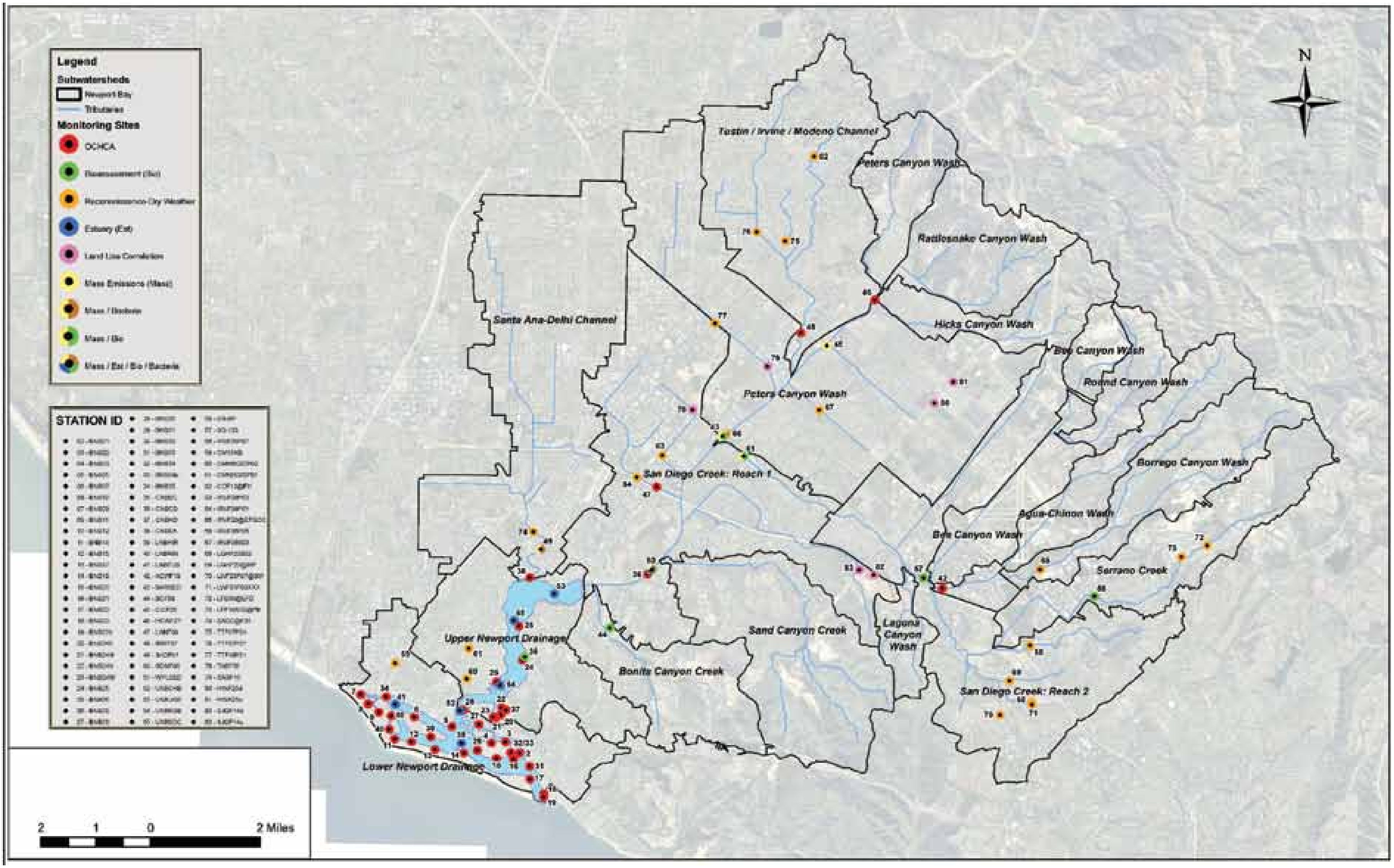


Figure 3.20 Monitoring locations

Table 3.12 Beneficial Uses of Water in Central Orange County IRCWM Region

	MUN	AGR	IND	PROC	GWR	NAV	POW	REC-1	REC-2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE	SPWN	MAR	SHEL	EST	Hydro-logic unit
LAKES																					
Laguna, Lambert, Peters Canyon, Rattlesnake, Sand Canyon, and Siphon Reservoirs	+	X						X1	X		X				X						801.11
BAYS, ESTUARIES, AND TIDAL PRISMS																					
Lower Newport Bay	+					X		X	X	X					X	X	X	X	X		801.11
Upper Newport Bay	+							X	X	X				X	X	X	X	X	X	X	801.11
Tidal Prisms of Flood Control Channels Discharging to Coastal or Bay Waters	+							X	X	X					X			X			801.11
OCEAN WATERS																					
SWQPA (former ASBS)						X		X	X					X				X			
Newport Bay						X		X	X	X									X		
INLAND SURFACE STREAMS																					
Buck Gully		X			X						X	X									
Morning Canyon		X			X						X	X									
Pelican Point		X			X						X	X									
Pelican Point Middle Creek		X			X						X	X									
Los Trancos		X			X						X	X									
Muddy Canyon		X			X						X	X									
SAN DIEGO CREEK																					
Reach 1 – below Jeffrey Road	+							X2	X		X				X						801.11
Reach 2 – above Jeffrey Road to headwaters	+				•			•	•		•				•						801.11

Table 3.12 Beneficial Uses of Water in Central Orange County IRCWM Region

	MUN	AGR	IND	PROC	GWR	NAV	POW	REC-1	REC-2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE	SPWN	MAR	SHEL	EST	Hydro-logic unit
Other Tributaries: Bonita Creek, Serrano Creek, Peters Canyon Wash, Hicks Canyon Wash, Bee Canyon Wash, Borrego Canyon Wash, Agua Chinon Wash, Laguna Canyon Wash, Rattlesnake Canyon Wash, and other Tributaries to these Creeks	+				•			•	•		•				•						801.11
Sand Canyon Wash	+				•			•	•		•				•						801.11
Wetlands																					
San Joaquin Freshwater Marsh	+							X	X		X			X	X	X					801.11

X Present or Potential Beneficial Use
• Intermittent Beneficial Use
+ Excepted from MUN
1 Access prohibited by Irvine Ranch Company
2 Access prohibited in all or part by Orange County Environmental Agency (OCEMA)

DEFINITIONS OF BENEFICIAL USE ARE AS FOLLOWS

MUN Municipal and Domestic Supply (MUN) waters are used for community, military, municipal, or individual water supply systems. These uses may include, but are not limited to, drinking waters supply.

AGR Agricultural Supply (AGR) waters are used for farming, horticulture, or ranching. These uses may include, but are not limited to, irrigation, stock watering, and support of vegetation for range grazing.

IND Industrial Service Supply (IND) waters are used for industrial activities that do not depend primarily on water quality. These uses may include, but are not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

PROC Industrial Process Supply (PROC) waters are used for industrial activities that depend primarily on water quality. These uses may include, but are not limited to, process water supply and all uses of water related to product manufacture or food preparation.

GWR Groundwater Recharge (GWR) waters are used for natural or artificial recharge of groundwater for purposes that may include, but are not limited to, future extraction, maintaining water quality, or halting saltwater intrusion into freshwater aquifers.

NAV	Navigation (NAV) waters are used for shipping, travel, or other transportation by private, commercial, or military vessels.
POW	Hydropower Generation (POW) waters are used for hydroelectric power generation.
REC-1	Water Contact Recreation (REC-1) waters are used for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses may include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, whitewater activities, fishing, and use of natural hot springs.
REC-2	Non-contact Water Recreation (REC-2) waters are used for recreational activities involving proximity to water but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses may include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, and aesthetic enjoyment in conjunction with the above activities.
COMM	Commercial and Sportfishing (COMM) waters are used for commercial or recreational collection of fish or other organisms, including those collected for bait. These uses may include, but are not limited to, uses involving organisms intended for human consumption.
WARM	Warm Freshwater Habitat (WARM) waters support warm-water ecosystems that may include, but are not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.
LWRM	Limited Warm Freshwater Habitat (LWRM) waters support warm-water ecosystems that are severely limited in diversity and abundance as the result of concrete-lined watercourses and low, shallow dry weather flows that result in extreme temperature, pH, and/or dissolved oxygen conditions. Naturally reproducing finfish populations are not expected to occur in LWRM waters.
COLD	Cold Freshwater Habitat (COLD) waters support cold-water ecosystems that may include, but are not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.
BIOL	Preservation of Biological Habitats of Special Significance (BIOL) waters support designated areas or habitats, including, but not limited to, established refuges, parks, sanctuaries, ecological reserves or preserves, and ASBSs, where the preservation and enhancement of natural resources require special protection.
WILD	Wildlife Habitat (WILD) waters support wildlife habitats that may include, but are not limited to, the preservation and enhancement of vegetation and prey species used by waterfowl and other wildlife.
RARE	Rare, Threatened, or Endangered Species (RARE) waters support habitats necessary for the survival and successful maintenance of plant or animal species designated under state or federal law as rare, threatened, or endangered.
SPWN	Spawning, Reproduction, and Development (SPWN) waters support high-quality aquatic habitats necessary for reproduction and early development of fish and wildlife.
MAR	Marine Habitat (MAR) waters support marine ecosystems that include, but are not limited to, preservation and enhancement of marine habitats, vegetation (e.g., kelp), fish and shellfish, and wildlife (e.g., marine mammals and shorebirds).
SHEL	Shellfish Harvesting (SHEL) waters support habitats necessary for shellfish (e.g., clams, oysters, limpets, abalone, shrimp, crab, lobster, sea urchins, and mussels) collected for human consumption, commercial, or sports purposes.
EST	Estuarine Habitat (EST) waters support estuarine ecosystems, which may include, but are not limited to, preservation and enhancement of estuarine habitats, vegetation, fish and shellfish, and wildlife, such as waterfowl, shorebirds, and marine mammals.

Pacific Ocean and also as receiving waters for San Diego Creek. Existing beneficial uses are designated in the Basin Plan for the reservoirs, bays, estuaries and tidal prisms, watershed streams and wetlands within the Newport Bay Watershed. For the Newport Coast Watershed, only the near-shore zone of the ocean waters has designated beneficial uses. Table 3.12 summarizes the designated beneficial uses within the Region.

3.5.2.2 Newport Bay Watershed

A major source of water quality contamination is urban runoff. San Diego Creek, Peters Canyon Channel, Upper and Lower Newport Bay and the Rhine Channel are listed on the 303(d) list as impaired with fecal coliform, organochlorine pesticides, PCBs, metals, and sediment toxicity. The EPA and the Santa Ana RWQCB have implemented TMDLs for the San Diego Creek and Newport Bay for toxics (including pesticides and metals), sediment, and nutrients. Additionally, a TMDL for fecal coliform has been established for Newport Bay.

Urbanization of our watershed has led to the creation of significant amounts of non-native landscaping that requires fertilization and irrigation during dry weather conditions. However, this landscaping is often over-irrigated and studies indicate that, when property owners reduce watering, plants' health often improves (IRWD, MWD, et al.). If irrigation were reduced, not only would polluted dry weather runoff decrease, but the amount of water leaching contaminants into the streams and groundwater would substantially decrease as well. The groundwater and soils in the central part of the watershed contain high levels of selenium, a serious hazard to wildlife. When over-irrigation elevates the water table, more selenium-rich groundwater flows into the surface streams to contaminate the aquatic habitat.

Constantly saturated soils also compromise the integrity of street subgrades leading to pavement failure. The repair of these failures is expensive and problematic when heavy equipment is brought in to work in saturated mud. Excessive irrigation in hillside areas is especially dangerous in a region prone to mud slides. In 2005, Bluebird Canyon in Laguna Beach failed because clay layers 100 feet deep became saturated resulting in a massive failure along this clay slip layer

Sediment

Sediment control has been a key water quality issue for decades. Increased surface water flow due to urbanization and channelization has increased the quantity of sediment transported through the watershed to Upper Newport Bay. For example, an estimated 400,000 cubic yards of sediment were deposited in Upper Newport Bay during the 1969 storm season (ACOE 1998). Issues related to increased surface water flow and sedimentation are: increased stream erosion, which has threatened homes, utilities, and other structures; impacts to estuarine species and habitats in Upper Newport Bay; and loss of navigation channels in Newport Bay (ACOE 1998). Stream erosion has been most notable in Serrano Creek, upstream of Serrano Creek Community Park, and in Borrego Wash. In Serrano

Table 3.13 Sediment Discharge from San Diego Creek to Newport Bay

Year	Annual Flow in Acre-Feet in the San Diego Creek at Campus Drive	Annual Sediment Discharge in Tons in the San Diego Creek at Campus Drive
1983	58,952	534,035
1984	29,425	64,455
1985	26,987	32,236
1986	29,746	37,760
1987	21,423	20,060
1988	22,089	34,186
1989	17,359	19,810
1990	19,154	24,855
1991	28,935	83,924
1992	37,186	173,212
1993	62,510	355,208
1994	20,000	33,027
1995	61,182	347,579
1996	23,501	49,438
1997	33,946	92,181
1998	92,345	618,006
1999	17,334	16,439
2000	17,780	28,864
2001	27,320	75,686
2002	10,610	5,640
2003	30,090	64,740

Source: URS 2003.

Creek, stream erosion threatens to undercut homes, has damaged and threatened a Los Alisos Water District sewer line and a Southern California Edison utility pole. It has cut hundreds of thousands of cubic yards of channel bank in a single storm season, which has resulted in the loss of riparian habitat (ACOE 1998).

Sedimentation in the Upper Newport Bay has altered the depth of the bay, which in turn has altered tidal exchange and the type and availability of aquatic and wildlife habitat (ACOE 1998). These conditions are of concern to natural resource groups and regulatory agencies, as Upper Newport Bay is one of only a few remaining estuaries in Southern California. It is one of the few remaining coastal Mediterranean habitats, is used as a stopover point on the Pacific flyway and is the home to numerous species of mammals, fish, invertebrates and native plants, including several endangered species (Newport Bay Naturalists and Friends 2007).

Upper Newport Bay has been dredged several times to keep it from filling in with sediment and is presently undergoing a multimillion dollar, multi-phased dredging and restoration operation by the Army Corps of Engineers, County of Orange, California Department of Fish & Game and the California Coastal Conservancy. This project addresses chemical and biological problems that have been created by a physically altered hydrologic system. The dredging project is only a remedial solution. Optimally, other solutions to control the sediment problem will be implemented in the upper watershed, such as erosion control and sediment capture and stabilization. The Sediment Control Monitoring and In-Channel Maintenance

Program is one strategy addressing this issue. In addition, the Orange County Stormwater Program mandates BMPs to improve overall runoff water quality. The IRWD Natural Treatment System, a network of constructed wetlands, also contributes to slowing and infiltrating runoff while trapping sediment.

The implementation of BMPs and the Sediment TMDL have improved these conditions of concern. However, tens of thousands of tons of sediment are still being deposited in the bay each year, as shown in Table 3.13, Sediment Discharge from San Diego Creek to Newport Bay (URS 2003). Appendix H, Water Quality Regulatory Issues, contains the 1999-2007 annual sediment discharge summary excerpted from the 2006-2007 Sediment TMDL Annual Report. The Sediment TMDL monitoring program includes a monitoring element for Newport Bay. The Newport Bay monitoring element includes bathymetric surveys, vegetation surveys, and sediment removal. All of the TMDL annual monitoring reports are posted at: http://www.ocwatersheds.com/watersheds/tmdls.

Nutrients

Over the past century, changes in land use from grazing to farmland have resulted in the discharge of nutrients into San Diego Creek and Upper Newport Bay. Nutrients are also discharged from landscaped areas of residential and commercial developments. The increased nutrient loading to the San Diego Creek and Upper Newport Bay has resulted in algal growth. Algal blooms in Newport Bay have been responsible for aesthetic nuisances and have interfered with recreational activities; furthermore, decomposing algae has resulted in fish kills due to the creation of anoxic conditions (EPA 1998). The nutrient impairment has resulted in non-compliance with the narrative water quality objectives of the Santa Ana River Basin Plan regarding algae and dissolved oxygen (EPA 1998).

Nutrient loading from San Diego Creek to Upper Newport Bay peaked in the mid-1980s at 7 million pounds of nitrate during the 1985-1986 season (EPA 1998). Nutrient loading decreased in the 1990s due to increased controls and BMPs; however, total inorganic nitrogen (TIN) data continued to be greater than the water quality goals in the 1990s, and algal blooms continued as a problem in Upper Newport Bay (EPA 1998). According to the 2005 Regional Monitoring Program Report for the Nutrient TMDL, “Algal biomass measurement over the past 10 years show that the overall trend in the bay is a decrease in macroalgal density… but the bay is still susceptible to large blooms when a flux of nutrients enter the bay… Such blooms occurred in 1999 (dredging of the bay resulting in a likely release of nutrients from sediment), in 2004 (unknown cause of localized increase at site 24) and in 2005 (record rainfall resulting in increased groundwater inputs).” (County of Orange, 2005)

San Diego Creek and Newport Bay have been placed on the EPA Section 303(d) list of impaired waters. Based on that listing, TMDLs of nutrients entering waters of the creek and bay were established. In accordance with the Nutrient TMDL, a Regional Monitoring Program was initiated in 2000. Data from the November 2003 Regional Monitoring Program Report for San

Diego Creek at Campus Drive (Reach 1) are presented in Table 3.14, Summary of 2003 Concentrations in San Diego Creek at Campus Drive (Reach 1). TIN data for San Diego Creek Reach 1 are presented in Table 3.15, Summary of Total Inorganic Nitrogen, 1990-1997.

The Basin Plan and Resolution R8-2004-0001 designate water quality objectives to meet or exceed the beneficial uses, as defined in Table 3.12. The water quality objectives designated for San Diego Creek are shown in Table 3.16, Santa Ana Basin Water Quality Objectives. There are no water quality objectives designated for Newport Bay; however, the water quality objectives include San Diego Creek – Reach 1, which empties into Upper Newport Bay.

Toxic Pollutants

Changes in land use from grazing to farming, as well as residential, industrial and military development, have resulted in the discharge of metals (cadmium, copper, lead, selenium, and zinc) and toxic organic compounds into San Diego Creek, Upper Newport Bay, and Lower Newport Bay. Furthermore, land use activities that cause erosion have increased the delivery of toxic substances to the waterways.

The U.S. EPA has established TMDLs for toxic pollutants, including organic chemicals and metals. The Toxics TMDLs focus on the RARE and WILD beneficial uses of San Diego Creek and Upper and Lower Newport Bay. These beneficial uses are "two of the most sensitive designated aquatic life and wildlife beneficial uses of concern in the watershed" and are designed to protect the special habitat of the Upper Newport Bay (EPA 2002). The TMDL includes the metals, cadmium, copper, lead, selenium and zinc and the organic compounds chlorpyrifos, diazinon, chlordane, dieldrin, DDT, PCBs and toxaphene.

Selenium, a primary metal of concern in the watershed, has been discharged to the San Diego Creek and eventually Newport Bay, through erosion, runoff, and discharges of shallow groundwater from dewatering activities and pump-and-treat groundwater remediation activities (EPA 2002).

Selenium is a naturally occurring substance that is a part of the Toxics TMDL, and it has become a chemical and biological problem due to physical alterations of the hydrologic system. Historically, selenium from soils in the Santa Ana Mountains flowed down through the San Diego Creek drainage basin and into the historic Swamp of the Frogs near the present confluence of San Diego Creek and Peters Canyon Channel. There, it accumulated in the sediments over thousands of years. The selenium remained insoluble while bound up in the anoxic marsh sediments but, when the Irvine Ranch dug channels to drain the swamp, oxidation processes turned the insoluble forms into soluble forms, which then leached into the groundwater. Because of the shallow water table and further channel deepening, it is seeping into the channels and is being carried into Upper Newport Bay, where it is toxic to wildlife, especially birds.

Table 3.14 Summary of 2003 Concentrations in San Diego Creek at Campus Drive (Reach 1)

	Total Nitrogen (mg/l)			Total Phosphorus as PO4 (mg/l)			Total Suspended Solids (mg/l)		
	YEAR	DRY WEATHER	WET WEATHER	YEAR	DRY WEATHER	WET WEATHER	YEAR	DRY WEATHER	WET WEATHER
Number of Samples	44	38	6	44	38	6	44	38	6
Mean	6.51	6.4	7	0.79	0.6	2.2	89	65.2	237
Maximum	12.14	12.1	10	3.98	1.8	4	670	200	670
Minimum	2.79	2.8	4.7	0.25	0.2	0.3	10	10	34

Source: Report of the Regional Monitoring Program for the Newport/San Diego Creek Watershed Nutrient TMDL, November 2003.

Table 3.15 Summary of Total Inorganic Nitrogen, 1990-1997 (San Diego Creek at Campus)

	October-March	April-September
Average	14.1 mg/L TIN	14.8 mg/L TIN
Standard Deviation	6.1	3.8
Median	16.0 mg/L TIN	14.0 mg/L TIN
Number of Samples	105	71

Source: EPA 1998.

Table 3.16 Santa Ana Basin Water Quality Objectives

	Water Quality Objectives, mg/L							
Surface Water Body	TDS	Hard.	Na	Cl	TIN	NO3-N	SO4	COD
San Diego Creek – Reach 1	1,500	-	-	-	13	-	-	90
San Diego Creek – Reach 2	720	-	-	-	5	-	-	-
Tributaries to San Diego Creek	-	-	-	-	-	-	-	-

LEGEND

Na = sodium

Cl = chloride

TIN = total inorganic nitrogen

NO_3-N = nitrate-nitrogen

SO_4 = sulfate

COD = chemical oxygen demand

TDS = total dissolved solids

Hard. = hardness

A recent set of studies by Dr. Barry Hibbs of California State University, Los Angeles (2004-2007) suggests that nitrates from synthetic fertilizers remaining in the soil and groundwater from surrounding historic orchards also play a role in oxidizing the selenium to more soluble forms. In addition, the presence of certain types of selenium-laden clays may be a factor. More testing of soils and groundwater needs to be done to determine the precise mechanisms for much of this. The Nitrogen and Selenium Management Program is addressing this problem through testing and experimental BMPs, including the Cienega selenium removal project (Selenium update workshop, March 10, 2008).

In November 2006, the Santa Ana RWQCB presented a staff report for TMDLs for organochlorine pesticides and PCBs. The RWQCB TMDLs report summarizes the information presented in the EPA TMDL and presents some new information and modifications to reflect the 2006 proposed 303(d) list and revised loading information.

The Lower Newport Bay has additional water quality issues associated with metals used in boat paints. Rhine Channel, located in the western end of Lower Newport Bay, has been surrounded by industrial uses, such as canneries, metal plating companies, and shipyards, since the 1920s (Anchor Environmental 2006). It is a dead-end channel where toxic pollutants have accumulated in the sediment.

Table 3.17, Toxic Pollutant TMDLs and Newport Bay/San Diego Creek Concentrations, shows the TMDLs and the concentrations of pesticides and metals contained in samples collected from San Diego Creek, Upper and Lower Newport Bay, and the Rhine Channel.

Groundwater

The Orange County Groundwater Basin is currently recharged by streambed percolation, recycling programs, and imported water purchases. OCWD monitors the quality of the groundwater basin extensively, testing for over 190 constituents, including nitrate, salts, selenium, trichloroethylene, volatile organic compounds, and radon to ensure potable quality. OCWD and OCSD are also implementing the new Groundwater Replenishment System, online in 2007, which takes highly treated wastewater from the OCSD Water Reclamation Plant and purifies it using micro-filtration, reverse osmosis, ultraviolet light and hydrogen peroxide before percolating it into the basin. Water produced by this system exceeds all state and federal drinking water standards and is so pure it is expected that it will actually help to reduce the growing mineral content in the basin.(OCWD 2005).

OCWD's Green Acres Project (GAP) is a water recycling effort that provides reclaimed water for landscape irrigation at parks, schools and golf courses as well as for industrial uses, such as carpet dying. The GAP has the capacity to purify 7.5 million gallons per day of reclaimed water from the Orange County Sanitation District. The use of reclaimed water allows an equivalent amount of groundwater to be saved for household uses (www.ocwd.com).

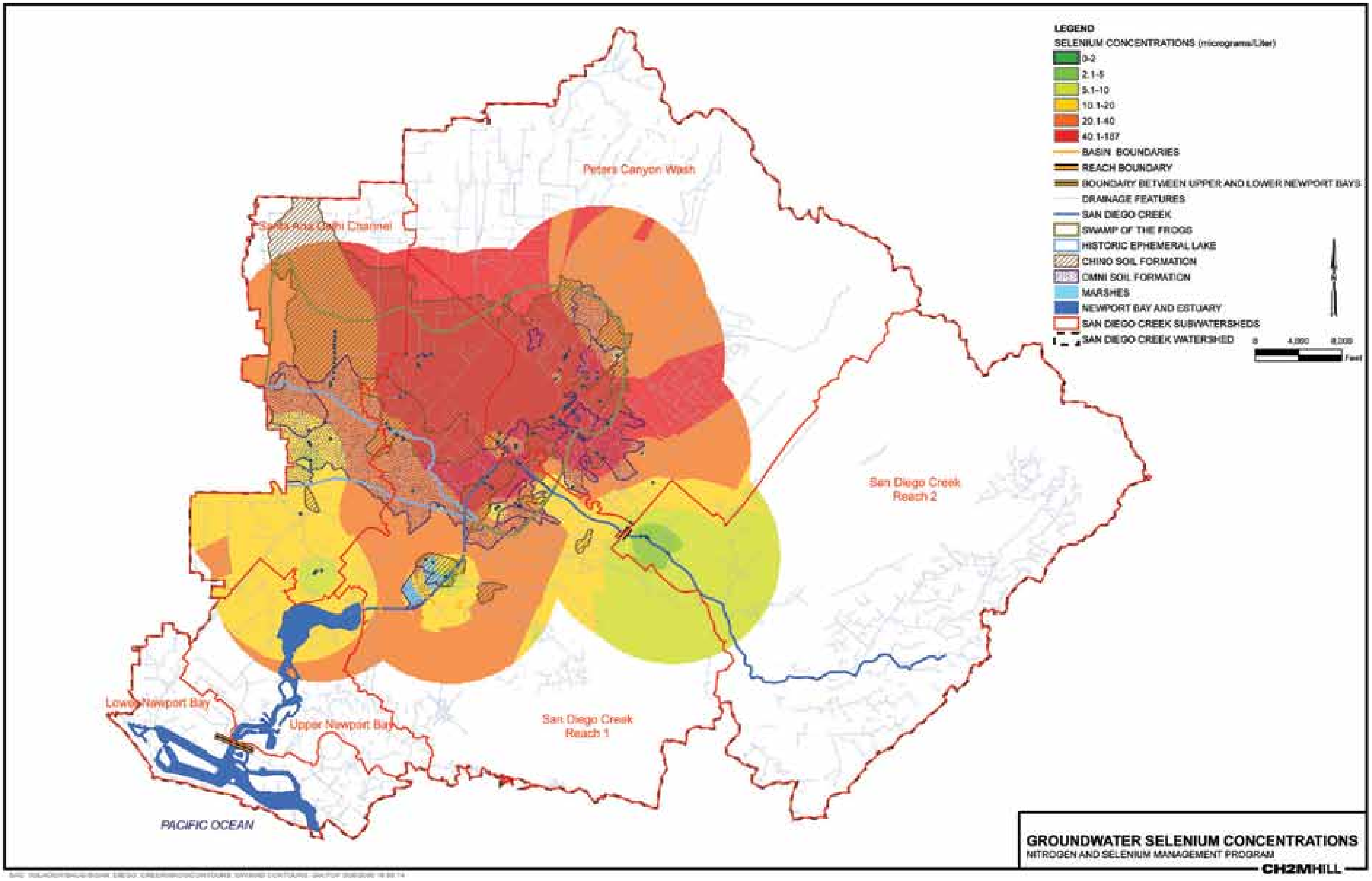


Figure 3.21 Selenium Concentrations in Groundwater (OC Nitrogen and Selenium Management Program).

Table 3.17 Toxic Pollutant TMDL Concentrations

				Criteria		2002 Concentrations			
Pollutant	Type Of Compound	Location	Criterion	Freshwater (ug/l)	Saltwater (ug/l)	San Diego Creek (ug/l)	Upper Newport Bay (ug/l)	Lower Newport Bay (ug/l)	Rhine Channel (ug/l)
Diazinon	Organophosphate Pesticide	San Diego Creek	Chronic	0.05		0.2	0.202		
			Acute	0.08					
Chlorphyrifos	Organophosphate Pesticide	San Diego Creek	Chronic	0.014	0.009	0.111	0.0433		
			Acute	0.02	0.02				
Selenium	Metal	San Diego Creek	Chronic	5		22.1			
			Acute	20	71 (dissolved)				
Cadmium	Metal	San Diego	Acute	8.9 to 19.1 for large flows to baseflows	42	0.13-0.27	0.095-0.22	-	-
		Creek	Chronic	4.2 to 6.2 for medium flows to baseflows	9.3				
Copper	Metal	San Diego Creek	Acute	25.5 to 50 for large flows to baseflows	4.8	2.4-5.5	3.4-29.0	8.2-26.3	-
			Chronic	18.7 to 29.3 for medium flows to baseflows	3.1				
Lead	Metal	San Diego Creek	Acute	134 to 281 for large flows to baseflows	210	0.05-0.35	0.023-0.96	0.03-0.89	-
			Chronic	6.3 to 10.9 for medium flows to baseflows	8.1				
Zinc	Metal	San Diego Creek	Acute	208 to 379 for large flows to baseflows	90	2.6-23.1	10-100	2.5-11.5	-
			Chronic	244 to 382 for medium flows to baseflows	81				
PCBs	Organochlorine Pesticides	San Diego Creek	Chronic	0.014		ND			ND

Table 3.17 Toxic Pollutant TMDL Concentrations									
				Criteria		2002 Concetrations			
Pollutant	Type Of Compound	Location	Criterion	Freshwater (ug/l)	Saltwater (ug/l)	San Diego Creek (ug/l)	Upper Newport Bay (ug/l)	Lower Newport Bay (ug/l)	Rhine Channel (ug/l)
DDT	Organochlorine Pesticides	San Diego Creek	Acute Chronic	1.1 0.001		ND		ND	
Chlordane	Organochlorine Pesticides	San Diego Creek	Acute Chronic	2.4 0.0043		ND			ND
Dieldrin	Organochlorine Pesticides	San Diego Creek	Acute Chronic	0.24 0.056		ND			ND
Toxaphene	Organochlorine Pesticide	San Diego Creek	Acute Chronic	0.73 0.0002		ND			ND

Source: EPA 2002;metal data from Newport Bay Toxics TMDL Part E.
LEGEND
NA – not analyzed ND – not detected DNQ – detected but not quantified

Individual water districts, such as IRWD, also test their domestic groundwater sources. IRWD, which serves the majority of the planning area, obtains domestic groundwater from three sources: the Irvine Subbasin, which is located within the Orange County Groundwater Basin, the Main Basin underlying northern Orange County and Lake Forest, which does not overlie the Orange County Groundwater Basin. The Irvine Subbasin is mainly used for non-potable water, as the groundwater is high in TDS, nitrates, and has color. Additionally, the groundwater obtained from the six Lake Forest wells within the former Los Alisos Water District service area has poor quality and is used as non-potable water to supplement IRWD's recycled water production. Water quality for groundwater from these two areas is presented in Table 3.18, Select Groundwater Concentrations in 2005.

As shown in Table 3.18 and Table 3.25, color is a water quality issue faced in portions of the Groundwater Basin, including Costa Mesa. Colored water is generally a problem in the deeper aquifer.

High total dissolved salts (TDS) in portions of the Irvine Subbasin are a water quality issue. High TDS in other areas of the groundwater basin are due to seawater intrusion.

Selenium is an issue in shallow groundwater in parts of the study area. High selenium concentrations are mainly found in the Peters Canyon Wash subwatershed and in the vicinity of the former MCAS–Tustin. Selenium concentrations in the main subbasins of the San Diego Creek Watershed from 1999-2005 are presented in Table 3.19, Selenium Concentrations in Groundwater Sources.

Table 3.18 Select Groundwater Concentrations in 2005

Analyte	Dyer Road Well Field (Irvine Subbasin) Concentration Range	Dyer Road Well Field (Irvine Subbasin) Average Concentration	Lake Forest Wells Concentration Range	Lake Forest Wells Average Concentration	Concentration Limit (MCL)
Nitrate and Nitrite as Nitrogen	ND-1.9 mg/l	<0.4 mg/l	ND-1.3 mg/l	0.6 mg/l	10 mg/l
Nitrate as Nitrate	ND-8.2 mg/l	<2 mg/l	ND-5.7 mg/l	2.6 mg/l	45 mg/l
Arsenic	ND-9.0 ug/l	<2 ug/l	3.3-5.7 ug/l	4.3 ug/l	0.004 ug/l
PCE	ND-0.9 ug/l	<0.5 ug/l	ND	<5 ug/l	5 ug/l
Color	ND-500	41	5-10	8	15
Iron	ND-172 ug/l	<100 ug/l	170-490 ug/l	300 ug/l	300 mg/l
Manganese	ND-22 ug/l	<20 ug/l	ND-75 ug/l	44 ug/l	50 ug/l
TDS	208-394 mg/l	263 mg/l	450-850 mg/l	670 mg/l	1,000 mg/l
Perchlorate	ND-6.1 ug/l	<4 ug/l	ND	<4 mg/l	N/A

Source: IRWD 2006 Water Quality Annual Report, Dyer Road Wellfield Data.

OCWD and local water districts have implemented water quality projects to treat the groundwater. These projects include the Irvine Desalter Project to remove nitrates, TDS, and volatile organic compounds (VOCs); the Tustin Desalter and Nitrate Projects to remove TDS, perchlorates and nitrates; the IRWD Deep Aquifer Treatment to remove color and organics; and the Mesa Consolidated Water District (MCWD) colored water program.

The Irvine Desalter Project focuses on groundwater in central Irvine, specifically in the vicinity of the former MCAS–El Toro facility. In addition to high TDS and nitrate concentrations, groundwater in this area was found to contain VOCs due to former use and disposal of solvents related to aerospace use. A one by three mile plume of VOC contamination extends southwestward from the former MCAS–El Toro. The contamination is about 150 feet deep beneath the base and 300-1,000 feet deep in the community area and is slowly moving toward the main Orange County underground water basin. The Irvine Desalter Project is a joint groundwater quality restoration project by IRWD and OCWD, with financial participation by the U.S. Navy, the Metropolitan Water District of Southern California (MWD) and the State of California. The

Table 3.19 Selenium Concentrations in Groundwater Sources

Sub-watershed	Range of Selenium Concentrations (ug/l)	Concentration Limits (ug/l)
San Diego Creek, Reach 1	3.15-187	2-5
San Diego Creek, Reach 2	1.87-12.8	2-5
Peters Canyon Wash	2.6-270	2-5
Santa Ana-Delhi Channel	7.69-106	2-5

Source: Sources and Loads and Identification of Data Gaps for Selenium – Nitrogen and Selenium Management Program.

cleaned water from the VOC plume is used for irrigation and the desalted water from outside the plume is used for drinking water. The Tustin 17th Street Desalter Project is now removing perchlorates in addition to nitrates and high concentrations of TDS. The Tustin Main Street water treatment plant removes nitrate contaminants from groundwater.

3.5.2.3 Newport Coast Watershed

In recent years, the Newport Coast Watershed, like much of Orange County, has faced watershed problems involving streambed instability, as exhibited by head-cutting and slope failures, the arrival of invasive plant species, and the loss of native wetland and riparian habitat. Seven of the seasonal canyon streams now flow year around due to over-irrigation in the upstream developments. The dry weather flows carry bacteria, fertilizer, and pesticides through the canyon reaches and into the ocean. These problems have become progressively worse and pose a threat to residents, the two ASBSs, Crystal Cove State Park, and the ecological function of the riparian corridors within the watershed. A piecemeal approach to dealing with these problems has been relatively ineffective due to the technical, jurisdictional, and financial hurdles that are best handled simultaneously.

Over the past 40 years, the Orange County Health Care Agency has been testing the coastal waters in Orange County for bacteria. As of 1999, new requirements for frequent testing of surf zone waters and stringent criteria for beach water closures went into effect as part of Assembly Bill 411. Samples from the watershed are collected weekly by the Health Care Agency from ten ocean, bay, and drainage locations (County of Orange 2003). The Irvine Company, IRWD, Surfrider Foundation, and Orange County Coastkeeper have performed limited water quality sampling as well. The results of these sampling programs are currently being reviewed. Monitoring programs are specifically geared toward providing information that can be used to develop programs to protect the two ASBSs (Newport Coast Watershed Program 2004).

In accordance with the Clean Water Act, the Santa Ana Regional Board in 2006 placed Buck Gully Creek and Los Trancos Creek on the draft 303(d) list for total coliform and fecal coliform. The Orange County coastline, which runs along over 5 miles of the Newport Coast Watershed, is also listed on the draft 303(d) list for trash.

A confluence of separate investigations and projects is being carried out in the Newport Coast Watershed by the City of Newport Beach, the Irvine Company, the County of Orange, IRWD, Orange County Coastkeeper, and the Surfrider Foundation. In order to address the destabilization and degradation of the watershed's coastal canyons in a systematic and effective manner, the City of Newport Beach is developing a watershed program for the Newport Coast community as an organizing tool for future activities in the watershed. As part of this program, a monitoring program will specify biological indicators and metrics to assess and monitor ecosystem health relative to watershed function. Examples of applicable indicators include biomass of native riparian wetland vegetation, habitat use by declining or sensitive species, attached fresh-water algae, aquatic macro-invertebrate diversity and distribution, and the health and diversity of intertidal and subtidal communities in the marine life refuges. Additional indicators will be selected in consultation with the Santa Ana RWQCB and the County of Orange. In addition, the watershed program will include a program for mapping the areas of invasive giant reed, *Arundo donax*, and instituting a removal program.

Six objectives have been put forth by the Newport Coast Watershed Program (Newport Coast Watershed Program 2004), several of which are already being implemented:

1) Complete the technical studies and prepare the watershed assessment report for the watershed management area (completed);
2) Implement a monitoring program for baseline data and ongoing monitoring to track changes in the watershed (in process);
3) Prepare a Watershed Management Plan that provides specific restoration recommendations for each of the coastal streams, with attendant ecological benefits for the intertidal and subtidal communities in the ASBSs (completed).
4) Implement specific stabilization and restoration projects in Buck Gully and Morning Canyon within the framework of the Watershed Management Plan;
5) Provide educational opportunities for city staff, community members, and stakeholders in watershed science and management skills and enlist community support in monitoring and restoring the health of the watersheds and marine life refuges (in process); and
6) Expand the scope of the watershed management program, including researching funding opportunities for subsequent restoration projects as outlined by the Watershed Management Plan.

Major efforts being conducted within the watershed to reduce non-point source releases and improve water quality as identified in the June 2006 State of the CCAs Report for Upper Newport Bay include:

1) **WORKING AT THE WATERSHED LEVEL SCIENCE & STEWARDSHIP PROGRAM & EARTH RESOURCES FOUNDATION HIGH SCHOOL CLUBS**: These include teaching modules on understanding the importance of a healthy watershed, urban refuse collection, data collection, source identification, and bioassessment. The program enhances teachers' opportunities to involve students in science (www.earthresource.org).
2) **NEWPORT COAST WATERSHED PROGRAM, ASSESSMENT, MANAGEMENT AND RESTORATION:** Objectives are to complete watershed assessments (survey, hydrologic/hydraulic, biological/ecological, water quality, and sedimentation), prepare restoration recommendations, and

implement stabilization and restoration projects (www.city.newportbeach.ca.us/Pubworks/pwmain.htm).

3) **ORANGE COUNTY COASTKEEPER**

Their mission is to protect and preserve Orange County's marine habitats and watersheds through education, advocacy, restoration, and enforcement (www.coastkeeper.org).

Streamflow and surface water quality data are lacking due to limited dry weather flows in the past. A program has been developed by the City of Newport Beach to monitor dry weather flows and water quality in Buck Gully (City of Newport Beach 2007). Additionally, a program is being developed by the City of Newport Beach to evaluate pollutant loads in the drainages in the Newport Coast Watershed.

Groundwater

While a groundwater basin has not been identified in the Santa Ana RWQCB Basin Plan for the Newport Coast Watershed, groundwater is present in the watershed (City of Newport Beach 2007). According to the City of Newport Beach, groundwater seepage occurs in Buck Gully and Crystal Cove State Park, located at the exit of Los Trancos Creek at the Pacific Ocean. A pumping experiment in Buck Gully in 1999 indicated that groundwater exfiltration adds a significant amount of water to dry-weather flows in the canyon. A groundwater seepage study is now underway to identify sources, quantities, and quality.

3.5.2.4 Regional Water Quality Projects

Major efforts being conducted within the Region to reduce non-point source releases and improve water quality, as identified in the June 2006 State of the CCAs Report for Upper Newport Bay, are listed in Table 3.20, Water Quality Projects Defined in the State of the CCAs Report.

Natural Treatment Systems

The Irvine Ranch Water District has plans to treat dry-weather surface flow throughout the Region using a Natural Treatment System. This is a constructed wetland technology that uses natural processes to filter dry weather runoff. Because plants and soil are used to metabolize and sequester contaminants in these systems, they may not be well suited as habitat for wildlife populations. However, they do improve water quality for downstream habitats and are a strategic tool for enabling healthy natural habitat elsewhere in the system.

Table 3.20 Water Quality Projects Defined in the State of the CCAs Report

1	Serrano Creek Stabilization and Restoration Project	Restore about 1.2 miles of Serrano Creek in the City of Lake Forest through installation of several creek stabilization features coupled with riparian restoration; designed to balance flood management, habitat, and recreation objectives. **www.willdan.com/Services_Flood.asp?ProjectID=41**
2	Newport Bay/San Diego Creek Watershed Management Plan	Framework for how to achieve effective watershed management, leading to a sustainable urban environment; includes wetland protection, education, water conservation, regulation, ad stormwater management, economics. **www.ocwatersheds.com/watersheds/pdfs/Newport_Bay_Watershed_Plan_04-12-15.pdf**
3	Special Area Management Plan for San Diego Creek Watershed	Plan will describe an approach and set of actions to preserve, enhance, and restore aquatic resources, while allowing reasonable economic development and construction and maintenance of public infrastructure facilities. **www.spl.usace.army.mil/samp/sandiegocreeksamp.htm**
4	Selenium Removal Pilot Project	Tested an anoxic biofiltration process using laboratory cylinders and “mesocosms” to remove selenium from surface water in San Diego Creek; now constructing a full-scale in situ version to treat water from Peters Canyon Wash. **www.irwd.com**
5	Upper Newport Bay Ecosystem Restoration Project	The project will deepen two sediment basins in the upper bay; includes an ongoing maintenance-dredging program and enhancements to several existing wetlands and tidal channels and the creation of a least tern nesting island. **www.spl.usace.army.mil/newportbay/uppernewportbay.htm**
6	Newport Bay Naturalists and Friends	Mission is to restore and preserve the native habitat of the bay and surroundings; educate the public about the ecological value of the bay; achieve good water quality, healthy native flora and fauna, and compatible public use. **www.newportbay.org**
7	Orange County CoastKeepers	Mission is to protect and preserve Orange County’s marine habitats and watersheds through education, advocacy, restoration, and enforcement. **www.coastkeeper.org**
8	Dry Weather Diversions, Storm Drain Inlet Modifications, and Circulation Study	Clean Beaches Initiative grant study at Newport Bay to divert or treat urban runoff. **www.city.newport-beach.ca.us/Pubworks/pwmain.htm**
9	Divert Urban Runoff at Newport Bay Beaches and Newport Beach and Ocean Beach	Grant for storm drain to sewer diversions. **www.city.newport-beach.ca.us/Pubworks/pwmain.htm**
10	Working At the Watershed Level Science & Stewardship Program & ERF High School Clubs	Modules on understanding importance of a healthy watershed, urban refuse collection, data collection, source identification, and bioassessment. Program enhances the teachers’ opportunity to involve students in science. **earthresource.org**
11	Big Canyon Creek Restoration Project	Improving the water quality of Big Canyon Creek as it enters Upper Newport Bay; remove exotic species and replace with native, non-invasive species; create effective riparian, wetlands, coastal sage scrub, and other habitat. **www.city.newport-beach.ca.us/Pubworks/pwmain.htm**
12	Newport Bay Fecal Coliform Source Identification and Management Plan	Activities to determine extent that urban and natural sources of fecal coliform contribute to bacterial quality problems throughout the bay; and development of a source management plan to address source inputs. **www.ocwatersheds.com**

Table 3.20 Water Quality Projects Defined in the State of the CCAs Report

13	Newport Bay Nutrient Total Maximum Daily Load (TMDL) Dissolved Oxygen and Algae Distribution Study	Two investigations of the Newport Bay Nutrient TMDL Regional Monitoring Program: (1) monitor dissolved oxygen levels continuously; and (2) collect remote sensing data of bay to document extent of algae growth. **www.ocwatersheds.com**
14	Assessment of Food Web Transfer of Organochlorine Compounds and Metals in Fishes Newport Bay, California	Identify fish species that could be used as surrogates for assessing ambient water quality relative to wildlife protection and human health concerns; examine food-web interactions of DDTs, PCBs, and trace metals in fish. **www.sccwrp.org**
15	Storm Drain Inlet Modifications and Implement Circulation Measures	Source abatement at Newport Bay. **www.city.newport-beach.ca.us/Pubworks/pwmain.htm**

3.5.3 Water Supply

Central Orange County's water supplies include groundwater, desalted groundwater, surface water, recycled water, and imported water. This water is used for both ecological and urban purposes. The water supply agencies in the Region obtain roughly two-thirds of their supplies from local groundwater and one-third from imported water (Orange County Phase 1, 2007). Imported sources come from the Metropolitan Water District (MWD), which imports water into Southern California from the Colorado River via the Los Angeles Aqueduct, and from Northern California via the State Water Project. Imported water is purchased wholesale from MWD by the Municipal Water District of Orange County (MWDOC) and separately by the City of Santa Ana, who is not a member of MWDOC. MWDOC then sells the water to its member water retail agencies, who then sell it to the individual water users (See Figure 3.24, Orange County Water Supply Agencies).

The water agencies in Central Orange County that manage and use this infrastructure include:

1) **MUNICIPAL WATER DISTRICT OF ORANGE COUNTY**

IRCWM Implementation Authority: water resource planning; water conservation. The Municipal Water District of Orange County (MWDOC) is a member agency of MWD and purchases imported water from the State Water Project and the Colorado River Aqueduct for the benefit of MWDOC member agencies. MWDOC's current services include: representation at MWD, water use efficiency programs, emergency preparedness, reliability studies, project development, water awareness/public information school programs, and legislative advocacy.

2) **ORANGE COUNTY WATER DISTRICT**

IRCWM Implementation Authority: water resource planning; groundwater management. The OCWD is an independent special district formed by an act of the State Legislature to protect Orange County's water rights to the Santa Ana River and to manage the groundwater basin that underlies northern and central Orange County. OCWD holds rights to up to 362,000 acre-feet per year of all Santa Ana River flows that reach Prado Dam. The District recharges the Orange County

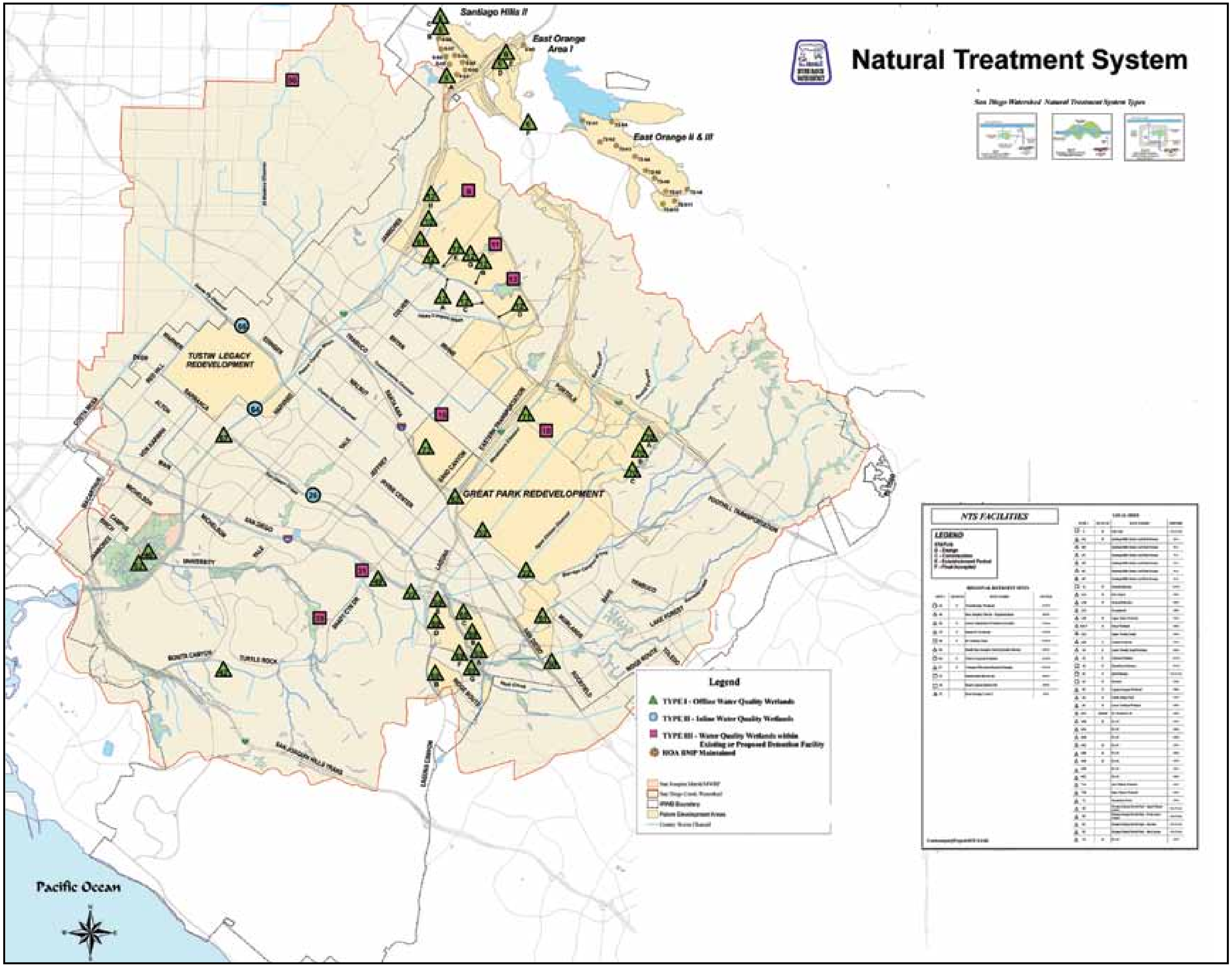


Figure 3.22 Proposed Natural Treatment System locations. Source: IRWD

NTS REGIONAL RETROFIT SITES

SITE #	STATUS	SITE NAMES	OWNER
● 26	C	Woodbridge Wetland	OCFCD
▲ 46		San Joaquin Marsh Augmentation	IRWD
▲ 53	C	Lower Marshburn Wetland (on hold)	Caltrans
▲ 55	C	Santa Fe Wetlands	OCFCD
■ 56	C	El Modena Park	OCFCD
■ 62		South San Joaquin Marsh (South Marsh)	IRWD
● 64	C	Peters Canyon Wetland	OCFCD
▲ 67	C	Cienega Filtration Project	OCFCD
■ 13		Rattlesnake Reservoir	IRWD
■ 39		Sand Canyon Reservoir	IRWD
▲ 72		East Orange 2 and 3	HOA

NTS LOCAL SITES

SITE #	STATUS	SITE NAMES	OWNER
■ 9	D	East Foot	City of Irvine
▲ 6A	D	Santiago Hills Basins & East Orange	HOA
▲ 6B		Santiago Hills Basins & East Orange	HOA
▲ 6C		Santiago Hills Basins & East Orange	HOA
▲ 6D		Santiago Hills Basins & East Orange	HOA
▲ 6E		Santiago Hills Basins & East Orange	HOA
▲ 6F		Santiago Hills Basins & East Orange	HOA
■ 11	D	Orchard Springs	OCFCD
▲ 12A	E	Port Culver	IRWD
▲ 12B	E	Orchard Meadow	IRWD
▲ 12C		No name yet	IRWD
▲ 12D	D	Upper Hicks Wetland	IRWD
▲ 12E/F	E	Forge Wetland	IRWD
▲ 12G		Upper Woody Knoll	IRWD

NTS LOCAL SITES

▲ 12H	C	Chelsie Wetlands	IRWD
▲ 10	C	Lower Woody Knoll Wetland	IRWD
▲ 16	C	Trabuco Wetland	OCFCD
■ 18	C	Marshburn Meadow	OCFCD
■ 31	F	Quail Springs	City of Irvine
■ 49	F	Meadow	IRWD
▲ 32	F	Laguna Canyon Wetland	IRWD
▲ 42	F	Turtle Ridge Pond	IRWD
▲ 61	E	Lower Eastfoot Wetland	IRWD
▲ 68A	deleted	PA 18 & PA 39	IRWD
▲ 68B	D	PA 18	IRWD
▲ 69A		PA 39	IRWD
▲ 69B		PA 39	IRWD
▲ 69C	D	PA 39	IRWD
▲ 69D	D	PA 18	IRWD
▲ 69E	D	PA 18	IRWD
▲ 69F		PA 18	IRWD
▲ 69G		PA 18	IRWD
▲ 70A		Alta Chinon Wetland	IRWD
▲ 70B		Baja Chinon Wetland	IRWD
▲ 71		Marshburn West	IRWD
▲ 22		Orange County Great Park — Agua Chinon Lower	City of Irvine
▲ 50		Orange County Great Park — Irvine Auto Center	City of Irvine
▲ 51		Orange County Great Park — Serrano	City of Irvine
▲ 52		Orange County Great Park — Bee Canyon	City of Irvine
▲ 73	D	PA 40	IRWD

LEGEND – STATUS

D—Design E—Establishment period C—Construction period F—Final groundwater basin primarily with water from the Santa Ana River, supplemented by untreated imported water purchased from MWD. The percolation ponds are located in northern Orange County, outside of this watershed. The groundwater basin is not adjudicated but is cooperatively managed by OCWD according to the Groundwater Management Plan developed in collaboration with the groundwater producers and adopted by the OCWD Board of Directors in 2004. OCWD, with the Orange County Sanitation District (OCSD), began operation of the Groundwater Replenishment System in 2008 and also operates the Green Acres Project to enhance the supply of recycled water for irrigation and industrial uses.

3) EL TORO WATER DISTRICT

IRCWM Implementation Authority: potable and recycled water service; water conservation; wastewater collection and treatment. The ETWD service area encompasses approximately 8.5 square miles, providing both potable and recycled water to Laguna Woods and parts of Lake Forest, Laguna Hills, Mission Viejo, and Aliso Viejo. ETWD provides water service to approximately 51,000 residents. Its six reservoirs have a combined capacity of 136 million gallons. Additionally, it provides sanitation services through its wastewater treatment plant, supplying recycled water to a portion of its service area.

4) EAST ORANGE COUNTY WATER DISTRICT

IRCWM Implementation Authority: water service; groundwater management; water conservation. The East Orange County Water District operates as a wholesale and retail water supplier. The District's wholesale pipeline distribution system delivers water to four sub-agencies within its boundaries, including the Golden State Water Company, City of Tustin, City of Orange and Irvine Ranch Water District. In addition, the District's Retail Zone is a financially and operationally distinct component of EOCWD. It serves portions of the North Tustin and County of Orange unincorporated areas with 1,192 service connections.

5) GOLDEN STATE WATER COMPANY

IRCWM Implementation Authority: water service; groundwater management; water conservation. The Golden State Water Company is a public utility company operating under the authority of the California Public Utilities Commission. It provides retail water service in Cowan Heights, an unincorporated area north of Tustin.

6) IRVINE RANCH WATER DISTRICT

IRCWM Implementation Authority: Land use; potable and recycled water service; groundwater management; water conservation; wastewater collection and treatment; habitat protection and restoration; water quality. The IRWD provides potable and non-potable water service; wastewater collection, treatment, and disposal; and wastewater reclamation. IRWD serves all of the City of Irvine and portions of the surrounding Cities of Tustin, Santa Ana, Orange, Costa Mesa, Lake Forest, Newport Beach, and unincorporated areas of the County of Orange. IRWD operates the Michelson Water Reclamation Plant (MWRP), a major regional facility providing recycled water throughout the District's service area. Currently, IRWD serves a

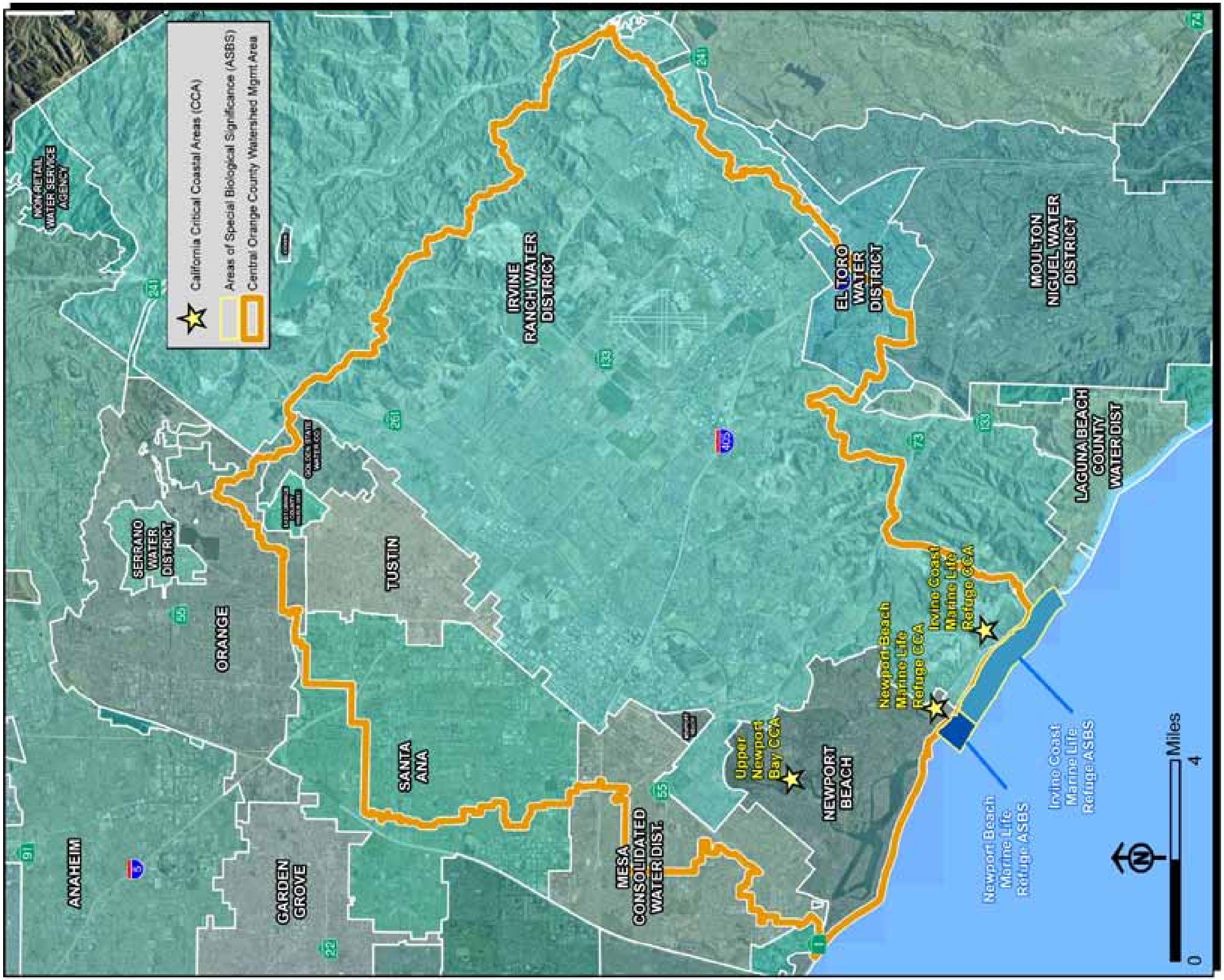


Figure 3.23 Water Agencies in IRCWMP Region.

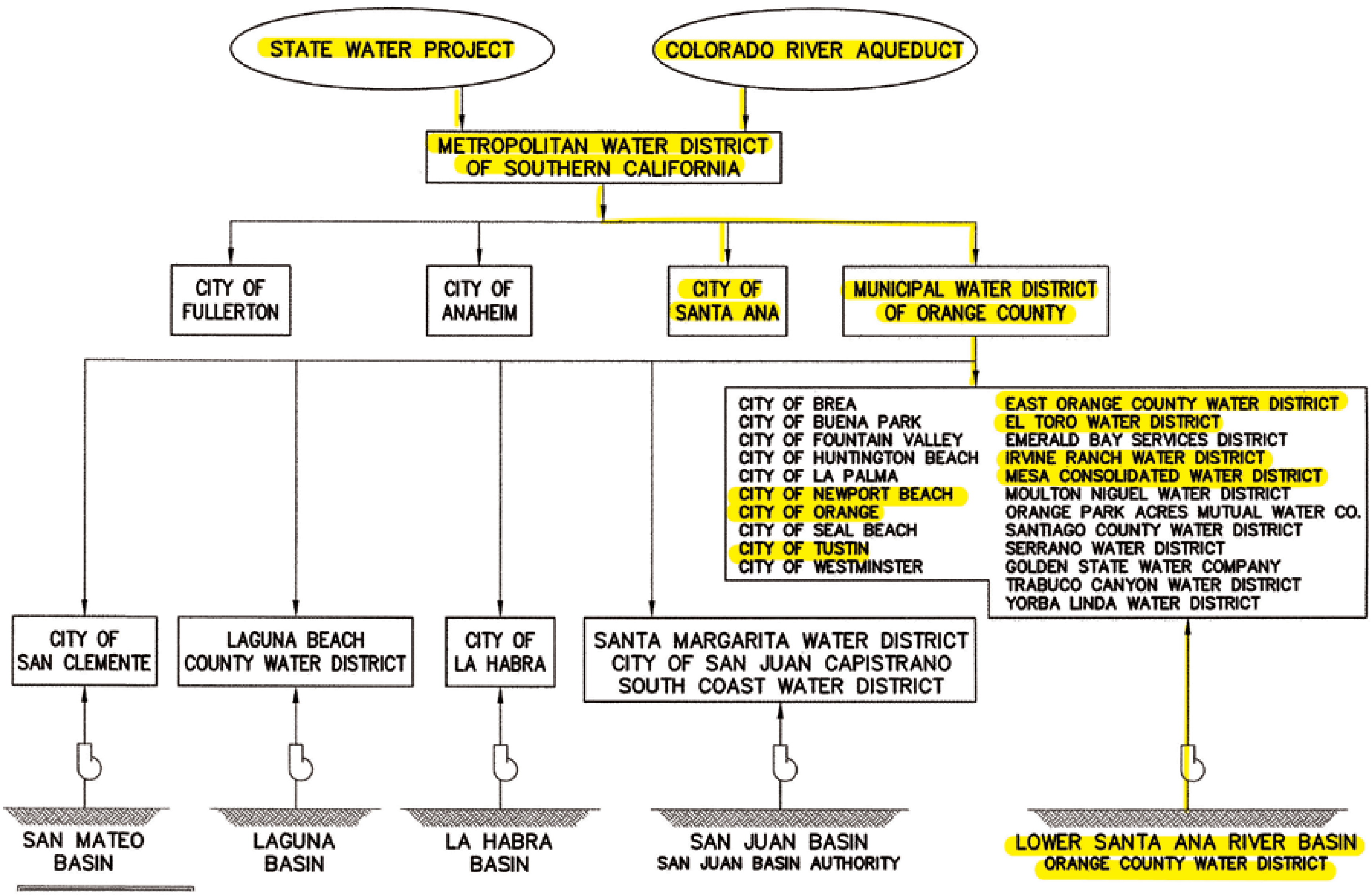


Figure 3.24 Orange County water supply agencies, not including recycled water, non-potable groundwater for irrigation or the Groundwater Replenishment System. Yellow highlights indicate Newport Bay / San Diego Creek watershed sources and agencies. Source: Orange County LAFCo

133-square-mile area with an estimated population of 316,000. In 2001, the California Legislature passed Assembly Bill 810, adding the diversion and treatment of urban runoff to the list of services that the District may provide. This gave the District authority to construct and operate a set of Natural Treatment Systems throughout its service area (See Figure 3.22).

7) **MESA CONSOLIDATED WATER DISTRICT**

IRCWM Implementation Authority: water service; groundwater management; water conservation. The MCWD services an 18-square-mile area with a population of approximately 112,000. The District's service area includes the City of Costa Mesa, portions of the City of Newport Beach, and a small portion of unincorporated Santa Ana Heights.

3.5.3.1 Balancing Water Supply and Demand

The 2005 MWDOC Urban Water Management Plan summarizes the total increases in demand expected by 2030 for the member agency service area. It states that demand is expected to increase from approximately 504,000 acre-feet in 2005 to approximately 614,000 acre-feet in 2030, an increase of 21.9 percent. Additionally, about 50 percent of the current direct water use in the MWDOC service area (including northern Orange County) is supplied with imported water. Over the next 25 years, increased demand will require significant investment in developing the local water resources and recycled water infrastructure, including comprehensive water use efficiency programs to reduce per capita demand.

Table 3.21, Retail Agency Water Sources, summarizes reported water sources by water providers within the Central Orange County Region for fiscal year 2005. Groundwater is the primary source of water supply for the Region. This is expected to continue, with the percentages shifting even more toward groundwater and recycled water as agencies seek to decrease their dependence on imported water supplies. Expanding the Groundwater Replenishment System will increase groundwater supplies with treated wastewater. Surface water is currently not used for water supply, but this will also change over time.

Table 3.21 Retail Agency Water Sources Fiscal Year 2005

Agency	Imported	Ground-water	Recycled Surface[1]	Non-potable
El Toro Water District	95%			5%
Mesa Consolidated WD	52%	44%		4%
East Orange County WD, Retail	37%	63%		
Golden State Water Company	36%	64%		
Newport Beach, City of	33%	67%		
Santa Ana, City of*	33%	67%		
Orange, City of	32%	66%	2%	
Irvine Ranch Water District	21%	41%	8%	30%
Tustin, City of	16%	84%		

Source: Orange County Water Agencies Water Rates Study (2005).
[1]Surface water supplies are obtained from Irvine Lake, which is outside the San Diego Creek watershed boundary.

Table 3.22 Central Orange County Water Demand Projections

	Water Demand Projections (acre-feet per year)					
Water Agency	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
East Orange County Water District (Retail only)	1,026	1,110	1,130	1,140	1,150	1,170
El Toro WD	11,536	11,559	11,728	11,898	12,068	12,220
Irvine Ranch Water District	86,602	116,710	123,119	130,063	135,208	136,560
Mesa Consolidated Water District	21,849	21,982	22,083	22,193	22,303	22,401
City of Newport Beach	18,648	19,791	21,555	21,640	21,716	21,716
City of Orange	35,081	36,588	37,244	37,244	37,244	37,244
City of Santa Ana	44,944	52,700	55,840	58,770	62,240	62,520
Golden State Water Company	30,214	31,431	32,371	33,367	32,920	33,101
Total	249,900	291,871	305,070	316,315	324,849	326,932

Source: 2005 UWMPs for Agencies and MWDOC.
Note: Some service areas extend beyond the Central Orange County IRCWM region; estimates include water demand for the agency's entire service area.

Water demand and supply projections for the water agencies within the Central Orange County IRCWM Region are shown in Table 3.22, Central Orange County Water Demand Projections, and Table 3.23, Central Orange County Water Supply Projections.

3.5.3.2 Imported Sources

Approximately 50 percent of Central Orange County's current potable water needs are met by imported water from MWD, delivered through the State Water Project and Colorado River Aqueduct. The majority of this water is supplied through the MWD Diemer Filtration Plant. Typically, the Diemer Filtration Plant receives a blend of Colorado River water from Lake Matthews through the MWD lower feeder and State Water Project water through the Yorba Linda feeder. The two major transmission pipelines that deliver water to the service areas are the Allen-McColloch Pipeline (AMP) and East Orange County Feeder No. 2 (EOCF #2). In addition to the Diemer Plant, imported water is also sent through the Orange County Feeder to the Weymouth Filtration Plant. The agencies understand the critical condition of water supplies throughout the state and the western United States and are actively working to enhance local water supplies and decrease reliance on imported supply.

Untreated water is also supplied by MWD. Untreated imported water and local runoff are delivered via the Irvine Lake Pipeline. Within the Region, untreated imported water is used primarily to meet agricultural demands and supplement landscape irrigation

Table 3.23 Central Orange County Water Supply Projections

Water Agency	Water Supply Projections (AFY) 2005	2010	2015	2020	2025	2030
BY AGENCY						
East Orange County Water District	383.8	290	300	300	300	310
El Toro WD	11,446	11,559	11,728	11,898	12,068	12,220
Irvine Ranch Water District	86,602	116,710	123,119	130,063	135,208	136,560
Mesa Consolidated Water District	21,848	21,982	22,083	22,193	22,303	22,401
City of Newport Beach	18,648	19,792	21,556	21,640	21,716	21,716
City of Orange	77,354	91,421	91,421	91,420	91,420	91,421
City of Santa Ana	48,722	54,810	57,410	61,560	63,800	62,750
City of Tustin	11,450	12,870	12,850	12,890	12,850	12,810
Golden State Water Company	3,287	3,281	3,302	3,327	3,352	3,375
Total	279,740.8	332,715	343,769	355,291	363,017	363,563
BY SUPPLY TYPE						
Imported Water	95,953.8	100,066	107,402	114,079	115,764	115,519
Treated Groundwater Production	66,290	67,030	69,120	71,070	73,390	73,570
Clear Groundwater Production	9,598	31,208	33,286	35,526	37,679	37,973
Recycled Water	17,193	28,603	28,534	30,413	31,696	31,988
Orange County Groundwater Basin	42,097	56,238	56,238	56,238	56,238	56,238
Surface Diversions - SWD	1,000	1,000	1,000	1,000	1,000	1,000
Purchased MWD untreated	5,304	6,303	4,556	3,434	3,225	3,225
Native (surface water)	7,251	4,000	4,000	4,000	4,000	4,000
Non-potable Groundwater	2,285	3,898	3,898	3,898	3,898	3,898
Supplier produced (with CWTF)	19,281	19,298	19,312	19,328	19,585	19,617
OCWD (Lower Santa Ana Basin)	11,927	13,590	14,921	14,778	14,990	14,960
Water Supplies from EOCWD	1,561	1,481	1,502	1,527	1,552	1,575
Total	279,740.8	332,715	343,769	355,291	363,017	363,563

Source: 2005 UWMPs for Agencies and MWDOC

Note: Some service areas extend beyond the Central Orange County IRCWM region; estimates include water demand for the agency's entire service area demands. Agricultural demands within Irvine Ranch Water District are expected to decline in future years as development occurs. Landscape irrigation demands will be partially met with an increased supply of recycled water. The Irvine Lake Pipeline conveys untreated MWD water and local runoff from Irvine Lake to the Lambert Reservoir (owned by The Irvine Company). Connections along the Irvine Lake Pipeline serve The Irvine Company irrigation system and the Irvine Ranch Water District's recycled water distribution system. The Baker Aqueduct also delivers MWD untreated water to central and south Orange County. Utilization of the Baker Pipeline has declined due to the use of the Allen-McColloch Pipeline and decline of area agriculture.

As stated in MWD's Regional Urban Water Management Plan and Integrated Resources Plan, MWD's planning efforts have acknowledged the importance of water quality and have set specific targets for imported water. Each of MWD's sources has specific quality issues or concerns, and, to date, MWD has not identified any water quality risk that cannot be mitigated. The only potential effect of water quality on the level of imported water supplies available could be increases in the salinity of water sources. If diminished water quality caused a need for membrane treatment, MWD could experience water losses of up to 15 percent of the water processed. However, MWD would only process a small portion of the affected water and would reduce salinity by blending processed water with the remaining unprocessed water. Thus, MWD anticipates no significant reductions in water supply availability due to water quality concerns (Metropolitan Water District 2005).

3.5.3.3 Local Sources

MWD and MWDOC have developed complementary strategies to incentivize the development of local resources while ensuring the continued delivery of high-quality supplemental imported water. Water remains a valuable resource, and it is imperative that Southern California continues to develop and implement alternative strategies to meet the demands of a growing population. The IRCWM Plan is consistent with the strategies of these regional water agencies, and, like them, it emphasizes a diversification of supplies and a reduced reliance on imported sources where possible.

Agency water use efficiency practices focus on the California Urban Water Conservation Council's 14 Best Management Practices for urban water use efficiency in California (www.cuwcc.org). These include home water surveys, low-flow showerheads and toilet retrofits, metering with commodity rates, landscape irrigation budgets, education, public information, conservation-based rate structures, water waste prohibitions, and industrial process water improvements. These BMPs offer cost-effective opportunities to moderate the amount of imported and local water supplies required by municipal and industrial users. These programs are offered both regionally by MWDOC and locally by individual water agencies.

Groundwater is the primary local water source for potable demand. In some portions of the groundwater basin, maximizing the benefit of this water resource requires treatment for nitrates, selenium, TDS, toxic plumes, perchlorates and colored water. Water recycling already occurs at a significant level in Central Orange County, but efforts can be extended to satisfy additional needs, particularly non-domestic demands for irrigation uses. Local water recycling systems require upgrades and infrastructure expansions to maximize and increase supplies and delivery. Surface water capture and treatment for non-potable supply, groundwater basin recharge, and riparian habitats are also considered a critical aspect of local water needs. Irvine Lake stores and captures local runoff.

Recycled Water

The existing non-potable water system is supplied by three primary sources: recycled wastewater, untreated imported water, and non-potable groundwater. This water comes from different sources, but reaches consumers through the same purple pipes used for non-potable water. Recycled wastewater provides the primary supply to the non-potable distribution system. Most wastewater in the Region is collected and treated by Orange County Sanitation District and the Irvine Ranch Water District. IRWD treats approximately two thirds of its wastewater to Title 22 recycled water standards (IRCWMP, 2007). El Toro Water District and Santa Margarita Water District also treat a small percentage of their wastewater to Title 22 standard for reuse. Sand Canyon Reservoir and Rattlesnake Reservoir store reclaimed water.

OCSD serves a population of approximately 2.5 million people living in a 471 square-mile area encompassing the majority of metropolitan Orange County, with regional treatment plants in Fountain Valley and Huntington Beach. During 2008, an average daily sewage influent flow of 216 million gallons per day (mgd) was treated and an average of 699 wet tons per day of biosolids was produced. (OCSD Biosolids Management Compliance Report, 2008).

The Orange County Water District's Green Acres Project is a recycled water supply project that takes clarified, secondary wastewater effluent from the Sanitation District and further treats it for irrigation and industrial purposes. Most of the water is used for irrigation of golf courses, greenbelts, cemeteries, and nurseries. The project was initiated in 1991 and produces approximately 7,700 acre-feet per year.

IRWD operates the Michelson Water Reclamation Plant and Los Alisos Water Reclamation Plant with a combined treatment capacity of 25.5 mgd. Wastewater is conveyed to the Michelson Plant for treatment and redistribution via a separate "purple piping" system. The nominal, dry weather treatment capacity is 18.0 mgd. In 2001, average influent flow into Michelson Plant was 14 mgd. With expansion, MWRP could treat up to 33 mgd. (IRWD-UWMP). The efficiency of recycled water production has been estimated at 86 percent of the wastewater inflow to the plant. The recycled water is used for irrigation,, landscape lakes and other non-potable uses. The water quality is high enough to earn an "unrestricted use permit",

Table 3.24 IRWD Wastewater Recycled Water Production

	2000	2005	2010	2015	2020	2025	2030
Wastewater Collected by IRWD	16.71	18.64	22.33	23.63	24.91	26.11	26.37
Wastewater Treated to recycled standard by IRWD	14.81	13.97	16.75	17.73	18.68	19.58	19.78
WASTEWATER COLLECTED AND TREATED BY OTHERS							
OCSD	9.5	11.3	12.8	13.6	14.5	14.8	14.9
Santa Margarita WD or El Toro WD	.9	1.1	.5	.5	.5	.5	.5

Source: IRWD Urban Water Management Plan, 2005.

qualifying it for every use except drinking. In 1991, IRWD obtained health department permits for the use of recycled water within interior spaces. Recycled water is now used for toilet flushing in both IRWD offices and in two high-rise office buildings in Irvine, which are dual-piped. Los Alisos Water Reclamation Plant has permitted capacity of 7.5 mgd for secondary treatment and 5.5 mgd for recycled water production.

Approximately 35 percent of all wastewater collected within IRWD's service area does not go to the Michelson or the Los Alisos Reclamation Plants but is currently served by OCSD, Santa Margarita Water District or the El Toro Water District. There are future plans to divert some of these other area flows to IRWD's treatment facilities. Table 3.24 summarizes the current and projected wastewater amounts collected by IRWD and treated to recycled water standards.

Groundwater

The Orange County Water District (OCWD) manages groundwater resources in northern and central Orange County. The groundwater in the Central Orange County Region is a part of the Orange County Groundwater Basin (Main Basin), which encompasses approximately 350 square miles and lies primarily under the Lower Santa Ana River Watershed. It is bounded on the north by the Puente and Chino Hills, on the east by the Santa Ana Mountains, and on the south by the San Joaquin Hills. It is bounded on the southwest by the Pacific Ocean and on the northwest by a low topographic divide that runs approximately along the Orange County–Los Angeles County line.

The Main Basin has three aquifer layers. "The aquifers comprising the Basin extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits" (DWR, 1967). In coastal and central portions of the Basin, these deposits are more separated by extensive lower-permeability clay and silt deposits, known as aquitards.

In the inland area, generally northeast of Interstate 5, the clay and silt deposits become thinner and more discontinuous, allowing larger quantities of groundwater to flow more easily between shallow and deeper aquifers." (GWMP, 2004)

"OCWD's extensive groundwater monitoring well network provides data on the Basin's aquifers to depths of 2,000 feet in many areas of the Basin. The monitoring wells provide detailed, depth-specific water level and water quality data from individual aquifer zones. Data from these wells were used to delineate the depth of the "principal" aquifer system, within which most of the groundwater production occurs. Shallower aquifers exist above the principal aquifer system, the most prolific being known as the Talbert aquifer. With the exception of a few large-system municipal wells in the cities of Garden Grove, Anaheim, and Tustin, wells producing from the shallow aquifer system predominantly have small-system industrial and agricultural uses. Production from the shallow aquifer system is typically about five percent of total Basin production.

The middle, or main, aquifer consists of lower Pleistocene Coyote Hills and San Pedro Formations. The average thickness of the middle aquifer is 1,600 feet and is composed of sand, gravel, and minor amounts of clay. The primary recharge of the middle aquifer occurs through a series of recharge basins receiving flows from the Santa Ana River in the northeast portion of the basin, in the Northern Orange County Watershed Management Area near Anaheim and Yorba Linda (DWR 2004).

"Deeper aquifers exist below the principal aquifer system, but these zones have been found to contain colored water or have been too deep to economically construct production wells. With the exception of four colored water production wells constructed by Mesa Consolidated Water District (MCWD) and IRWD, few wells penetrate the deep aquifer system." (GWMP, 2004) The lower aquifer system consists of the Upper Fernando Group of upper Pliocene age and is composed of sand and conglomerate 350 to 500 feet thick (DWR 2004).

3.5.3.4 Irvine Subbasin

Resolution No. R8-2004-0001 was adopted by the Santa Ana Regional Water Quality Control Board to amend the Water Quality Control Plan and combine the Irvine Forebay I, Irvine Forebay II, and Irvine Pressure groundwater basins into one groundwater management zone called the Irvine Management Zone. In the Orange County Water District Groundwater Management Plan (2004), this area is called the Irvine Subbasin.

The Irvine Subbasin and Main Basin are hydraulically continuous; however, they have separate recharge conditions. The percentage of clay and impermeable silt is much higher in the Irvine Subbasin than in the Main Basin (USGS 2002). The thickness and permeability of the water-bearing alluvium increases substantially from Irvine towards the central portion of the Main Basin. The Irvine Subbasin is bounded by the San Joaquin Hills to the south and the foothills of the Santa Ana Mountains to the northeast (Wildermuth 2000).

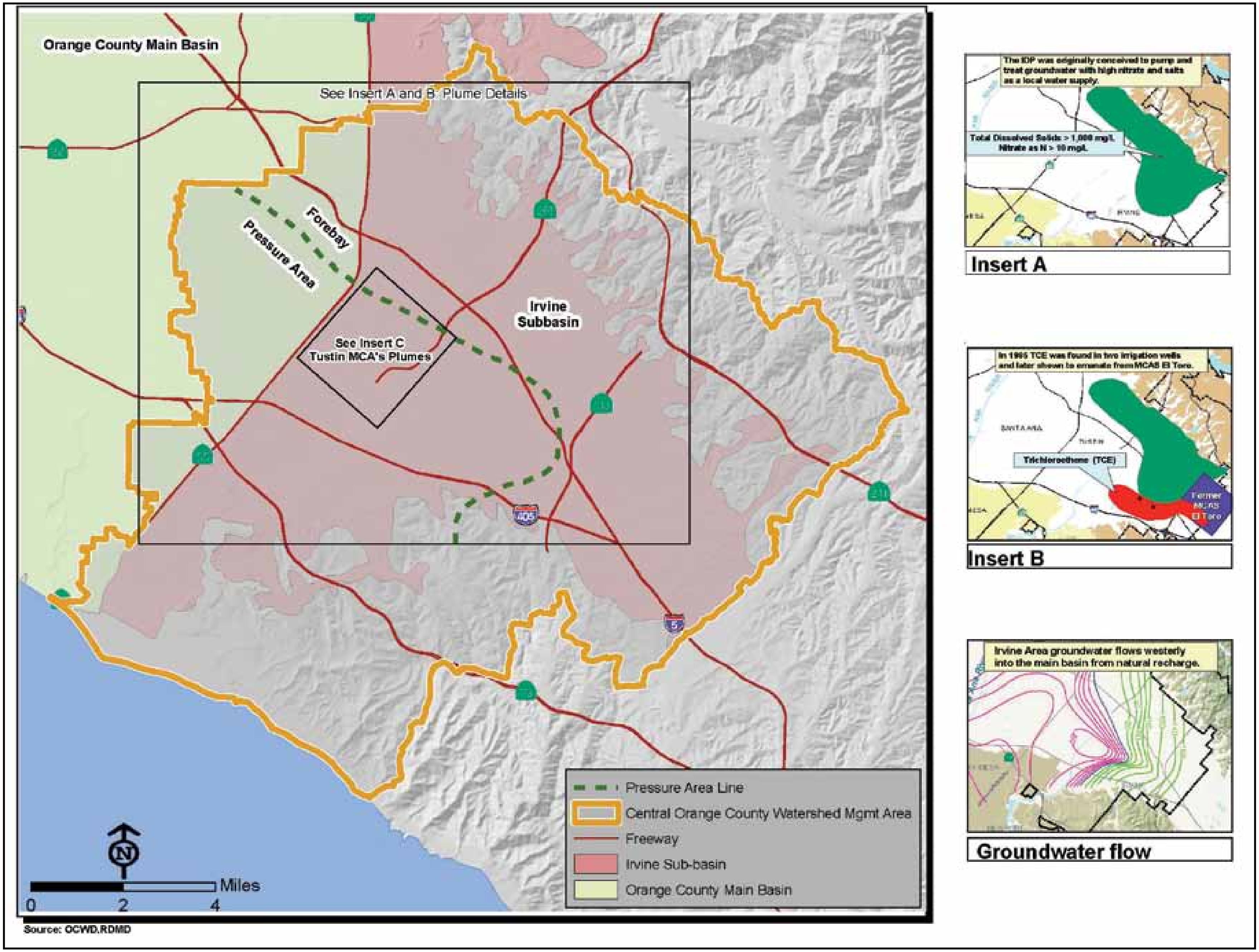


Figure 3.25 Irvine Subbasin Groundwater with pressure area, forebay and inserts for groundwater plumes. See also the associated map of Tustin MCAS plumes (Insert C). (Source: OCWD)

The boundary with the Main Basin is approximately along Interstate Highway 55 and Newport Boulevard.

Much of the central and coastal portions of the Irvine Subbasin are referred to as the "pressure area". This is an area where dense clay and silt layers at shallow depths (upper 50 feet) impede significant percolation. Traditional groundwater recharge is unlikely to succeed in this area because water cannot infiltrate well and would instead lead to surface flooding and increased discharges into surface waters. The Subbasin groundwater recharge that does happen occurs through streambed percolation, precipitation infiltration, flow from the Main Basin, irrigation infiltration, and recharge basins.

Groundwater in the Irvine Subbasin flows westward from the forebay area near the northern foothills into the pressure area. Groundwater flow direction can vary locally due to variations in climate and groundwater production patterns; however, the prevailing flow direction remains westward (Wildermuth 2000). The depth to groundwater in the basin also varies, based on the permeability characteristics of the subsurface soils, irrigation, groundwater pumping, and groundwater recharge.

As in the Main Basin, the Irvine Subbasin also has three layers of groundwater aquifers, the shallow, principal, and deep aquifers (OCWD 2004). The shallow aquifer is unconfined, is of poor quality, and is generally used for irrigation water. Plumes of pollution or selenium contamination may be present in the shallow aquifer. The principal aquifer provides 90-95 percent of the groundwater produced from the subbasin. The deep aquifer has colored water issues, so is not widely used, although Irvine Ranch Water District (IRWD) and Mesa Consolidated Water District (MCWD) are operating colored water treatment facilities.

Table 3.25 Irvine Groundwater Aquifers

Aquifer	Description	Thickness
Shallow	System of unconfined semi-perched aquifers in Pleistocene marine terrace deposits that is generally not used for domestic or agricultural supply. Consists mostly of fine sands, silts, and clays. In the vicinity of the Upper Newport Bay, the shallow aquifer discharges to Upper Newport Bay.	1 to 180 feet
Principal	The principal aquifer is where the majority of the water is produced. It includes an alluvial sequence of interbedded sands and gravels with silts and clays.	400 to 1,000 feet
Deep	The deep aquifer consists of fine- to coarse-grained sands. It is rarely used for supply due to economical constraints and slight brownish tint. IRWD began pumping and treating approximately 7,400 acre-feet per year in 2002. Water in the deep aquifer contains fewer minerals than in other areas of the basin.	1,000 to 3,000 feet

Source: USGS 2005.

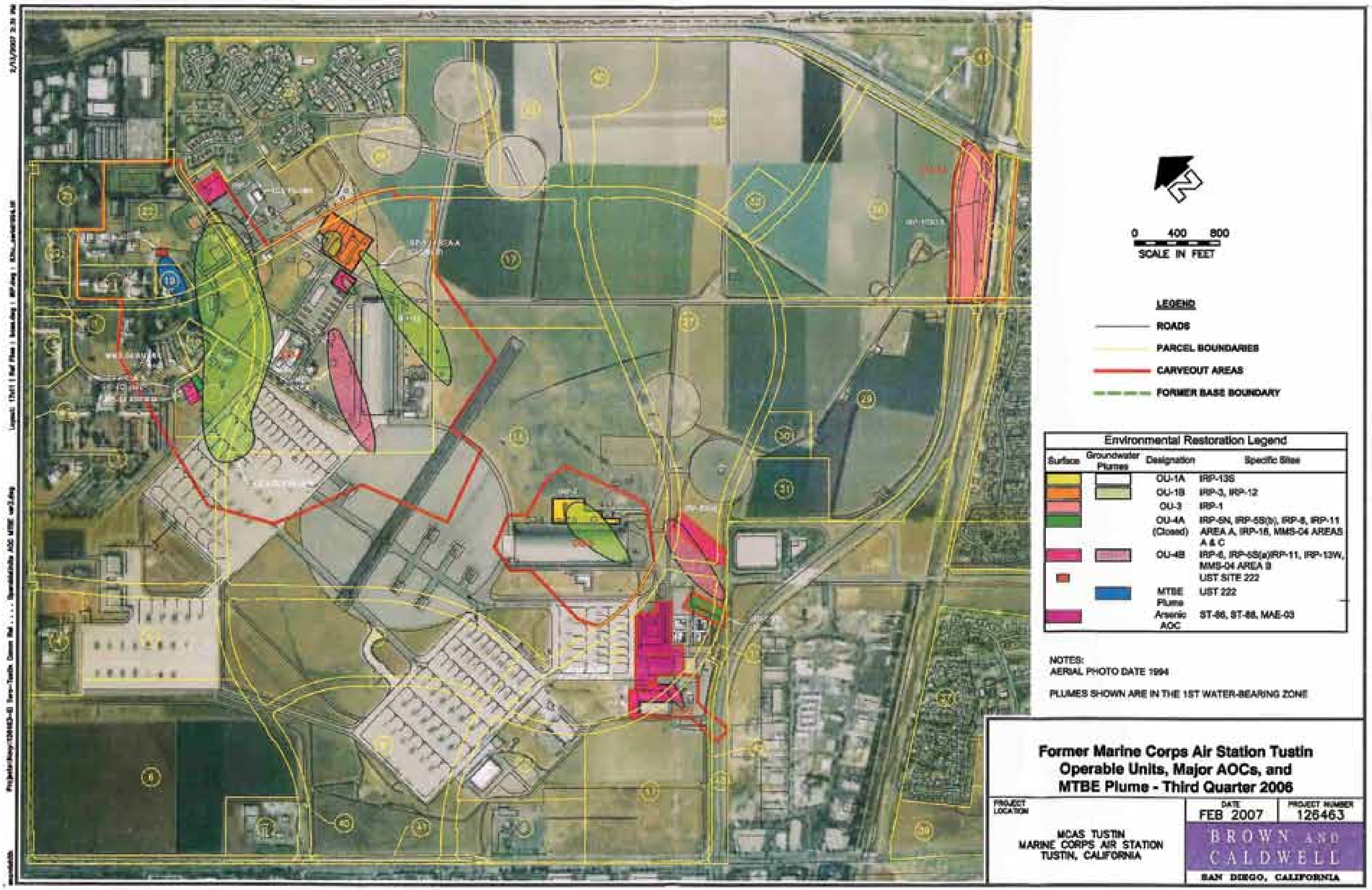


Figure 3.26 Insert C for Irvine Subbasin Groundwater map. Tustin groundwater plumes

Details regarding each of these aquifers are presented in the Table 3.25. This table is an overall generalization of a fairly complex aquifer system, and the depths of the three aquifer units described above vary based on location. For instance, the units thin and converge at the basin margins, and the principal aquifer is located at much shallower depths in these areas.

3.5.3.5 Groundwater Budget

Based on the studies and modeling conducted by OCWD, the Main Basin stores approximately 66 million acre-feet of water, although only a fraction can be removed without causing physical damage, such as seawater intrusion or land subsidence (OCWD 2004). OCWD annually sets an optimum level of pumping considering a sustainable level of pumping and maintaining a safe operating range. OCWD has developed a water budget (with balanced inflows and outflows) to evaluate Basin production capacity and recharge requirements. The budget factors in recharge, groundwater production, and groundwater flows along the coast and across the Los Angeles/Orange County line. The budget shown in Table 3.26, Representative Basin Water Budget, is based on the following assumptions: (1) average precipitation; (2) accumulated overdraft (400,000 acre-feet from full); (3) recharge at forebay facilities equal to current maximum capacity of 250,000 acre-feet per year; and (4) adjusted groundwater production to balance inflows and outflows (OCWD 2004).

Table 3.26 Representative Basin Water Budget

INFLOW	Acre Feet
MEASURE RECHARGE	
1. Forebay spreading facilities, current maximum, including imported water	250,000
2. Talbert Barrier injection, Orange County only	12,000
3. Alamitos Barrier injection, Orange County only	2,500
UNMEASURED RECHARGE (AVERAGE PRECIPITATION)	
1. Inflow from La Habra Basin	3,000
2. Santa Ana Mountain recharge into Irvine subbasin	13,500
3. San Joaquin Hills recharge into Irvine subbasin	50
4. Areal recharge from rainfall/irrigation (Forebay area)	13,000
5. Areal recharge from rainfall/irrigation (Pressure area)	4,500
6. Chino Hills recharge into Yorba Linda subbasin	6,000
7. Subsurface inflow at Imperial Highway beneath SAR	4,000
8. SAR recharge between Imperial Highway and Rubber Dam	4,000
9. Subsurface inflow beneath Santiago Creek	10,000
10. Peralta Hills recharge into Anaheim/Orange	4,000
11. Tustin Hills recharge into City of Tustin	6,000
12. Seawater inflow through coastal gaps	2,000
Subtotal:	70,500
TOTAL INFLOW	335,000
OUTFLOW	
1. Groundwater Production	327,000
2. Flow across Orange/Los Angeles County line, est. at 400,000 acre-feet accumulated overdraft	8,000
TOTAL OUTFLOW	335,000
CHANGE IN STORAGE	0

Note: The representative water budget has equal (balanced) total inflow and total outflow and does not represent data for any given year.
Source: OCWD 2004

Figure 6.7. Soils in San Diego Creek classified based on their infiltration capacities.

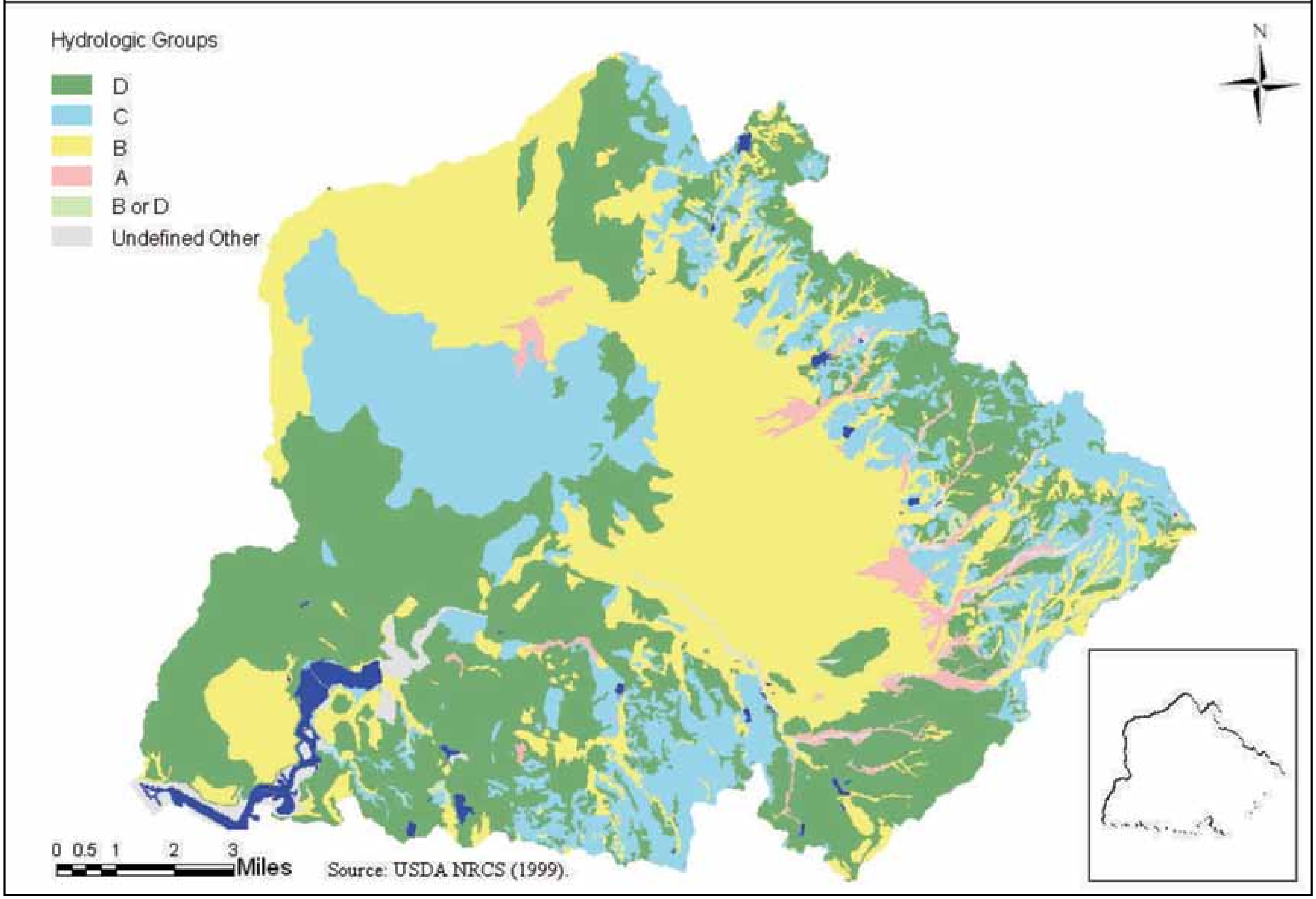


Figure 3.27 Soils by infiltration capacity. (with legend) This map is too general to be used to locate specific infiltration sites but shows generally where appropriate soils might occur. The groundwater pressure area, groundwater levels and groundwater pollution areas should also be considered, as well as slopes too steep to allow safe infiltration. On-site soil samples will also need to be tested. (Source ACOE, 2005)

Orange County Hydrological Soil Groups

GROUP	INFILTRATION RATE (IN/HR)	RUNOFF POTENTIAL	SOIL COMPONENTS & CHARACTERISTICS
A	High	Low	Deep, well-drained sands or gravels
B	Moderate	Moderately Low	Moderately deep & moderately well-drained sandy-loam with moderately fine to coarse texture.
C	Moderate Low	Moderate	Silty-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture.
D	Low	High	Clay soil with high-swelling potential, soils with permanent light water table, soils with clay pan or clay layer at or near the surface, or shallow soils over nearly impervious material

3.5.3.6 Production

There are approximately 500 active wells within OCWD's boundaries, with an estimated 300 wells producing less than 25 acre-feet per year (OCWD 2004). All large-capacity wells are metered, and individual well production is documented monthly. OCWD manages groundwater production from the groundwater basin by setting an annual basin pumping percentage based on net water available for pumping divided by net total water demands from the previous year. The basin pumping percentage is directly related to hydrologic conditions and recent groundwater production. Water available for future basin pumping is estimated at approximately 357,000 acre-feet in 2007-2008, increasing to 367,104 acre-feet in 2010-2011 (OCWD 2006). Producers pay a Replenishment Assessment for groundwater production up to the basin pumping percentage; production that exceeds the basin pumping percentage is assessed an additional higher-cost Basin Equity Assessment charge to cover the cost of replenishing that groundwater. Through these methods, OCWD is able to manage the basin resources and provide financial incentive for producers to work cooperatively to manage total pumping.

Groundwater production has doubled since 1954, and increasing use is anticipated as agencies seek to reduce dependence on imported water. OCWD has developed a draft Long-Term Facilities Plan that identifies and evaluates projects that could increase the sustainable yield of the basin to the highest possible amount. The Plan also identifies projects to protect and enhance groundwater quality and protect the coastal portion of the basin.

3.5.3.7 Recharge

Recharge to the Main Basin originates from Santa Ana River flow infiltration, infiltration of precipitation, and injection into wells. The Santa Ana River flow contains natural flow, water from wastewater treatment plants upstream of El Prado Dam, and imported water that is spread in the basin forebay (DWR 2004). The water is released from Prado Dam and delivered into recharge basins in the northern portion of the County (Main Basin), outside of this Region.

Recharge to the Irvine Subbasin occurs through infiltration of flow within the unlined stream channels, underflow from the saturated alluvium and fractures within the bordering bedrock, and from precipitation and irrigation (Wildermuth 2000). As groundwater production increases in the Irvine Subbasin to where it exceeds recharge, groundwater will flow from the Main Basin into the Subbasin. Unmeasured recharge to the Irvine Subbasin, based on average precipitation, is approximately 20,000 acre-feet per year.

In 2008, OCWD's new Groundwater Replenishment System began treating secondarily-treated water from OCSD's reclamation plant for groundwater recharge and as a seawater barrier. The first phase of this project provides an estimated 72,000 acre-feet of highly treated recycled water per year to the Talbert Seawater Intrusion Barrier and the Anaheim recharge operation. The Anaheim recharge system uses surface spreading basins to recharge the Main Basin northwest of Highway 55. The Groundwater Replenishment System will operate at a maximum of 120,000 acre-feet per year, to be realized in subsequent phases. One of the key components of future phases is the availability of secondarily treated wastewater flows from OCSD.

OCWD replenishes the Main Basin through recharge basins located outside of the IRCWMP Region because soil permeability is limited in the Irvine Subbasin. Although the Groundwater Replenishment facility is located just outside of the IRCWMP Region near the mouth of the Santa Ana River, it benefits this Region's supply because water retail agencies in the Central Orange County area pump groundwater from the Northern Orange County area for use in the Central Orange County area.

Desalted Water

As previously mentioned, local water agencies operate three groundwater desalter programs in Irvine and Tustin to remove total dissolved solids (TDS), nitrates from historical agricultural practices, perchlorates and a volatile organic compound (VOC) plume from the former EL Toro Marine Corps Air Station. The Irvine Desalter Project is a joint groundwater quality restoration project by IRWD and OCWD, with financial participation by the U.S. Navy, Metropolitan Water District and the State of California. In 1985, portions of the basin beneath the former El Toro Marine Corps Air Station in the central area of Irvine were found to contain VOCs from compounds used on the base. A plume of contamination now extends off the base and is currently moving toward the main basin. The Irvine Desalter Project consists of two water purification plants with separate wells and pipeline systems. One treatment plant removes TDS and VOCs from contaminated groundwater. The treated water is used for irrigation and other recycled water purposes. A second purification plant treats water from outside the VOC plume to remove total dissolved solids and nitrates. This treated water is used for potable water supply (OCWD 2004). The Irvine Desalter Project will yield approximately 7,700 acre-feet per year of potable drinking water and 3,900 acre-feet per year of non-potable water, which will supplement IRWD's non-potable system (IRWD 2005).

The second project is the Tustin Seventeenth Street Desalter, which has been in operation since 1996. It reduces nitrate, perchlorate and TDS contaminants from the groundwater produced by Tustin's Seventeenth Street Wells Nos. 2 and 4 and Tustin's Newport well. During fiscal year 2001-2002, 354,000 pounds of nitrate per year were removed at this treatment facility (OCWD 2004). The facility yields approximately 2,100 acre-feet per year. The third project is Tustin's Main Street Plant which removes nitrates from groundwater.

A number of sites in Southern California are currently being considered for ocean water desalination facilities. The Central Orange County Region could someday receive potable water produced by one or more of these facilities. Just north of this Region in Huntington Beach, an ocean water desalination facility is being proposed. The project consists of the construction and operation of a 50 million gallon-per-day desalination facility. However, as proposed, the water agencies within the Central Orange County Region would not be receiving supplies from this plant. The Metropolitan Water District addresses seawater desalination on a regional basis in its 2005 Regional Urban Water Management Plan, and it is included in its Integrated Resources Plan Update targets under local water production.

3.5.3.8 Climate Change and Water Supply

Water supply in Central Orange County is complex, as it is dependent upon an imported water network as well as on groundwater recharge sourced from local surface water and treated wastewater. Climate change will affect all of these water sources. Imported water and surface water supplies are dependent on annual precipitation, not only in this Region, but also in all the areas across California and the Colorado River watershed from which we import water. The local groundwater basins are also heavily dependent on imported water because a large component of recharge comes from water that has been imported, used, treated and released into the upstream reaches of the Santa Ana River, other stream channels and groundwater recharge facilities.

Climate change (see also Chapter 2.1) is expected to have the following impacts:

- **SMALLER SNOW PACK:** By 2050, scientists project a loss of at least 25 percent of the Sierra snowpack, an important source of water for urban, agricultural, and environmental functions.
- **CONCENTRATED FLOWS:** Weather patterns are becoming more variable, causing more severe winter and spring flooding and longer, drier droughts.
- **POTENTIAL INFRASTRUCTURE DAMAGE:** Since the 1950's, flood flows on many California rivers have been the largest on record. Levees, dams and flood bypasses are forced to manage flows for which they weren't designed.
- **RISING SEA LEVEL:** In the past century, sea level has risen over one-half foot at the Golden Gate. Projected continued sea level rise will threaten many coastal communities as well as

the sustainability of the Sacramento-San Joaquin Delta which supplies 25 million Californians with drinking water.

- **CHANGING TEMPERATURES AND HYDROLOGY:** Rising water temperatures and changes in runoff patterns are adversely impacting salmon and other aquatic species (DWR, June 2007).

The above impacts would have direct impacts upon Central Orange County. Smaller Sierra Nevada snow pack volumes means less water available for export to Southern California. Loss of levees, dams and flood bypass infrastructure would also result in a direct loss of the ability to capture and convey water to Southern California. Concentrated flood events in this Region would increase the amount of stormwater capture facilities needed to reduce in-stream flooding and to develop stormwater as a local source of supply. Furthermore, sea level rise may eventually threaten the Orange County groundwater basins by increasing the threat of seawater intrusion.

Rising sea levels will affect surface water habitat in Newport Bay and lower San Diego Creek by bringing in more sea water, possibly flooding the estuary, parts of Balboa Island and increasing salinity levels. If flood levels in lower San Diego Creek rise, increased flood protection for IRWD's Michelson Water Reclamation Plant will become increasingly imperative.

We've already seen a reduction in the amount of water Northern California will export in order to maintain the amount of water it takes to support viable populations of Delta Smelt. The years 2007 and 2008 have seen record low runs of salmon in California. This may result in additional reductions in flow from the Delta to protect those populations.

An IRWMP must consider how to reduce climate change impacts, as well as how to respond to those that do occur. Adapting to climate change scenarios will require more storage in groundwater basins, more surface water capture and reuse and innovative, integrated water projects to help ensure a reliable water supply for Central Orange County's future. The biggest tool the Central Orange County IRCWMP has available to it for reducing this Region's impact on climate change is to work toward severely reducing the use of imported water. This requires further policy discussions among affected Orange County water agencies to determine future policy direction. According to the Metropolitan Water District, pumping and conveying water from one end of the state to another is the single largest user of energy in the state.

3.5.4 Habitat

Water usage in Southern California increased significantly in 1913 when the first aqueduct was built, bringing water from the Owens Valley to Los Angeles. Since then, the State of California and the Metropolitan Water District have developed one of the most advanced water conveyance systems in the world, bringing water from seven states into Southern California. This movement of water has a heavy impact on ecosystems. Water is the basis of life and the more water that gets taken from other places, the less primary production is left to support the local food chain in those places. For aquatic species, smaller water flows also means less viable living conditions.

In Southern California the ecological impact of an increased water supply has been the freedom to disregard and pave over local rivers, wetlands and groundwater recharge areas to make way for increased development. This separates local water flow from its normal interaction with the ground, which degrades local habitat functions and water quality. While the growth in this Region over the last century has been good for many social and economic reasons, the overall environmental outcome is that we have degraded and polluted our own water resources to make way for an environmentally unfriendly kind of land development, while at the same time, degrading and depriving the ecosystems that are the source of the imported water.

The equation that justifies this approach has relied on the ability to access more and more sources of water from elsewhere, while externalizing many of the costs of doing so. However, as the resources become stretched to their limits in these places, the equation is beginning to change. Courts are ruling that water export-related threats to habitats and endangered species must be considered. Furthermore, the cost of imported water increases with competition from urbanization in those regions. And, in our own region, we find that complex hydrological problems and the costs of fixing them can negatively influence ecological, social and economic conditions.

A combination of such factors are pushing stakeholders to find ways to refocus on the health of the local aquatic ecosystem so as to make the best use of this Region's human, natural and monetary capital. This requires place-based urban design that works with the needs of the local habitat and hydrologic system, rather than against it. Having a clear understanding of the local ecosystem and how it works is the first step.

Habitat Types

Orange County's native plant communities are part of the California Floristic Province, designated by Conservation International as a world biodiversity "hotspot" due to an unusually large number of species that occur only here. Diegan coastal sage scrub is the most common native plant community in this Region. Others are oak and sycamore woodlands, chaparral, willow riparian, coastal strand, fresh water marsh and saltwater marsh. Much of the terrestrial and riparian habitat is naturally dry during parts of the year.

The following maps of the NCCP/HCP Central and Coastal Subregions provide an illustration of the general distribution of the habitat types described below.

Most of the following information in this section is based on the U.S. Army Corps of Engineers 2005 Newport Bay/San Diego Creek Watershed Study Feasibility Report. The descriptions of the nine natural habitat types identified in the Region are taken from Holland (1986) and the County of Orange (1991).

Figure 3.28 Central and Coastal Subregion NCCP/HCP.(Nature Reserve of Orange County).

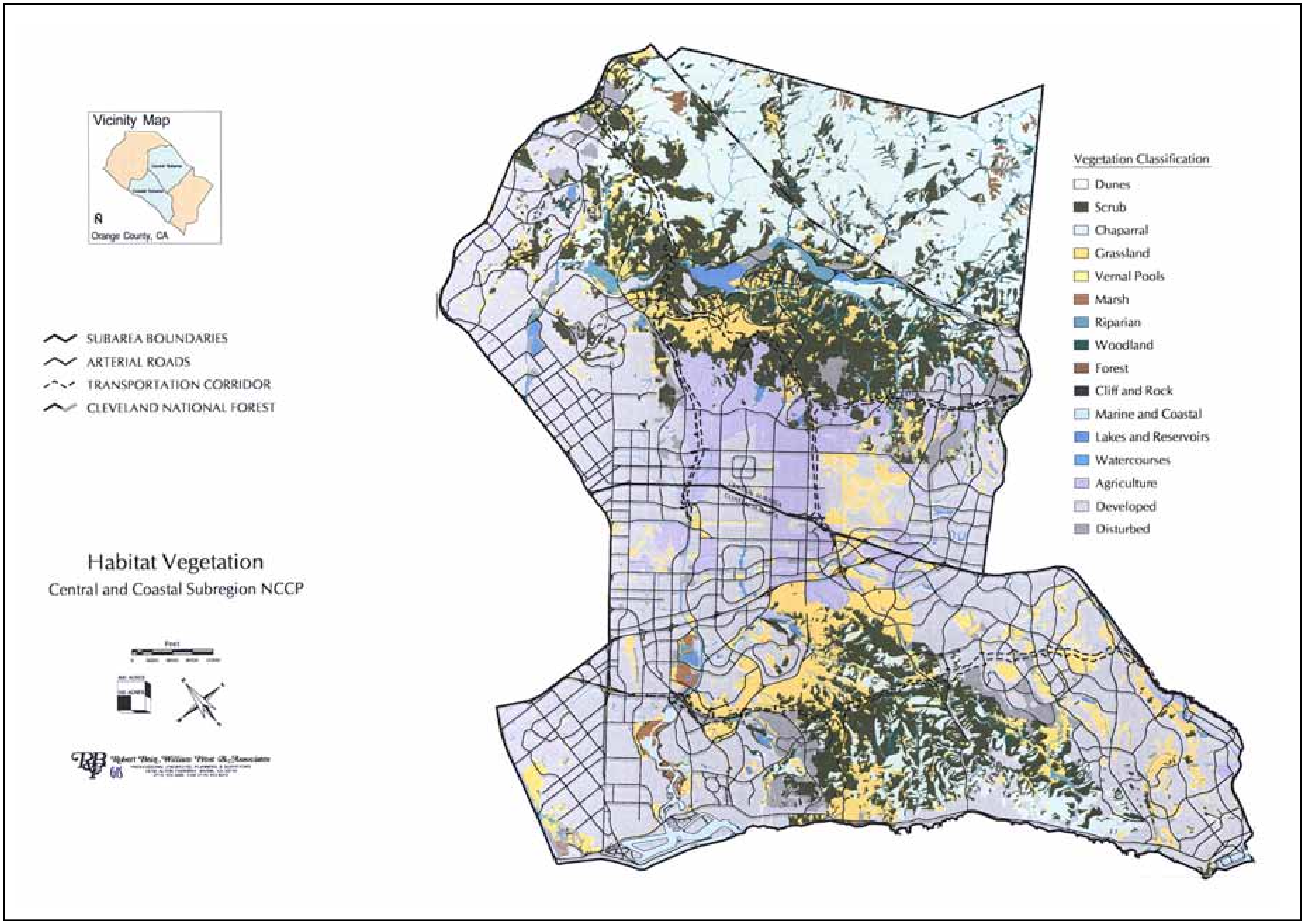


Figure 3.29 Habitat vegetation in the Central and Coastal Subregion NCCP/HCP

WOODLAND HABITATS: Woodland habitats are multi-layered vegetation communities dominated by trees that characteristically have an open canopy. The extent of woodland habitat is limited primarily to one sub-community, coast live oak woodland. Coast live oak woodland is typically found on north-facing slopes and shaded ravines usually below 1,200 meters (4,000 feet). It is described as evergreen woodland dominated by *Quercus agrifolia* and reaching a height of 10 to 25 meters (30 to 80 feet) in height. The shrub layer is poorly developed but may include *Heteromeles arbutifolia*, *Ribes spp.*, *Rhus laurina*, or *Sambucus mexicana*. The herb layer is continuous and dominated by *Bromus diandrus* and several other introduced taxa.

CLIFF AND ROCK HABITATS: Cliff and rock habitats are characterized by vascular plants and lichens that grow on steep rocky faces. Some cliff faces have been identified in the San Joaquin Hills, the foothills of the Santa Ana Mountains, and around Upper Newport Bay.

SCRUB HABITAT: Scrub communities are generally dominated by small shrubs with drought deciduous leaves. Most of the plant species found within these communities regenerate following fire events. These communities often occur on dry xeric sites, such as south facing slopes, and provide structures for shelter and nesting. The Orange County Habitat Classification System identifies eight scrub communities occurring within the county: southern coastal bluff scrub, maritime succulent scrub, Venturan-Diegan transitional coastal sage scrub, southern cactus scrub, Riversidian coastal sage scrub, floodplain sage scrub, chenopod scrub, and sage-scrub grassland ecotone. The most prominent of these are the Venturan-Diegan transitional coastal sage scrub (found in the Central/Coastal NCCP), southern cactus scrub, and floodplain sage scrub.

Figure 3.30 Coastal live oak woodland

CHAPARRAL HABITAT: Chaparral communities are dominated by large arborescent shrubs that generally have large evergreen leaves. Most chaparral plant species regenerate from underground root structures following fire events. These communities generally occur on moderately moist mesic sites, such as north facing slopes.

GRASSLAND HABITAT: Grasslands consist of low-growing herbaceous species dominated by annual and perennial grasses and forbs. The native grassland communities that once blanketed the southern California landscape have largely been out competed by non-native annual grasslands. Existing native grasslands are presently restricted to designated open space areas contained within the NCCP reserve system.

VERNAL POOLS, SEEPS, AND WET MEADOWS: Three types of vernal pools, seeps, or wet meadows are found in the Region. The southern hardpan vernal pool is typically found on level grassland or scrub areas with a deep underlying clay hardpan layer. Alkali meadows are seeps and wet areas that occur in low-lying alkaline or saline soils. Freshwater seeps are isolated, small perennial water sources often associated with outcrops. Southern hardpan vernal pools have been observed in Whiting Ranch Regional Park while alkali meadows and freshwater seeps are known to occur in and around Upper Newport Bay.

MARSH HABITATS: All four of the marsh habitats identified in the County of Orange inventory are represented here. Two of these, southern coastal salt marsh and coastal brackish marsh, are linked to Upper Newport Bay in the lower part of the watershed. Coastal freshwater marsh and cismontane alkali marsh are found in the vicinity of the Bay as well as in other areas of the Region.

MARINE AND COASTAL HABITATS: Habitats falling under this category include tidal mud flats and marine open water subtidal areas.

RIPARIAN HABITATS: Riparian areas are defined as narrow ecotones that typically exist between the bankfull channel of alluvial streams and adjacent uplands. These systems are characterized by two distinct zones although either may be absent under certain conditions. The first zone is the portion of the riparian corridor that is flooded by a river or stream at least every five or ten years. The second zone consists of abandoned floodplains or terraces

Figure 3.31 Coastal sage scrub

Figure 3.32 Non-native grassland

that are now flooded only episodically during larger precipitation events.

- **Southern Coastal Salt Marsh:** Salt marsh consists of halophytic perennial herbs and low shrubs that occur on regularly (or historically) flooded or saturated clay and silt solids that are high in salts, such as Upper Newport Bay. Salt marsh is dominated by California cord grass (*Spartina foliosa*) in low intertidal areas, pickleweed (*Salicornia virginica*), coastal salt grass (*Distichlis spicata*), shoregrass (*Monanthochloe littoralis*), fleshy jaumea (*Jaumea carnosa*), American saltwort (*Batis maritime*), alkali heath (*Frankenia salina*), California marsh rosemary (*Limonium californicum*), saltbush (*Atriplex sp.*), and sea-blite (*Suaeda spp.*).
- **Coastal Freshwater Marsh:** Freshwater marsh consists of seasonally or permanently flooded low-lying areas (such as San Joaquin Marsh) dominated by cattails (*Typha spp.*) and bulrushes (*Scirpus spp.*), along with species such as marsh fleabane (*Pluchea odorata*), swamp water weed (*Polygonum lapathifolium*), mayweed (*Cotula coronopifolia*), willow herb (*Epilobioum spp.*), Spanish sunflower (*Pulicaria paludosa*), seep monkeyflower (*Mimulus guttatus*), and speedwell (*Veronica spp.*).
- **Riparian Herb:** Herbaceous riparian vegetation is an early successional stage of riparian scrub and forest. Flooding (or other disturbance factors) often scours woody riparian vegetation away and the site is rapidly colonized by pioneer wetland herbaceous plants and various non-native weedy species. Examples are mugwort (*Artemesia douglasiana*), cattails, sedges, willow seedlings and saplings, millet ricegrass (*Piptatherum meliacea*), rabbit-foot grass (*Polypogon monspeliensis*), cocklebur (*Xanthium strumarium*), western ragweed (*Ambrosia psilostachya*), and black mustard (*Brassica nigra*). Various grasses may also be found within this habitat type.
- **Floodplain Sage Scrub:** The vegetation types occurs in alluvial washes and floodplains where flooding is infrequent. Dominant species include *Lepidospartum squamatum*, California sage (*Artemisia californica*), buckwheat (*Eriogonum fasciculatum*), and various introduced grasses.
- **Mule Fat Scrub:** Mule fat (*Baccharis salifcilfolia*) scrub consists of dense stands of mule fat with lower concentrations of willow. This vegetation type is commonly found within intermittent streambeds, washes, and seeps. Other species associated with this vegetation type often include mugwort, western ragweed, castor bean (*Ricinus communis*), cocklebur, rabbit-foot grass, Bermuda grass (*Cynodon dactylon*), and *Bromus spp*.
- **Southern Willow Scrub:** Willow species and riparian forest saplings dominate willow riparian scrub. This vegetation type is characterized by arroyo willow (*Salix laseolepis*) and red willow (*Salix laevigata*) with lower concentrations of mule fat and/or black willow.
- **Sandbar Willow Scrub:** This vegetation type is dominated by *Salix exigua* in shrub and herb layers. This willow species is

adapted to areas with repeated natural disturbances, such as in flood scour zones.

- **Southern Arroyo Willow Forest:** This vegetation type is dominated by an arroyo willow canopy, with other components being other willow species such as black willow.
- **Black Willow Riparian Forest:** Black willow riparian forest is a multilayered forest with a canopy dominated by mature black willow (*Salix goodingii*) with some lower concentrations of arroyo willow and red willow, and coast live oak (*Quercus agrifolia*) and sycamore (*Platanus racemosa*) occasionally present on the outer margins. This vegetation type is found on floodplains along major streams and creeks.
- **Cottonwood-Willow Riparian Forest:** Cottonwood-willow riparian forest (southern cottonwood-willow riparian forest) is a multilayered forest community dominated by Fremont cottonwood (*Populus fremontii ssp.fremontii*), black cottonwood (*Populus balsamifera ssp. trichocarpa*), black willow, and red willow. A second canopy layer consisting of arroyo willow, mule fat, poison oak (*Toxicodendron diversilobum*), wild grape (*Vitis girdiana*) is often present. Various herbs and vines may comprise the understory. Several invasive weedy species are found in this vegetation type, including giant reed (*Arundo donax*), castor bean, and tree tobacco (*Nicotiana glauca*).
- **Southern Sycamore Riparian Woodland:** Sycamore riparian woodland consists of open to dense woodlands dominated by western sycamore, with coast live oak and mule fat Scrub, or willow riparian scrub as an understory. Other species associated with this vegetation type include holly-leaf redberry (*Rhamnus ilicifolia*), California coffee-bean (*Rhamnus californica*), laurel sumac (*Malosma laurina*), Mexican elderberry (*Sambucus mexicana*), fuchsia-flowered gooseberry, toyon (*Heteromeles arbutifolia*), poison oak, and lemonadeberry (*Rhus integrifolia*). Large grassland areas dominated by *Bromus sp*. are often present under and between the canopies of the trees in this vegetation type. Sycamore riparian woodland is often found on large intermittent streams.
- **Southern Coast Live Oak Riparian Forest:** This vegetation type occurs around intermittent and ephemeral drainages. Dominated by coast live oak, the understory may contain various riparian and/or upland plant species. Often, this vegetation type is intergraded with sycamore riparian and coast live oak woodlands.
- **Coast Live Oak Woodland:** This community type is dominated by coast live oak with associated shrubs such as California coffee-berry, toyon, *Ribes spp.*, elderberry, and poison oak. The herb layer may contain various herbs and grasses. This vegetation type is generally located on north-facing slopes and shaded ravines, not necessarily associated with drainages.
- **Canyon Live Oak Ravine Forest:** This vegetation type is a montane riparian community of steep headwaters dominated by various *Quercus spp.*, and may include such tree species as

maple (*Acer macrophyllum*) and California bay (*Umbellularia californica*).

References

- Anchor Environmental 2006. Rhine Channel Sediment Remediation Feasibility Study and Alternatives Evaluation. January.
- California Administrative Code. Title 22, Division 4, Department of Health Services.
- California Department of Water Resources. July 2006. Progress on Incorporating Climate Change into Management of California's Water Resources. Technical Memorandum Report. Pp. 2.29-31, 3.43-47. **http://baydeltaoffice.water.ca.gov/climatechange.cfm**
- California Floodplain Management Task Force, December 12, 2002. **http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/approved_report.pdf**
- California State Polytechnic University, Pomona. August 2004. Healthy Urban Watersheds: Design Guidelines for San Diego Creek and Upper Newport Bay, CA. Heuler, N., Kuo, C., McFerran, J.,Sabin III, S. Masters Project. Pomona, CA: California State Polytechnic University, Pomona, Department of Landscape Architecture.
- Chapman University. 2007a. Economic Forecast for the U.S., California, and Orange County.
- Chapman University. 2007b. Economic Pulse of Orange County: Second Annual Survey of Financial Executives.
- City of Newport Beach 2007. Accessed in May 2007 at **http://www.newportbeachca.gov/index.aspx?page=814**
- County of Orange. 2007. Central Orange County Integrated Regional and Coastal Watershed Management Plan. "IRCWMP Phase 1" 2.0 Regional Description. August 2007 .
- **www.ocwatersheds.com/watersheds/pdfs/CentralOC.IRCWMPlan_Aug202007.pdf**
- County of Orange 2003, Drainage Area Management Plan, Draft Newport Coast Watershed Chapter.
- County of Orange. 2003. Report of the Regional Monitoring Program for the Newport/San Diego Creek Watershed Nutrient TMDL. November.
- County of Orange. 2005. Regional Monitoring Program Report for the Newport Bay / San Diego Creek Watershed Nutrient TMDL. November. **http://www.ocwatersheds.com/watersheds/pdfs/nutrient_tmdl2005_Nutrient_TMDL_Report.pdf**
- County of Orange Resources and Development Management Department. 2005. Hydrologic Data Report 2004–2005 Season, Volume XLI.
- DWR (California Department of Water Resources). 1967. Progress Report on Ground Water Geology of Central Coastal Plain of Orange County.
- DWR. 2004. Coastal Plain of Orange County Groundwater

Basin. California's Groundwater Bulletin 118.

- ETWD (El Toro Water District). 2005. Accessed May 2007 at: **www.etwd.com/pdfs/UWMP.pdf**
- Hibbs, Dr. Barry, California State University, Los Angeles. Selenium Workshop, March 10, 2008, Laguna Hills, California
- Hoag, Barbara Lillian. 1983. Channel Erosion as a Source of Sediment in Newport Bay, California. Masters thesis UCLA.
- IRWD, MWD, MWDOC, Network Services, d.d. Pagano, Western Policy Reseach. 2001. Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study.
- Irvine Ranch Water District. Retrofitting a Watershed for Water Quality. San Diego Creek Natural Treatment System. 2004. Norris Brandt, PowerPoint presentation. **www.coastalconference.org/h20_2004/pdf/C-Sessions/T5C/Brandt_102303%20h20.pdf**
- IRWD (Irvine Ranch Water District). 2005. Urban Water Management Plan.
- IRWD (Irvine Ranch Water District). 2006. Water Quality Annual Report, Dyer Road Wellfield Data.
- Marquis-Smith, W. 2005. Personal Communication (telephone conversation) with the San Diego Creek project manager for the RWQCB. July 8.
- McAfee, Lyndine, Executive Director, Nature Reserve of Orange County. Email correspondence, Nov. 2007. **www.naturereserveoc.org**
- MWD (Metropolitan Water District of Southern California). 2005. Regional Urban Water Management Plan.
- Metropolitan Water District. 2004. Integrated Resources Plan.
- Newport Bay Naturalists and Friends 2007. Website **www.newportbay.org/ bayintro.htm accessed in May 2007**.
- Newport Coast Watershed Program. 2004.
- Orange County Central/Coastal Natural Community Conservation Plan/Habitat Conservation Plan. July 1996.
- Orange County Water District. 2004. Groundwater Management Plan.
- Orange County Water District. 2005. **www.ocwd.com**
- Orange County Water District. 2008. Final Draft Long Term Facilities Plan.
- Orange County Water Agencies. 2005. Water Rates Study.
- Roberts, F.M., Jr. 1998. A checklist of the vascular plants of Orange County, California. Second Edition. F.M. Roberts Publications, Encinitas, California.
- Santa Ana Watershed Project Authority. 2007. Accessed May 23, 2007, from **www.sawpa.org/about/watershed.htm**

- Smith, R. Daniel. 2007. Assessment of Riparian Ecosystem Integrity in the San Diego Creek Watershed, Orange County, California. Prepared for U.S. ACE Los Angeles District, Regulatory Branch, by Engineering Research and Development Center Waterways Experiment Station. Vicksburg, MS. **http://www.spl.usace.army.mil/regularoty/samp/sdcreek.pdf** **http://www.spl.usace.army.mil/cms/index.php** San Diego Creek SAMP
- South Orange County IRWM Plan. 2005.
- State of the CCAs Report for Upper Newport Bay. June 2006.
- URS. 2003. Review of the Sediment TMDL Monitoring Program for the San Diego Creek Watershed. December.
- U.S. Army Corps of Engineers. 1998. Expedited Reconnaissance Study Section 905(b) (WRDA 1986) Analysis, Newport Bay/ San Diego Creek Watershed, California. August 1998.
- U.S. Army Corps of Engineers. 1999. Newport Bay/San Diego Creek Watershed Project Study Plan.
- U.S. Army Corps of Engineers. 2005. Upper Newport Bay Ecosystem Restoration Feasibility Study.
- U.S. Army Corps of Engineers. 2005. San Diego Creek/ Newport Bay Watershed Management Plan.
- USGS. 2007. National Water Quality Assessment Program. Accessed in May, 2007, from **http://water.usgs.gov/nawqa**
- Watershed and Coastal Resources Division 2007. Accessed in May 2007 from **www.ocwatersheds.com/ watersheds/sandiego_reports_studies_reconnaissance.asp**
- Weston Solutions, Inc. 2006. Newport Coast Water Quality and Flow Assessment. Prepared for the City of Newport Beach.
- Wildermuth Environmental, Inc. 2000. TIN/TDS Study – Phase 2A of the Santa Ana Watershed, Final Technical Memorandum. July.
- **www.gwrsystem.com**
- **www.irvineranchwildlands.org/reserve**
- **nrs.ucop.edu/San-Joaquin-Marsh.htm**

4 • DYNAMIC PLANNING APPPROACH

The advanced planning approach used in developing this Plan reflects this Region's significant progress in watershed planning. Continued scientific study and monitoring has increased our understanding of how this watershed functions under changing conditions. This body of knowledge enables this Plan to effectively blend planning, engineering, and ecological thinking:

- The "high-level" regional planning approach is counter-balanced with local, "engineering-in-the-trenches" knowledge and insight.

  The Dynamic Planning Approach explicitly recognizes the importance of both regional and local expertise and takes advantages of both in the planning process.

- The ecological balance vision is harmoniously balanced with evolving demands on the watershed.

  A considerable amount of effort has gone into defining types of integration, both at the regional and local levels, that can be incorporated into the planning effort to bring all our water resources into a healthy and self-sustaining state. To support implementation, a prioritization process is required to encourage the proper order for rolling out projects that fulfill regional and local objectives and state regulatory requirements.

These two coupled ideas: 1) regional and local expertise and 2) integration planning and prioritization, form the backbone of our Dynamic Planning Approach that will guide project selection, planning and design efforts (see Figure 4.1).

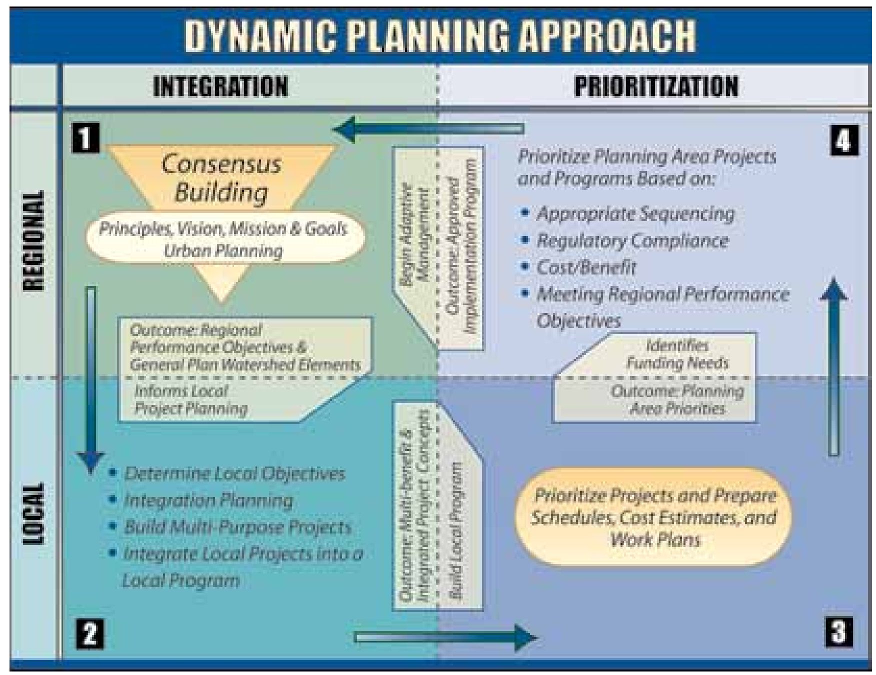


Figure 4.1 Dynamic Planning Approach

4.1 Step 1: Regional Integration

Integration at the regional scale takes four forms:

1. Integration based on stakeholders establishing common policies based on Principles, Vision, Mission and Goals;
2. Integration based on formulation of Regional Performance Objectives;
3. Integration based on urban planning policies that link land use with hydrologic considerations; and
4. Integration planning with neighboring IRWM regions.

First, this plan establishes common policy language by broadly defining Principles, Vision, Mission and Goals in terms of establishing healthy, balanced hydrologic conditions within the watershed (See Chapter 2). The watershed Vision provides a beacon to help guide project development.

Following this, stakeholders have defined specific Regional Performance Objectives for each of the three watershed goals (Integrated Water Resources, Economic Development and Collaboration). Regional Performance Objectives are used by project proponents to quantify the watershed benefits of a proposed project.

Ultimately, the “Desired State” that is being developed by the stakeholders will define the desired conditions within the watershed in 20 years, reflecting a balance of the Region’s ecosystem functions. The process of determining the Desired State is being achieved through a collaborative, consensus-building process to define a reasonable balance among the four water resource management areas:

1. Flood Management
2. Water Quality
3. Water Supply
4. Habitat

When the stakeholders that represent these interests are in agreement on how to best technically balance these needs, they have defined the Regional Performance Objectives that describe the Desired State for this Region. This version of the IRCWMP begins the collaborative process for defining preliminary Regional Performance Objectives. As a starting point, existing plans and regulations, (TMDLs for example), are used as the initial set of Regional Performance Objectives.

The stakeholders readily acknowledge that conditions within this watershed are dynamic. Project implementation, growth, regulatory changes, climate change, and other factors will require that the Desired State and Regional Performance Objectives be reviewed and updated periodically.

The preliminary Regional Performance Objectives for the water resources goal are presented in Chapter 6: Water Resources. Preliminary Regional Performance Objectives are also identified for Economic Development (Chapter 7) and Collaboration (Chapter 8) in order to provide guidance on how to meet these goals in support of the water resources goal.

The third type of Regional Integration involves urban planning, where General Plans are used to tie hydrologic functions to land use. This is discussed in Chapter 9.

The fourth type of Regional Integration is characterized by seeking and developing common goals with our neighboring IRWM regions. The Central Orange County Region is coordinating with South Orange County Region on common issues in the Newport Coast area, with San Diego County on ASBS issues, with North Orange County Region on groundwater and wastewater issues, and with SAWPA on regional water supply issues.

Figure 4.2 diagrams how these regional integration types work. In the first frame, Vision and Goals tends to pull the development of the four water resource areas together (Regional Integration Type 1). Because the Vision and Goals are rather general, the endpoint is vague and development of the water resource areas is somewhat divergent.

In the second frame, Regional Performance Objectives provide a tighter target and therefore, development of the four water resource areas can be pulled closer together (Regional Integration Type 2).

In the third frame, agency land use plans provide further guidance for developing and integrating our water resources (Regional Integration Type 3).

In the fourth frame, neighboring IRWM regions meet to develop common regional objectives and urban planning strategies (Regional Integration Type 4).

4.2 Step 2: Local Project Integration

The Desired State provides the broad basis for integrated design. It is a top-down kind of integration because it focuses on regional-scale hydrologic functions. Within this framework, a bottom-up integration process, focusing at the project scale, begins to have greater context and relevancy. Project integration is a place-based process that implements local performance objectives within the opportunities and constraints of the project site.

Project Integration at the local level consists of two parts: 1) defining watershed issues, objectives and projects, and 2) integrating projects into larger planning and programming efforts through an integration planning methodology.

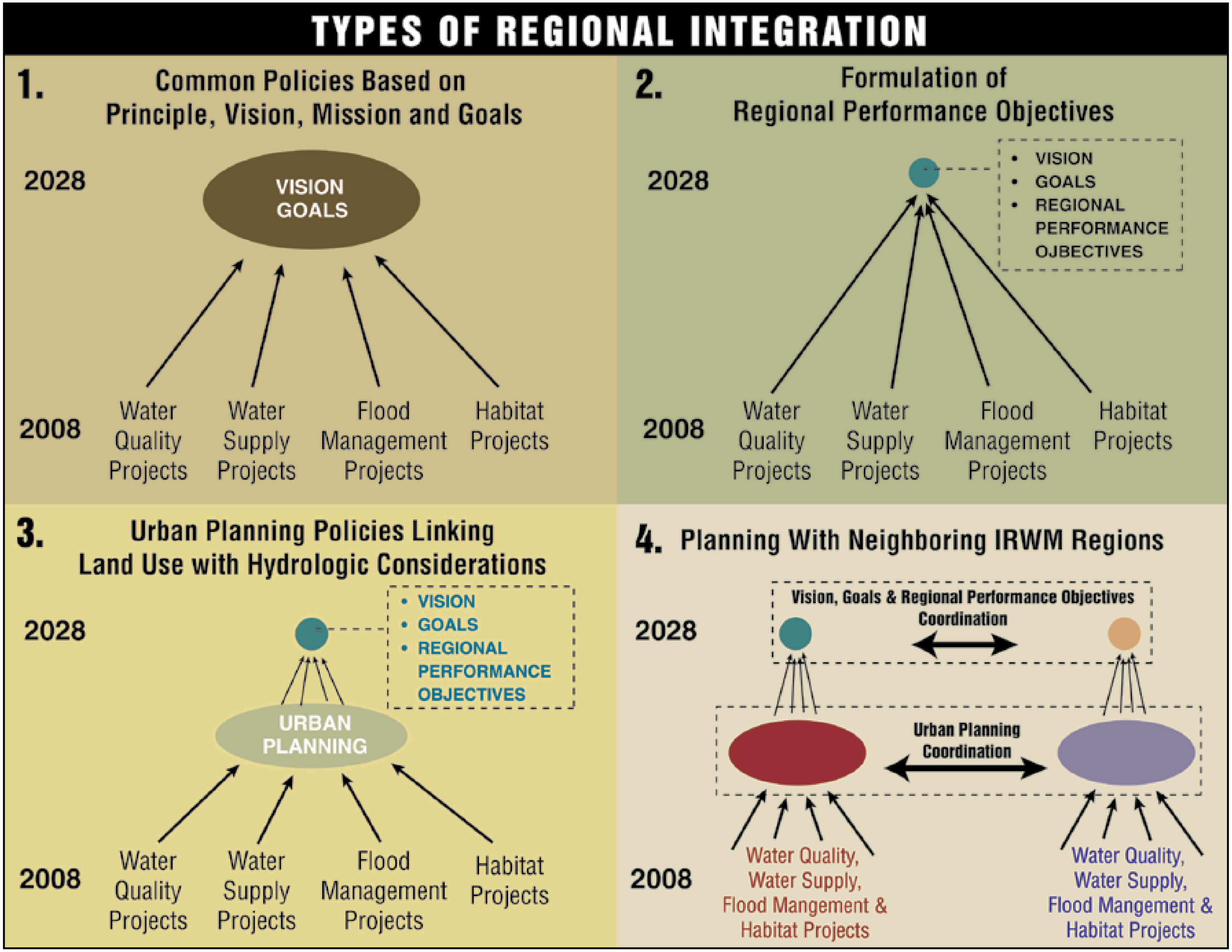


Figure 4.2 Types of Regional Integration

Local Watershed Issue, Objectives and Projects

Local stakeholders define their own water resource issues, objectives and projects, keeping in mind that, at the end of the day, their projects must also support the Regional Performance Objectives. Local objectives are specific, measurable outcomes that address opportunities and constraints based on local political, economic and hydrologic requirements. This kind of decentralized project planning captures local expertise and mobilizes grass roots stakeholders. It also avoids imposing a specific design solution on local interests who more fully understand the dynamics of their particular locations better than the regional, state or federal stakeholders.

This Region has eighteen subwatersheds that function as separate hydrologic units. Rather than asking stakeholders to focus on each of these areas one by one, they were grouped into six Planning Areas that group subwatersheds based on similar characteristics:

1. Northern Foothills
2. Southern Foothills
3. Central Plain
4. Urban Bay
5. Bay/Coastal
6. Coastal Canyons

Some challenges exist across all Planning Areas (e.g., over-irrigation, pesticides, nutrients and bacteria). However, each Area also has somewhat unique characteristics that define the primary problems undermining their local hydrology. Implementation of projects that address the most fundamental problems will create a new baseline condition that enables the other objectives for the Area to be met. These kinds of projects are referred to as Baseline Projects. Projects that help to address the other issues in the Planning Area support the regional and local objectives, and are referred to as Supporting Projects. In most cases, currently identified projects will not be sufficient to fully achieve regional and local objectives. Additional projects will need to be identified as the watershed program evolves.

Integration Planning Approach

As local objectives are established and projects conceptually defined, project proponents will next wish to see how the project can be integrated with the watershed Vision, the three watershed Goals and watershed-wide Regional Performance Objectives. To outline the approach, first consider the three watershed Goals (Section 2.5):

1. **INTEGRATED WATER RESOURCES:** Coordinate, integrate and balance the hydrologic functions of flood management, water quality, water supply and habitat. (Water supply includes supplies from conservation. Both flood management and water quality include surface water runoff issues.)
2. **ECONOMIC DEVELOPMENT:** Integrate economic development with water-related programs and watershed restoration efforts.
3. **COLLABORATION:** Build and sustain effective relationships among watershed agency, landowner and community stakeholders to achieve common goals through positive collaboration and communication.

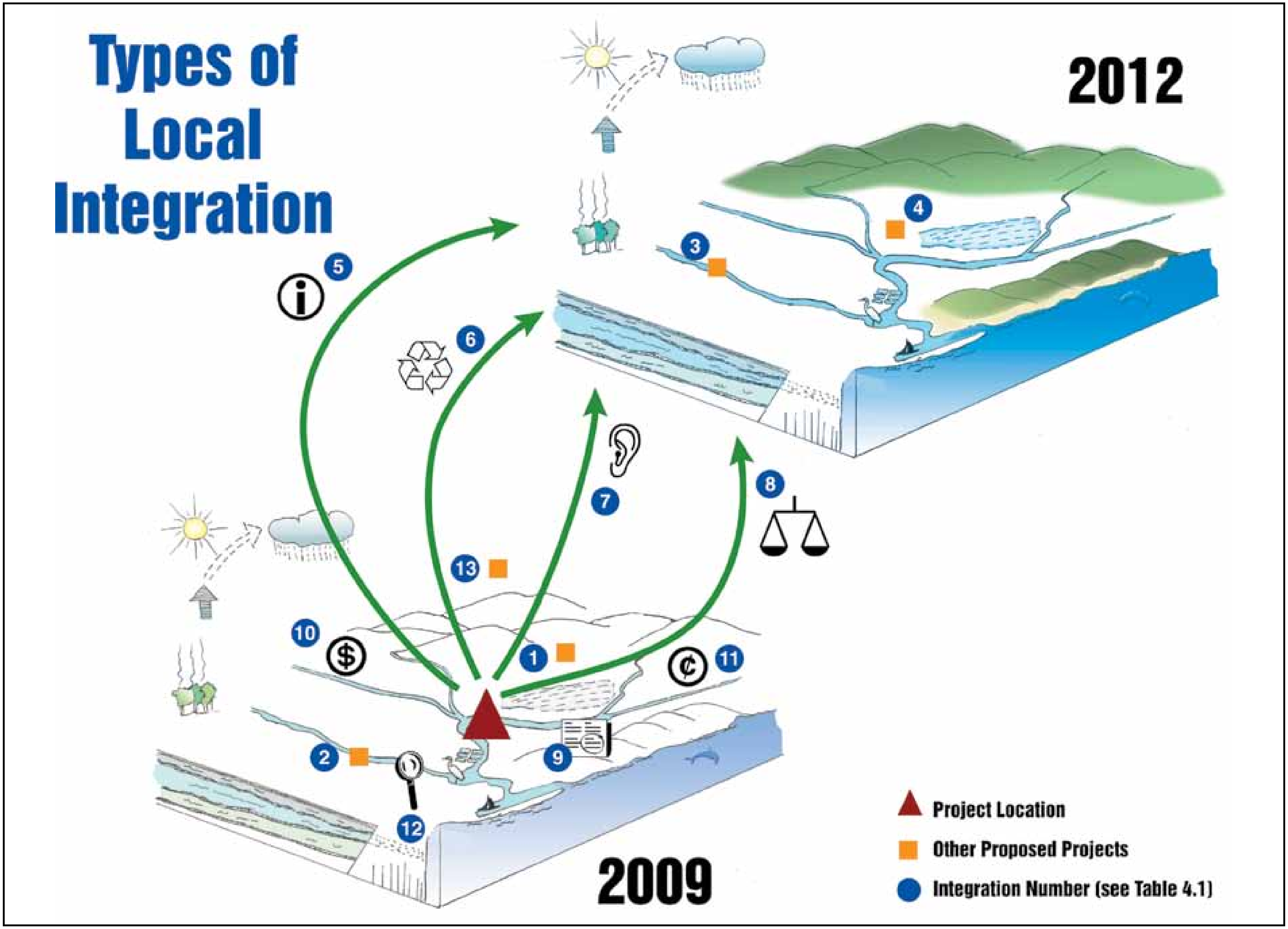


Figure 4.3 Types of Local Integration

Table 4.1 Types of Local Integration		
Integration No.	**Integration Type Description**	**Watershed Goal**
I_1	Projects or actions tie in adjacent projects such that all projects work together to promote healthy local hydrologic function or effectively resolve significant water related conflicts.	Goal 1
I_2	Project or actions are designed to significantly and effectively promote healthy downstream hydrologic function including projects that effectively resolve significant water related conflicts.	Goal 1
I_3	A pilot project is implemented to serve as an example for a larger future project or program	Goal 1
I_4	The project is designed such that it promotes effective implementation of future projects including projects that effectively resolve significant water related conflicts.	Goal 1
I_5	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to alleviate stress on our finite water resources.	Goal 1
I_6	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals for green economic development goals	Goal 2
I_7	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to foster full community participation in developing and implementing the Watershed Vision	Goal 3
I_8	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to foster full community participation by disadvantaged communities in developing and implementing the Watershed Vision	Goal 2
I_9	Stakeholders enter into a Memorandum of Understanding to develop a particular project	Goals 2 & 3
I_{10}	Stakeholders enter into a collaborative advocacy agreement to find project funding	Goals 2 & 3
I_{11}	Projects are designed for low cost Operations and Maintenance.	Goal 2
I_{12}	The project monitoring program is designed to fulfill the requirements of several local and regional projects	Goals 1, 2 & 3
I_{13}	The project explicitly ties with projects in adjoining watersheds or sister watersheds.	Goals 1 & 3

These goals explicitly recognize that at the regional level, coordinating, integrating, balancing, collaborating and communicating are essential mechanisms that must occur to create a functional plan that can achieve the watershed Vision. These are also essential at the project site. In fact, these mechanisms can be specifically defined and incorporated in the project design. Table 4.1 lists thirteen types of "integration" mechanisms to be considered by project proponents. A review of this list shows that none of these integration mechanisms would compromise a design. In fact, the cross-linkages created by these integration types are likely to enhance the functionality of the design and the long-term cost-effectiveness

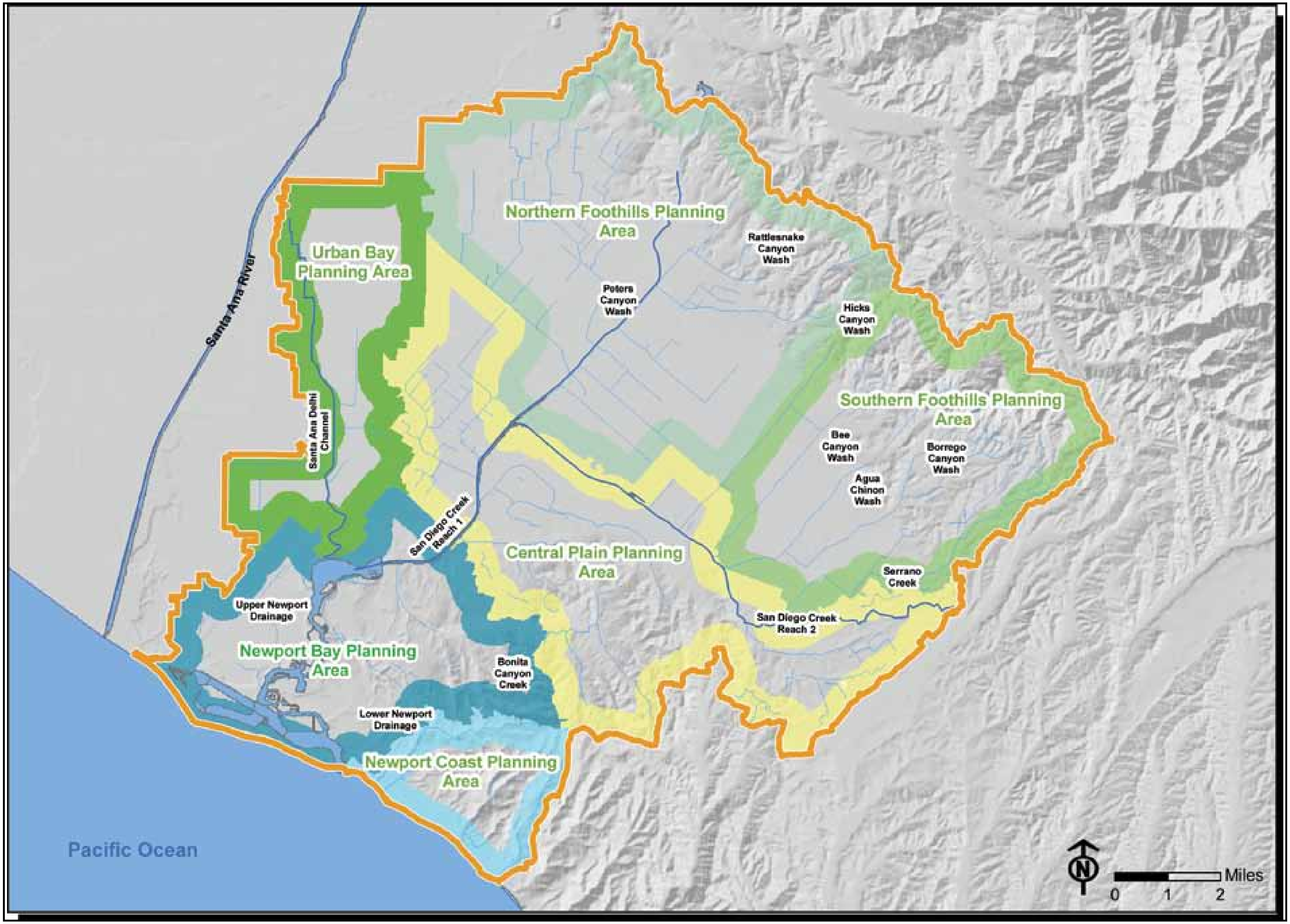


Figure 4.4 Planning Areas

of the project. These thirteen types of local integration are illustrated in Figure 4.3.

This Plan makes a distinction between "multi-benefit" projects and project integration planning. They are actually complementary concepts.

A multi-purpose project usually consists of a core project that includes, as possible, auxiliary projects. For example, a canyon stabilization project also lends itself to removal of invasive plants and replanting of native plants. It might be possible to replant in a way that provides a fuel modification zone for fire protection. It may also be possible to include public trails and amenities within the project limits. Clearly, we want to encourage water resource projects that look for opportunities to serve multiple purposes.

While multipurpose projects are generally a good thing, it is not necessarily an effective regional planning approach. Problems with an approach based solely on multiple benefits include:

- While a single project may serve more than one function, it may not be serving the functions that are most appropriate for a given site or for the watershed. Furthermore, these projects may still not be integrated with each other to function in a mutually beneficial way.
- Simply requiring multipurpose planning does not necessarily provide the tools to facilitate and direct appropriate multipurpose design. Because agencies tend to be set up for single purposes, other functions usually are not considered, especially if they are outside of that agency's expertise.
- The ideas that go into formulating a multi-purpose project do not necessarily provide guidance on how that multi-purpose project fits with another multi-purpose project. These projects could actually be working against one another.

A multi-benefit project can be considered a core project, along with additional tasks added to address site-specific concerns. Integration is the next step, where the multi-benefit project is amended to include attributes that will work with neighboring projects and downstream projects, foster future projects, etc., as reflected in Table 4.1. Chapter 11: Prioritization, proposes a scoring system that awards points based on the multiple benefits of a project, as well as the planning integration that has gone into the project concept.

Now, consider the idea of effective integration. A particular problem or issue that has been well studied and understood will not only be in a much better position to identify good project design solutions, but will also be in a better position to identify real and productive integration opportunities.

Planning for the purpose of integrating a project with the watershed vision is an effort above and beyond normal project planning and project impact analysis. For instance, in a typical CEQA analysis, a project proponent identifies impacts and corresponding mitigation practices to minimize adverse impacts. However, under integration planning, the project proponent looks for connections, linkages and synergies to other watershed projects and programs to support the long-term health of the hydrologic system as defined by the Desired State. This type of planning is ecosystem-based, as it looks to see how a proposed project fits into the larger scheme of a healthy and sustainable hydrologic system. Integration planning for each project will require innovative thinking to first identify relationships with other existing or potential watershed resources, and then to formulate practical ideas for creating synergies with these projects.

As this is a new kind of planning, there are few examples to draw upon. However, the planning for the Great Park provides an excellent example of how residential and commercial development can be integrated with the creation of the hydrologic and recreational aspects of the Great Park.

Another example of integrated planning is the Newport Coast ASBS Protection Program. This is a multi-pronged approach to protect the sensitive marine life. This program includes a dry-weather runoff reduction program, intertidal docent program, public-use assessment, capital improvement projects to reduce contaminant loads in the canyons, landscape and irrigation ordinance, Newport Bay pollutant load assessment, intertidal and subtidal surveys, mussel bioassessments, intertidal restoration, collaborative agreements with stakeholders and cooperative project funding with the State and local stakeholders.

Who would perform an integration planning study? It is likely to be a diverse team of experts drawing upon the planning, biological, ecological, social, engineering, computer science, economic and regulatory disciplines. The key is that the integration planning effort needs to include analyses of integration possibilities and recommendations such that accomplishment of watershed goals and achievement of the Desired State are facilitated.

As integration planning becomes more commonplace and more reports enter the public realm, it is likely that agency staff will be able to use these previous efforts as templates for integration planning on similar types of proposed projects.

Integration planning is explicitly rewarded when developing a list of priority projects for our watershed (See Chapter 11, Prioritization).

4.3 Step 3: Local Project Prioritization

In Step 2, local proponents define integrated water resource projects that meet local objectives. For the County and cities, these projects are incorporated into a capital improvement program with priority projects receiving funding (Step 3).

Each agency has its own prioritization process that balances regulatory, political, community, planning and engineering considerations. Another factor that can affect the priority of a project is the available funding, including funding available through cost-share agreements and grants.

4.4 Step 4: Regional (Watershed-wide) Project Prioritization

Stakeholders will have identified many important projects to address pressing local and regional objectives, such as providing for a reliable potable and reclaimed water supply, flood control, canyon stabilization, sediment control, toxic pollutant control, upland habitat restoration, estuarine rehabilitation, and ASBS protection. Furthermore, local agencies define priority projects based on local priorities. Given the importance of each of these projects, differing local priorities, and budgetary constraints that do not allow us to roll out all of these projects at the same time, how can projects be ranked to recommend those that work the hardest at making progress toward the Vision?

A project scoring system must take into account:

1. Watershed Goals and watershed-wide Regional Performance Objectives,
2. Local objectives,
3. State watershed issues and strategies,
4. Multi-benefit projects, and
5. Carefully planned integration of projects. It is recognized that state requirements for watershed planning, watershed-wide Regional Performance Objectives and identification of project inter-linkage types are in a state of active development, and therefore, the sophistication of the scoring system should not outstrip the confidence we have in the underlying parameters; i.e., our scoring system should be as simple as possible. The proposed scoring system that takes these parameters into account is described in Chapter 11.

Once all projects are scored, the draft list of prioritized projects (See Appendix A) will be reviewed by the Watershed Stakeholder Committee and then forwarded to the Newport Bay Watershed Executive Committee with recommendations. The Executive Committee members will consider the recommendations and approvals for the final project prioritization list.

Each project sponsor is responsible for identifying funding sources, including strategies for funding the long-term operation and maintenance of their project. For the projects identified in this version of the IRCWMP, funding needs and probable funding sources are included on the Project Information Form for each project (see Appendix B-1: Project Information Form).

On a complementary track, Orange County Watershed Division staff will perform research on potential grant funding options and, in consultation with the Stakeholder Committee, provide recommendations to the Executive Committee. The Executive Committee will provide direction regarding pursuing the grant funds.

4.5 Adaptive Management

The stakeholders place a high priority on the adaptive management process that will be used going forward. The Dynamic Planning Approach identified in this Plan is iterative and adaptive. Once projects are prioritized and implemented, stakeholders monitor the performance indicators for each regional and local objective to assess the progress that is being made. The Executive, Management and Stakeholder Committees can then use this information to identify ways to improve any part of the planning process. Any such improvement begins the four step dynamic planning approach over again. Adaptive management is a way to remain responsive to changing information and to choose the most appropriate strategies for this Region over time. It also requires monitoring progress towards the specific objectives, which is why it is important that each objective has a measurable indicator for success. This allows stakeholders to transparently and scientifically predict, monitor, analyze, and adjust the performance of projects, policies and strategies. A common monitoring program that coordinates data collection across all of the different stakeholders can be used for individual stakeholder purposes, as well as to understand the larger system over time and the impact of any actions taken. This science becomes data input for the next round of the Dynamic Planning Process as it is used to refine the Desired State and Regional Performance Objectives.

The Santa Ana RWQCB Watershed Management Initiative (November 2004) states that priorities for grant funding shall include projects that provide tools for managing and/or enhancing access to regional water resources data, water quality data, and watershed data. The Southern California Coastal Water Research Project (SCCWRP) is a joint powers agency formed to facilitate collaboration among local and regional public agencies to perform environmental research. SCCWRP focuses on coordinating and collecting data necessary for effective management of regional environmental resources. Local stakeholders are coordinating with SCCWRP to develop an effective and coordinated monitoring program that will: 1) refine the Desired State functional regional performance objectives, 2) identify appropriate indicators for monitoring change, and 3) assess the ecosystem outcomes of projects and activities. Continued cooperation through SCCWRP provides an excellent way to build on existing successful local monitoring and data assessment programs, such as the Nitrogen and Selenium Management Program, for multipurpose, regional benefit.

Adaptive management consists of four main components:

1. Data Collection: Each project will include a monitoring plan with performance indicators as part of the project proposal. These indicators are to be based on the Regional Performance Objectives that the project helps to achieve. Upon implementation, these indicators will be regularly monitored and tested to determine if objectives are being met that help achieve the Desired State. The lead project proponent will provide

update reports to the Watershed Management Committee. Examples of existing indicators are the TMDL and NPDES permit measurements. Identifying the appropriate performance indicators for the region has not been addressed so far, and is a next step for SCCWRP and others to focus on.

Sample monitoring opportunities include: water quality sampling, surface water ambient monitoring (SWAMP), pollutant loads, wetland restoration and photographic documentation. Examples of other elements to monitor could include imported water use, recycled/potable water produced and used, 100-year flood control FEMA compliance, habitat recovery from fire, invasive plant control efforts, NPDES permit requirements, other water quality parameters, groundwater levels and quality, soil salinity, sediment in Upper Newport Bay, ASBS and Bay measures of ecological health, habitat connectivity measures, and public participation levels. These types of data could also be used in the city/neighborhood planning, site design and in permitting phases of development.

2. Evaluation: If the indicators are not performing as desired, or if something in the situation has changed, then other management options are evaluated and prioritized. This may involve simple adjustments or it may require ad hoc committee work, studies, technical advisory input and/or stakeholder input. It also may involve reconsidering how water-related issues can be better integrated into infrastructure or other planning and design elements. Collaborative work among all involved stakeholders would allow solutions consistent with other regulatory plans,

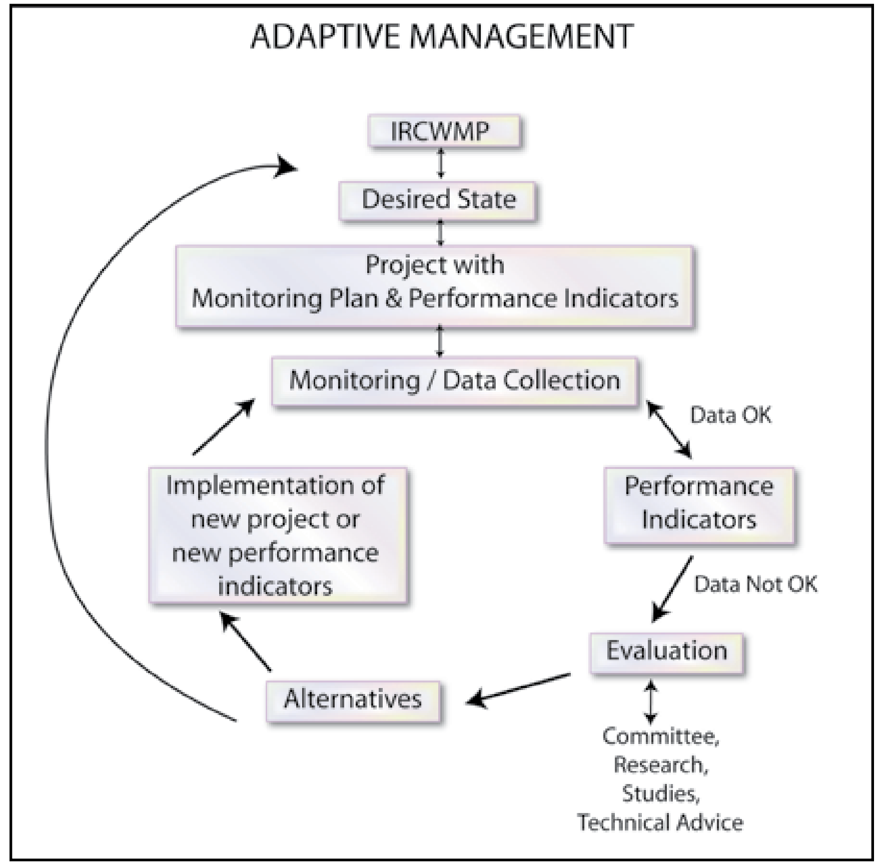


Figure 4.5 The process of adaptive management.

such as General Plans, building codes, the Drainage Area Master Plan, and state and federal regulations.

3. Communication: Data in different electronic formats may not be as valuable as a single database of information. Data sets, updated by each data set producer, could be stored in a multi-relational database, such as a GIS, to facilitate storage, querying, analysis, forecasting, simulation and reporting of indicators. Such a database would allow watershed-scale decision-makers to see the big picture more easily and thus, to make more informed decisions. Once information is developed and available for dissemination, the public and general stakeholders will be able to access specific data electronically, either through a single site or a directory of sites. Through the current and future technology of websites and data browsers, the public, stakeholders, and regulators can query data to assist in decision making and management objectives. Other monitoring websites may be identified and utilized as appropriate during implementation of the Plan.

4. Adaptive Planning: Appropriate decision-makers in the watershed use monitoring results to adapt any processes or projects that are not properly performing. Results can also improve the understanding of system function itself, in which case the Desired State or Regional Performance Objectives may need to be updated. At this time, performance indicators would also be updated if necessary.

This cycle is an ongoing process. It allows management to adjust strategies that aren't working and adapt to changing circumstances and new knowledge. A formal public revision of the IRCWMP itself can occur at regular intervals so that the stakeholders can assess progress and milestones as a group, and focus on any problems with the strategic components of the plan that require consideration.

References:

- Newport Coast Watershed Management Plan. October, 2007. City of Newport Beach.
- Santa Ana Regional Water Quality Control Board. November, 2006. Watershed Management Initiative. California State Water Board, California Environmental Protection Agency.
- **www.waterboards.ca.gov/santaana/html/wmi.html**

5 • SCIENCE-BASED DESIGN

The nature of a watershed system is largely determined by the way water moves through and interacts with the land. Rapid urban growth in the Central Orange County Region has created a myriad of challenges within the four water resource areas (flood management, water quality, water supply and habitat).

Effectively addressing watershed challenges requires taking a closer look at the design and construction of infrastructure, which should ideally support balanced hydrologic conditions. These conditions depend on the balance of physical, chemical and biological forces acting upon water and earth. As the balance is changed, due to natural or man-made events, the hydrologic system will shift. Although physical, chemical and biological processes are interrelated via natural cycles (e.g., carbon, nitrogen, hydrological cycles) and through networks and feedback loops, there is a general order of causation. Biology is in large part dependent on chemistry, and watershed chemistry is in large part dependent on physics (or the flow of water and sediment within the watershed). Therefore, appropriate designs for the physical, chemical and biological layers of the system can help define an integrated Desired State for the system.

This chapter describes important watershed processes and discusses general suggestions on how the hydrologic system could be changed to become more healthy and self-sustaining, while meeting community needs and expectations.

5.1 Physics

The ‘physics’ aspect of the hydrologic system involves the volume and velocity of dry weather and storm flows conveyed into the storm drainage system or infiltrated into the groundwater aquifers.

The turbulent nature of flowing water causes it to entrain sediment and transport it downstream. Water flowing at higher velocities has a greater capacity to carry sediment. Water that is not already carrying its capacity of suspended sediment, known as ‘hungry water’, will pick up new sediment wherever it can from stream channels until it reaches its carrying capacity. Therefore, storm flows already carrying large amounts of sediment are less erosive, while those with lighter sediment loads, or ‘hungry water’, are more erosive. The rate of erosion is determined by the water’s sediment carrying capacity and the composition of the base material (Boyle Engineering, 2007).

Over time, this movement of water and soil, in concert with other natural forces, creates landforms, water bodies, alluvial flood plains, gravelly foothills, marshes and meadows, and groundwater infiltration areas. Canyon streambeds form an equilibrium state, called a pool and riffle stream structure, which is composed of alternating reaches of steep, rocky reaches characterized by rapid and white waters, and flat reaches of slow moving water and pools with beds of sand and fine sediments.

Prior to urbanization, the leading edge of storm flows eroded the plains, hillsides and canyons, transporting sediment downstream. If the storm was long enough and of sufficient intensity, this sediment was transported into Newport Bay and the ocean, where it replenished beach sand. As the storm diminished, sediment fell out, thereby replenishing the areas previously scoured by the leading edge of the storm.

The human process of altering the flow of water over land is called hydromodification. Urban hydromodification has caused sediment transport rates to become unbalanced, resulting in severe downcutting of upstream streambeds and canyons and excessive sediment deposition downstream in Newport Bay, throwing both kinds of habitats off-balance and creating very expensive maintenance issues. Hydromodification occurs as land is covered by impermeable surfaces such as roads, sidewalks, parking lots and roofs.. The water that used to absorb into that ground is then directed into storm drains, increasing the volume and velocity of water flowing directly to the stream channels during storm events.

Figure 5.1 Sediment in San Diego Creek near Barranca Parkway, Irvine

This causes both increased flooding as well as erosion. At the same time, runoff flowing over impervious surfaces, such as roofs, concrete and asphalt is not picking up enough sediment to fulfill its carrying capacity. Storm runoff enters the canyons and is severely undernourished for sediment. As a result, storm flow deeply erodes the canyon to try to fulfill its sediment carrying capacity. As the storm intensity decreases however, there is not enough sediment dropping out to fully replenish the scoured streambed. Over time, this results in a net erosion of the canyon stream beds. In the past 20 years, streambed 'down-cutting' of 10 to 15 feet or more has been measured in Serrano Creek and Borrego Creek, as well as the coastal canyons in Newport Coast. Streambed down-cutting is especially dangerous as it erodes the material that forms the buttress for canyon banks, destabilizing the banks and potentially resulting in landslides. Clearly, a more balanced sediment transport is desirable as this protects the stability of the canyon as well as the flora and fauna that it supports.

Stream flow characteristics that would create a more balanced sediment transport is desirable because it would protect the stability of the streams and canyons, as well as the flora and fauna that live in them. The first step in designing a Desired State for the hydrology of the Region would be to determine the flow characteristics needed to support naturalized stream channels that have a stable physical structure and adequate flood flow capacity. In many cases, this will require looking for opportunities to decrease peak flows entering a stream, canyon or channel. It can also mean designing naturalized channels that have alternating pools and riffles in order to stabilize sediment transport through areas that have a steeper slope. Natural channels usually have lower conveyance capabilities within the same amount of space than concrete channels do. Channel conversion would require reducing the volume of water in a stream, or purchasing the land along the channel in order to avoid flood damage to developed property.

From the point of view of water quality improvements and habitat creation, naturalized stream channels in the Region would be preferred. This is where the iterative collaborative process begins because naturalizing all stream channels will require a great degree of alteration to the existing drainage system at significant cost. In most cases the constraints are too great and require a compromise solution.

Figure 5.2 Erosion in Borrego Creek.

5.2 Chemistry

The next layer of the hydrologic system is chemistry. The physical structure of the system defines where water goes and how long it stays there. Wherever water goes, it exchanges molecules with everything it comes into contact with. As water rushes quickly over soil and debris, it can leave contaminants behind or pick up new ones. All of these molecules interact to form the chemical environment for plant and animal life. When the combination of chemicals becomes toxic, or when an oversupply of a particular constituent creates unhealthy conditions, water quality problems arise and limit the value of the resource for a variety of human and habitat purposes.

Soil, plants and bacteria naturally take up the contaminants that find their way into water. However, when water is separated from land by concrete, contaminants accumulate because they don't interact with anything that can metabolize or convert them. Once this water finally reaches a natural environment its chemistry is so far from any range of what naturally occurs, that the receiving water has no way to handle the load and becomes an unhealthy place for plants, animals and humans. The next step in defining a Desired State is determining the extent to which water needs to be reintroduced to natural surfaces upstream in order to achieve the desired conditions downstream.

In order to stabilize the physical structure of the hydrologic system, stakeholders will be retaining more water on site, thus slowing its movement into the stream channels. This provides an opportunity to address the chemistry of the water that is being held back, by reintroducing it to the cleansing capability of soil, vegetation and bacteria, in conjunction with mixing, aeration and other simple treatment processes. This is one way a hydrologic system design can begin to serve multiple, and mutually-beneficial, purposes.

One method for doing this is to increase the use of vegetated bioswales. Instead of directing water to the street where it rushes quickly to a concrete storm drain, it can be directed to vegetated medians or planter areas where soil, plants and bacteria can consume contaminants and release clean water. In high density areas where water capture is not feasible on site, it can be directed to local parks and open spaces, which can be redesigned to naturally filter the water before it moves on. All of these techniques are what is known as green infrastructure or low impact development (LID). Water is sent through a constructed treatment train using natural processes that serves as both water quality and flood management infrastructure. As an example, the Newport Boulevard bioswale, composed of layers of sand, gravel and river rock, is removing about 75 percent of fecal indicator bacteria. The IRWD Natural Treatment Systems are another example.

Another benefit to capturing and treating runoff is the opportunity for re-use as a water supply for landscapes or potable uses. The level of treatment may vary, depending on its ultimate use, but taking advantage of this local source could be a significant factor in reducing the imported water supply demands of this region.

These types of projects should be strategically located throughout the watershed to maintain a high level of water quality at the source. This is preferable to treating poor water quality downstream where treatment is unmanageable and degradation is already an environmental and regulatory liability. Stakeholders working to define a Desired State need to work on quantifying the amount of

Figure 5.3 Newport Boulevard bioswale.

systemic contaminants needing this type of treatment. Determining the amount of additional local water the region needs in order to have a self sufficient water supply is also important. The purification capability necessary to produce that amount of water will need to be quantified. These figures can then be used to determine the amount of treatment necessary and the extent of green infrastructure it would take to produce it. This figure will be a guide for local planners who will find the many implementation opportunities over time.

The locally appropriate solutions for achieving overall Desired State requirements will vary. For example, naturally occurring selenium is a big problem in this Region. Selenium is part of our natural food chain, but in elevated levels it inhibits the ability of local animal species to reproduce. In areas with extremely high levels of selenium, open bioswales may not be the best solution because animals who find their way to those projects may suffer from the pollution. This may require a different technology, even though the total amount of water that needs to be treated will remain the same.

5.3 Biology

The physical and chemical conditions of a place largely influence the kinds of biological systems and habitats that will naturally survive there. Over centuries, they define the conditions to which native species gradually adapt. For example, coastal sage scrub and chaparral plant communities have developed adaptations to lean gravelly soils, drought and fire. In Upper Newport Bay, native plants are adapted to the wet, salty, alkaline conditions of an alkali marsh. Animal populations, in turn, adapt to the hydrological conditions, plant communities and other animals.

Plant and animal life evolve around these conditions, but they also close the loop by providing physical and chemical inputs of their own. Plants are 'primary producers', using the sun's energy, water and a variety of other chemicals to produce biomass. Their roots release oxygen back into the water and soil, develop synergistic relationships with native soil microorganisms, and anchor the soil in place. The energy contained in this biomass is passed up the food chain when it is consumed by animals. Animal and plant material then decays with the help of microorganisms, contributing physical and chemical components back into the soil, water and air. This natural process contributes to the habitat that supports an area's biodiversity, provides important filtration functions, reduces flood impacts by slowing and absorbing rainwater, intercepts particulate air pollution, provides recreational and aesthetic value to the surrounding community, and calms and cools urban streetscapes.

Stakeholders developing the Desired State need to establish appropriate acreage and locations for natural habitat. As more stormwater and water quality projects are implemented, the ability to sustain healthy in-stream and downstream habitat will improve. Achieving the Desired State requirements for biological systems may take the longest; but getting there will require actions that begin now, such as using riparian open space priorities as a guide for land use planning and mitigation programs..

Reference

- Boyle Engineering, November 7, 2007 meeting. Hank Fehlman, Consultant. Presentation: Upper Newport Bay Ecosystem Restoration Project and Sediment TMDL Compliance Objectives.

PART II: PLANNING

In Part II, Chapters 6, 7 and 8 present the Regional Performance Objectives for each of this Plan's three goals: Integrated Water Resources, Economic Development and Collaboration.

Chapter 6: Integrated Water Resources, describes the Desired State for the Region in terms of the four water resource areas: flood management, water quality, water supply and habitat. Note that the Desired State applies only to the Integrated Water Resources Goal (Goal 1) because of the need to define a common understanding of how the hydrologic ecosystem works among those who manage different aspects of this system. The Desired State is based on building a stakeholder consensus for how these hydrologic functions should be balanced given the finite quantity of water in the Region. Existing policies and regulations provide the starting point for defining the Desired State. Additionally, as described in Section 4.1, stakeholders have begun identifying other water resource objectives to provide a more robust description of the Desired State. Refinement and integration of the Regional Performance Objectives for the Desired State will take time and will occur through subsequent phases of watershed planning for the region.

Regional Performance Objectives for Goal 2, Economic Development and Goal 3, Collaboration are listed in Chapters 7 and 8, respectively. Chapter 9: Urban Design, presents a range of land-use strategies to enable the achievement of the Regional Performance Objectives.

6 • WATER RESOURCES

Goal No. 1 for the Central Orange County IRCWMP is to: "coordinate, integrate and balance the hydrologic functions of flood management, water quality, water supply, and habitat." The Desired State for our region involves implementation of a balanced approach toward managing the four primary water resource areas:

1. Flood Management
2. Water Quality
3. Water Supply
4. Habitat

In a healthy and self-sustaining environment, these four water resource areas function in balance with each other. Chapter 3 outlines some of the specific challenges and undesirable outcomes being faced in each of these management areas. For example, large scale land development has increased impermeable surface area and as a result, decreased sediment transport from land into nearby streams. This shortage of sediment supply has disrupted the natural hydrologic balance, resulting in streambed erosion and destabilization of canyon banks. This in turn has resulted in increased flooding hazard, destruction of riparian habitat and estuary sedimentation. The current movement to encourage on-site detention of storm flows is a good start toward correcting the problem.

This chapter presents preliminary watershed-wide Regional Performance Objectives for Goal 1, Integrated Water Resources. In the ongoing development of the IRCWMP, and through the adaptive management process, these objectives will be expanded and refined. Where conflict persists among these uses, local stakeholder groups and technical experts will need to collaborate to achieve a resolution. While the Regional Performance Objectives are defined for the whole watershed, they provide guidance for individual project identification, planning, design, integration and prioritization.

6.1 Flood Management Regional Performance Objectives

Storm intensity and duration, infiltration capability of the land, antecedent soil conditions (saturation of the ground due to earlier storm events) and existing water volume in the storm conveyance system impact the storm conveyance capability of a particular channel. In general, our stormwater conveyance system of natural and concrete channels is sized to handle 65 percent of the largest storm event likely to happen in a 25-year period, commonly referred to as the 25-year storm event. The other 35 percent of the peak flow is captured using a system of detention facilities

Figure 6.1 Hicks Canyon Retarding Basin sediment levels after the 2007 Santiago fire and subsequent winter rains. (3-photo sequence)

managed by the Orange County Flood Control District. With climate change, storm intensities may increase while storm durations decrease.

Regional Performance Objectives to address flood management issues that are in concert with the watershed Vision include:

1. Conduct a study by 2010 to inspect all storm and flood conveyance systems and provide findings and recommendations regarding the potential impact of climate change on flooding, canyon and channel stability, water quality and habitat.
2. Conduct a study by 2010 to provide recommendations on how to reduce peak flow in all the canyons and channels by 10 percent. The study will make recommendations on neighborhood-scale green infrastructure for water capture and treatment.
3. Conduct a study by 2012 to look for opportunities to implement stream channel naturalization efforts, including the use of eco-friendly engineering structures and soft bottomed channels, to promote riparian habitat and natural water quality treatment in concert with stable sediment transport and flood safety.

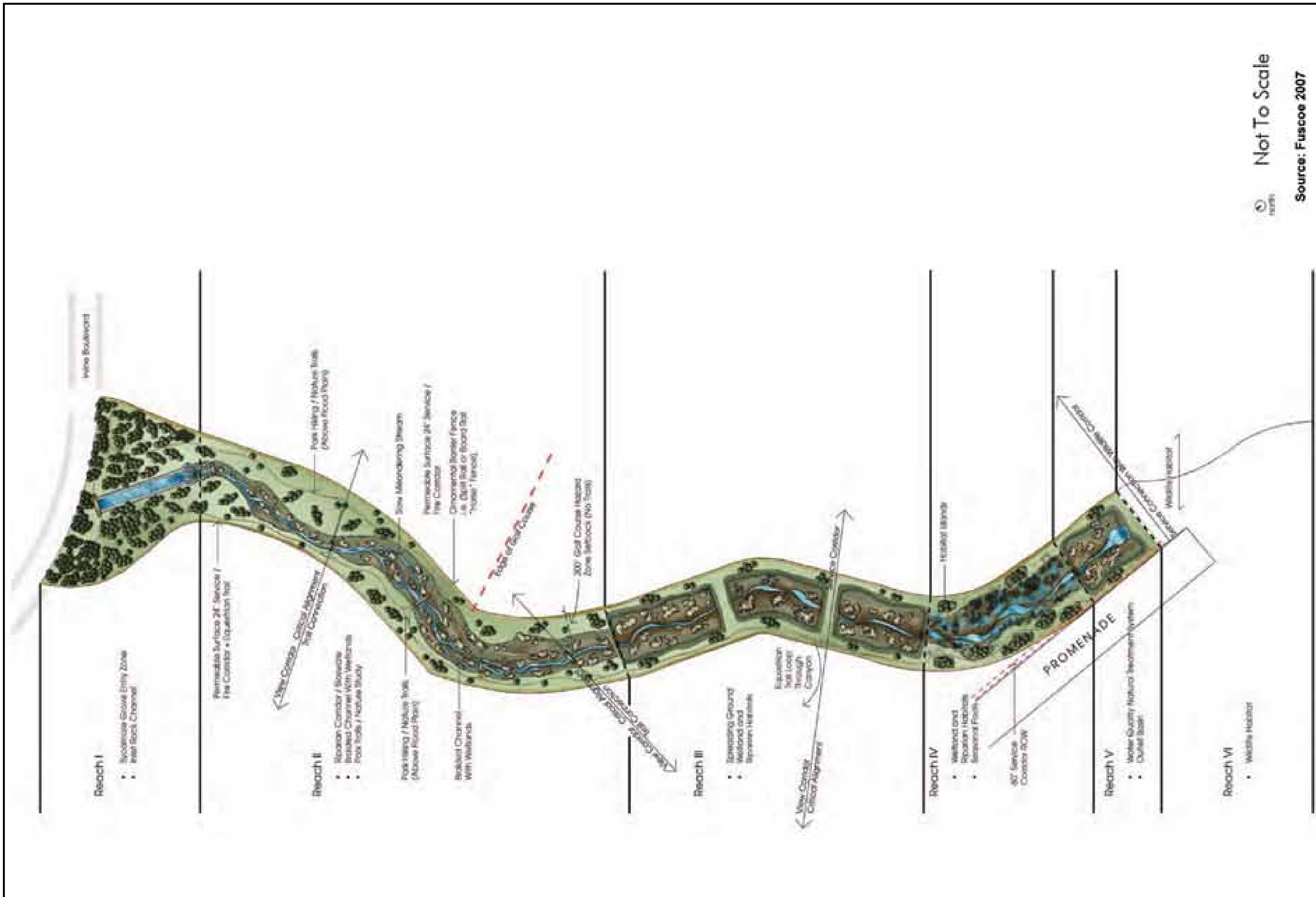


Figure 6.2 Proposed design for daylighting the Great Park section of Agua Chinon.

Figure 6.3 Borrego Channel near Alton and Barranca, Irvine

Figure 6.4 Serrano Creek restoration upstream from Bake Parkway and Toledo, Lake Forest

6.2 Water Quality Regional Performance Objectives

Water quality objectives have to do with the quality of surface water and groundwater. This section defines objectives at the site scale, community scale and regional scale.

Site Scale

The proposed Regional Performance Objectives addressing site-scale surface water runoff are:

1. By 2020, reduce the volume of stormwater urban runoff by capturing or the first 0.25 inch of rainfall on site or treating it off-site.
2. Eliminate dry weather urban runoff at site scale by 2020.

Strategies for reducing surface water runoff include:

- Requiring low impact development BMPs on all new development and redevelopment projects.
- Retaining the first 0.25 inch of rainfall on site.
- Encouraging infiltration in areas with appropriate soil, slope and groundwater levels and pollution characteristics. For example, parking lots can be graded to drain to vegetated swales. Maps locating such areas and site-scale soil testing will be necessary. Another consideration is that the Orange County Vector

Control District requires complete infiltration within 72 hours to discourage mosquito breeding. These areas should also have adequate vegetation cover to naturally treat captured water.

- In sites not suited for infiltration, consider draining runoff through vegetated swales or constructed wetlands to preserve water quality as it flows off site.
- Reducing irrigation needs by encouraging landscaping with native and non-invasive drought- tolerant plants in favor of water-thirsty or invasive (www.cal-ipc.org) plants. Local landscaping ordinances should consider requiring native or non-invasive drought-tolerant plant palettes. Encourage successful pilot projects using weather-based "smart" irrigation controllers to eliminate over-irrigation. These controllers meter water to plants based on weather conditions, plant and soil type, slope and sun exposure. Pilot studies in Southern California indicate that residential and commercial landscape reductions of 10-18 percent could be realized (U.S. Dept. of the Interior, 2008). IRWD, MWD and the U.S. Bureau of Reclamation have been leading proponents for the weather-based "smart" controllers. The State is also moving forward with regulations to promote use of these controllers.

Figure 6.5 Swale at Ladera Ranch, Orange County

Community Scale

The proposed Regional Performance Objectives addressing surface water runoff from a community are:

1. Reduce peak flows for a two-year storm event at neighborhood and subwatershed scales by 25 percent by 2024.
2. Protect from erosion all canyons and channels tributary to Newport Bay by 2020 (added August, 2009, per Bay-Coastal

Figure 6.6 Neighborhood treatment wetlands, Orange County. (Source: Fuscoe Engineering)

water quality meeting).

Strategies for reducing surface water runoff at the community scale include:

- Designing streetscapes, medians, open spaces, parks, neighborhood common areas and public facilities to capture and treat runoff from the sites themselves as well as runoff from surrounding land uses.
- Allow infiltration in areas with appropriate soil, slope and groundwater characteristics.

Regional Scale

The proposed Regional Performance Objectives addressing surface water runoff at the regional scale are:

1. Meet TMDL requirements for sediment, nutrients, fecal indicator bacteria and toxics.
2. Reduce dry weather flows to Newport Bay associated with over-irrigation and wash-down activities by 50 percent by 2020 (added August, 2009, per Bay/Coastal water quality meeting).
3. Reduce sediment loads to the bay such that no dredging of the bay is required before 2030 (added August, 2009, per Bay-Coastal water quality meeting).
4. By 2012, prepare a study to examine commercially available nutrients, herbicides and pesticides and prepare recommendations for moving toward using less toxic substances, including the practice of Integrated Pest Management..
5. By 2012, prepare a study to consider modifying stream, canyon and channel habitats to provide better removal of contaminants and to encourage aquatic nutrient cycling. Include incorporation of vegetated riparian buffers along sides of stream channels where feasible.
6. Implement and continue projects to reduce groundwater pollutant concentrations by 50 percent by 2024.
7. Reduce regional scale peak flows for a two year storm event by 25 percent by 2024.
8. Reduce regional scale peak flows for a 100 year storm event by

10 percent by 2024.

9. Reduce fecal indicator bacteria associated with pet waste discharge into Bay by 90 percent by 2024.

6.3 Water Supply Regional Performance Objectives

Ideally, the Desired State for water supply would be to supply the Region from local water sources, except in emergencies. Exactly how that could happen is not yet known. The ability to deliver water to a user is a function of the location, timing, quality, quantity and price of the source water. All of these factors have to come together correctly in order for water supply agencies to make investments in developing new sources of water and new water efficiencies. To work through these variables, agency stakeholders will need to analyze a variety of scenarios, examining the basic assumptions required in order to increase local water supplies and decrease per capita demand.

In 2009, the University of California Office of the President awarded $2.4 million to the Center for Hydrologic Modeling, which links researchers at eight UC campuses (including UC Irvine) and the Lawrence Berkeley, Lawrence Livermore and Los Alamos national laboratories. The center will determine how much water exists in California and where it's located by using satellites and field research. Water agencies throughout the state will use the results when developing policies and allocation plans. (Evangelista, 2009.)

An important first step is to quantify all of the water that is currently moving through our Region. A system water budget would quantify all of the water in the Region, where it is and where it currently goes. This analysis will show us what our constraints and opportunities are. It will be the tool the water supply agencies need in order to coordinate with flood, water quality, and habitat managers to develop management strategies for serving each of these interests.

At the same time, "Goals for percentages of water supply demand that should be met by local sources should be set collectively by all the stakeholders of the region lying within the boundary of the groundwater basin. Proposed objectives should be consistent with the existing policies and plans of the Orange County Water District." (OCWD, 2009)

This challenge may be daunting; however, it is very important. Pumping water around the state to supply distant users is the single largest user of energy in the state. Eliminating or severely reducing reliance on imported water is the most important thing this Region can do with its water resources to reduce its impact on climate change. It is also important for ensuring an adequate water supply for habitats elsewhere in the state that depend on this water.

As agencies come together to analyze the system parameters and develop the Desired State's system design, the following Regional Performance Objectives for water supply will be refined to reflect those advancements:

1. Each local agency is to develop a water budget its service area by 2020.
2. Revise the county and municipal general plans by 2020 to integrate watershed-wise strategies into all elements of a general plan.
3. Increase total local supplies of potable and recycled water to 90 percent of total normal demand by 2024.
4. Increase total local supplies of recycled water to 90 percent of total normal demand by 2024.
5. Reduce total potable water use by 20 percent by 2024.
6. Reduce landscape irrigation by 50 percent by 2024.
7. "Over the long term (several years), the Basin must be maintained in an approximate balance (inflow and outflows are approximately equal) to ensure the long-term viability of Basin supplies." (GWMP, 2004)

6.4 Habitat Regional Performance Objectives

In general, the ecological purpose for preserving habitat is to provide the conditions the flora and fauna of the Region need for long-term and robust survival. The Ecological Society of America (Christensen, et al. 1996) lists eight elements of ecosystem management to provide guidance to the Regional Performance Objectives for Habitat:

1. **SUSTAINABILITY:** Ecosystem management does not focus primarily on deliverables but rather regards intergenerational sustainability as a precondition.
2. **GOALS:** Ecosystem management establishes measurable objectives that specify future processes and outcomes necessary for sustainability.
3. **SOUND ECOLOGICAL MODELS AND UNDERSTANDING:** Ecosystem management relies on research performed at all levels of ecological organization.
4. **COMPLEXITY AND CONNECTEDNESS:** Ecosystem management recognizes that biological diversity and structural complexity strengthen ecosystems against disturbance and supply the genetic resources necessary to adapt to long-term change.
5. **THE DYNAMIC CHARACTER OF ECOSYSTEMS:** Recognizing that change and evolution are inherent in ecosystem sustainability, ecosystem management avoids attempts to freeze ecosystems in a particular state of configuration.

Figure 6.7 South Coast Ecoregion Wildlife Movement Linkages (Source: South Coast Wildlands Project).

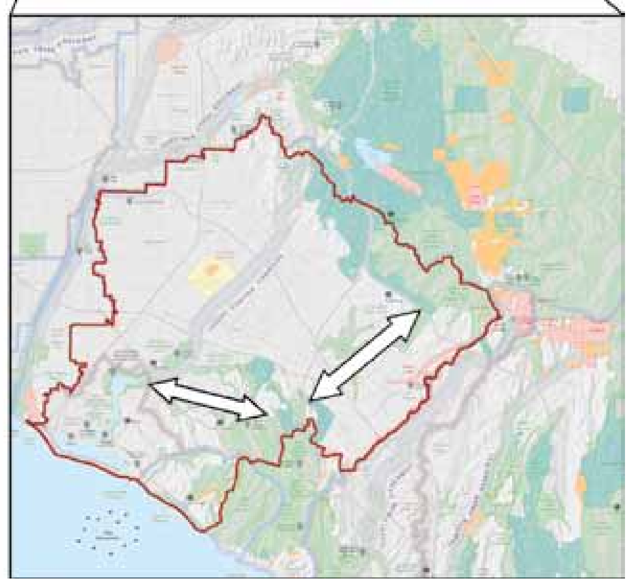


Figure 6.8 Regional and watershed wildlife linkages. Great Park Wildlife Corridor and San Joaquin Hills – Upper Newport Bay linkages. (Source: Friends of Harbors, Beaches and Parks).

6. **CONTEXT AND SCALE:** Ecosystem processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is greatly affected by surrounding systems. Thus, there is no single appropriate scale or timeframe for management.
7. **HUMANS AS ECOSYSTEM COMPONENTS:** Ecosystem management values the active role of humans in achieving sustainable management goals.
8. **ADAPTABILITY AND ACCOUNTABILITY:** Ecosystem management acknowledges that current knowledge and paradigms of ecosystem functions are provisional, incomplete, and subject to change. Management approaches must be viewed as hypotheses to be tested by research and monitoring programs.

These elements reiterate the necessity of preserving ecosystem processes at multiple scales and also of allowing for population fluctuations. This is why the idea of habitat connectivity and linkage is so important. As survival becomes threatened in one area, due to natural or man-made disturbances, disease or climate change, species need opportunities to move elsewhere.

The South Coast Wildlands Project (SCWP) is a non-profit organization based in Southern California that focuses on identifying and preserving the habitat linkages that are most critical to the long term survival of those species present in the South Coast Ecoregion. They have developed habitat modeling and mapping methodologies based on the science of conservation biology. The mapping is GIS-based so that it can be easily used by a wide variety of decision makers at any scale and at any time (www.scwildlands.org).

Their work provides a methodology for identifying the most critical areas for conservation that the stakeholders here could adapt to scientifically enhance the basis of the long term Regional Habitat Performance Objectives. For ultimate effectiveness, it is important to connect the habitat management activities with the work being done at the larger South Coast Ecoregion scale. The NCCP/HCP, the Laguna Canyon Foundation and the Great Park wildlife corridor plans have already engaged in some of this type of planning (Figures 6.7, 6.8).

The U.S. Army Corps of Engineers is in the process of preparing a Special Area Management Plan (SAMP) for the riparian areas of the San Diego Creek Watershed. When finished, ecological research from that report may be useful in adjusting the Regional Performance Objectives.

The proposed habitat Regional Performance Objectives include:

1. By 2010, prepare a region-wide invasive plant review (veldt grass, garland chrysanthemum, pampas grass, artichoke thistle, castor bean, and *Arundo*) with recommendations for a systematic removal program. Study to also include recommendations for restricting sale and planting of problem plants.
2. By 2010, prepare a region-wide invasive animal review, including bullfrogs, African clawed frogs and brown-headed cowbirds with recommendations for a systematic removal

Figure 6.9 Estuarine habitat, Upper Newport Bay.

Figure 6.10 Light-footed clapper rail in cordgrass. (Photo courtesy of ©Russ Kerr/majestyofbirds.com)

Of particular importance is the light-footed clapper rail (*Rallus longirostris levipes*),which has been a state and federally listed endangered species since the early 1970s. It is a non-migratory year-round resident of coastal wetlands in Southern California and northern Baja California, Mexico. It inhabits coastal salt and freshwater marshes containing cordgrass, cattails, and rushes and is often best seen during high tides, when the bird is forced out of the thick marsh vegetation. The bird rarely flies, preferring to run. It feeds primarily on invertebrates such as crabs, snails, insects, worms, and mussels, supplemented occasionally with fishes, tadpoles, plant matter and possibly mice. Raptors, raccoons and larger mammals predate on the birds and their eggs.

The survival of this bird is threatened by loss and degradation of habitat, especially nesting habitat, although management efforts may result in eventual recovery. The Upper Newport Bay subpopulation of 165 breeding pairs comprised 37.3% of the state total of 443 pairs in 2007. It is considered the only viable subpopulation of light-footed clapper rails in California that is capable of rebounding quickly following weather-induced catastrophes. The Tijuana Marsh NWR subpopulation and those of six other marshes in Southern California comprise most of the rest of the breeding populations.

program. Study to also include recommendations for restricting sale of problem animals.

3. By 2010, prepare a study that examines evidence of impacts to the fish and birds in Newport Bay and provide recommendations for setting impact targets based on a weight-of-evidence approach.
4. By 2012, prepare a region-wide review of native plants and animals. The study to identify critical indicator species with recommended targets for population, number of breeding pairs, and spatial distribution and coverage.

5. By 2012, prepare a study of the marine life resources in the Critical Coastal Areas and Areas of Special Biological Significance and prepare recommended targets for indicator species population and diversity.
6. By 2012, prepare a region-wide review of legal and illegal trails and provide recommendations for increasing the number of legal trails and eliminating illegal trails.
7. By 2012, prepare a region-wide study of critical linkages between vegetation communities and provide recommendations for creating wildlife corridors and increasing buffer zones along creeks.
8. By 2012, prepare a region-wide study of fire hazard areas at the wildland-urban interface (WUI) and provide recommendations for establishing fuel modification zones, converting non-native grasslands to native plants, stricter building and planning regulations, improved fire response capability, restricting access to certain critical open space areas during the fire season, and reviewing fire risks due to power lines.
9. Repair and restore 75 percent of degraded wetland/upland habitat around the bay by 2020 (added August, 2009 per Bay/Coastal water quality meeting).
10. Repair and restore all degraded bay wetland and upland habitat by 2025 (added August, 2009 per Bay/Coastal water quality meeting).
11. Increase freshwater riparian habitat to 50 percent high integrity habitat by 2020.

Discussion of these objectives follows.

Estuarine

The total existing area of estuarine habitat in the Upper Newport Bay, including salt marsh, mudflat and tidal open water habitat is roughly 760 acres. The potential to expand this type of habitat is limited to areas with tidal influence in San Diego Creek, Delhi Channel, and/or Big Canyon. Rising sea levels due to climate change may impact these numbers.

Riparian and Freshwater Wetland

The total existing area of riparian habitat in the Newport Bay Watershed, per the ACOE Riparian Restoration Plan, is roughly 1,670 acres, of which 570 acres (34 percent) is considered high integrity. The IRWD Natural Treatment System Project when fully implemented would add or enhance roughly 120 acres of riparian and freshwater wetland habitats. Additionally, to minimize the adverse impacts of human activities to habitat and wildlife, vegetated buffer zones around aquatic habitat are important.

Terrestrial

Terrestrial habitats are comparatively widespread. Specific habitats (e.g., coastal sage scrub) are protected by various regulatory programs. There are roughly 354,000 acres of coastal sage scrub habitat in the watershed. Terrestrial habitats achieve greater connectivity when located in areas adjacent to riparian corridors or other habitat areas.

Another big threat to terrestrial habitat is frequent wildfires. If fires are at least 15-20 years apart, native coastal sage scrub and chaparral plant communities rejuvenate on their own. However, fires have been more frequent due to human influence. The recent October 2007 Santiago Fire burned most of the foothill areas in Central Orange County, resulting in a likelihood of type-conversion to non-native grasses, increased stress on endangered species (e.g., coastal cactus wren) and increased erosion and sedimentation. The Nature Reserve of Orange County has come up with a plan to improve fire management within larger open areas.

The Orange County Fire Authority (OCFA) provides Regional Performance Objectives for reducing fire risks in the Urban-Wildland Interface Fire Safety Report (May 2005):

- Clear all dead or flammable vegetation at least 30 feet from structures.
- Thin vegetation within the next 70 feet and replace with fire-resistant plants. See www.occnps.org and www.ocfa.org for a list of native plants that are on OCFA's fire-resistant list.
- Space trees and shrubs at least 10 feet apart.
- For trees taller than 18 feet, remove branches within 6 feet of the ground.
- On slopes or near thick, tall vegetation, clear a space at least 100 feet from all structures.
- Important design features are fire breaks, non-combustible

Figure 6.11 Riparian and freshwater wetland, Veeh Creek.

Figure 6.12 Terrestrial habitat, Laguna Coast Wilderness.

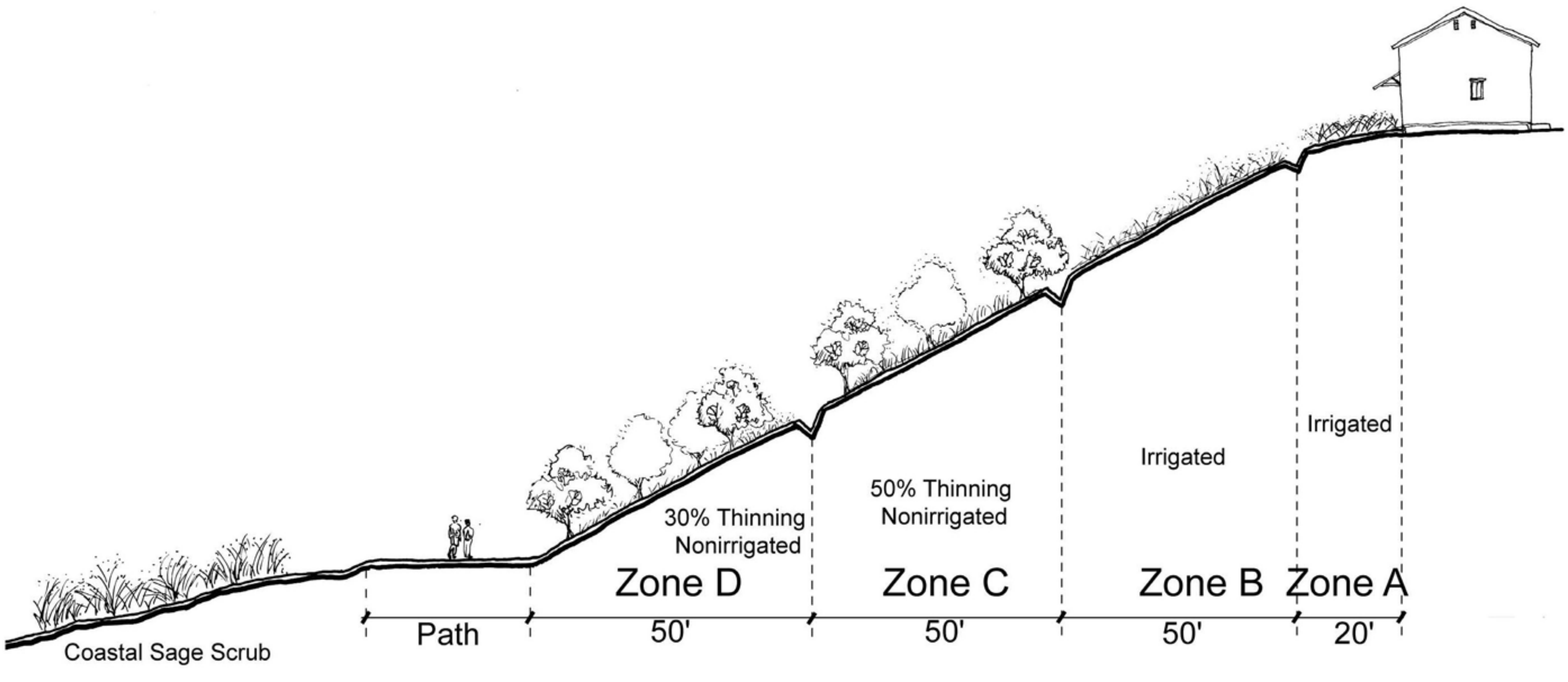


Figure 6.13 Wildland Urban Interface (WUI) fuel modification, sample section diagram. (Source: Healthy Urban Watersheds Design Guidelines, and Orange County Fire Authority)

fencing, enclosed eaves, fire-resistant roofs and decks and landscaping that reduces the risk of spreading the fire. See also: Chapter 10.1.

There may be times when the habitat needs of one of these species will conflict with the needs of another. For instance, the light-footed clapper rail and the California least tern are both endangered and breed in the Upper Newport Bay. However, one needs lower salt marsh for nesting, while the other needs sandy areas and open water close to its nesting area. The least tern now has successful breeding colonies at various locations along the coast, but the light-footed clapper rail's largest viable population is in Upper Newport Bay. Therefore, the clapper rail's habitat should be given priority in the near term while the most effective balance for the biodiversity of the ecosystem as a whole is being identified.

References

- California Department of Fish & Game. **www.dfg.ca.gov**
- Christensen, Norman L., Ann M. Bartuska, James H. Brown, Stephen Carpenter, Carla D'Antonio, Robert Francis, Jerry F. Franklin, James A. MacMahon, Reed F. Noss, David J. Parsons, Charles H. Peterson, Monica G. Turner and Robert G. Woodmansee. 1996. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. Ecological Applications, Vol. 6, No. 3, pp. 665-691. Published by: Ecological Society of America. **www.jstor.org/stable/2269460**
- Evangelista, Andy. 2009. UC teams Attack Urgent State Issues. August 6. **www.universityofcalifornia.edu/news/article/21649**
- Irvine Ranch Water District. Natural Treatment System. **www.irwd.com**
- Nature Reserve of Orange County. **www.naturereserveoc.org**
- South Coast Wildlands. **www.scwildlands.org**
- U.S. Army Corps of Engineers. Feasibility Study, 2005
- U.S. Army Corps of Engineers. San Diego Creek Special Area Management Plan (SAMP), in progress. **www.spl.usace.army.mil/samp/sandiegocreeksamp.htm**
- U.S. Department of the Interior, Bureau of Reclamation. April, 2008. Smart Controller Water Savings Studies: Literature Review of Water Savings Studies for Weather and Soil Moisture Based Landscape Irrigation Control Devices. Technical Memorandum No. 86-68210-SCAO-01.
- **www.bird-friends.com**
- **www.clapperrail.com/documents/Census2007.pdf**
- **www.seaworld.org/Animal-info**

7 • ECONOMIC DEVELOPMENT

The second goal for this water management plan is to, "integrate economic development with water-related programs and watershed restoration efforts."

The quality of life in Orange County, as symbolized by the coastline, Newport Bay and canyons, attracts national and international business, tourists and homebuyers. We have a vested interest in maintaining and improving water resources in a way that fosters a healthy local economy. The Orange County Business Council openly calls for action to address the crisis in the state's water infrastructure and has set up an online resource center (www.ocbc.org/water) to highlight broad support from the business community for a comprehensive solution.

Rather than view environmental regulatory compliance and the idea of a sustainable environment as obstacles to economic development, watershed planning opens up new opportunities to infuse capital into the economy, find efficient and effective ways to address environmental issues, create a more balanced watershed hydrology, reduce operations and maintenance costs, encourage development of green industries in our Region and improve resource attractiveness to the community, business and tourists.

A number of major cities are now embracing sustainable development through river restoration and revitalization, LEED building certification, transportation oriented developments (TODs), green roofs, low impact design and other techniques. The City of Toronto, Canada has implemented a waterfront revitalization program, which is currently redesigning the city's edge along Lake Ontario to embrace and support the lake as both an ecological and urban amenity. Chattanooga and Pittsburg have used river restoration as an anchor for surrounding urban revitalization. Chicago is developing a reputation as a "green" city because of local government efforts to better integrate the city with its local ecosystem. Portland, Oregon is considered by many to be the most advanced city in the United States in terms of becoming sustainable, especially in regard to innovative stormwater management. All of these places provide examples of how to blend economic development and environmental health.

This trend is increasingly supported, and even required, by the State of California. In 2007, the State won a lawsuit against the County of San Bernardino for inadequately addressing the cumulative environmental impacts of the growth outlined in their new General Plan. Specifically, the County was found to have inadequately accounted for climate change impacts that would occur under its approved plan for allowable growth. This lawsuit made it clear

Figure 7.1 Portland, Oregon
(Source: portlandonline.com, explorethepearl.com)

that it will only get more difficult for municipalities to plan for economic development that is counter-productive to environmental goals and responsibilities. Therefore, communities will need to look for innovative ways to develop their local economy in an environmentally sustainable way. This chapter outlines preliminary Regional Performance Objectives for doing that.

7.1 Real Estate Regional

Performance Objectives

From a local government's perspective, land use and planning is very much tied to economic development. This is because economic development is largely achieved through real estate development projects. Development fuels the local economy by creating more places for people to live and work and by attracting employers, which in turn supply jobs for the new residents. These residents need to shop, which in turn attracts new retail businesses, creating greater sales tax revenues for the municipality. The municipality can then afford to build more infrastructure and provide more services to the community. While the economic advantages of incorporating healthy ecological amenities into a community are easy to understand (e.g., long-term cost savings associated with sustainability, increased property values associated with natural greenbelts, avoiding fines or costs for pollution cleanup, ensuring adequate water supplies), the additional upfront costs are often a hurdle to making important real estate deals work. However, the public sector has an interest in incentivizing sustainable land use because it stands to save millions, sometimes billions, of dollars in infrastructure and regulatory costs.

There are emerging examples of sustainable development in this Region. For example, The Irvine Company has implemented a large native plant restoration program in concert with its residential developments in Newport Coast, including replanting the Pelican Hill Golf Course with more water-thrifty turf in the fairways. The Irvine Company is also constructing an underground cistern as part of its Pelican Hill Resort that will capture flow from a five–year storm event and reuse it to irrigate a golf course. On a larger scale, Heritage Fields El Toro, LLC (including Lennar Corporation) is planning green residential and commercial developments on the former El Toro Marine Corps Air Station that will complement the substantial restoration efforts planned for the future Great Park. The City of Newport Beach has won awards for its new General Plan, which makes a point of emphasizing its conservation element and integrating sustainability concepts into its Land Use element.

The proposed Regional Performance Objective addressing economic development for real estate is for each agency, as part of its general plan, to draft planning policies by 2012 that address hydrologic, water supply and habitat needs. Suggestions with regard to drainage, land use planning and pilot projects are discussed in the following sections.

The following sections list strategies that could be considered as kernel ideas for Regional Performance Objectives for sustainable land use and real estate development in the Region.

7.1.1 Site Drainage

- Capture and reuse the first flush of stormwater on site. Runoff can be directed to rain gardens. Placed at a low point on the site, they contain plants that can live primarily on seasonal precipitation, imitating what happens in natural systems. As such plants become established, they need little or no dry weather irrigation. Cisterns provide the opportunity to reuse water on site, reducing the utility costs for the owner.
- Reduce or eliminate irrigation runoff by incorporating an attractive native or drought tolerant landscape.

7.1.2 Land Use Planning

- Reduce or eliminate irrigation needs with non-invasive drought tolerant landscape.
- Create riparian overlay zones and conservation easements for possible future stream daylighting.
- Manage open space as native habitat and/or for runoff capture.
- Develop a mitigation implementation and management plan for the Region.
- Map areas of important hydrologic function in a publicly accessible GIS database.
- Identify supplemental funding for private projects that serve regionally significant hydrologic purposes.
- Develop tax & permitting incentives & design support to implement sustainable development projects. For example, the City of Newport Beach has a two-year program to provide free weather-based “smartt” irrigation controllers for property owners in the Newport Coast area, where excess irrigation runoff sends pollutant loads into coastal canyons that drain to an Area of Special Biological Significance.
- Design projects to create, as much as possible, a long-term self-

Figure 7.2 Landscapes with drought-tolerant California native plants, Los Angeles, Alta Loma , Pasadena

sustaining natural system, thus minimizing maintenance needs.

- Develop infill areas with low impact development practices (LID).
- Develop brownfields with low impact development practices (LID).
- Conduct an educational/networking workshop series with cities, developers, Caltrans, Urban Land Institute, U.S. Green Building Council. These would expand upon the existing yearly County Stormwater Management Program workshops with city planners.

7.1.3 Pilot Projects

- Institute urban revitalization pilot projects. These demonstration projects can serve as models for the financing and underwriting of sustainable development in the Region by providing comparison examples for the assessment of risk This kind of financial analysis partly determines developers' cost of borrowing money, which in turn determines the kinds of things they will be able to do in their projects.
- Organize a Newport Bay Watershed Stakeholder Regional

Committee for urban planning, economic development & ecosystem interests in order to facilitate pilot land use projects.

- Develop a pilot concept land use plan for one riparian overlay zone within each city to implement IRCWMP objectives.

7.2 Business Regional

Performance Objectives

Real estate (land use) is one element of economic development. Another is business. In his book Local Economic Development and the Environment (2002), David Gibbs states that, in order for an area to move toward an environmentally sustainable local economy, businesses need to address four broad principles:

1. Consideration of the environment, future generations, public participation and equity
2. Diversification of the local economy
3. Increasing local self-sufficiency
4. A focus on spatial integration (place-based), rather than functional integration (process-based)

Gibbs outlines a wide range of implementation strategies for realizing these principles. He states that an economy is a complex system that requires dynamic and equally complex policies and programs in order to facilitate change. Therefore, rather than using these strategies in isolation, it is most effective to use them in combination as a 'portfolio of instruments' each of which will be effective in different circumstances. He identifies strategies for community, business and government that serve as the basis for this Plan's proposed Regional Performance Objectives for local businesses.

The proposed Regional Performance Objective addressing economic development for business is for each agency to draft planning policies by 2012 that address economic, hydrologic and habitat needs, as part of its General Plan.

Suggestions with regard to the workforce, industry and government are discussed in the following sections.

7.2.1 Workforce

- Increase training in watershed sciences - see education & outreach.
- Improve access to capital for disadvantaged communities, through methods such as Miocean Foundation, venture capitalists, microfinance, neighborhood projects.

7.2.2 Industry

- Provide guidance for businesses in sustainable practices via workshops and training.
- Reuse waste by using it as part of another local business's supply chain: An example might be an Internet-based clearinghouse for local material reuse.
- Incentivize development of renewable technologies.

- Conduct a study to monetize the value of environmental services over the long term to determine economic value.
- Conduct a study to anticipate potential liabilities due to more rigorous future legislation.
- Ensure that water supply is adequate and reliable. Increase recycled water use, supply and infrastructure.
- Ensure 100-year flood protection.
- Clarify funding and permitting requirements and schedules regarding hydrological and habitat needs.

7.2.3 Government

- Prepare design guidelines for incorporating 'green thinking' into eco-system projects.
- Provide training for urban planners regarding watershed considerations that could be included in a General Plan. Provide supplemental training to urban planners to increase understanding of specific regulations so that environmental resource needs, mitigation and compliance can be built into general plans.
- Create tax incentives to redevelop brownfields and derelict land
- Evaluate water and resource efficiencies in county and city in-house practices
- Promote watershed programs through General Plans: :

7.3 Transportation System Regional Performance Objectives

The proposed Regional Performance Objective addressing economic development of transportation systems is for each agency to draft planning policies by 2012 that address transportation, hydrologic and habitat needs as part of its General Plan.

Suggestions with regard to transportation diversification, business clusters and 'green streets' are listed below.

7.3.1 Diversify Transportation and Connect Business Clusters

- Institute transportation planning to examine expanding the existing transportation system to support developing strategic business areas. Businesses fare better when they are a part of a critical mass of activity. Conversely, interaction decreases when businesses and customers are spread out over a widely diffused area. Business area clustering can also reduce the need for lower density development elsewhere, and make alternative forms of transportation, such as light rail, bike paths and walking trails, more viable.
- Increase business area mixed-use clustering and transportation oriented developments.

- Increase mass transit options and efficiency; connect with urban development hubs.
- Increase the number of Class 1 bikeways.
- Increase the number of urban park-school-trail connections.

7.3.2 Green Streets

Given that roads generally account for 30 percent to 60 percent of the total impermeable surface of urban areas (Rodrigue, 2005), consider if new and retrofit transportation projects can use the Sustainable Travelways or "Green Streets" design approach, as proposed for the Great Park. These guidelines for capturing and treating road runoff on-site include:

- Enhanced tree canopy
- Low volume irrigation
- Permeable pavements and surfaces
- Use of recycled materials
- Integrated runoff treatment, including swales and planters
- Conservation-oriented planting palettes
- Structured soil preparation
- Reflective color/light values
- Integrated transit or neighborhood electric vehicle (NEV) travelways
- Alternative lighting
- Traffic calming features
- Reduced pavement widths
- Road runoff captured and treated according Green Streets / Sustainable Travelways guidelines, or LEED guidelines

7.4 Operations & Maintenance Regional Performance Objectives

The proposed Regional Performance Objective for Operations and Maintenance is to create an umbrella group(s) by 2010 to oversee and facilitate funding for long-term maintenance and operation of all open spaces and water resources infrastructure.

- Create a template for maintenance & operations funding agreements.
- Projects will be required to:
- include a maintenance plan and an agency or stakeholder that will assume responsibility.
- leverage the laws of nature to minimize maintenance needs. A balanced natural system is self maintaining.

References

- Jean-Paul Rodrigue, Claude Comtois and Brian Slack (2006), The Geography of Transportation Systems; New York: Routledge
- IrvineBusiness Complex Draft Vision Plan, July, 2006. City of Irvine. **www.cityofirvine.org**
- Sustainable Travelways, 2007. City of Irvine. **www.scag.ca.gov/wptf/pdfs/wptf022207_Travelways.pdf**

8 • COLLABORATION

The third goal of the IRCWMP is to: **"Build and sustain effective relationships among watershed agencies, landowners and community stakeholders to achieve common goals through positive collaboration and communication."**

This goal focuses on the institutional and interpersonal relationships it will take to support collaborative efforts for watershed-wide planning and implementation. As the idea of collaborative planning and governance has become more popular within the last decade, the role of collaborative networks in creating change has garnered increased attention.

This idea is not new. America has always been based on the idea of collaboration. In 1835, the French politician and social thinker, Alexis de Tocqueville, observed, "Americans of all ages, all stations of life, and all types of disposition are forever forming associations... In democratic countries, knowledge of how to combine is the mother of all other forms of knowledge; on its progress depends that of all the others." (Democracy in America)

Many people would say that America's 'social capital' has been slowly declining with the rise of inventions such as the automobile, television and personal computer, which lead us to spend less and less time with each other. While the specialization and the segmentation of the modern era serves many important purposes, we now find ourselves looking for ways to reconnect.

Elements of collaboration within this IRCWMP include governance, social networks, and education and outreach. Regional Performance Objectives have been identified in this chapter for each of these areas.

8.1 Governance

Effective governance has the following attributes, based on the following governance best practices from the Delta Vision program:

BE SPECIFIC: Define shared problems and outline finite steps to address them.

INCLUSIVENESS: Include all interest groups, including the less powerful. Network with adjoining and regional watersheds. Governing bodies are responsive to society and major constituencies. Governing bodies are accessible to all and equitable in their decisions, meeting expectations for justice in our society.

FLEXIBILITY: Be adaptive and be able to resolve conflicts. The plan can change over time to better meet its goals.

MONITORING: Create an effective institutional framework for monitoring, using experts, local knowledge and/or agencies.

TECHNICAL CONSENSUS: Have a way for technical advisory committees to incorporate local knowledge and resolve scientific differences of opinion.

BUILDING CONSENSUS: All players collaborate to find common ground and make agreements and move forward based on anticipated good-faith efforts by all stakeholders.

RESPECT: Protect local land-use decision making. Include a trust-building element into the governance structure.

FUNDING: Create reliable funding mechanisms. Implement an effective financing system that receives funds from those who benefit from use of the public resource or public policies wherever possible, including control of needed finances and sufficient legal authority

LEGAL AUTHORITY: Ensure the governing body has needed authority, can make needed decisions balancing critical values and effectively implement its decisions.

The proposed Regional Performance Objective addressing effective and participatory governance is for each agency to draft a watershed management planning policy, as part of its General Plan, that highlights its partnership with the Watershed Executive Committee for effective implementation of the Vision, Goals and Regional Performance Objectives of the IRCWMP. This is to be submitted to the WEC by 2012.

Suggestions with regard to policy coordination, planning and public works, and NPDES requirements, are listed below.

- Incorporate Delta Vision governance principles into the governance structure.
- Incorporate watershed-friendly retrofit objectives & guidelines into city General Plans.
- Conduct city planner workshops. For example, the County Stormwater Management Program conducts ongoing stormwater BMP workshops for city inspectors and planners as a requirement of the NPDES permit.
- Ensure adequate funds for IRCWMP management by promoting a watershed-wide fee. Proposition 218 requires that property-related fees be put to a vote with the consent of a two-thirds majority of the property owners. Other funding could come from cost-sharing such as the formula used by the County Nitrogen and Selenium Management Program, developer fees, business revenues, recreational or license fees, water utility fees, and wastewater system fees. Funding for projects could come from the same sources or from state water proposition grants or loans, state agencies, federal agencies or appropriations, water agency promotions or non-profit groups.
- By 2012, institute a mechanism that will fund an account to be used for paying for the next dredging of the bay, anticipated no

earlier than 2030 (added August, 2009 per Bay/Coastal water quality meeting).

- Review and revise the IRCWMP every five years.
- Participate in California Watershed Network / DWR workshops to incorporate ideas into the WMP process.

8.2 Social Networks

The various stakeholders of this Region have come together around water resources because they all share a vested interest in working as a team to manage these water resources. A formal governance structure, as discussed above, is one level of collaboration. But informal collaboration among the people within a community also affects their ability to function as a team and accomplish common goals.

Adapting principles from The Team Handbook (Scholtes, et al, 2003), successful teams must have a sense of direction, understand their connection to each other and their goals, have measures to monitor effectiveness, have decision-making authority, and have clear lines of communication. Furthermore, teams must have convenient access to experts, data, technology, and not be bogged down with red tape. "Too often management groups are inappropriately called teams when, in fact, they have no interdependent work, integrated goals, shared responsibilities or common ways of working toward results."

Building in mechanisms to create trust and foster interpersonal ties can assure that fears are addressed, conflicts worked out and all parties are heard. Important questions to ask about team members include: "What are their concerns? What do they see as risks? What are their needs and how can they be met? Do they need to see an idea in action? Do they need to see data? Do they need to talk to the people involved in the change?" (Scholtes, et al, 2003)

Regional Performance Objectives for the appropriate mechanisms of communication and interaction are only preliminarily identified here in this version of the IRCWMP. Social network analysis is a new field of social science that provides a methodology for developing a more meaningful group of indicators in future versions of this Plan. Generally, it measures the effectiveness of social relationships and interpersonal group dynamics. It uses the quality of relationships between individuals, rather than the performance of individuals themselves, as the most important indicator of organizational capability and success. Network analysis is a tool increasingly used by companies to better understand how their organizations are really functioning and what can be done to improve them. Additionally, it is used as a method for assessing collaboration among organizations as an indicator of community capacity (Singer, 2004). The research in this field provides a template for setting specific targets and tracking progress towards more collaborative solutions to water resource problems.

In particular, PARTNERS is a new social network analysis tool being developed by Danielle Varda with the RAND Corporation in Santa Monica. It stands for Program to Analyze, Record and Track Networks to Enhance Relationships. It has been used primarily by agencies to help collaborative groups understand interactions and measure change in group relationships over time. PARTNERS can evaluate group composition, quality of interactions, governance and management structures, accountability, conflict management, levels of commitment, quality and location of trusting relationships, types of influence, problem solving, and tangible or intangible group resources (Varda, 2008).

Environmental Justice Networks

It is especially important to connect disadvantaged communities into water resource communication networks. Non-profit organizations such as Latino Health Access can help planners tap into the needs of these communities. To support this kind of cross-collaboration, 100 percent of the environmental justice organizations active within the Region need to be fully aware of the IRCWMP process, the access to project funding available though this process, and how to take advantage of this funding channel.

Financial Networks

Public-private financing partnerships are another way to accomplish mutually beneficial projects and contribute to the community's economic well-being. One example of creative financing is the Orange County Great Park – Heritage Fields (Great Park Neighborhoods) partnership. Innovative funding approaches such as this require private investment that is willing to support public needs and interests. This enables the public sector to bring its resources to the table for a specific project as well. Therefore, IRCWMP projects that identify both public and private sources of funding are a good indicator that the public and private sectors have worked together to leverage the capabilities of both sectors.

Regulatory Networks

All of the Region's regulations, from Clean Water Act requirements down to city ordinances and homeowner association CC&Rs, work together to determine how land and water resources are affected by urban development. However, different regulating entities do not tend to coordinate with each other, often sending project sponsors and land managers in confusing and conflicting directions. As a result, permittees may take an unpredictable path, or whatever becomes the path of least resistance through this legal maze. Therefore, to maximize the value of regulatory processes, agencies could streamline these processes for the users and coordinate regulations among different agencies to support commonly desired outcomes. This would improve a regulation's effectiveness as a tool for implementing the Desired State for the Region's water resources.

8.3 Education and Outreach

Urban-ecosystem information systems are important tools for understanding the wide variety of information about the urban and ecosystem contexts. They include data sets for elements of watershed function, such as habitat type, soils, topography, land

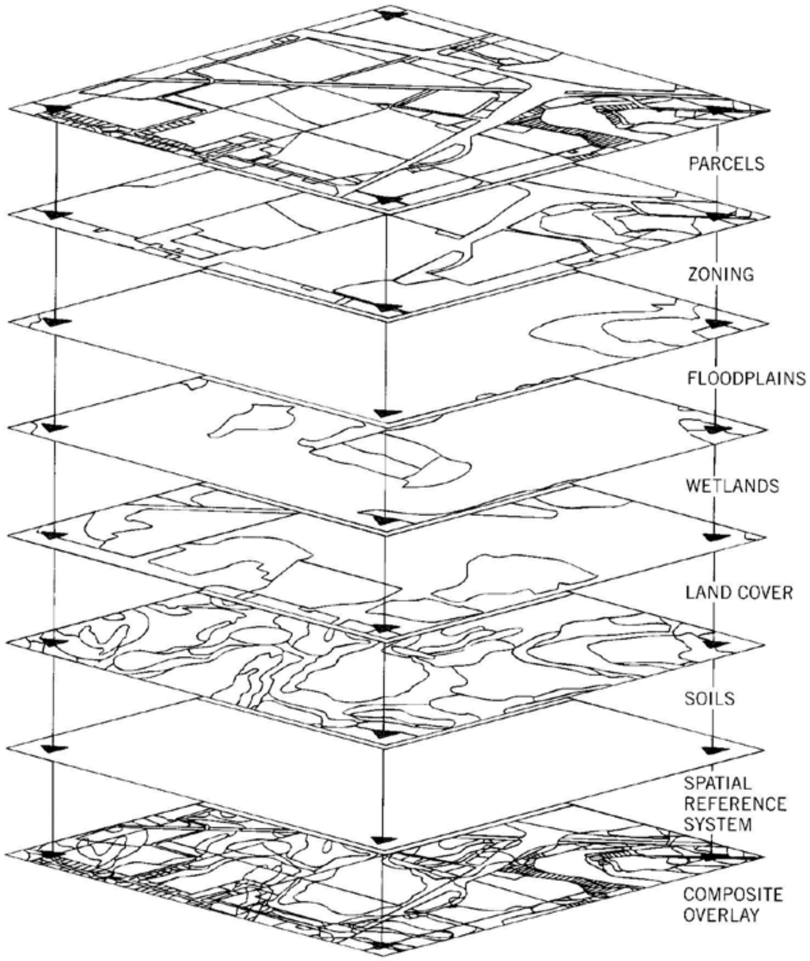


Figure 8.1 GIS Layers. Illustration of digital data layers registered to a common spatial reference system, through a connection to the National Geodetic Reference Network. Composite information maps can be produced because the spatial references match. Many types of data layers are possible, enabling a variety of suitability analyses. (Source: Nicholas Chrisman, 1997. "Exploring Geographic Information Systems". John Wiley & Sons, Inc. New York)

use, drainage infrastructure, groundwater, etc. They can also include other kinds of social or economic data, such as income levels, land use, land ownership, property boundaries, real estate prices, etc. Each data set is mapped to form a data layer. These layers are overlaid on top of each other in a Geographic Information System, or GIS. A GIS is a database of mapped data layers that show how different elements come together in a specific location, in order to illustrate relationships among them at that location. From this set of data overlays, along with a set of decision parameters, a "suitability analysis" can be conducted in order to determine constraints and opportunities for locating projects (Figure 8.1).

At present, there is no one entity that manages the Region's data as a whole. Data is housed by different agencies and by different departments within them. Each agency maintains and updates its own databases. The County of Orange has a website dedicated to this Region at www.ocwatersheds.com that posts general information and documents for downloading. Orange County also facilitates the exchange of information through its coordination work in the Executive, Management and Stakeholder Committees. The Nature Reserve of Orange County (NROC), manager of the NCCP/HCP, also has its own website and databases at www.naturereserveoc.org. RWQCB, Army Corps of Engineers, California Department of Fish and Game, cities, and various other agencies and organizations all have their own websites and databases. Newport Bay Naturalists and Friends post data on Upper Newport Bay on their website, www.newportbay.org. As a local stewardship organization with an interest in everything that affects the Region's water resources, they have also begun to sift through data sources in the Region to identify accurate sources of data and identify additional data needs.

The new California Sustainable Watershed/Wetland Information Manager, known as CalSWIM, is a GIS of watershed-related information that is available to anyone at any time at www.calswim.org. The Newport Bay Watershed is the first area in California for which this system has collected information.

In summary, by making the Region's data more complete and interactive, stakeholders will better understand the most suitable locations for ecosystem functions, such as infiltration, habitat, water-quality treatment and stormwater retention. Urban-ecosystem information systems are a source of coordinated information that can guide the many individual actions of agencies, developers, architects, landscape designers, and planners who are responsible for integrating sustainable, ecosystem-appropriate development into the urban fabric. Convenient access to accurate data is crucial to making informed decisions and coordinating adaptive management. At present, water resource data exists in the scattered records of agencies, private companies, cities and non-profit organizations, which makes it difficult to compile an accurate picture of the hydrologic system's function as a whole. Therefore, this Plan recommends that all water resource related data be created in coordinated formats, be publicly available, and be connected through a common information portal.

The proposed Regional Performance Objective addressing stakeholder and community collaboration is for each agency to draft watershed management planning policy as part of its General Plan to promote social networking. This is to be submitted to the WEC by 2012. Suggestions with regard to environmental justice, financial, regulatory and data networks include:.

- Create a centralized data source such as a website "shopping mall" or portal.
- Utilize a wiki or other website as forum for disseminating and discussing issues and information.
- Connect disadvantaged communities to collaboration networks.
- Conduct a stakeholder survey to identify collaboration issues.
- Conduct a yearly stakeholder review to assess accomplishments and adjust objectives.
- Conduct discussions with neighboring entities.
- Increase agency collaboration and cooperation for problem solving.
- Include local and regional expertise in collaborative cross-disciplinary technical advisory committees and stakeholder meetings.

8.4 Education and Outreach

The Santa Ana RWQCB Watershed Management Initiative Chapter (November, 2004) states that priorities for grant projects shall include projects that support watershed management planning efforts, especially those that build local capacity in watershed management through citizen involvement and public education. The monitoring and data management activities discussed above also have an important role to play in education and outreach activities. The most effective way to get people engaged in their local watershed is through the idea that interesting things are happening in their community, and they can play a part in it. The monitoring data, and the changes it illustrates, is a good communication tool because it can be used to tell a story about what is happening right now and what we want to be happening in the future. In order for that to work, the data has to be understandable to the lay person. People become interested in current events that they can understand; they care about issues and places where they feel they can personally make a difference. Therefore, it will be important to provide data in a manner that is readily accessible to interested community members. This also presents an opportunity to translate for the public any successes that have occurred along the way and attract them to the process through an atmosphere of accomplishment.

Once people are interested, they may become advocates and volunteers who can be invaluable in a wide variety of ways. A good example of an organization that engages and involves the public is Heal the Bay, based in Santa Monica, California. This organization has demonstrated that once you have people's interest and involvement, it is important to have something meaningful for them to do and to show off the results afterwards so they can see their efforts matter. Locally, there are already a number of volunteer groups that will be connected to the larger IRCWMP process and leveraged through effective communication and public involvement programs such as the following:

Hands-On Learning

People learn-by-doing through activities such as water quality monitoring, native plant restoration, beach and stream cleanups, anti-litter campaigns, pollution hotlines, docent nature programs, drought-tolerant non-invasive landscaping, weather-based irrigation controllers, low impact development retrofits, and engagement in the stakeholder public processes. Opportunities for involvement can be found in the colleges, senior centers, libraries, homeowner associations, the workplace, places of worship, nurseries, museums, parks and nature centers, newspapers, TV, radio, magazines, books, Internet discussion boards and wikis, community service activities, clubs and special events such as fairs, forums and festivals.

Schools

K-12 schools, community colleges and state universities are an important way to reach people. Science and civics teaching materials, websites, clubs, field trips and community service activities are ways to integrate water resource information into the curriculum.

- Inside The Outdoors is an environmental education program administered by the Orange County Department of Education that provides hands-on activities, daylong and overnight field trips for elementary school students. Youth groups such as Scouts, 4-H, Boys and Girls Clubs, day camps and after-school activities are also ways to involve youth. As an added benefit, children often bring materials home and educate their parents. The Orange County Discovery Science Center in Santa Ana, with hands-on science exhibits, attracts school groups and families with children.

- The Earth Resource Foundation (www.earthresource.org) facilitates high school environmental clubs (ERF Clubs) by providing materials and guidance to students and advisors. They also provide teachers with modules on watershed topics (Working at the Watershed Level Science and Stewardship Program).
- At the college level, students and professors can contribute to the knowledge base by participating in on-the-ground research studies, water monitoring or as consultants.

Figure 8.2 Boy Scouts plant a California sagebrush plant at Upper Newport Bay as part of the Adopt-a-Park restoration program.

Civic Spaces

Parks and nature centers are of particular importance as it is part of their mission to teach the public about natural systems. Watershed education opportunities abound at The Upper Newport Bay Muth Nature Center, the Laguna Canyon Nix Nature Center and the future Great Park, as well as Mason and Peters Canyon Regional Parks, community parks, and smaller local nature centers. These train volunteers as docents and OC Parks trains naturalist volunteers through its Adopt A Park program. Three-dimensional models of the watershed, films, interpretive signs, docent walks, trails, ecological restoration activities, hands-on exhibits, books, clubs, demonstration gardens, native plant gardening classes, playground design, water park design and games are possible ways of engaging the public in this issue.

Figure 8.3 Peter and Mary Muth Interpretive Center

Professionals

Education and outreach (bilingual if necessary) can be directed toward “greening” the work of certain kinds of professionals, such as real estate managers and developers, nurseries, landscape designers and contractors, irrigation installers, landscape maintenance businesses, pesticide applicators, vector control, urban planners

Figure 8.4 Seminars held at nurseries are a way to involve the public. (Photo courtesy of Roger's Gardens)

and homeowner associations. Important issues include drought-tolerant landscaping (native or noninvasive climate-adapted plants), weather-based irrigation controllers, efficient irrigation layout and maintenance, maintenance techniques for native plants, Integrated Pest Management and low-impact design elements, such as rain gardens, cisterns, swales, rainwater detention and retention. Nurseries can be educated not to sell, or forbidden to sell, the same invasive plants that government agencies and volunteers are spending millions of dollars to eradicate in wildlands and stream channels. Nursery personnel can also be educated regarding the selection and maintenance requirements of native plants so that they can better educate the public with demonstration gardens, garden design services or one-on-one advice.

Non-Profit Sector

Non-profit environmental organizations provide another avenue for public outreach and education. Many already conduct outreach activities such as hikes, restoration, lectures, tabling events, brochures, websites, meetings, conferences, volunteer stewardship, and consultation to public agencies. Examples include the Newport Bay Naturalists and Friends, Southern California Wetland Recovery Group, California Native Plant Society, Sea and Sage Audubon Society, Sierra Club, Orange County Coastkeeper, Surfrider Foundation, Earth Resource Foundation, Laguna Canyon Foundation, local garden clubs, UC Extension Master Gardeners, UCI Arboretum, Nature Reserve of Orange County, and the Irvine Ranch Conservancy. Nationally, the Center for Watershed Protection, the River and other watershed organizations provide outreach materials and guidance to local stakeholder groups interested in raising public awareness.

Agency Programs

Agencies can and do publicize specific actions that residents, businesses and industry can take to improve watershed health. This includes both voluntary actions and those required by regulations and ordinances. Outreach materials, activities, incentive programs and policies are all tools they can use. Mailers, bus stop and bus ads, local TV station ads, radio spots and interviews, documentaries, curb stenciling, no-parking-on-street-sweeping-days signs and waste management recycling programs are some examples of how this can work to get the message out. Due to extensive public exposure, government and water agency buildings are also an ideal location for demonstration native and drought-tolerant gardens, as well as for demonstrating landscape low-impact design (LID) elements. IRWD already conducts free irrigation audits and landscaping classes for interested homeowners to advise them on saving water. MWD and MWDOC are promoting a "be water wise" campaign and a "California Friendly" plant list. In addition, the cities and County are responsible for educating building industry and planners regarding Best Management Practices and for enforcing NPDES permit regulations. The Newport Coast Watershed Program provides educational opportunities for city staff, community members and stakeholders in watershed science and management skills. They also enlist community support in monitoring and restoring the health of the watersheds and marine life refuges. Diverse ethnic populations may require multi-lingual materials or advertisements.

The proposed Regional Performance Objective addressing stakeholder and community collaboration is for each agency to draft watershed management planning policies as part of its General Plan to build local stewardship capacity in watershed management through citizen involvement and public education. This is to be submitted to the WEC by 2012. Suggestions with regard to hands-on learning, schools, civic spaces, professionals, non-profit sector and agency programs are discussed in the following sections.

- Integrate watershed science into K-12 science curriculums.
- Increase the number of community college classes related to watershed subjects and skills needed.
- Increase the number of four-year-college classes related to watershed subjects and skills needed.
- Increase community volunteer participation.
- Increase awareness of stakeholder meetings.
- Continue and expand NPDES permit BMP education for the building and planning industry (DAMP).
- Provide educational support for low water use landscape design and maintenance.
- Balance public access to open space with habitat protection through docent-led hikes.

References

- CALFED Delta Vision and Science Workshop Essays. 2007. www.science.calwater.ca.gov :
    - Innes, Judith. 2007. "Reflections on Governance Issues Raised in the Visions for the Delta."
    - Norgaard, Richard. 2007. "Aims of Governance Change for the Future of the Sacramento-San Joaquin Delta."
    - Sabatier, Paul. 2007. "Governance Issues Which Need to Be Addressed in Visions of the Delta."
    - Silva, J. Fred. 2007. "The Lesson Learned, Perspectives on Governance and Finance of Three Complex Ecosystem Restoration Programs."

* CALFED Delta Vision Blue Ribbon Task Force Report. 2008. **deltavision.ca.gov**

- California Watershed Network **www.watershednetwork.org**
- City of Irvine. 2007. Orange County Great Park Master Plan
- County of Orange. 2007. Central Orange County Integrated Regional and Coastal Watershed Management Plan, Phase 1
- Alexis de Tocqueville, 1835, *Democracy in America*
- Scholtes, Peter R., Brian L. Joiner, Barbara J.Streibel. 2003. The Team Handbook, Third Ed. Oriel Inc., Madison, WI.
- Singer, Helen Harber, MPH, Michelle Crozier Kegler, DrPH, MPH. 2004. Assessing Interorganizational Networks as a Dimension of Community Capacity: Illustrations From a Community Intervention to Prevent Lead Poisoning. Health Education & Behavior, Vol.31(6):808-821(December).
- Tri-state Water Quality Council. **www.tristatecouncil.org**
- U.S. Army Corps of Engineers. 2005. Newport Bay/San Diego Creek Watershed Management Plan, Watershed Studies Section, Plan Formulation Branch, Planning Division, Los Angeles District **www.ocwatershed.com/watersheds/pdfs/Newport_Bay_Watershed_Plan_04-12-15.pdf**
- Varda, Danielle M. 2008. "Strategic Network Management of Community Collaboration, From Theory to Practice." Presentation. RAND Corporation
- Westefer, Paul. 2008. Southern California Wetlands Recovery Project, Orange County Task Force. E-mail notification, Jan. 16, 2008. **www.scwrp.org**

9 • URBAN DESIGN

The main instrument for implementing urban design is a city or county General Plan, and the main tool within a General Plan is providing guidance on land use by specifying what can happen and where. The nature of a watershed system is largely determined by the way water moves through and interacts with the land, which leads to certain hydrologic outcomes within the four water resource areas (flood management, water quality, water supply and habitat). Therefore, land-use decisions have a big impact on the way a watershed functions hydrologically.

Up to this point, the hydrologic function of a community has not been considered an urban planning issue. To remedy this, hydrologic considerations can be considered within each of the mandatory elements in a General Plan. The underlying watershed processes and their locations, can be included as part of standard land use analysis. For example, when locating parks and open spaces, strategic locations for functions such as stormwater capture or habitat connectivity would be considered. These latter issues have traditionally been the responsibility of public works departments, which generally do not make the land use decisions.

In order to help create a healthier in-stream hydrograph that in turn fosters wider scale water resource management and restoration, the way land is designed and used can be modified. For example, consider an objective of reducing stormwater and dry-weather runoff to predevelopment levels. A way to approach integration of hydrologic needs into land use design would be to begin with a specific water budget for the land in each of the jurisdiction's drainages. It would be based on the flow rates that the receiving streams would require in order to function in a natural condition. It would also be guided by the overall water budget developed for the regional water supply performance objective. Water budgets are already used as a standard design parameter for architects, landscape architects, engineers, and water managers; similar methods could be adopted by land use planners. A city could integrate land use changes at the regional, neighborhood and site scale so that a balanced water budget could be met over time.

9.1 Land Use Planning and Design Scale

Land use design occurs at regional, neighborhood and site scales. The following sections describe methods for integrating healthy watershed function into each scale, and discusses

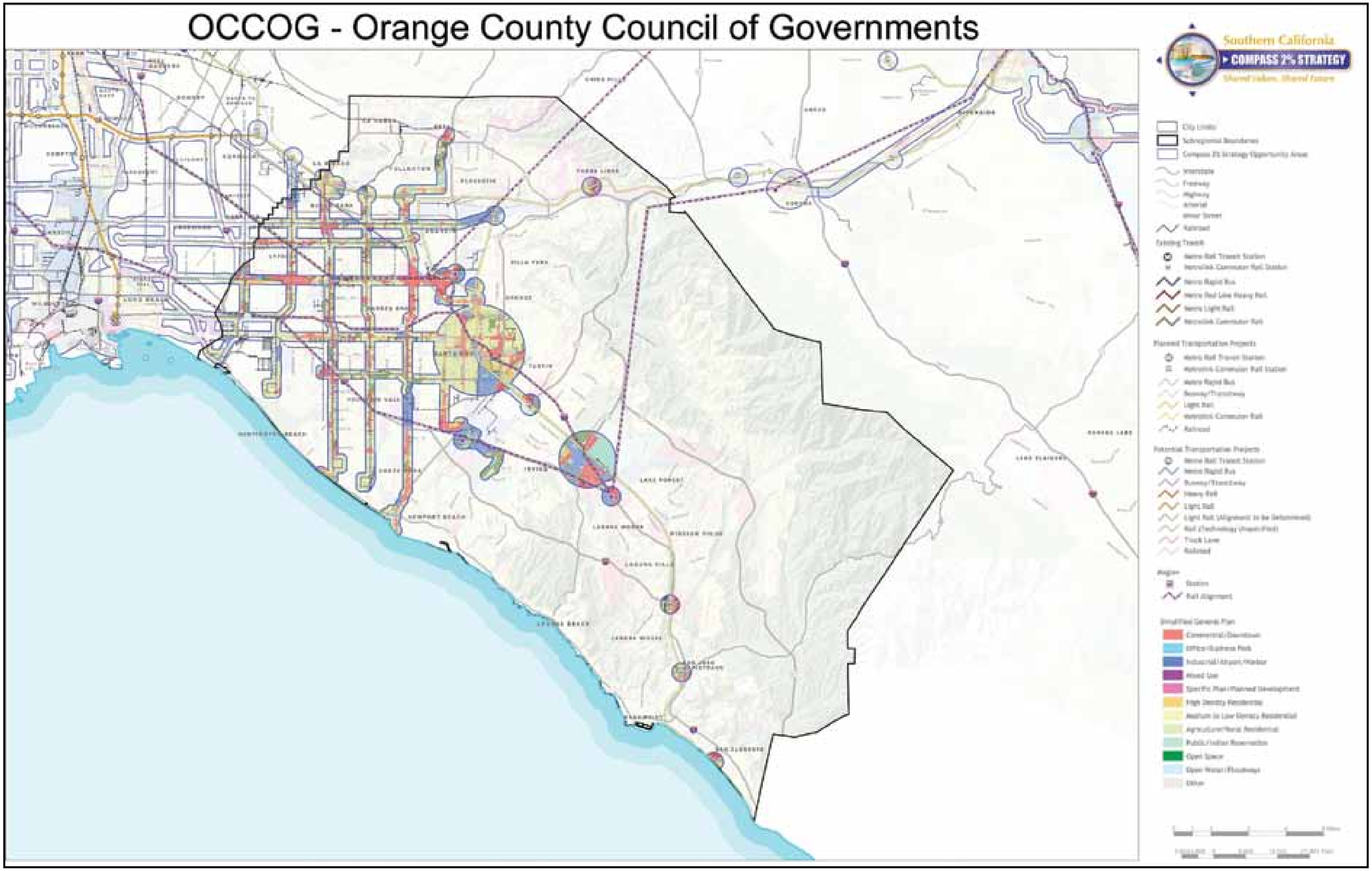


Figure 9.1 "Two Percent Strategy" Opportunity Areas from 2004 Compass Blueprint Growth Vision Report. (Source: Southern California Association of Governments & Orange County Council of Governments)

how these methods relate to the environmental, social and economic goals of this Plan.

Regional Scale

The Southern California Association of Governments (SCAG) expects the population in the Southern California region to grow by five million people over the next twenty-five years. Accommodating this population growth will require a significant amount of new development, infrastructure and resources. Existing infrastructure will also need rehabilitation and upgrades. Other challenges include freeway congestion, rising water demand and increasing energy costs. SCAG sponsored a regional study to identify ways to accommodate this population increase in the most resource efficient manner. The result of the study was a recommended strategy to condense future growth into the two percent of Southern California where investment in infrastructure would be the most cost effective. This would mean increasing urban density along the major transportation corridors in the region.

This kind of growth is called transit oriented development, or TOD. It places denser urban development around public transportation hubs in order to accommodate a larger population, reduce the need to drive private cars and relieve traffic on surface streets and freeways. Although this strategy was not originally designed as a strategy for addressing water resource concerns, centralization of development provides opportunities for implementing more effective water management strategies. Centralizing urban growth into dense hubs reduces watershed-wide impervious surface area. It increases opportunities for recycled water use and simplifies waste water and stormwater treatment. At the same time, it protects outlying areas, increases open space and allows for restoration of more natural habitats.

As described in Chapter 6 on the Desired State, additional mapping of the most important habitat corridors is needed. NROC and the Army Corps of Engineers have already identified potential wildlife corridor linkages in Central Orange County that would create more functional habitat corridors. The planning for increased development around transportation centers can be coordinated with planning for habitat linkage opportunities. In places, urbanization already encroaches on habitat corridors; for example, Buck Gully is isolated from other coastal canyons by Newport Coast Road and housing developments. In these cases, urban design parameters can be tailored to accommodate the special ecological needs of these areas. Additionally, local governments can use high ecological value areas to provide a theme and style for the community in order to highlight its uniqueness and sense of place. Engaging local community members to become stewards of these areas through active volunteer programs will help them become advocates and help offset special operations and maintenance needs that may be required. It is also an opportunity for local schools to learn about the natural sciences by using their own communities as a classroom.

Regional open space corridors primarily provide passive recreation opportunities because these corridors play such an important role in the health of native animal species. As feasible, a network of trails and greenbelts could connect to regional open spaces. This

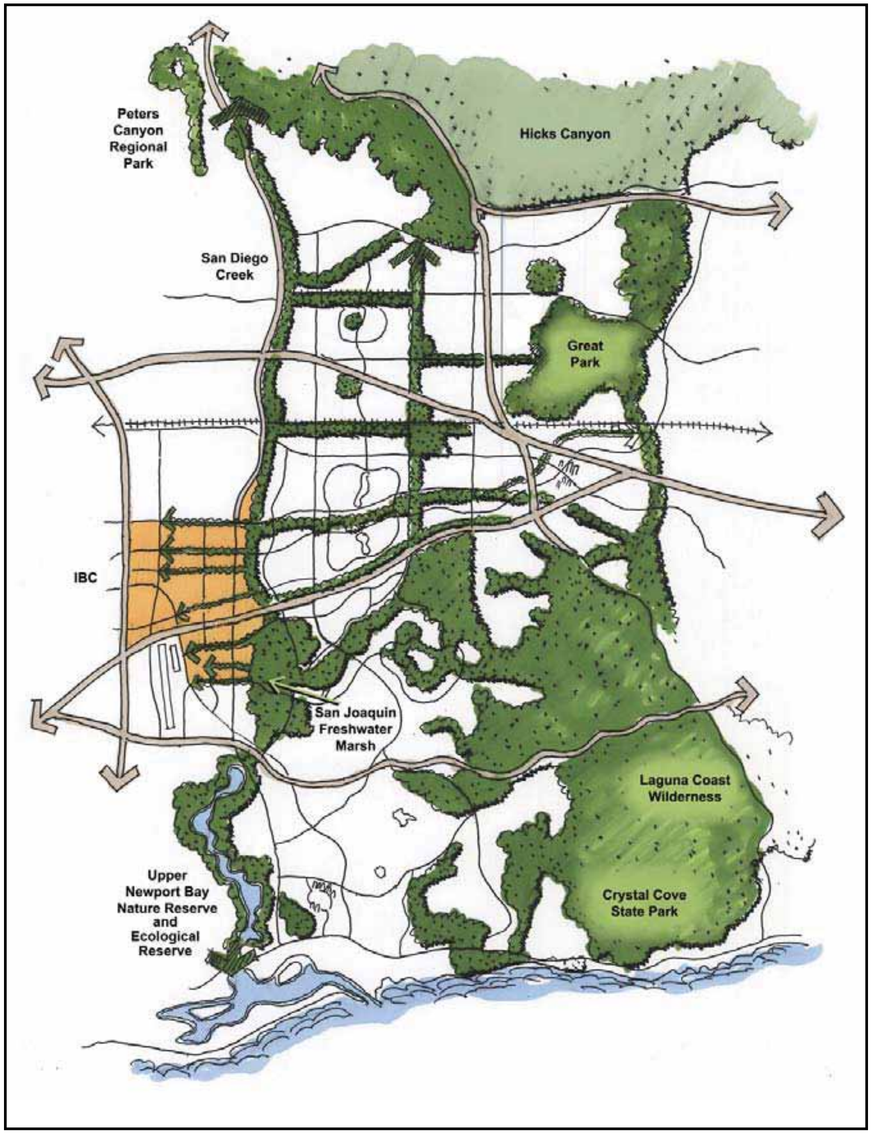


Figure 9.2 Open space connections – mountains to bay, Irvine. (Source: Irvine Business Complex Vision, 2006)

could help a balance urban density and opportunities for an active and healthy lifestyle. On a psychological level, walking and bicycle trails alleviate tension and reduce social anxiety levels. They also contribute to a dynamic visual aesthetic with interesting pathways connecting urban points of interest. At the same time, care must be taken to protect the most sensitive habitats from urban edge effects such as polluted runoff, litter, trampling, erosion from mountain bikes and ATVs, invasive weeds, soil compaction, fire, vandalism, noise and light pollution. An example of sensitive habitat is the endangered arroyo toad habitat located at the edges of certain riparian streams. Docent-led hikes and nature centers are one way to strike a balance between habitat protection and public access, while also increasing appreciation and enjoyment through education. At present, the Laguna Canyon Foundation and the Irvine Conservancy conduct such hikes in the NCCP Reserve areas.

Neighborhood Scale

A neighborhood is a relatively self-contained area with a relatively distinct character and identity within a larger city or town. It contains most of the services residents need on a daily basis such as stores, schools and businesses, as well as civic functions such as parks, a post office and fire stations. There are many different theories about what makes a neighborhood great, but one criticism of modern mass-produced development is that its uniformity has led to places with little distinction. This is a characteristic of 'sprawl', which has been the dominant form of urban development since the end of World War II. Developing a sense of community and neighborhood character in these places requires implementing changes over time that interrupt the uniformity of density, style and function.

Advocates of neighborhood design argue that local character is important because it increases civic participation and social cohesion, and provides a design template that unifies and gives direction to any future development in that area. In the 1980s-90s there was a movement to return to more traditional urban templates for development that were thought to be more supportive of community experience and community needs. This movement produced urban design guidelines such as Smart Growth, Transit Oriented Development, Traditional Neighborhood Development, LEED for Neighborhood Development and New Urbanism.

As in this report, the New Urbanism approach identifies appropriate development strategies for the regional, neighborhood and site design scales. The Charter of the New Urbanism states that, "A range of parks, from tot-lots and village greens to ball fields and community gardens, can be distributed within neighborhoods. Conservation areas and open lands can be used to define and connect different neighborhoods and districts". The habitat corridors discussed as part of the regional scale help define urban areas by creating a spatial distinction among them. Currently, most urban parks and open spaces are isolated from each other, serving only recreational purposes. If these spaces can be connected to

Figure 9.3 Bike path along San Diego Creek, Woodbridge, Irvine.

Figure 9.4 Peters Canyon Regional Park Trail (Source: USACE San Diego Creek Study, 2000)

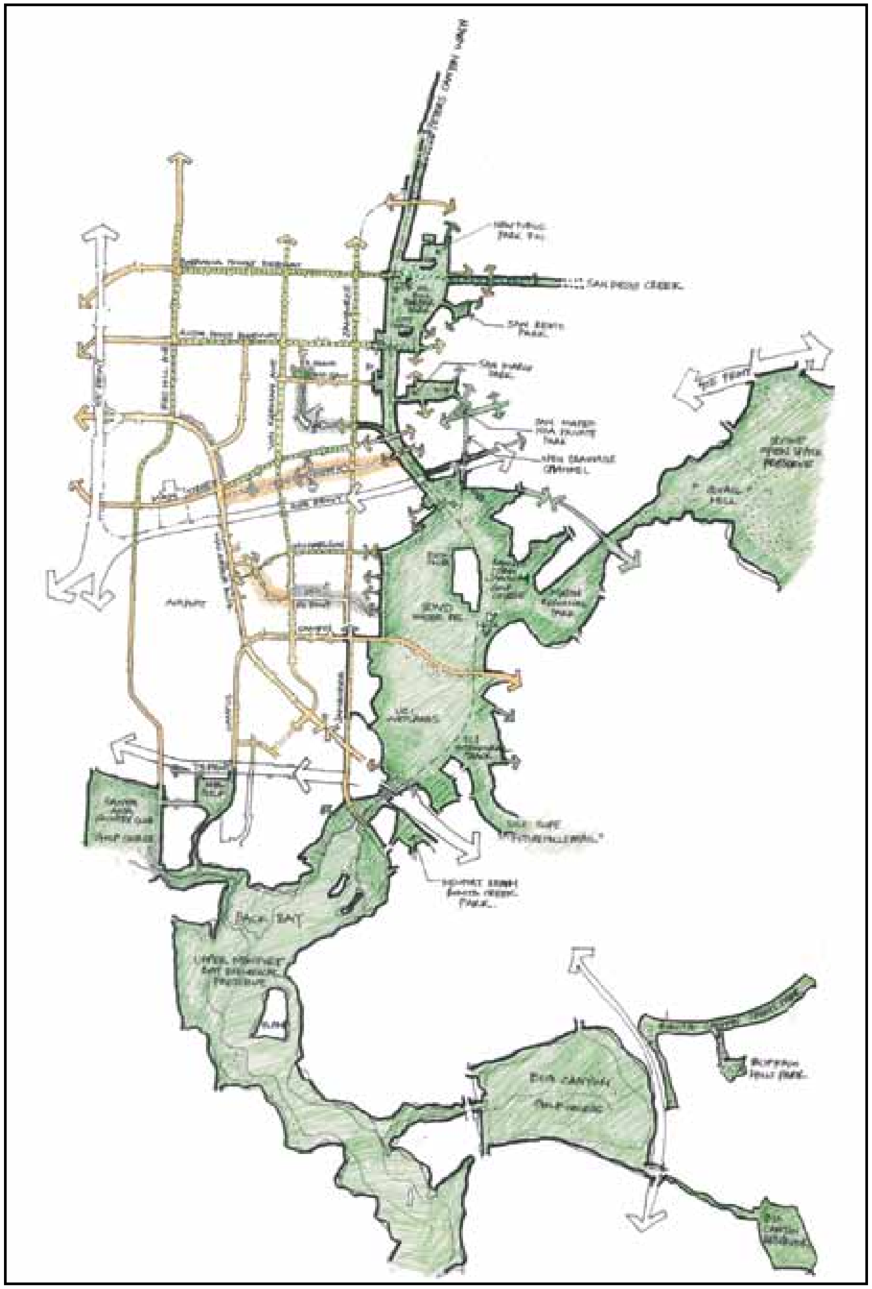


Figure 9.5 Open space connections near Irvine Business Complex. (Source: IBC Vision Plan, City of Irvine, 2000)

accommodate both human use and natural functions, it would open up a wide range of new funding sources from organizations and agencies that financially support the improvement of hydrological and ecological systems. There are many opportunities for connecting isolated open spaces around Newport Bay and Newport Coast. One caveat to consider when designing such corridors is that care must be taken not to create mortality sinks for wildlife through close proximity to roads, pet cats or dogs off-leash. Other potential edge effects should also be controlled, such as noise and light pollution, vandalism, fuel modification "brush clearing" regimes, polluted runoff, litter and erosion.

This IRCWMP does not include a detailed urban planning analysis of open space locations. Subsequent iterations of this Plan will look into this as a way to bridge the gap between the natural and the man-made environments. Bringing urban design into this process will enable a greater degree of mutual benefit between the social, economic and environmental interests of this region. First, a spatial analysis of public open spaces throughout Central Orange County could identify neighborhoods that currently do not have an active urban park within walking distance. In neighborhoods that do not have parks, creating one could become a planning priority for the long-term economic and social well-being of that community and its residents. Next, existing or planned urban parks could be evaluated for opportunities to implement stormwater, water supply, water quality and/or habitat improvements.

One objective could be to connect all urban parks by a system of trails and, in doing so, link neighborhoods together through open spaces to form a more cohesive region. This way, large regional open spaces would separate and define communities spatially, but urban open spaces and trail corridors would functionally connect them. Although urban open spaces may be less suitable for habitat because of urban pressures that would be dangerous to some animal communities, at a minimum, urban open space areas can bolster habitat function by using locally native landscaping. The Orange County Parks Strategic Plan, completed in 2007, includes nine strategic goals (See Appendix I.) that complement this IRCWMP and, over time, these plans can be more fully integrated.

Furthermore, many public parks, open spaces and greenbelts could be redesigned to serve important hydrologic functions, such as stormwater capture, treatment, reuse and/or infiltration where appropriate. For instance, they could handle runoff from higher density areas, such as high-density transit oriented developments, that do not have the space for on-site stormwater management. Such environmental services are important to the communities that live adjacent to the parks and greenbelts and also to natural and urban communities further away.

Parks and greenways contribute to economic development goals because they add economic value to urban land and establish community value in a balanced, pedestrian-scale development. To maintain a neighborhood scale water budget, local agencies can use Redevelopment Project Area Master Plans to balance high density mixed-use projects with ecosystem-serving parks and greenways. Together, the balance of urban and open space development helps to satisfy stormwater permit requirements, minimize stormwater engineering project costs, and provide economically valuable green space.

Figure 9.6. Neighborhood vegetated swale, Village Homes, Davis, California.

Urban green spaces provide outdoor environments that counter-balance the intensity of urban landscapes. Green spaces are venues for community and watershed stakeholders to learn and build relationships. Parks and greenways contribute to sense of place and community and provide opportunities for diverse forms of recreation that can range from farmers markets to ball games and other types of civic activities. When distributed throughout the urban environment, greenways connect people to parks, offer alternative modes of transit, and improve access for park-starved communities.

Figure 9.7 Streambed swale, Jeffrey Open Space Spine, Irvine.

To successfully achieve the hydrologic, social, and economic benefits of neighborhood parks and greenways, local planners, engineers, urban designers, and architects can recommend the daylighting of underground creeks and storm drains as creeks or drainage swales, creation of open space standards to allow equitable access to parks, creation of habitat connections, utilization of native or non-invasive drought tolerant plants and strategies to capture, treat, and infiltrate stormwater where feasible.

Site Scale

Because private property (individual homeowners, business owners, and municipal agencies, flood control districts, transportation authorities, and utilities) accounts for so much of the land area within the watershed, its impact on the water resources of the region is unavoidable. Therefore, it is important to encourage its use in a way that promotes appropriate hydrologic function for the subwatershed areas without diminishing the social and economic purposes served by private property.

In traditional landscapes, runoff from over-irrigation and wash-down activities typically flows from private property into gutters and storm drains. Watershed-friendly site design now requires that low volumes of water be detained on site. This type of design can be encouraged by providing public education, design guidelines and financial incentives, while codifying it into city and county building codes, zoning ordinances, Local Implementation Plans, the Drainage Area Management Plan and redevelopment guidelines.

At present, Local Implementation Plans are required to implement low impact development (LID) retrofits only on certain types of redevelopment and new development (DAMP). Once a water budget is identified for the Region and the respective planning areas, local land use jurisdictions will also be able to more clearly quantify exactly what kind of hydrologic changes are needed from land owners to support the restoration and integration of the region's water resources. On the supply side, the IRWD tiered-water pricing

SOURCES OF INFORMATION FOR SUSTAINABLE DEVELOPMENT

INTERNATIONAL AND NATIONAL PROGRAMS

- **LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)**: – U.S.Green Building Council. **www.usgbc.org**
- **SUSTAINABLE SITES INITIATIVE:** Site design principles and rating system – American Society of Landscape Architects and others. **www.sustainablesites.org**
- **LOW IMPACT DEVELOPMENT (LID):** Stormwater runoff focus. **www.lid-stormwater.net**, **www.epa.gov/owow/nps/lid**, "Rooftops to Rivers": **www.nrdc.org/water/pollution**
- **BETTER SITE DESIGN:** Development principles to protect stream, lakes and wetlands. Website includes a manual and a codes and ordinances worksheet which could be useful for cities in developing Orange County DAMP Local Implementation Plans. **www.stormwatercenter.net**
- **SMART GROWTH:** US Environmental Protection Agency. **www.epa.gov/smartgrowth**
- **TRANSIT-ORIENTED DEVELOPMENT (TOD):** the Center for Transit Oriented Development. **www.reconnectingamerica.org**
- **FORM-BASED CODES:** A smart growth movement to reform design codes. Form-based codes emphasize performance of the built environment over land use. **www.formbasedcodes.org**
- **GREENSCAPES:** Landscaping guidelines to help preserve natural resources and prevent waste and pollution. U. S. Environmental Protection Agency. **www.epa.gov/greenscapes**
- **GREEN ROOFS FOR HEALTHY CITIES:** Non-profit, dedicated to increasing awareness of economic, social, and environmental benefits of green roof infrastructure and advancing development of the market for green roof products and services. **www.greenroofs.org**
- **BEST MANAGEMENT PRACTICES (BMPS):** Site and neighborhood scale design elements for reducing stormwater and construction runoff and erosion problems. Many websites and manuals. California Stormwater Best Management Practice Handbooks: **www.cabmphandbooks**

REGIONAL AND LOCAL PROGRAMS

- **ORANGE COUNTY DRAINAGE AREA MANAGEMENT PLAN (DAMP)**, & associated **LOCAL IMPLEMENTATION PLANS (WQMP)** adopted by each city: Includes site-design regulations adopted by the county and cities for new construction and redevelopment projects, for the purpose of decreasing stormwater runoff and pollution. 2003 **www.ocwatersheds.com/StormWater/documents_damp.asp**
- **CALIFORNIA SMART GROWTH INITIATIVE:** Urban Land Institute **www.uli.org**
- **SUSTAINABLE TRAVELWAYS, 'GREEN STREETS' GUIDELINES:** City of Irvine Redevelopment Agency. Sustainable street design for the Great Park and adjacent Heritage Fields development. **www.ci.irvine.ca.us/depts/redevelopment/sustainable_travelways.asp**
- **GREEN HOME:** Green building design for affordable housing. **www.greenhome.org**
- **"CALIFORNIA-FRIENDLY" PLANT LISTS:** List of drought tolerant and native plants compiled by Metropolitan Water District and nursery industry. **www.bewaterwise.com**

Figure 9.8 Non-invasive drought-tolerant garden. (Source: Roger's Gardens)

Figure 9.9 "California Friendly" Garden contest winner, 2007. California native plants plus Mediterranean climate-adapted plants. (Source: Roger's Gardens)

system is one example of institutional support for increased water use efficiency.

Each site ideally would be designed to support the ecosystem needs identified for the local neighborhood, which would in turn support regional processes. Some sites are on soils that allow effective groundwater recharge and some are not. Some areas have a big problem with selenium in the groundwater (e.g., Swamp of the Frogs in Tustin and Irvine) and some areas have significant erosion issues. Some high density or problem areas may need to look at a neighborhood scale solution instead. Different site design approaches will be appropriate in each of these different situations. The watershed advocates and stakeholders in each of the six planning areas will be able to develop mapped information to guide local site design recommendations.

There are some general design principles identified by The Charter for the New Urbanism for the site scale:

1. Architecture and landscape design should grow from local climate, topography, history, and building practice.
2. All buildings can provide their inhabitants with a clear sense of location, weather and time. Natural methods of heating and cooling can be more resource efficient than mechanical systems.
3. Preservation and renewal of historic buildings, districts, and landscapes affirm the continuity and evolution of urban society.

Other universally appropriate site-scale strategies decrease the volume, velocity and pollution of urban runoff and conserve water, energy and habitat. These include:

- Minimize the amount of impervious cover for roads, parking lots, driveways, sidewalks.
- Retain, detain, filter, infiltrate and/or store runoff on site.
- Allow for non-invasive vegetated greenway buffers along streams and channels.
- Encourage infill and 'brownfield' redevelopment, including densely clustered multi-use development near transit centers and away from flood plains.
- Conserve water and energy through use of native and non-invasive drought tolerant landscaping that requires minimal to no irrigation.
- Use locally native plants and locally available or recycled hardscape materials.
- Minimize landscape irrigation, fertilization, and pesticide use.

These kinds of activities may increasingly become a part of our legal structure. For example, the Regional Water Quality Control Boards will soon be requiring low impact development (LID) site design practices through the NPDES MS4 stormwater permitting process. LID is a set of design strategies for site planning and engineering that maintains or restores the pre-development hydrologic regime of urban watersheds. It deals with the way runoff is handled on-site.

In addition, State Assembly Bill AB 1881 requires local jurisdictions to adopt a water-efficient landscape ordinance that is at least as effective as the State Model Water-efficient Landscape Ordinance, by 2010. Water-efficient landscapes reduce water supply needs by using climate-adapted plants with minimal irrigation needs and by utilizing efficient irrigation technology, including weather-based controllers. Note: At present (summer, 2009) MWDOC, the Orange County Division of the League of California Cities and municipal, county and agency stakeholders are drafting a county-wide Model Water-efficient Landscape Ordinance to comply with AB 1881.

Within the past few years, several comparative studies have been conducted around the country to measure the effectiveness of various LID best management practices (BMPs) in terms of volume of runoff prevented and pollutant concentrations in runoff. One such study in Connecticut, comparing three neighborhoods with traditional, control and LID designs, found significant reductions in peak flow volume of runoff and in amounts of various runoff pollutants from the LID development, as compared with the traditional development (Bedan, et. al., 2009). It should be noted that the neighborhoods were located over well-draining soils that allowed effective infiltration.

Both LID and water conservation can be integrated into site designs in a way that adds value to the site. Attractive seasonal water features with native and non-invasive drought tolerant landscapes can be designed that require little fertilizer, pruning or pesticides. Dry streams, ponds, boulders and local California native plants create a

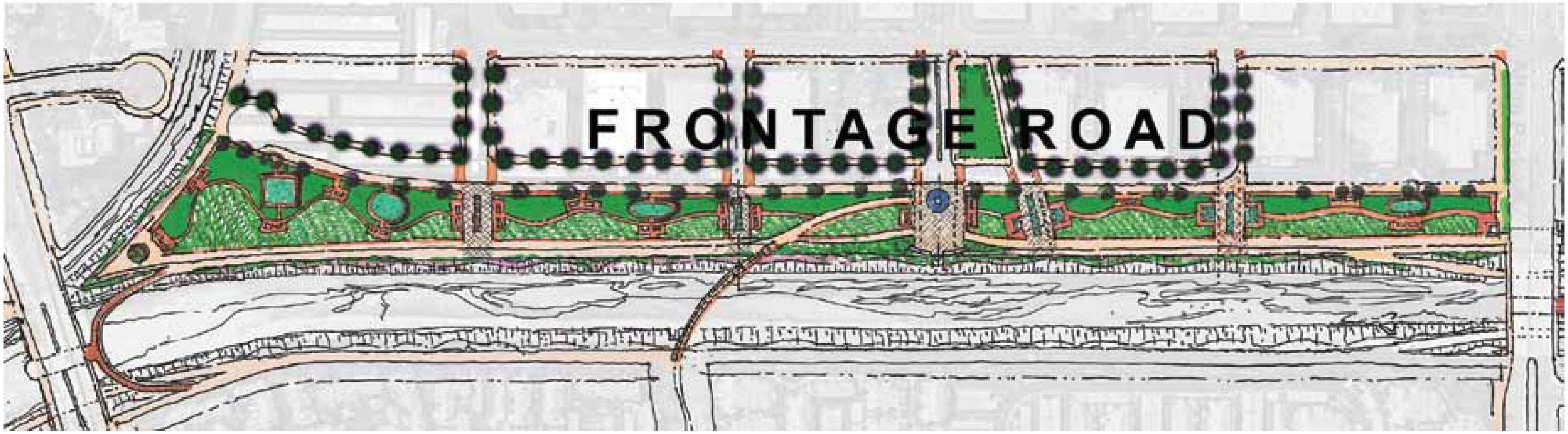


Figure 9.10 Irvine Business Complex proposed "Creekwalk" , plan view showing vegetated buffer along edge of lower San Diego Creek.

Figure 9.11 Irvine Business Complex proposed "Creekwalk" along lower San Diego Creek at McGaw

Figure 9.12 Stormwater planter, Portland, Oregon

Figure 9.13 Curb cuts in parking lot median

Figure 9.14 Stormwater collection cells for under parking lots

beautiful natural aesthetic that is unique to this area. During storm events, stormwater can be directed towards 'rain gardens', which serve double-duty as on-site retention and attractive landscape design features. Water is naturally directed to a rain garden because it is located at a low spot on the site. Rain gardens are generally vegetated with drought tolerant plants that can also tolerate short periods of standing water. In some cases, captured stormwater can also be retained for later irrigation. Aside from slowing and retaining stormwater and reducing pollution, this type of landscape also creates a more authentic sense of place.

Fire

UC Berkeley fire expert, Jon E. Keeley, and others conclude that periodic massive wildland fires have always been and always will be a part of life in Southern California. The best way to live with them is to plan and engineer for them in the same way as for earthquakes. Examples of such planning are to avoid inter-fingering development and wildlands and to use irrigated parks or golf courses as buffer zones. Municipalities are also increasingly requiring that urban areas near large open spaces fireproof themselves to reduce the chance for damage when fire does inevitably occur. "According to State Fire Marshal Kate Dargan, fire and building code changes that took

Figure 9.15 Green roof at Ford Premium Automotive Headquarters, Irvine

effect January 1, 2008, are designed to reduce fire risk by requiring that new construction include fire- retardant building materials and design elements, such as enclosed eaves that prevent sparks from flying into attic." Steven Quarles, of the U.C. Berkeley fire lab, notes that 60-70 percent of wildfire risk in California's existing wildland-urban interface (WUI) is found in structural vulnerability to embers, hot air/wind, or direct flame impingement. Thus, much of the risk can be reduced by retrofitting existing structures, eliminating flammable structures and maintaining plantings within yards. Houses (which are dry) burn more easily than irrigated landscaping (which is wet). Tile roofs alone are not sufficient for fire resistance. A house should also have fire-resistant siding, enclosed eaves, screened attic vents and dual pane tempered glass windows, as well as fences, outbuildings and enclosed decks made with fire-resistant materials.

Providing wide enough roads for rapid evacuation access at the same time that the fire engines are entering is also important. According to Pasadena Fire Chief Dennis Downs, "What we're still facing as fire service professionals are areas in our communities that have limited access and high brush areas; these are older neighborhoods with narrow streets and homes built in the wildland-urban interface, where development continues." (Hudson, 2008) Wide enough primary access roads and the aforementioned issues can be included in the zoning and building codes for areas adjacent to open spaces that are prone to fire. If trying to reduce impervious surface area at the same time, modular support technologies are available that allow fire trucks to drive on vegetated or gravel shoulders.

Regarding the role of planning, Dargan states, "At this point in time, there is only one generic document in the land use planner's toolbox that speaks to the General Plan and wildfires; it's a great first-generation document, but it isn't very specific in terms of fire.

There are no guidance documents for fire protection plans or zoning guidance for subdivisions; there are no infrastructure checklists. For the planning profession, there are few if any educational materials that explain how to do a plan review with respect to fire. We need to develop some type of certification to offer land use planners in this area." (Hudson, 2008)

9.2 Environmental Justice

Wealth gravitates to places with well kept amenities. On the other hand, ugly, unhealthy or blighted conditions in a community can scare investment away and devalue surrounding property.

Larger scale blight can drive down property values, which can be a silver lining for finding affordable housing. However, living in a blighted community can perpetuate financial hardship, long-term poverty and inhibit social mobility. These areas may have problems associated with higher crime rates, lower accessibility to adequate services, fewer jobs with growth potential, and increased pollution and health hazards. Any one of these things, but especially a combination of them, can impact a person's ability to get an education, work and accrue wealth. According to the Environmental Justice Coalition for Water, a community becomes disadvantaged as a whole when low overall wages cause the median income to fall below 80 percent of the state-wide median income (Thirsty for Justice, 2005). Within our watershed there are a few areas in the City of Santa Ana and student housing areas around UCI that fit under this designation (See Figure 3.4). Promoting good community design in our watershed will provide opportunities to reverse economic downward spirals that, not only impact our economically disadvantaged areas, but also neighboring areas.

Figure 9.16 Blight

The IRCWMP's environmental, social and economic goals represent the three elements of a sustainable society, as it is commonly defined by the United Nations' Brundtland Commission Report (1987) . Each of these elements impacts the others to influence the overall vitality of a community. Community blight is a symptom that these elements are working against each other and can be an early warning sign of future decline. The IRCWMP can have a meaningful impact on the overall quality of life in disadvantaged communities by reversing some of these relationships and by implementing environmental projects that support social and economic needs.

Figure 9.17 Lively urban area — The Spectrum, Irvine

Figure 9.18 Lively urban area — Santa Ana

Disadvantaged communities in Southern California are often park-poor and suffer from a lack of amenities in general, because cities view these as a drain on limited funds when there are other basic needs like roads, schools, and police that are already under-funded. Open spaces that are designed to serve an ecological function become eligible for a variety of outside funding sources and partners. If integrated properly with urban planning in the area, these spaces can also provide a financial opportunity by anchoring economic development (Thirsty for Justice, 2005). Urban design often focuses on the technical and functional aspects of a place, at the expense of the less quantifiable experience of making it a more humane place to be. A "humane metropolis" is created, not with a concrete jungle of endless buildings and roads, but rather, by interweaving greenery and public spaces into urban communities. Developers spend a lot of money to hire landscape architects to create this kind of atmosphere within their projects because it attracts customers as more people-friendly. Cites can attract developers and businesses using this same strategy on a larger scale.

The City of Santa Ana has few remaining vacant areas that can be developed as parks. As an alternative, street and property lot landscaping can provide some relief. Along these lines, Southern California Edison and the non-profit Shadetree Partnership have tree-planting programs that also reduce energy needs associated with cooling and heating.

Sometimes urban revitalization is complicated by the presence of hazardous soil contamination. Toxic pollution creates both physical and economic liabilities. Abandoned gas stations are a prime example of pollution leading to long-term disinvestment because no one wants to take on the liability involved in clean-up. Beneficial ecosystem function can be incorporated into all redevelopment plans, but in the case of brownfields, it is an absolute prerequisite to attracting any kind of future investment. These places need well orchestrated efforts on the part of a number of supporting agencies to remediate the contamination and then integrate the land back into the community. In areas that are especially built out or blighted, brownfields pose an opportunity to create pocket parks and neighborhood green spaces to address environmental justice in two ways: one, by eliminating a local health hazard, and two, by bringing opportunities for active or passive recreation into places that urgently need them.

With access to regional parks, neighborhood parks, and greenways, people can access and enjoy active lifestyles. If there are no recreational areas nearby, or if they are not safe to visit, residents are discouraged from being active. Outdoor activities can help to prevent or treat health problems exacerbated by car-centric development patterns. The social and financial costs of obesity, hypertension, diabetes, cancer, and other health problems can be greatly diminished if people are regularly walking, biking, playing games and engaging in other forms of exercise. Exercise is also good for emotional well-being by balancing the stressors of urban life and providing a sense of calm. In less affluent neighborhoods, people often cannot afford gym memberships; thus, outdoor amenities such as soccer fields or walking trails become even more important in these areas.

Reducing health problems in the population increases productivity at work and decreases the amount of personal, employer and public sector expenses devoted to medical care. Because of this, any organization dedicated to dealing with the health problems of a community has a vested interest in more active lifestyles. In fact, the public health sector has begun to advocate more and more for community design that supports it. These groups and foundations can be brought in as potential partners and funders for these kinds of open space projects.

One of the largest expenses businesses face is health care for their employees. Therefore, they also have a vested interest in a workforce that stays healthy and physically fit. This makes them another potential partner and sponsor for some aspect of open space projects in local communities. Business organizations, such as Chambers of Commerce, may have an interest in facilitating these kinds of partnerships. It provides an opportunity for businesses to demonstrate their support for the community, while it also saves them money to have employees who are more productive on the job, or customers with more disposable income due to fewer medical expenses.

Bikeways and greenway trails can become transportation and movement corridors for people walking and using bikes. The Southern California climate couldn't be better suited for it.

The Orange County Parks Strategic Plan makes note of these opportunities in its Access and Connections goal. Transportation agencies also support alternative transportation modes and are additional future partners for these projects, especially if they connect areas of increased density and traffic congestion. This could lessen the need for cars, roads and other high-impact transportation modes that perpetuate environmental injustice.

The future of local watershed planning will rely in part on 'home-growing' our own planners, ecologists, engineers and scientists. As one of the most proactive water resource programs for urbanized areas on the West Coast, our watershed provides some unique opportunities to provide high school students with on-site, advanced science training. One proposed pilot project includes supplementing selected Environmental Science high school classes with site visits and special field studies to Newport Bay and the coastal canyons of Newport Coast. Successful students interested in pursuing environmental sciences could matriculate to a watershed oriented course of work at UCI.

References:

- American Society of Landscape Architects, Lady Bird Johnson Wildflower Center, United States Botanic Garden. 2008. Draft Sustainable Sites Initiative. www.sustainablesites.org
- Bedan, Erik S. and John C. Clausen, 2009. Stormwater Runoff Quality and Quantity From Traditional and Low Impact Development Watersheds. Journal of the American Water Resources Association (JAWRA) 45(4):998-1008. DOI: 10.1111 /j.1752-1688.2009.00342.x
- Chrisman, Nicholas. 1997. Exploring Geographic Information Systems. John Wiley and Sons, Inc., New York.
- Congress for the New Urbanism. 1996. Charter of the New Urbanism. **www.cnu.org/charter**
- County of Orange. 2003. Drainage Area Management Plan. Hudson, Jude. March 11, 2008. "Planning with Fire: Balancing Growth and Safety in Fire Hazard Areas", Western City, League of California Cities.
- Keeley, Jon E. 2004. Lessons from the October 2004 Wildfires in Southern California. **www.nature.berkeley.edu/moritzlab/docs/Keeley_etal_2004.pdf**
- Orange County Parks. 2007. Orange County Parks Strategic Plan. Orange County Resources and Development Management Department. **www.ocparks.com/strategicplan/**
- Quarles, Steven. Center for Fire Research and Outreach. College of Natural Resources, University of California, Berkeley. **http://firecenter.berkeley.edu/quarles/squarles.htm**
- Thirsty for Justice: A People's Blueprint for California Water, Environmental Justice Coalition for Water, June, 2005
- United Nations Brundtland Commission Report. 1987. Oxford University Press. **www.worldinbalance.net/pdf/1987-brundtland.pdf**

PART III: PROJECTS

Coordinated studies, plans, projects, partnerships, programs and policies are all required to successfully manage water resources over the long term. This phase of the IRCWMP has focused primarily on planning and projects. The outcomes are a planning methodology to identify and integrate projects and a list of prioritized projects.

The planning framework and methodology were presented in Parts I and II of this Plan. Part III focuses on projects and the state strategies they implement. Chapter 10: Local Level Planning and Integration presents local objectives, project integration designs, and the list of projects that support both local and regional objectives.

Chapter 11: Regional Prioritization presents a simple scoring system based on a project's multiple benefits and an integration concept that is based on state priorities. Once the body of Regional Performance Objectives is sufficiently robust and detailed, the scoring system can be adapted in a more sophisticated manner to reward projects that accomplish specific regional objectives. Additionally, the scoring system can be easily modified to accommodate changes in local and state priorities.

Chapter 12: Next Steps for Plan Implementation summarizes the studies, programs, policies, plans and partnerships that will be needed in subsequent phases of this IRCWMP process

10 • LOCAL LEVEL PLANNING & INTEGRATION

A key concept of this Plan is that project-level planning and design should be infused with ideas that promote rebalancing of the hydrologic system, in order to establish a healthy and stable ecosystem. Based on this underlying principle, the purpose of the IRWM planning process is to identify, prioritize and implement those projects that are key toward 1) addressing water resource issues and 2) creating a foundation for implementing other supporting water resource projects and programs.

Chapter 2 presented state guidelines for water resource planning (Section 2.6). This chapter describes local project planning elements, which are then used to outline potential integrated local programs.

As a first step in defining local programs, it is useful to define sub-regions or 'Planning Areas" within the watershed as follows:

1) Northern Foothills
2) Southern Foothills
3) Central Plain
4) Urban Bay
5) Bay/Coastal
6) Coastal Canyons

Each Planning Area is a cluster of subwatersheds that share relatively similar hydrologic circumstances and benefit from project designs tailored to local conditions.

Based on this delineation, meetings were held with stakeholders within each Planning Area. Stakeholders were queried regarding local objectives, project challenges, and ideas for potential projects and programs that would be beneficial to the area. These discussions are the basis for this Plan's project-level planning and integration.

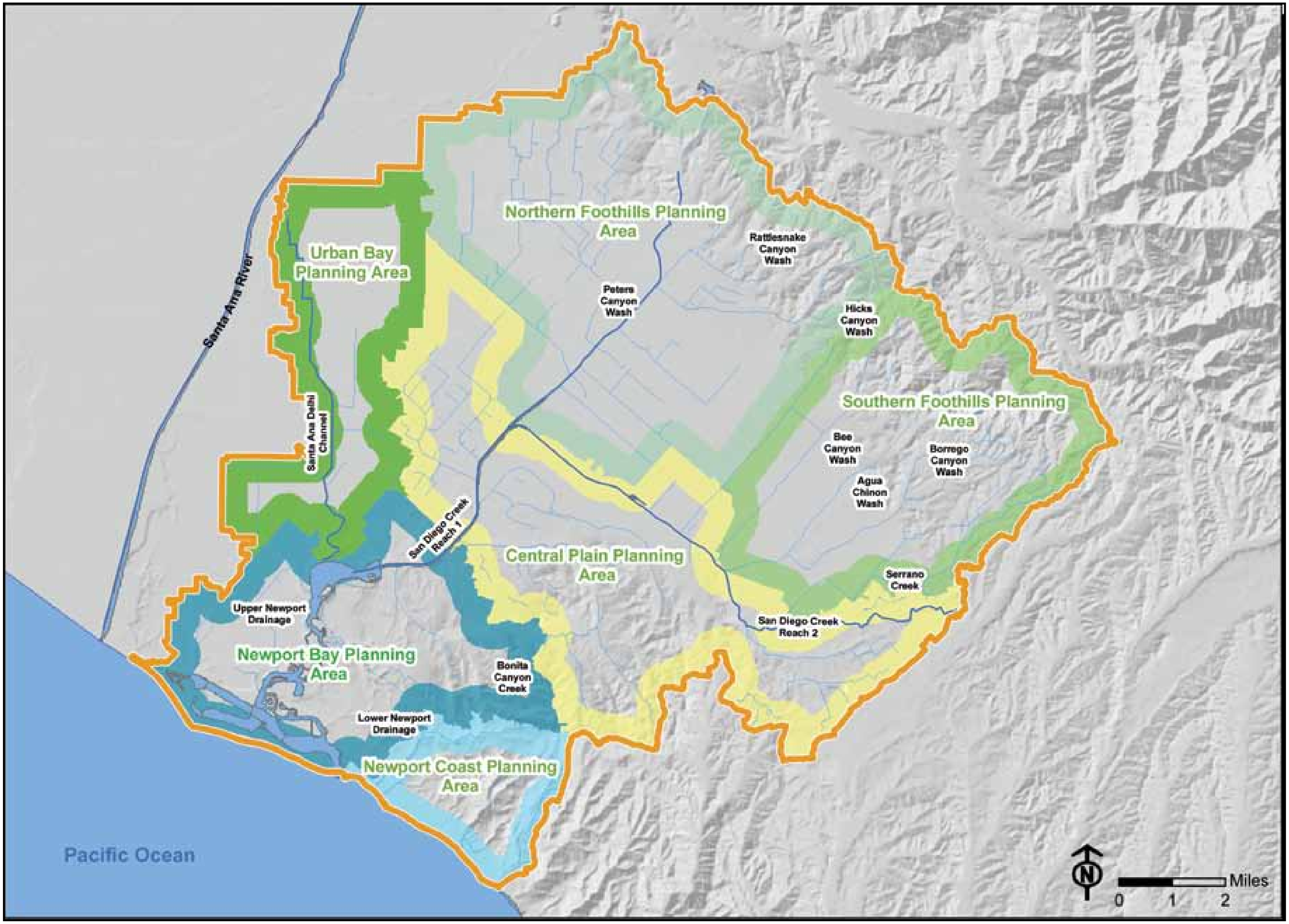


Figure 10.1 IRCWMP Planning Areas.

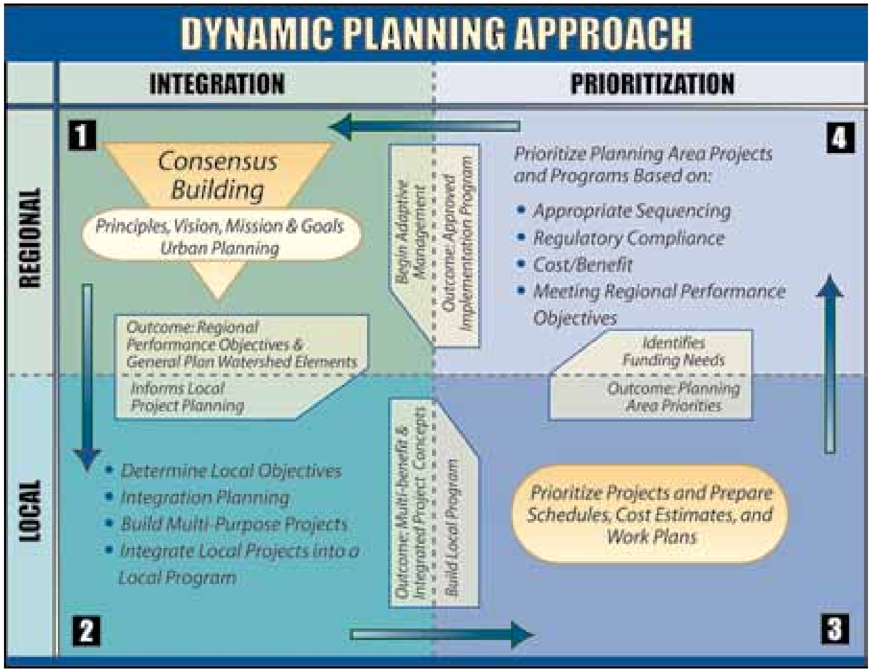


Figure 10.2 Dynamic Planning Approach

Project level planning and integration consists of four parts, as illustrated in Step 2 of the Dynamic Planning Approach (Figure 10.2).

1. Defining local objectives
2. Assessing challenges and opportunities
3. Building multi-purpose projects, and
4. Integrating projects into larger planning and programming efforts through integration planning.

Local objectives are based on immediate and long-term needs and goals. This Plan provides a framework where local objectives can inform and be guided by the Regional (watershed-wide) Performance Objectives, which set watershed targets and milestones toward re-establishing a healthy and stable regional ecosystem. Local and regional objectives guide the planning and formulation of potential water resource projects. Table 10.1 lists potential key and supporting projects for each of the planning areas.

There are already many examples in our watershed of water resource projects that provide multiple benefits. The most important types of projects are those that address the most egregious impacts to a healthy hydrologic system. These projects can be considered as baseline or cornerstone projects. These projects not only work to reestablish a healthy and balanced ecosystem, but also create a foundation that fosters supporting and future projects.

Integration

At the root of the concept of integrated water resource planning are inter-linking and cross-connecting multi-purpose water resource projects that have been designed in accordance with hydrologic principles. Planning and design integration are creative actions involving the four water resource areas (flood control, water supply, water quality and habitat), economics, community interests, political climate and funding opportunities. Chapter 4 outlines four types of regional integration and thirteen types of local-level integration that can be considered by the project proponent in order to create cross-

Table 10.1 Central Orange County IRCWMP: Key Projects for Each Planning Area

	Northern Foothills	Southern Foothills	Central Plain	Urban Bay	Bay/Coastal	Coastal Canyons
HYDROLOGY/ FLOOD CONTROL	• Foothill detention basins	• Borrego/Serrano in-line detention basins • Borrego/Serrano canyon stabilization • Foothill detention basins • Re-establishment of Agua Chinon Canyon. • Upper Bee Canyon restoration	• San Diego Creek flood conveyance improvements below Jeffrey Road • Michelson water reclamation plant flood wall • Peters Canyon Wash Restoration		• University Avenue flood protection project	• Buck Gully erosion control project
WATER QUALITY	• MCAS-Tustin Storm and Groundwater Capture • Cienega filtration plant (Selenium removal) • NTS • Como wetland project • Peters Canyon Wash in-Line Channel Restoration • Smartimer Irrigation controllers	• Great Park groundwater cleanup • Foothill fire risk reduction program • Smartimer Irrigation controllers	• Selenium removal • San Diego Creek In-channel sediment traps, • NTS • Smartimer Irrigation controllers	• Pilot projects to reduce runoff from medians • Delhi Channel diversion & restoration pilot projects • Smartimer Irrigation controllers	• Upper Newport Bay Dredging project • Harbor dredging project • Rhine Channel remediation • Newport Bay copper reduction project • NTS-San Joaquin • Smartimer irrigation controllers	• Buck Gully stabilization project • Canyon fuel modification program • Smartimer Irrigation controllers
WATER SUPPLY	• Groundwater treatment • MCAS-Tustin water supply wells • Rattlesnake reservoir • Rawlings reservoir • Weather indexing • CA Friendly landscaping program • Landscaping auditing program	• Lake storage for irrigation water (Great Park) • Baker pipeline regional water treatment plant • Siphon Canyon Reservoir • Lake Forest recycled water expansion project • Weather indexing • CA Friendly landscaping program • Landscaping auditing program	• San Joaquin Hill Reservoir storage for reclaimed water • Peters Canyon reservoir conversion to recycled water storage • Recycled water expansion project • Weather indexing • CA Friendly landscaping program • Landscaping auditing program	• Recycled water expansion project • Weather indexing • CA Friendly landscaping program • Landscaping auditing program	• Recycled water expansion project • Weather indexing • CA Friendly landscaping program • Landscaping auditing program	• Recycled water expansion project • Weather indexing • CA Friendly landscaping program • Landscaping auditing program

Table 10.1 Central Orange County IRCWMP: Key Projects for Each Planning Area

	Northern Foothills	Southern Foothills	Central Plain	Urban Bay	Bay/Coastal	Coastal Canyons
HABITAT	• Foothill Fire Risk Reduction • Open space acquisition - Headwaters of Hicks and Rattlesnake Canyons.	• Agua Chinon wildlife corridor • Great Park multi-use trails. • Great Park native plant landscaping program • Limestone Canyon & Whiting Ranch Wilderness Park restoration • Toll Road area habitat restoration and fire suppression projects	• Shady and Bommer Canyons habitat linkage areas • Irvine Business Center trail and ecosystem enhancements • Irvine Wildlife Corridor	• Watershed AP environmental science classes	• Newport Bay Restoration projects • Big Canyon creek restoration project • Lower SDC tidal barrier project • Bonita Canyon Creek restoration • San Joaquin Marsh restoration	• Buck Gully Resource Management plan • Landscape and irrigation ordinance • Tidepool projection program • ASBS investigation and protection program

connections with other projects and stakeholders. The best example of planning integration in our Region is the Orange County Great Park (see Section 10.2).

This chapter examines each of the six Planning Areas with regard to regional issues, local objectives and the challenges of reestablishing a hydrologic balance within the Region. It then presents examples of baseline and supporting projects. The integration concepts outlined in Chapter 4 are illustrated by calling out potential interlinkages among the projects within the Bay/Coastal Planning Area (Section 10.5).

10.1 Northern Foothills Planning Area

The Northern Foothills Planning Area includes four major drainages: Hicks Canyon, Rattlesnake Canyon, El Modena-Irvine Channel and Peters Canyon Wash. The first three channels drain into Peters Canyon Wash, which ultimately drains the entire Planning Area. Hills and canyons lie along its outer edges, but it flattens out as the topography transitions into the Tustin Plain. The local land use jurisdictions are the Cities of Irvine, Orange (very small area), Santa Ana, Tustin and unincorporated areas of the County of Orange. It also includes the former Tustin Marine Corps Air Station, within the City of Tustin's jurisdiction. Additional Planning Area partners include: California Department of Fish and Game, East Orange County Water District, IRWD, William Lyon Homes, Vestar Kimco, Lennar Corporation, Tustin Legacy Partners, John Laing Homes, Rancho Santiago Community College District, South Orange County Community College District, Nature Reserve of Orange County, Shea Homes, and The Irvine Company.

Regional Issues:

- Selenium in groundwater
- Urban runoff pollution
- Water supply
- Limited habitat connectivity

Local Objectives:

- Redevelop the former Tustin Marine Corps Air Station
- Develop water wells to supply development at the former MCAS-Tustin.
- Upgrade water treatment facilities to treat colored water and contaminated groundwater
- Reduce fire hazards in the foothills
- Reduce selenium loads to Newport Bay
- Reduce sediment and other pollutant loads to Newport Bay
- Acquire and improve park facilities
- Improve habitat connectivity
- Remove invasive plants in the canyons and reestablish native plant communities.

Planning Area Challenges and Opportunities:

- Additional potable water supply is needed in order to develop the former Marine Corps Air Station at Redhill Road.
- Potable groundwater supplies are potentially threatened by a plume of pollution.
- Storm flows are significant, which constrains downstream riparian restoration.
- This area has been a problematic source of selenium. Perched groundwater draining from the Tustin Plain picks up selenium from the soils and carries it into stream channels and then the bay, where it poses a potential hazard to the reproductive processes of the estuary species.
- Enabling riparian restoration would require reducing peak storm flows, which would require stormwater capture. As infiltration could contribute to the selenium transport issue, projects that capture, treat and reuse stormwater above ground could enable riparian restoration downstream, reduce the selenium being transported into the bay through groundwater, and create a local source of nonpotable water supply.
- These multipurpose surface water projects will help to create baseline hydrologic conditions that will enable other projects that are required to achieve the Desired State's Regional Performance Objectives and the local stakeholder objectives. Supporting projects and programs include reducing urban runoff and water demand through water conservation.

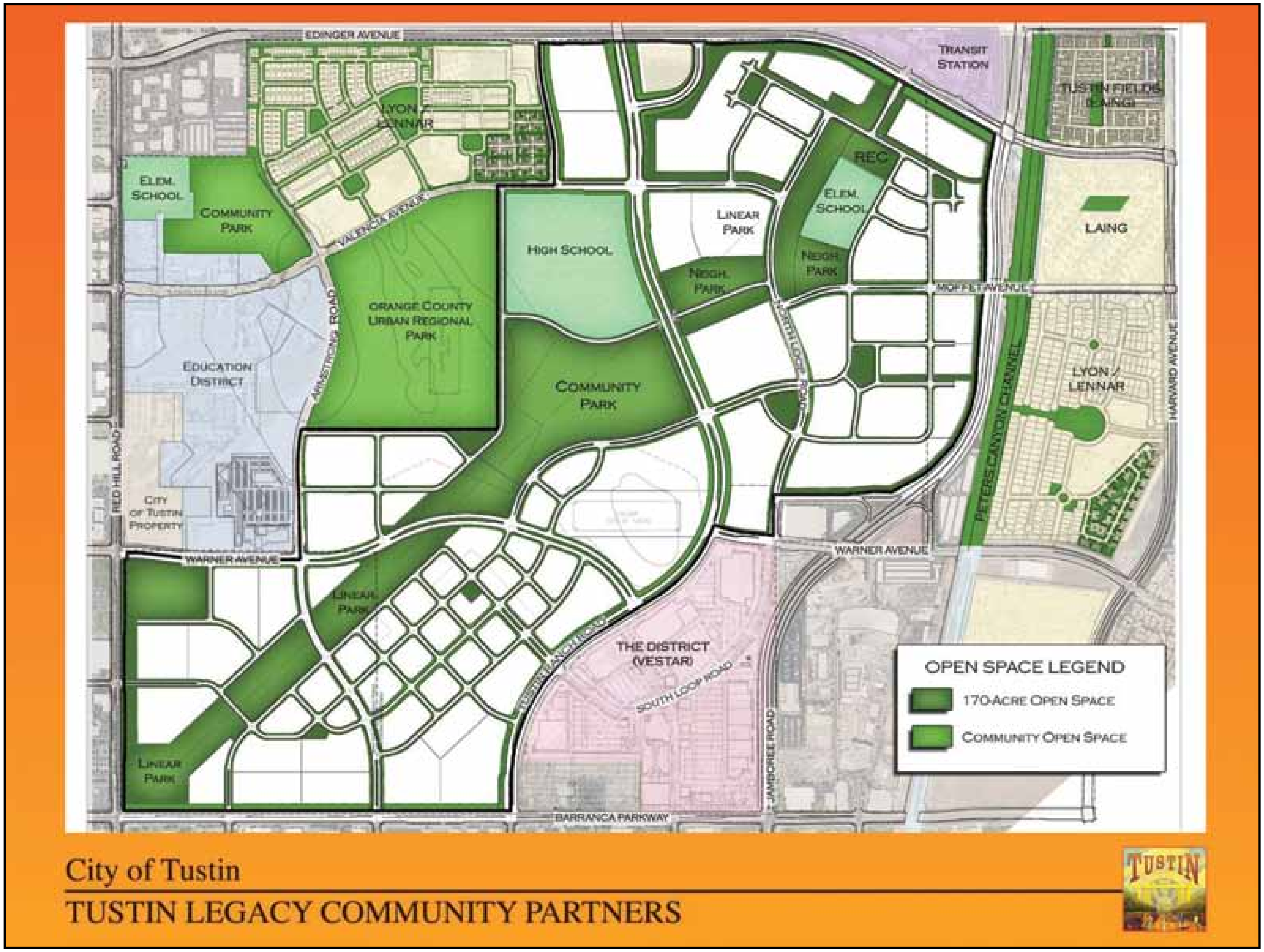


Figure 10.3 Tustin Legacy Open Space (proposed), Tustin Legacy Specific Plan

Baseline Project:

TUSTIN MARINE CORPS AIR STATION STORMWATER AND GROUNDWATER CAPTURE AND REUSE: The former 1,600 acre MCAS-Tustin, located in the City of Tustin, is being redeveloped by Vestar Kimco, John Laing Homes, Tustin Legacy Partners, William Lyon Homes, Lennar Corporation, and Rancho Santiago and South Orange County Community College Districts, as 'Tustin Legacy'. Tustin Legacy is a master-planned community with commercial, residential, and industrial elements and will be the site of a new regional park. IRWD will be installing four wells in support of this project.

The master plan for this project includes a variety of open spaces that could be used as water retention facilities. This water could then be made available as a supply source for the other urban parts of this new development project.

These projects could capture as much water as is technically feasible from the Planning Area, especially groundwater runoff that occurs year round.

Supporting Project Examples:

IMPROVE WATER SUPPLY RELIABILITY: The City of Tustin has pumped and treated contaminated groundwater, both for potable use and to protect the aquifer from further contamination. The City is now engaged in a program to modernize its aging facilities and to bring new facilities online to treat and use water colored by fulvic and humic acids. This area is also a good candidate for expanding landscape water use efficiency measures.

Figure10.4 Natural treatment wetland, Irvine

HABITAT PROTECTION THROUGH FIRE RISK REDUCTION MEASURES: The November, 2007 Santiago Fire in the neighboring foothills burned seventeen percent of the county, including valuable foothill habitat and some canyon homes in the cities of Tustin and Irvine. This Plan proposes fire risk reduction measures, including freeway fire barriers and human activity exclusion zones during the high fire season.

SELENIUM REMOVAL: Selenium discharges from this area have been impacting endangered and other species in Newport Bay through bioaccumulation (Hibbs, 2008). A stakeholder group including state, county and local agencies, water districts and private entities, was formed in 2005 in order to oversee the development of a Nitrogen and Selenium Management Program

Figure 10.5 Least Bell's vireo of California, considered endangered, primarily from loss of riparian habitat and cowbird parasitism. Photo courtesy of Scott Streit, www.bird-friends.com

(NSMP). Under this program, treatment technologies and BMPs are being developed and implemented. See Figure 3.21 for a map of selenium concentrations.

NATURAL TREATMENT: The Plan proposes a series of water quality projects, including IRWD Natural Treatment Systems, the City of Irvine's Como Wetland Project, and the City of Tustin's Peters Canyon Wash In-line Channel Restoration. These projects will be engineered to provide removal of metal, bacteria and nutrients.

OPEN SPACE: Several important sites that will improve foothill habitat connectivity have been identified in the vicinity of the headwaters of Hicks and Rattlesnake Canyons.

10.2 Southern Foothills Planning Area

The Southern Foothills Planning Area includes five major drainages: Serrano Creek, Borrego Canyon Wash, Agua Chinon Wash, Bee Canyon Wash and Marshburn Channel. The former El Toro Marine Corps Air Station, home of the Orange County Great Park, is located across all of these drainages. The local jurisdictions include portions of the cities of Laguna Woods, Lake Forest, and Irvine, as well as unincorporated areas of the County of Orange. Other area partners include the California Department of Fish and Game, U.S. Fish and Wildlife Service, FAA, Department of Defense, Great Park Corporation, Heritage Fields El Toro LLC, Nature Reserve of Orange County, IRWD and The Irvine Company.

Regional Issues:

- Excessive erosion, sedimentation and channel destabilization
- Fragmented riparian corridors
- Pollution in urban runoff

Local Objectives:

- Complete development of the Baker Ranch and redevelopment of the former El Toro Marine Corps Air Station
- Reduce fire hazards in the foothills
- Stabilize canyons

- Reduce sediment and pollutant loads to Newport Bay
- Improve habitat connectivity
- Remove invasive plants in the canyons and re-establish native plant communities.

Planning Area Challenges and Opportunities:

This area contains steep sandstone canyons with sandy streambeds. With development, sediment supplies from the surrounding land have decreased, while stormwater runoff volumes and velocities have increased, subjecting the canyons to erosion by "hungry-water". This is particularly true for Borrego Canyon and Serrano Creek. As a result, this Planning Area is the largest source of sediment deposition to the Newport Bay.

Projects that will establish the necessary baseline conditions to support the attainment of all of the area objectives are: 1) stormwater capture projects that reduce peak flows in the canyon washes and 2) canyon stabilization projects. These projects will create opportunities for concurrent or complementary riparian habitat restoration projects in the canyons and channels.

Baseline Project:

- **BORREGO/SERRANO SUBWATERSHED STORMWATER CAPTURE:** Orange County Flood Control District will have to define exactly how much stormwater should be retained on land in order to stabilize Borrego and Serrano Canyons' soft bottom stream channels. These figures will define the required capacity of water retention facilities. Development of stormwater capture and retention facilities that reduce peak flows in Borrego and Serrano Creeks will help establish the necessary baseline conditions for this area.

  The Great Park Master Plan incorporates stormwater capture capabilities into the park design while its manmade lake, supplied with recycled water and stormwater, will be used for irrigation. In addition, the Nature Reserve of Orange County could develop retention facilities within its territory, where feasible. Various land use jurisdictions or local agencies that want additional sources of irrigation water for future use may also find it in their interest to develop these kinds of facilities in urban open space areas. Currently, no projects have been submitted to serve this function. Either existing projects could be modified to serve this capacity, or new projects could be developed.

Supporting Project Examples:

- **GREAT PARK AND GREAT PARK NEIGHBORHOODS WATER INFRASTRUCTURE:** One of the most important developments in Orange County is the redevelopment of the former El Toro Marine Corps Air Station. This redevelopment includes 2,300 acres of urban development called Great Park Neighborhoods (owned by Heritage Fields El Toro, LLC), and 1,347-acres of park space known as the Orange County Great Park. The Master Plans for these communities and the park focus on opportunities to create and strengthen ecological, social and cultural connections. The Great Park has established sustainability goals for energy and water conservation, as well as for promoting ‘green’ technologies.

(Note: On August 11, 2009, the Irvine City Council approved an Amended and Restated Development Agreement, calling for Heritage Fields to commit $58 million over the next five years for Great Park infrastructure and maintenance, and to give the City 131 more acres of park land. In return, the developer is dropping plans for a promised golf course, will increase the number of dwelling units, and will build on a 173-acre swath of agricultural land north of Irvine Boulevard (Orange County Register, 2009).

The Great Park and Great Park Neighborhoods water infrastructure projects are integrated within this Planning Area to the extent that they can help capture and treat runoff, incorporate water use efficiency measures, increase habitat, and do not detract from any of the other regional or local objectives.

- **GREAT PARK WILDLIFE CORRIDOR:** The wildlife corridor is designed with the goal of reconnecting two large patches of Orange County’s NCCP/HCP wildlife areas. The first patch includes the Cleveland National Forest, Limestone-Whiting Wilderness Park and the proposed El Toro National Wildlife Refuge to the north of Irvine. The second patch includes the Irvine Open Space Preserve, Laguna Coast Wilderness and Crystal Cove State Park to the south of Interstate 5. Sections 2, 3, and 4 of the habitat corridor, extending from Irvine Boulevard to the Borrego Flood Control Channel, fall within the confines of the park. Development of the corridor will include significant terraforming

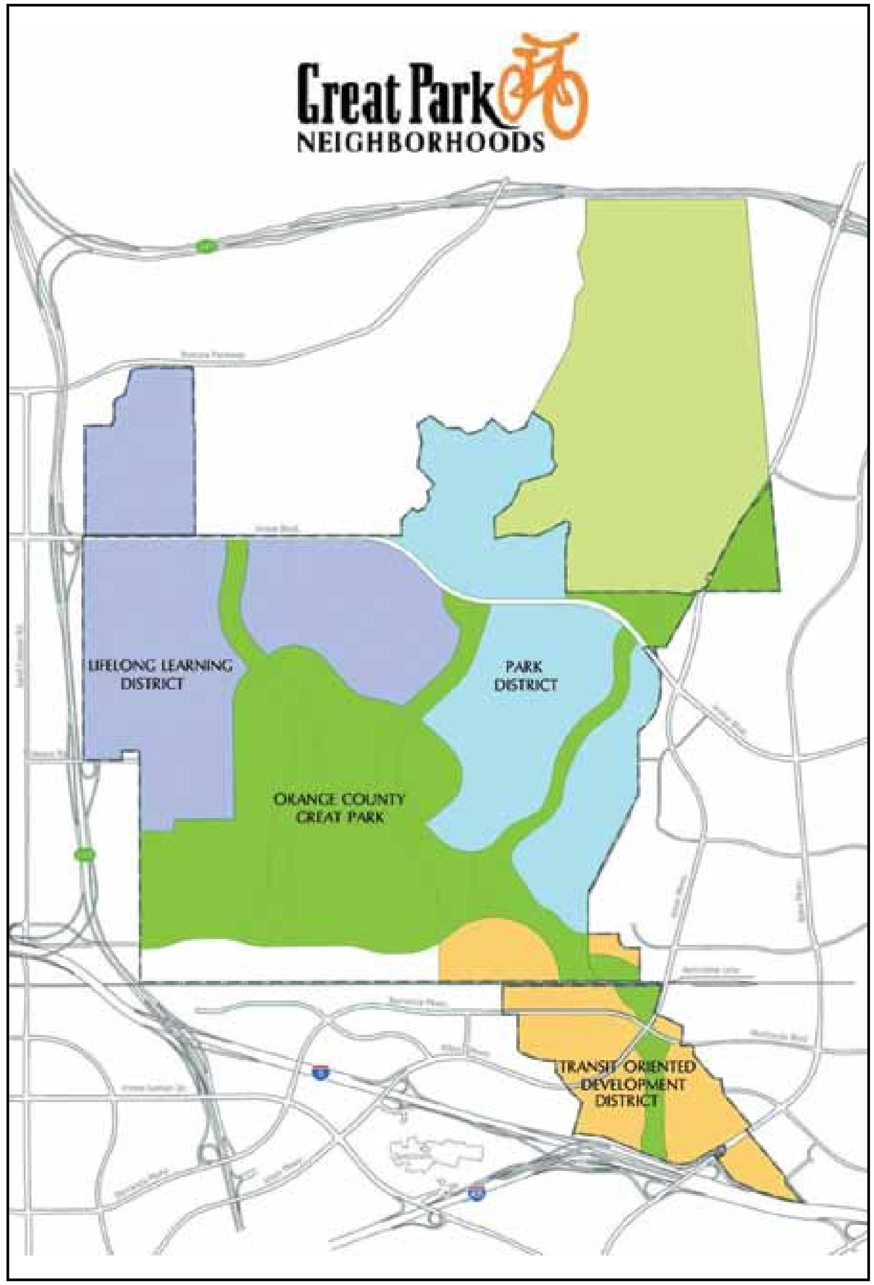


Figure. 10.6 Great Park and Great Park Neighborhoods (Source: www.greatparkneighborhoods.com).

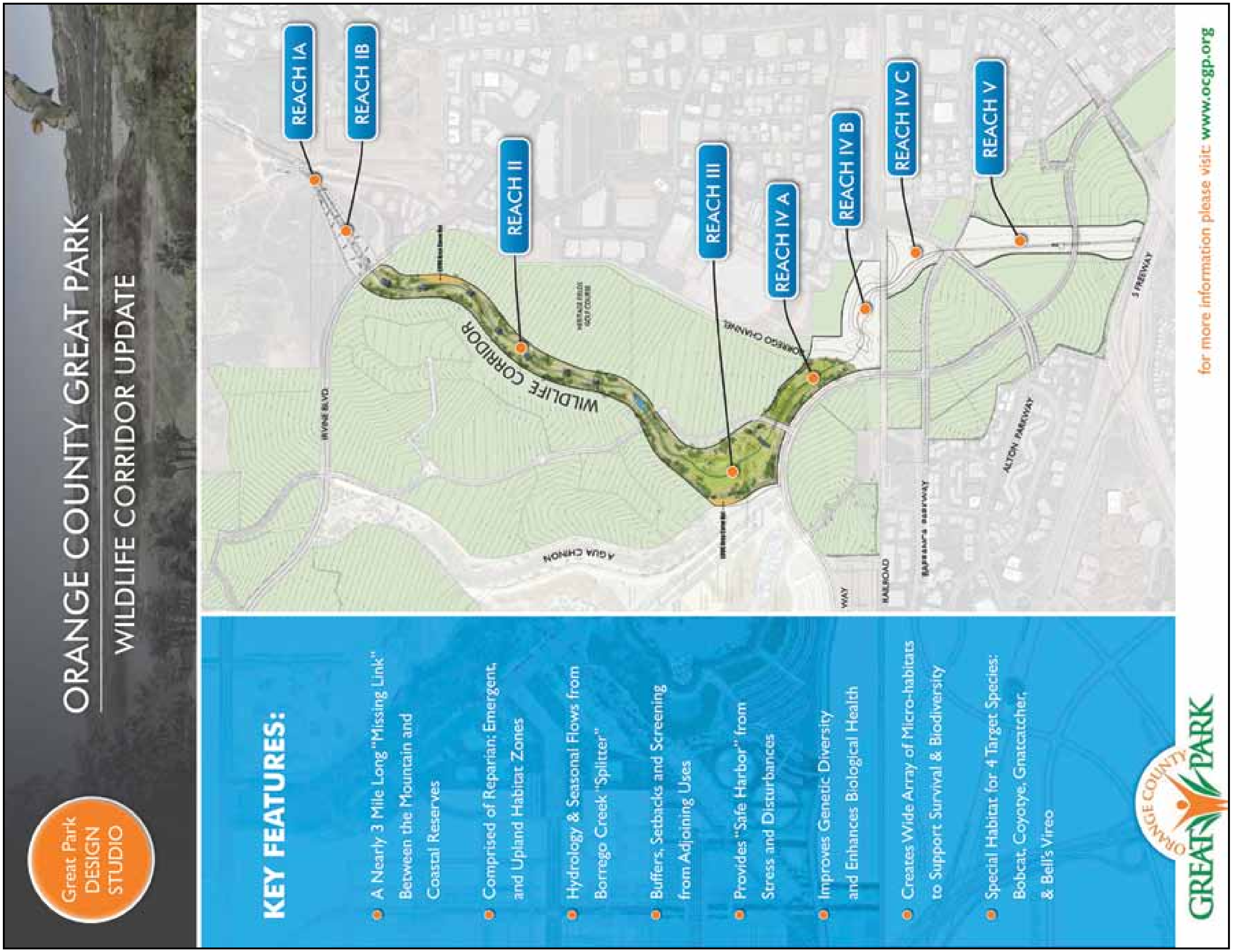


Figure 10.7 Great Park segment of proposed Wildlife Corridor. (Source: Great Park Design Studio)

and habitat restoration along Borrego Canyon Wash and Serrano Creek, including a partial dry-weather flow diversion of Borrego Wash north of Irvine Boulevard, and the creation of intermittent ponds and wetlands. The development of the Great Park will also re-establish a reach of the Agua Chinon Wash by daylighting the park portion of the creek, currently piped underground, and restoring riparian and upland vegetation along its banks.

- **BORREGO/SERRANO STABILIZATION:** Streambed down-cutting and erosion in Serrano Creek threatens to undermine homes and damage sewer and electrical facilities. Furthermore, an estimated 30 to 40 percent of the sediment entering Newport Bay originates from erosion in Serrano Creek and Borrego Canyon Wash. The County and other stakeholders are spearheading efforts to stabilize these canyons using eco-friendly materials (gabions and drop-structures). These future projects also provide opportunities to restore habitat within these canyons. These projects support integrated project design for this Planning Area by stabilizing the physical structure of this system, helping to better support the other ecological functions in this system.
- **FIRE RISK REDUCTION:** The November 2007 Santiago Fire in the neighboring foothills is the latest dramatic instance of the vulnerability of these valuable habitat areas to human activities. This Plan proposes implementing additional fire risk reduction measures, including freeway fire barriers and human activity exclusion zones during the high fire season.

Figure 10.8 Erosion in Serrano Creek

10.3 Central Plain Planning Area

The Central Plain Planning Area includes the area generally bounded by Alton Parkway to the north and the San Joaquin Hills Corridor Toll Road to the south. San Diego Creek and the lower reaches of Peters Canyon Wash are the primary drainage channels. The Laguna Canyon Wash, Sand Canyon Wash and Bonita Canyon Wash subwatersheds are also a part of this planning area. The primary municipal jurisdiction in the area is the City of Irvine, but it also includes Laguna Woods, Santa Ana and Tustin, as well as unincorporated areas of the County of Orange around the John Wayne Airport. Other stakeholders include the California

Department of Fish and Game, IRWD, Nature Reserve of Orange County and The Irvine Company.

Regional Issues:

- Selenium contamination
- Legacy pesticide contamination
- Contaminated dry-weather flows

Local Objectives:

- Ensure flood control.
- Develop adequate and reliable water supply.
- Reduce selenium loads to Newport Bay.
- Reduce sediment and other pollutant loads to Newport Bay.
- Construct transportation improvement projects constrained by contaminated shallow groundwater.
- Improve habitat connectivity.
- Remove invasive plants in the canyons and reestablish native plant communities.

Planning Area Challenges and Opportunities:

The central area of this Region is known as the Tustin Plain. It historically received water flowing down from both the Northern and Southern Foothills Planning Areas. Because the terrain is flat, surface water would slow down, deposit sediment it picked up from the foothills, and then percolate into the ground, where it would

Figure10.9 A weather-based smart controller, a Best Management Practice being tested in Newport Coast for controlling runoff

flow both above and below ground toward the Swamp of the Frogs. The lower portion of the Northern Foothills Planning Area shares these same hydrologic conditions. Over time, the soils in both of these Planning Areas accumulated selenium and agricultural pesticides. These leached into groundwater that now flows into storm channels and is carried into Newport Bay, causing biological contamination. This Planning Area is also positioned over the groundwater basin, leading to drinking water quality concerns from the legacy pollutants.

Historically, the defining hydrologic characteristic of this Planning Area has been the flow of groundwater relatively close to the surface.

Water near the surface increases the primary production capacity of the habitat but also creates a flooding risk; i.e., potential habitat value is highest in the same places that natural potential for flooding is highest. Moreover, this is also where legacy contaminants are most likely to concentrate. Additionally, the contaminated groundwater poses a problem for the water supply.

Projects that will begin to reintegrate baseline hydrologic conditions in this Planning Area are multipurpose floodplain management projects that manage land in the most flood-prone areas, treat the water to remove contaminants, and then restore native habitat where feasible.

Baseline Projects:

- **FLOOD CHANNEL CAPACITY:** The Orange County Flood Control District is planning flood conveyance improvements on the lower reach of San Diego Creek below Jeffrey Road.
- **NITROGEN & SELENIUM MANAGEMENT TASK FORCE GROUNDWATER TREATMENT PROJECTS:** Pilot projects are underway to test treatment trains for selenium removal.

Supporting Project Examples:

- **WATER REUSE:** IRWD is exploring projects to increase its production of reclaimed water and to begin using the San Joaquin Hills Reservoir for storage.
- **RUNOFF SOURCE CONTROLS:** In-channel sediment traps, natural treatment systems, irrigation runoff reduction projects, low impact development and other source controls are being tested and implemented in order to reduce sediment and pollutant loads to Newport Bay.

Figure 10.10 Brown-headed cowbird trap

- **HABITAT:** Important habitat linkage areas in Shady and Bommer Canyons have been proposed for incorporation into the NCCP Reserve. The Nature Reserve of Orange County and the Irvine Company are working together in this area on programs to remove non-native birds, such as the brown-headed cowbird nest parasite. They are also removing invasive plants and replanting with native plants.

- Irvine Business Complex (IBC): This is a Mixed Use Residential Plan and Overlay Zone located within the City of Irvine. Opportunities exist for ecosystem restoration and trail enhancement along the riparian corridors in this area that would complement urban redevelopment activities (http://www.cityofirvine.org/depts/cd/planningactivities/ibc_graphics.asp).

10.4 Urban Bay Planning Area

The Urban Bay Planning Area includes the eastern areas of the cities of Santa Ana and Costa Mesa that drain into the Santa Ana Delhi Channel. This area is the oldest, densest and most highly urbanized area of the watershed. It has a low, flat elevation with a high water table. The low elevations could be at risk for flooding if sea levels rise due to global warming. The Region's disadvantaged communities are also located within this Planning Area (Figure 3.16, Disadvantaged Communities within the Region).

Regional Issues:

- Urban Runoff Pollution

Local Objectives:

- Reduce sediment and other pollutant loads to Newport Bay by source controls, drought tolerant landscapes and low impact development retrofits.
- Increase watershed science educational opportunities at all levels (grade school, high school, Santa Ana Community College)
- Increase public awareness and access to the watershed ecological and recreational opportunities.

Planning Area Challenges and Opportunities:

Because this area is so densely urbanized, pollutant loads associated with over-irrigation and wash-down activities have become a problem. There are few open spaces for implementing runoff capture projects, and few open space, habitat or riparian restoration projects.

The best prospects for achieving the baseline conditions required for balancing the local hydrology lie with urban revitalization and renewal projects that can incorporate runoff capture and treatment projects, open space and habitat amenities, and drought tolerant landscaping.

Green infrastructure can be integrated into renewal or infill projects that will capture and treat runoff at the neighborhood scale. Habitat and riparian restoration projects can also be incorporated into the surrounding land uses. This provides the additional amenities of landscape, vegetation and open space that make the development an attractive, pleasant place to be.

Baseline Project:

Runoff Improvement Pilot Projects: This Plan proposes pilot projects utilizing drought tolerant landscaping, alternative irrigation technologies and runoff capture and treatment, in order to reduce runoff volumes from landscaped medians, streetscapes, residential and commercial areas.

Supporting Project Examples:

- **LOWER SANTA ANA DELHI CHANNEL RESTORATION PILOT PROJECT:** The Santa Ana Delhi Channel is the second largest tributary to Newport Bay. This subwatershed includes some of the oldest and most urbanized area of the basin. A pilot program in the lower reach of this channel will reestablish creek habitat, construct water quality improvement features and launch a model pollutant source reduction program within the adjacent neighborhoods. This project will tie into the larger efforts to restore Upper Newport Bay.
- **HIGH SCHOOL EDUCATION:** An Advanced Placement Environmental Sciences class, supplemented with emerging watershed information and studies, is proposed for each high school in this Planning Area. These classes will include guest speakers with local watershed expertise, field trips to NCCP areas and Newport Bay, and special projects involving watershed monitoring. The goal is to inspire high school students to continue study within the environmental sciences at the local community college or UCI.
- **COMMUNITY OUTREACH:** As new watershed restoration projects come online, there will be opportunities to showcase their success to the community. 'Eco-tours' can be set up for interested community members. Community conferences in association with sponsoring high schools can be an innovative way to energize the community about watershed resources and the benefits of knowledgably using these resources.

10.5 Bay/Coastal Planning Area

The Bay/Coastal Planning area includes many small canyons that drain directly into Upper and Lower Newport Bay, the lower reaches of San Diego Creek and the Santa Ana Delhi Channel, all of which are tidally influenced. Land use jurisdictions include the cities of Costa Mesa, Irvine, Newport Beach, and the County of Orange. Additional stakeholders include the U.S. Army Corps of Engineers, California Department of Fish and Game, IRWD, RWQCB, California Coastal Commission, Newport Bay Naturalists and Friends, Southern California Wetland Recovery Project, Save and Protect Our Newport Bay, and UCI.

Regional Issues:

- Sediment and pollutant loads entering the bay
- Pollutant loads from canyons and storm drains
- Habitat degradation due to public use and invasive plants

Local Objectives:

Hydrology/Flood Control

- Protect low-lying areas from flooding around the harbor, upper bay and San Diego Creek.

Water Quality

- Reduce water quality impacts associated with local urban runoff, boat maintenance activities and legacy pollutants.
- Maintain harbor navigation.
- Reduce irrigation runoff.

Water Supply

- Expand the recycled water program.
- Increase public awareness of, and access to, CIMIS (California Irrigation Management Information System) weather indexing data – used by property owners to manually adjust irrigation controllers (http://wwwcimis.water.ca.gov).
- Expand landscape irrigation reduction programs.

Habitat

- Restore the Upper Newport Bay ecosystem habitat for endangered fish and bird species.
- Provide methods to facilitate maintenance of the bay's bulkheads, marinas and docks while protecting high value eel grass areas.
- Restore the upland areas around Upper Newport Bay.
- Improve NCCP habitat connectivity with Buck Gully and Shady Canyon.

Economy

- Foster a healthy environment for tourism and harbor-related businesses.

Planning Area Challenges and Opportunities:

The defining hydrologic characteristic of Newport Bay and its immediate surroundings is the intertidal interaction of salt and fresh waters. Originally, Newport Bay had very little freshwater flowing into it because its largest tributary, San Diego Creek, flowed into the Swamp of the Frogs. This made the bay more of a large coastal salt water lagoon than an estuarine type of environment.

San Diego Creek was connected to the bay in the early 1960's as a flood control project to drain stormwater off of private property. Instead of draining the water to the ocean directly, it was directed into the upper end of the bay.

The diversion of San Diego Creek into Upper Newport Bay had two important impacts:

1. It dramatically increased the amount of fresh water in the bay, creating an estuarine environment and affecting the survival of organisms that required a more salty environment.
2. It delivered significant sediment loads and pollutants to the bay.

The current practice for handling the excess sediment is to periodically dredge the bay. However, with cost now topping $50 million for the latest Upper Bay dredging program, a new strategy is clearly called for: the strategy of rebalancing upstream watershed hydrology to reduce sediment and pollutant loading to the bay.

Rebalancing a disturbed watershed equilibrium will be a trial-and-error affair. Monitoring the health of the bay over time will serve as a barometer of restoration activity success. The kinds of projects that will best enable the effective management of the Newport Bay Planning Area are projects that provide the quantitative and qualitative data necessary to implement a science based, adaptive management program. This data will also provide the foundation for focusing and refining watershed Regional Performance Objectives.

BASELINE PROJECT:

- **NEWPORT BAY PROTECTION AND RESTORATION PROGRAM:** Estuary protection and restoration projects center on two primary tributaries, San Diego Creek and Santa Ana Delhi Channel, at the points where they enter Upper Newport Bay. Programs are in place that study selenium, legacy pesticides, sediment, nutrients, toxic materials and fecal indicator bacteria entering the bay. These programs inform pilot projects that curtail point and non-point sources of these pollutants. Habitat restoration projects are underway that have drawn together jurisdictional agencies, water resource experts in academia, professional consultants and community activists. I1(2); I2(2,12); I7

  I2(2,12) means that this project was designed to promote healthy downstream hydrologic function (Integration Type 2) for Project No. 2 – Harbor Dredging and Project No. 12 – Upper Newport Bay Habitat Restoration. See Table 4.1 for a complete listing of integration types.

SUPPORTING PROJECTS:

Navigation/Economics

- **HARBOR DREDGING:** The long-term economic health of the harbor depends on maintaining the depth of the harbor. I1(1,3)

Hydrology/Flood Control

- **SEA LEVEL RISE AND SEAWALL EVALUATION STUDIES:** A more precise understanding on how sea level changes could affect the peninsula and islands will help define more efficient measures for protecting harbor resources.

- **UPLAND AREAS AND UNIVERSITY AVENUE FLOOD THREAT EVALUATION:** Sea level rise studies will help define the threat to areas around Upper Newport Bay.

Water Quality

- **RHINE CHANNEL SECTION OF NEWPORT HARBOR:** Dredging of the harbor will provide an opportunity to more cost effectively address this difficult water quality problem. I1(2,3)

- **SAN JOAQUIN MARSH NATURAL TREATMENT SYSTEM (NTS):** The NTS provides a lower-cost way to reduce pollutants of concern in San Diego Creek. I1(1); I3(upstream NTS projects); I11

Water Supply

- **EAST BLUFF RECLAIMED WATER EXPANSION PROGRAM:** With the cost of water rising at a rapid rate, the option of installing a reclaimed water system is becoming increasingly attractive. I1(8,9,10,11); I5

- **SMARTIMER IRRIGATION CONTROLLER:** These irrigation controllers adjust watering times based on predicted weather. Successful pilot programs will promote a larger future program within the Planning Area as well as for the entire watershed. I1(7,9,10,11); I3 (watershed-wide)

Figure 10.11 Dredging in Upper Newport Bay, Army Corps of Engineers restoration project

- **WEATHER INDEXING:** A weather index, such as the statewide CIMIS website, based on predicted weather conditions, solar irradiance, wind, etc. can be published daily in the local paper and used by property owners to manually adjust irrigation controllers if they are not using the weather-basined Smartimer irrigation controllers. I1(7,9,10,11); I5
- **"CALIFORNIA-FRIENDLY" LANDSCAPING PROGRAM:** A landscaping pilot program promoting native and other non-invasive, water-thrifty plants could result in lower landscape irrigation needs. Combined with an Integrated Pest Management program, it could also reduce the need for fertilizers and pesticides that can be transported into the canyon or bay. Successful pilot programs will promote a larger future program within the planning area. I1(7, 8,9,11); I3 (watershed-wide); I5
- **LANDSCAPING AUDITING PROGRAM:** I1(7,8,9,10); I3 (watershed-wide); I5

- **WATER CONSERVATION AND WATER QUALITY PUBLIC OUTREACH PROGRAM:** www.WaterSmartNewport.org

Habitat

- **UPPER NEWPORT BAY HABITAT RESTORATION PROJECT:** The centerpiece for the restoration of Upper Newport Bay is currently underway under the auspices of the Army Corps of Engineers Ecosystem Restoration Project. It includes components for sediment detention, open water restoration (dredging), island creation, and island rehabilitation. This habitat project has water quality improvement elements as well as long-term, indirect economic benefits. I1(1,13); I7;

- **UPPER NEWPORT BAY UPLAND RESTORATION PROGRAM:** This program includes 25 projects along the periphery of the bay to stabilize slopes, remove invasive plants, remove illegal trails, rehabilitate walking trails, plant coastal sage scrub and cactus scrub, refurbish wetland areas, and create bird-watching lookouts. I1(1,13); I7; I8

- **BIG CANYON CREEK RESTORATION PROJECT:** Currently in design, this project will be the City of Newport Beach's largest canyon restoration project to date, including re-establishment of tidal influence at the canyon mouth and restoration of 50 acres of coastal sage scrub. Simple amenities, such as a small amphitheatre and information signage, will accommodate school field trips and community access. I1(1, 12, 13, 14); I3(upstream NTS projects); I7; I8; I11

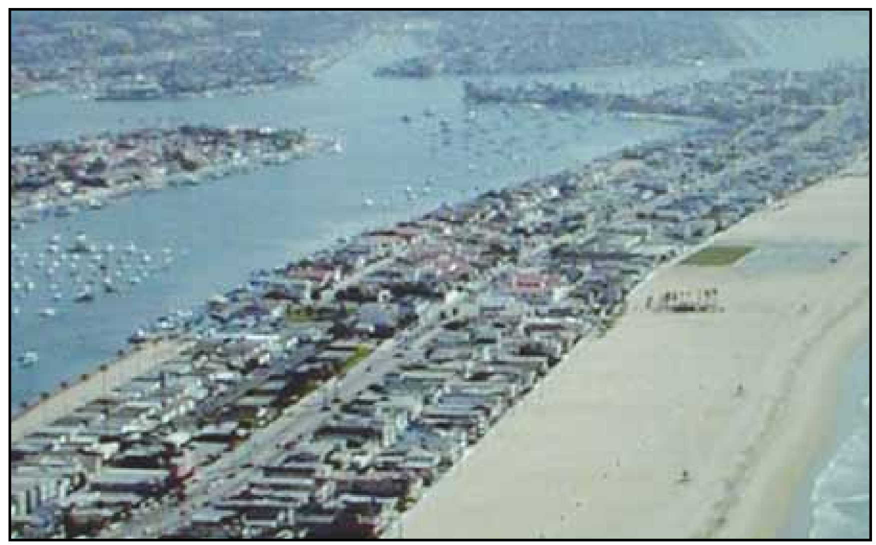
Figure 10.12 ROOTS restoration activities — pampas grass removal

10.13 Big Canyon Creek mouth

Figure 10.14 Lower San Diego Creek, looking north toward Jamboree

10.16 Bonita Canyon Creek

Figure 10.15 San Joaquin Marsh



10.17 Newport Harbor

- **LOWER SAN DIEGO CREEK TIDAL BARRIER (BETWEEN THE MICHELSON WATER RECLAMATION PLANT AND JAMBOREE ROAD):** The removal of a plank barrier in San Diego Creek at Jamboree will re-establish the tidal prism in the creek. A future study will indicate estuarine restoration options along the impacted reach of San Diego Creek, which could include rehabilitation of light-footed clapper rail or least Bell's vireo habitats. I1(1, 12);

  Re-establishment of the tidal prism further strengthens the connectivity between the bay and the San Joaquin Marsh area where ten wetland, riparian and upland projects are proposed by the County, IRWD and UCI.

- **BONITA CANYON CREEK:** Refurbishment of relatively intact upland and riparian habitats along the 73 Toll Road will provide a stronger connection between the NCCP Reserve in Newport Bay and the NCCP Reserve areas within the Newport Coast Watershed and would include coastal sage scrub restoration projects at Coyote Canyon Landfill, adjacent to the UCI campus, and along Bonita Canyon Creek. Enhancement efforts will provide protection from flooding at Jamboree Road. I1(1, 12)

- **LOWER NEWPORT BAY (NEWPORT HARBOR):** The Harbor Area Management Plan for Lower Newport Bay is under preparation and a draft summary is included in Appendix J. The study addresses several important issues facing the harbor including potential sea level rise, navigational concerns, eel grass protection, sediment and water quality management practices, and beach replenishment. It will be the platform for follow-up focus studies. I1(1, 2); I3(upstream NTS projects); I6; I7; I11

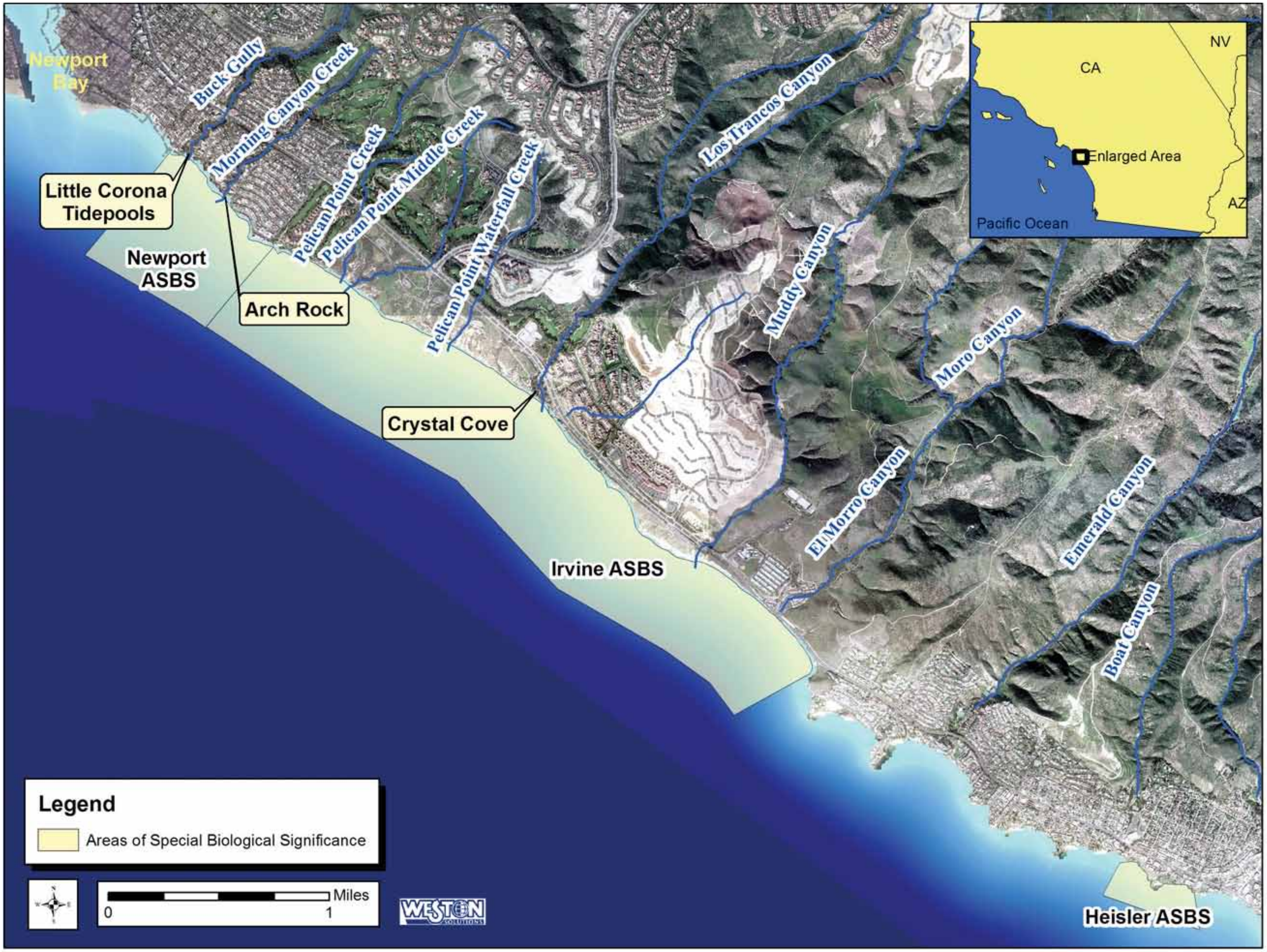
10.6 Coastal Canyons Planning Area

(See also: Chapter 3.5.2.3: Newport Coast Watershed)

This Planning Area includes the two rocky intertidal ASBSs: 1) Robert E. Badham State Marine Conservation Area, from Poppy Avenue (north) to Cameo Shores (south) and 2) Crystal Cove State Marine Conservation Area, from Cameo Shores (north) to the end of El Morro (south).

The Coastal Canyons Planning Area is a ten-square-mile watershed, referred to as the Newport Coast Watershed. It includes eight coastal canyons that drain into the Areas of Special Biological Significance (ASBS) that lie along its three-mile stretch of coastline. The ASBSs are also within the receiving waters for the Newport Bay watershed. Planning Area partners include California Department of Parks and Recreation, City of Newport Beach, County of Orange, California Department of Fish and Game, Friends of Newport Coast, IRWD, Orange County Coastkeeper, Orange County Surfrider Foundation, Southern California Wetland Recovery Project, California Coastal Commission, RWQCB, and The Irvine Company.

The Newport Coast Watershed Management Plan, completed in 2007, provides a roadmap for meeting the challenges of this planning area (Weston Solutions, 2007). The Plan incorporates



10.18 Robert E. Badham State Marine Sanctuary(Newport ASBS) and Crystal Cove State Marine Sanctuary (Irvine ASBS) findings of the 2006 study of groundwater recharge and exfiltration in the canyon due to over-irrigation practices in this area (Todd Engineering, 2006). A separate study is underway to further investigate the potential stressors to the ASBS rocky intertidal areas. This report was completed in June, 2009 (Weston Solutions and Everest International Consultants).

Regional Issues:

- Fire Prevention
- ASBS protection

Local Objectives:

- Reduce fire hazards in the canyons.
- Stabilize canyons.
- Reduce pollutant loads to the ASBS from the canyon and Newport Bay.
- Reduce pollutant loads to the canyons through water conservation measures.
- Reduce public impacts to the ASBS rocky intertidal areas.
- Remove invasive plants in the canyons and reestablish native plants.
- Provide public access and recreational opportunities.
- Promote watershed education (grade school, high school and university levels).

Planning Area Challenges and Opportunities:

Fire danger is high due to proximity of urban development to natural open space areas. The danger is compounded because of canyon overgrowth of non-native plants.

With mounting pressures on the state-wide water supply, the State in 2009 declared a regulatory drought, mandating a 20 percent cutback in water usage. The potential for water savings in Newport Coast is highlighted by the continual flow of runoff in the naturally seasonally-dry canyons. The amount of water running in Buck Gully is 17 million gallons a month, a significant portion of which originates from the Delta or the Colorado River.

There are some limited pollutant impacts within the coastal canyon streams including CTR (California Toxics Rule) exceedences of fecal indicator bacteria and copper. Perhaps more important is the transport of pesticides and fertilizers into the canyon that, in concert with over-irrigation practices, stimulate plant growth, especially non-natives. The overgrowth compounds the danger of fire. The State Water Resource Control Board and the California Coastal Commission are paying special attention to pollutant discharges from the canyons into the ASBS.

The Newport Beach Fire Department has completed a preliminary study for implementing a fuel modification program in Buck Gully and Morning Canyon for fire protection. Complementary studies for canyon landscaping and irrigation are being prepared by the Public Works and Planning Departments. Once these preliminary studies are completed, staff will meet with homeowner associations to discuss options for implementing measures in the canyons to reduce fire risk and reduce irrigation runoff into the canyons.

The fire danger necessitates creation of fuel modification zones that act as fire breaks between urban communities and natural open space. As has been seen elsewhere in Southern California, fires can quickly spread down vegetated canyons and into urban communities. Establishing fire breaks between these canyons and local neighborhoods are important for safety considerations.

Baseline Project:

- **BUCK GULLY RESERVE RESOURCE AND RECREATION MANAGEMENT PLAN (RRMP):** Buck Gully has experienced the most urban development of the all the coastal canyons in this compact watershed. As such, it has provided an early warning of negative impacts caused by urban development: streambed erosion, canyon bank destabilization, foliage overgrowth due to over-irrigation on the hillside, invasive species, destruction of habitat for endangered species, and pollutant loads to the beach and sensitive marine-life areas. A comprehensive program is underway to correct immediate problems and to reestablish an ecological balance that will also provide educational and recreational opportunities to the community and tourists.

  "As a signatory to the Central-Coastal Subregion NCCP/HCP, the City (of Newport Beach) has certain obligations under the Implementation Agreement to ensure the appropriate management of the BGR. These obligations are shared with the IRC (Irvine Ranch Conservancy) and include the preparation of a Resource and Recreation Management Plan (RRMP), which focuses on preserving and protecting the unique resources of the BGR while integrating passive recreation uses, as appropriate. The RRMP describes the regulatory setting, existing conditions, potential issues and threats, public access and recreation management, the physical and natural resources management, and the monitoring and adaptive management of resources located within the habitat Reserve System." (Buck Gully Reserve Resource and Recreation Management Plan, Executive Summary, 2009)

Supporting Project Examples:
Runoff Reduction Projects:

- A 2005 study determined that Buck Gully was sending up to 190 million gallons of runoff a year into the Crystal Cove ASBS. The City of Newport Beach introduced a runoff reduction program, conducting irrigation efficiency audits for homeowners and encouraging them to fix leaks. The City also offered free weather-based controllers to homeowners who had efficient irrigation equipment and at least 1,200 square feet of irrigated landscape. With a federal grant and matching city funds, the City purchased 650 controllers and hired contractors to install and program them and later follow up with the homeowners. Monitoring indicates a 20 percent runoff reduction in Buck Gully (Stemming the Runoff Tide, 2007).

  A supporting project is to continue and expand this program, by working with landowners in canyon areas to increase usage of: weather-based 'smart' controllers, alternative low-runoff irrigation technologies, irrigation audits, citations for excess dry weather runoff, and drought tolerant plantings designed in context with Orange County Fire Authority fuel modification regulations. In tandem, the City could conduct landscape education workshops for homeowners, homeowner associations and landscape maintenance companies.

- **WATER CONSERVATION:** The Irvine Company has recently completed a major two-year project to re-sod the Pelican Hills Golf Course with more water-thrifty fairways, and plant native plants around the fairways.
- **CANYON STABILIZATION:** The Morning Canyon Stabilization Project, constructed in 2005, is one of the first successful coastal canyon stabilization projects in Southern California using eco-friendly slope stabilization methods. This project removed the largest stand of *Arundo donax* (giant reed) in Newport Coast and replanted a one-half- mile reach of canyon with native plants.
- Buck Gully: The Buck Gully Road Maintenance and Wetland Project was completed in 2008. Using four types of gabion structures, this project combines utilitarian components with innovative restoration techniques.
- **TIDE POOL EDUCATION:** The City of Newport Beach tide pool docent program has been a successful educational pilot program for working with beach-goers, teaching them to treat the tide pool areas with respect.

10.19 Pelican Hills Golf Course

- **HIGH SCHOOL EDUCATION:** Surfrider Foundation and the City of Newport Beach have teamed up with Corona del Mar High School to sponsor supplementary reference materials, site visits, guest speakers and field visits for an Advanced Placement Environmental Sciences class.
- **ASBSS:** A variety of studies and projects have created a core experience to serve as a basis for more focused studies of pollutant and public impacts to the ASBSs, as well as for

10.20 Morning Canyon Stabilization Project, before and after

10.21 Buck Gully Road Maintenance and Wetland Project

Figure 10.22 Public impact to tide pools in ASBS Marine Sanctuary

pilot and capital environmental improvement projects for this Planning Area. Proposed studies and projects include:

- Buck Gully canyon slope fire protection program
- Buck Gully Erosion and Canyon Stabilization Project
- Canyon bacterial source identification study
- Toxic load modeling from Newport Bay
- Poppy Lane bioswale
- Boat copper paint alternatives pilot project
- Irrigation runoff reduction program
- Rocky inter-tidal public exclusion pilot project
- Buck Gully canyon habitat protection and public access program

Sponsorship of expanded high school science classes to include watershed topics

10.7 Project Strategy Summary

(Refer to Figure 2.1: IRCWMP Planning Framework)

A strategy, as defined by the California Water Plan Update of 2005, is a project, program or policy that helps local agencies and governments manage their water and related resources. This chapter has focused on projects with an on-the-ground, place-based perspective to help create a stable hydrologic balance. It has also explored opportunities for combining strategies within a single project so as to serve multiple purposes and provide multiple benefits.

All of the state strategies discussed so far are implementation actions. There are two state strategies that are not implementation actions, but rather planning actions: the Watershed Management and Urban Land Use Management strategies. These two planning strategies are implemented by this entire document and planning effort. They will continue to be implemented through further development of the Desired State, IRCWMP objectives and projects, IRCWMP administration and through future land use planning efforts.

References

- Dudek, facilitated by Irvine Ranch Conservancy. 2009. Buck Gully Reserve Resource and Recreation Management Plan. Prepared for the City of Newport Beach. **http://www.newportbeachca.gov/index.aspx?page=1335**
- Emery, Sean. 2009. Irvine Approves Revisions to Lennar, Great Park Deal. Orange County Register, August 11.
- Hibbs, Dr. Barry, California State University, Los Angeles. Selenium Workshop, March 10, 2008, Laguna Hills, California
- Todd Engineering. 2006. Newport Coast Seepage Study, City of Newport Beach.
- Stemming the Runoff Tide, 2007. American City and County, October. **http://americancityandcounty.com/publicworks/government_ca_runoff_tide/**
- Tustin Legacy. 2005. Urban Land Institute Holds Seminar on Successful Base Closure and Creating Successful Master Planned Developments. City of Tustin. **www.tustinlegacy.com/article.cfm?id=53**
- Tustin Legacy Specific Plan/Reuse Plan for the Marine Corps Air Station (MCAS) Tustin, 2006. **www.tustinlegacy.com/article.cfm?id=48**
- Weston Solutions, Inc. 2007. Newport Coast ICWMP, Prepared for the City of Newport Beach. Carlsbad, California.
- Weston Solutions, Inc. 2009. Newport Coast Flow and WaterQuality Assessment Addendum 2: Public Use, Biological Surveys, Bioaccumulation and Restoration Monitoring for Newport Coast and Laguna Beach. ASBS Protection and Restoration Program, Grant Agreement No. 05-230-550-0. Prepared for City of Newport Beach. June26. Carlsbad. California.

11 • PROJECT PRIORITIZATION

REGIONAL LEVEL

Stakeholders have identified many important projects to address pressing local objectives, such as providing for a reliable potable and reclaimed water supply, flood control, canyon stabilization, sediment control, toxic pollutant control, upland habitat restoration, estuarine rehabilitation, and ASBS protection. Furthermore, local agencies define priority projects based on local objectives. Given the importance of each of these projects, differing local priorities, and budgetary constraints that do not allow us to roll out all these projects at the same time, any proposed project ranking system needs to recognize projects that work hardest toward making progress toward the Vision by:

1. addressing state watershed issues and strategies,
2. advancing Regional Performance Objectives,
3. fulfilling local objectives, and
4. integrating projects to more efficiently and effectively implement the Region's Vision.

It is recognized that state requirements for watershed planning, Regional Performance Objectives and defining potential integration mechanisms are in a state of active development, and therefore, the sophistication of the scoring system should not outstrip the confidence we have in the underlying parameters — i.e., our scoring system should be as simple as possible.

11.1 Comments on the First Proposed Formula for Project Scoring

(See Appendix K: Previous Draft 1 Prioritization)

In the first draft of the plan, a project scoring formula was proposed as follows:

SCORE= (A+I+P) X S

Where:

A is the sum of the issues coefficients,
I is the sum of the integration coefficients,
P is the sum of the project readiness coefficients, and
S is the project size.

In addition to scoring each project, projects are grouped in three management strategy types (formerly termed "tiers"): planning and education related projects, low impact projects and treatment/repair projects. Each grant proposal would include projects from each management strategy type.

On April 14, 2008, a stakeholder focus group met and critiqued this methodology. Several important suggestions were made by individuals including:

- The issues (coefficient A in the scoring formula) should be directly tied to State planning and project strategies. Projects that accomplish regulatory goals and strengthen the regulatory process should be rewarded.
- The importance of implementing a project should not necessarily be related to its project readiness (based on the preparation of preliminary and final construction documents, permits and CEQA documents).
- The importance of a project should not necessarily be related to its size. The example given was that a small and well-conceived project should not necessarily be trumped by a passive, mundane large watershed program.
- Additional types of integration should be defined, including those that explicitly consider the water resource management goals of economic development and stakeholder collaboration.
- Projects that improve the health of the habitat should be rewarded.
- The idea of project "tiers" met with several objections. One comment was that the top prioritized projects should receive first cut for all grant funding. Another comment was that the word "tier" should be changed to something else, such as "category" or "type". Another comment was that each project type should receive some minimum level of funding but that the level should not be determined ahead of time.

11.2 New Proposed Scoring System

The flowchart in Figure 11.1 shows how the following items intersect within the new proposed scoring system:

- State watershed issues,
- Regional Performance Objectives,
- Local objectives,
- Multi-benefit projects and
- Project Integration

State watershed issues, our watershed goals and the Regional Performance Objectives are linked:

- Table 2.1 in Chapter 2 shows the linkages between the three watershed goals and the project types enumerated in the Proposition 84 guidelines.
- The Regional Performance Objectives flow directly from the three watershed goals.

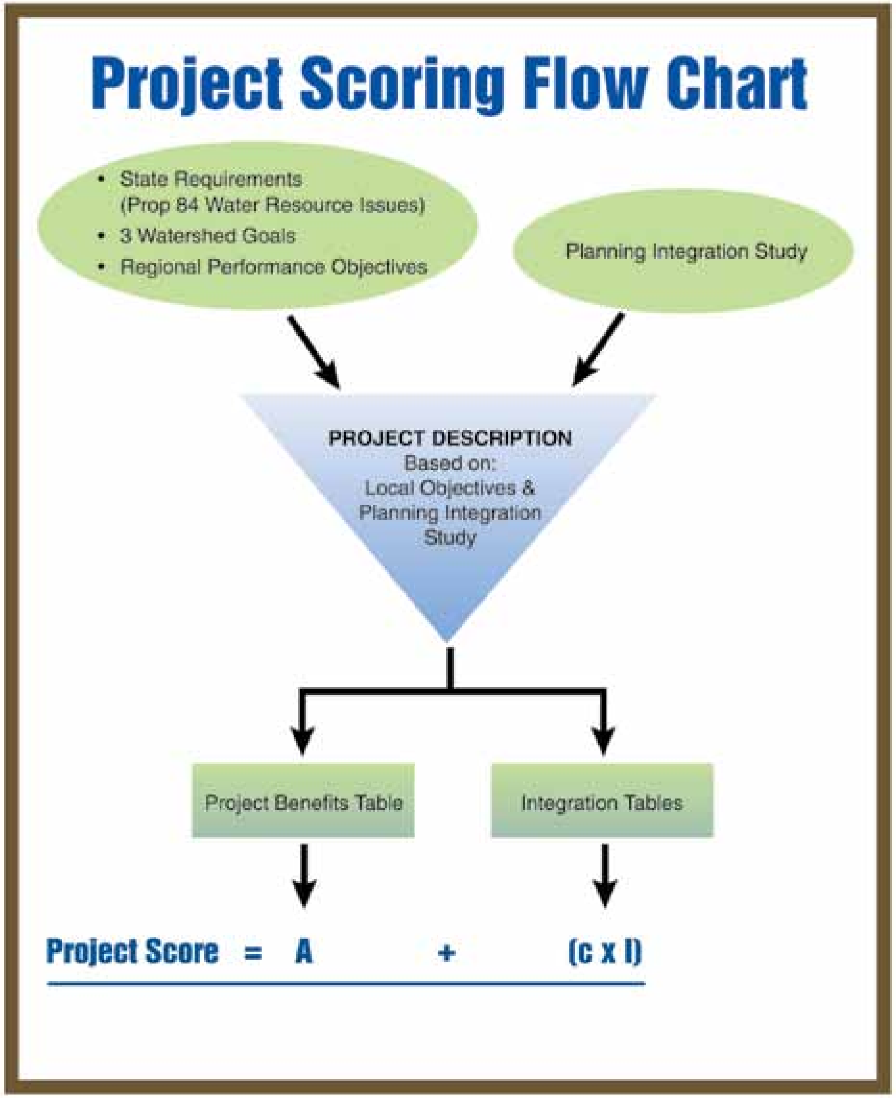


Figure 11.1 Parameters of the New Scoring System

Local objectives are explicitly embodied in the design of proposed projects. Project proponents seeking potential grant funding complete a Project Information Form that provides a full description and a work plan for the project.

This Plan proposes a method where a local project is awarded points based on the project's ability to fulfill Regional Performance Objectives, which are linked to state watershed issues (see Section 11.3, Project Benefit Factors). In the Project Information Form, the project proponent discusses how Regional Performance Objectives (and therefore, the watershed goals and state watershed issues) are addressed and advanced with the implementation of the local project. A well thought-out project will be able to substantially address several watershed issues, and as such, provides multiple benefits. This scoring system rewards this type of multi-benefit planning.

Complementing the idea of multiple benefits is the idea of integration. Chapter 4 identifies eleven types of integration that can occur at the project level and identifies different levels of integration planning that can occur during concept development of a project. The scoring system rewards projects that incorporate integration ideas into the design (See Sections 11.4 and 11.5).

The proposed new scoring formula is:

PROJECT SCORE = A + (C X I)

Where:

A is the sum of the Project Benefit factors (Section 11.3),
I is the sum of the Integration factors (Section 11.4), and
C is the Integration Planning coefficient (Section 11.5).

These factors and the coefficient are discussed in the noted sections. Note that the project readiness coefficient (P) and size coefficient (S) are not used in this second formula.

In addition to scoring each project, projects are grouped into three management strategy types: planning and education related projects, low impact projects and treatment/repair projects. This is discussed in Section 11.5.

11.3 Project Benefit Factor (A)

Proposition 84 guidelines identify eleven water resource project types as a framework for addressing issues within a water resource management plan. These Proposition 84 project elements (listed in California Public Resources Code Section 75026) are:

1. Water supply reliability, water conservation and water use efficiency
2. Stormwater capture, storage, clean-up, treatment, and management
3. Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands
4. Non-point source pollution reduction, management and monitoring
5. Groundwater recharge and management projects
6. Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users
7. Water banking, exchange, reclamation and improvement of water quality
8. Planning and implementation of multipurpose flood management programs
9. Watershed protection and management
10. Drinking water treatment and distribution
11. Ecosystem and fisheries restoration and protection

In Table 11.1 the state-recognized watershed issues have been subdivided so that the different elements can be assigned a Project Benefit Factor (A). Higher factors are assigned to issues that address

The preliminary assignment for the Project Benefit factors are:

Table 11.1 Project Benefit Factors

Prop 84 Project Type	Project Benefit No.	Prop 84 Project Types	Project Benefit Factors (A)
1	A1	Water Supply Reliability, Conservation and Use Efficiency	50
2	A2	Storm Water Capture, Storage, Cleanup, Treatment and Management	50
3a	A3a	Removal of invasive non-native species	10
3b	A3b	Creation and enhancement of wetlands	25
3c	A3c	Acquisition of Open Space and Watershed Lands for Habitat Connectivity	100
3d	A3d	Restoration of Open Space and Watershed Lands or Expanded Habitat Reserve	30
4a	A4a	Non-point source pollution reduction, management and monitoring watershed-scale projects. Add 50% for projects addressing toxic compounds, pesticides or sediment.	100
4b	A4b	Non-point source pollution reduction, management and monitoring subwatershed scale projects. Add 50% for projects addressing toxic compounds, pesticides or sediment.	50
4c	A4c	Non-point source pollution reduction, management and monitoring (Small scale projects). Add 50% for projects addressing toxic compounds, pesticides or sediment.	10
5	A5	Groundwater recharge and management projects	100
6	A6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	100
7	A7	Water Banking, Exchange, Reclamation and Improvement of Water Quality	50
8	A8	Planning and implementation of multipurpose flood management programs	100
9a	A9a	Watershed Protection and Management (Fire)	50
9b	A9b	Watershed Protection and Management (Public Access)	10
9c	A9c	Watershed Protection and Management (Education)	10
9d	A9d	Watershed Protection and Management (Land Use Planning)	10
9e	A9e	Watershed Protection and Management (Economic Planning)	25
10	A10	Drinking Water Treatment and Distribution	100
11a	A11a	Ecosystem Restoration (Canyon Stabilization)	100
11b	A11b	Ecosystem Protection – Habitat Protection	10

baseline conditions (see Chapter 10) and lower factors to issues that, while important, do not address as directly the most pressing issues in the watershed.

As a first step toward determining a score for a project, the project will be assigned points for each water resource issue addressed by the project. While in general, a particular project will have one predominant benefit, other benefits can be realized in concert with the primary project, i.e., projects can be designed to have multiple benefits. For instance, a canyon stabilization project (A11a=100) can be designed to have a meaningful wetland restoration component (A3b=25) and also provide community access via controlled hiking trails and lookouts (A9b=10), for a total of:

A= A11A+ A3B + A9B = 135.

The project scoring form performs the summation automatically.

Note that higher factors are associated with project types that favor “baseline” projects that are central toward re-establishing a healthy and stable hydrology. Lower coefficients are associated with project benefits that support healthy functioning of the watershed and promote efficient use of our water resources.

11.4 Integration Type Factor (I)

As discussed in Chapter 4, finding ways to integrate a project into the Desired State for the watershed is a central tenet of the IRCWMP. This proposed metric awards those projects that incorporate meaningful integration into the project design.

First, a project proponent looks for different ways a project can incorporate integration mechanisms into the design. Table 11.2 suggests thirteen types of integration.

Under this metric, the total integration factor is obtained as:

$$I_{TOTAL} = I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13}$$

11.5 Integration Planning

Coefficient (C)

As discussed in Chapter 4, effective integration can best be realized if integration is formally addressed in the planning stages. How would the integration planning be performed? It may utilize a diverse team of experts drawing upon the planning, biological, ecological, social, engineering, computer science, economic and regulatory disciplines. Regardless of who does the planning, the key point is to include analysis of integration possibilities, along with recommendations for accomplishing watershed goals and achieving the Desired State or Vision.

Table 11.2 Integration Type Factors

Integration No.	Integration Type Description	Integration Factor (I)
I_1	Project or actions tie into adjacent projects such that all projects work together to promote healthy local hydrologic function or effectively resolve significant water related conflicts.	1
I_2	Project or actions are designed to significantly and effectively promote healthy downstream hydrologic function including projects that effectively resolve significant water related conflicts.	1
I_3	A pilot project is implemented to serve as an example for a larger future project or program	1
I_4	The project is designed such that it promotes effective implementation of future projects including projects that effectively resolve significant water related conflicts.	1
I_5	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to alleviate stress on our finite water resources.	1
I_6	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals for green economic development goals.	1
I_7	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to foster full community participation in developing and implementing the Watershed Vision.	1
I_8	Project integrates an educational, planning or regulatory component that promotes long-term watershed goals to foster full community participation by disadvantaged communities in developing and implementing the Watershed Vision.	1
I_9	Stakeholders enter into a Memorandum of Understanding to develop a particular project.	1
I_{10}	Stakeholders enter into a collaborative advocacy agreement to find project funding	1
I_{11}	Project is designed for low cost operations and maintenance.	1
I_{12}	The project monitoring program is designed to fulfill the requirements of several local and regional projects	1
I_{13}	The project explicitly ties in with projects in adjoining watersheds or sister watersheds.	1

Table 11.3 Integration Planning Coefficient

Integration Planning Level	Integration Planning Coefficient, [C]
Potential integration possibilities have been identified but no formal review or report has been prepared.	1
A survey or study has been prepared that formally identifies integration possibilities.	2
A study has been prepared detailing a work plan to explore how a list of prioritized integration possibilities can be realized. The coefficient is only applied to those integration types for which a work plan has been prepared.	4
An integration work plan has been completed that presents a detailed list of recommendations for integration.	8
An integration work plan has been completed that presents a detailed list of recommendations for integration along with an economic analysis.	12

As integration planning amplifies the integration process, let's define a coefficient "C" to quantify the amount of integration planning that has been incorporated into a project. Then the amplified integration factor is "C x I". The Integration Planning Coefficient for a particular project is quantified as follows.

11.6 Management Strategy Types

Projects can be defined in terms of three management strategy categories:

CATEGORY 1

Proactive planning, educational programs and low-cost projects

CATEGORY 2

Source control and relatively low-cost projects

CATEGORY 3

Treatment and repair projects

The long-term goal for a mature watershed program would be to have a program focused primarily on low-cost proactive projects, planning and education, such that expensive repair and mitigation projects are avoided. Examples of projects and programs that fall under these three types of management strategy categories are listed below.

Category 1

PROACTIVE, LOW COST: Projects that utilize this management strategy are generally low- cost projects, the most efficient way to maintain a healthy watershed over the long term. These types of projects include education and public outreach programs such as watershed-science class; promoting water conservation through use of water-thrifty, native plants; reducing toxic pollutant loads with Integrated Pest Management methods; reducing erosion by proper land use practices; irrigation audits; storm drain catch basin stenciling; and programs that promote proper disposal of pharmaceuticals and hazardous waste.

Category 2

SOURCE CONTROL: Projects that utilize this management strategy are generally lower cost projects that treat problems near the source and include street sweeping projects to pick up leaves, trash, oily grit and copper brake pad dust; weather-based "smart" irrigation controllers; low impact development practices, habitat protection measures; illegal trail removals; catch basin screens; eliminating invasive plants that pose a fire hazard; dock pump-out upgrades; local fire-hazard reduction programs; smaller habitat linkage projects; and smaller-scale canyon stabilization projects

Category 3

TREATMENT AND REPAIR: These projects tend to be urgently needed to address public health and safety or to address an imminent environmental hazard. Category 3 projects usually have large capital funding requirements, long permitting timelines and, often-times, complex design and construction requirements.

Because of the nature of Category 3 projects, this metric will tend to give these projects higher scores. These projects will likely put a heavy demand on available future funds. Since the long-term success of the water management plan will require wide-spread public support, it is also essential that smaller, community scale Category 1 and Category 2 projects also receive funding and move forward with the Category 3 projects. To this end, this water management plan proposes that each grant request include top ranked Category 1 and Category 2 projects.

11.7 Project Scores

Each project score is found using the following formula:

PROJECT SCORE= A + (C X I)

As most projects are still only skeletally defined, each score should be considered provisional. In order to remove the provisional status of a project, project proponents will be required to provide a full description of each project and a work plan so that a proper re-evaluation of the score can be performed. Note that if the project does not have a high ranking, the work plan provides a path to increase the project score. An example is provided in Section 11.8.

A list of all the project scores and rankings is included in Appendix A. There are three additional corresponding lists showing the ranking of Category 1, Category 2 and Category 3 projects.

11.8 Scoring Example

As part of the planning for the Great Park, it has been proposed that Agua Chinon Creek be day-lighted. First, let's examine Project Benefits. Using the Project Information Form for this project and Table 11.1, this project receives points for Habitat Connectivity (A3c=100), Habitat Restoration (A3d=30), Invasive Species Removal (A3a=10), NPS Load Reduction

(A4b=50+50percent=75) and Public Access (A9b=10), for a total Benefits score of 225.

Now consider the Integration Factors. Reading through Table 11.2, the following integration types apply to this project:

I_1: The project ties into adjacent projects, such that all projects work together to promote healthy local hydrologic function or to effectively resolve significant water-related conflicts.

I_2: The project is designed to significantly and effectively promote healthy downstream hydrologic function including projects that effectively resolve significant water related conflicts.

I_3: A pilot project is implemented to serve as an example for a larger future project.

I_4: The project is designed to promote effective implementation of future projects including projects that effectively resolve significant water-related conflicts.

I_7: The project integrates an educational, planning or regulatory component that promotes long-term watershed goals to foster full community participation in developing and implementing the Watershed Vision.

I_9: Stakeholders enter into a Memorandum of Understanding to develop a particular program

I10: Stakeholders enter into a collaborative advocacy agreement to find project funding

I_{11}: Projects are designed for low cost operations and maintenance.

I_9: The project explicitly ties in with projects in adjoining watersheds or sister watersheds.

The total of the integration factors is:

$$I_{TOTAL} = I_1 + I_2 + I_3 + I_4 + I_7 + I_9 + I_{10} + I_{11} + I_{13} = 9$$

Now let's consider the planning integration factor. Per the Project Information Form, we know the Agua Chinon Creek Restoration was planned in concert with the larger Great Park Master Plan, which includes "Green Streets", site infiltration, linkages between canyons, water features that include treatment, etc. The park includes amenities to allow the public to enjoy the restored areas. The residential and commercial areas are designed to work in tandem with the restored habitat areas. Funding requirements for the park have been analyzed and some funding agreements are already in place. Referring to Table 11.3, an Integration Planning coefficient of C=8 is assigned for this project. (Note that the integration planning done for the Great Park is the exception in our watershed. Almost all the projects that have been scored were assigned an Integration Planning coefficient of C=1.)

So that now that A, I and C have been determined, the project score is calculated as:

PROJECT SCORE = 235 + (8 X 9) = 307.

11.9 Provisional Project Rankings

Appendix A shows the provisional project scores and rankings for over 130 projects, where it is noted that six larger Upper Newport Bay upland projects have been defined to consolidate over 20 smaller projects around the bay.

The top rated projects for which Project Information Forms were received are listed in Table 11.4. Except for the ET Controller project, all the top rated projects are Category 3 projects, which are higher cost, capital improvement projects.

Table 11.4 Top Rated Projects with Project Information Forms

Rank	Project Title
1	Upper Newport Bay Ecosystem Restoration (Dredging)
2	Buck Gully Restoration
3	Serrano Creek Reaches 2, 3, and 4
4	Peters Canyon Wash Improvements
5	Tollroad Foothills Fire Prevention
8	Agua Chinon Corridor Connector
9	San Joaquin NTS
11	Agua Chinon Inlet/Outlet and all Reaches (5)
15	West Bay Project Area
19	Rhine Channel Remediation Project (Phase 1)
24	Rawlings Reservoir Improvements
25	Michelson Water Reclamation Plant Flood Wall
26	Cienega Filtration Project
30	Newport Bay Copper Reduction Project
31	ET Controllers - Newport Beach
32	Irvine Wildlife Corridor

Table 11.5 Top Rated Category 1 Projects

Rank	Project Title
84	San Diego Creek Levee System FEMA Certification Study
94	Weather Indexing
	UC Cooperative Extension-Drought Tolerant Grass Research
	Buck Gully Resource Management Plan
106	Landscaping Auditing Program
107	California Friendly Landscaping Program
108	Landscape Certification Program
114	County-Wide Pharmaceutical No Drugs Down Drain
115	Study to Determine Priority Areas for the Removal of Exotic Animals
123	Bight 08 - Sediment Toxicity (Coastal Ecology)
125	AP Environmental Sciences Class
126	UC Cooperative Extension-Herbicide and Pesticide Research
127	San Diego Creek Watershed-Scale Pesticide Runoff Mitigation
128	Watershed Urban Forest Long Term Conversion Study
129	Bight 08 - Coastal Ecology
130	Watershed Training for Planning Engineers

Table 11.6 Top Rated Water Supply Projects

Rank	Project Title
23	Rawlings Reservoir Improvements
30	ET Controllers - Newport Beach
40	Baker Pipeline Regional Water Treatment Plant
41	District-Wide Recycled Water Expansion Project
42	Lake Forest Recycled Water Expansion Project
43	Siphon Reservoir Conversion
44	MCAS-Tustin Potable Wells

The top rated Category 1 projects, low cost, proactive planning projects, are listed in Table 11.5.

The top rated water supply projects for which Project Information Forms were received are listed in Table 11.6.

11.10 Scoring Revisions based on the Project Work Plan

Each project proponent develops a work plan that shows how the project can move forward towards implementation. As project planning proceeds and new project benefits are identified, new types of integration are incorporated into the plan, or as planning integration efforts are intensified, the project score will be updated accordingly.

12 • NEXT STEPS FOR IMPLEMENTATION

The IRCWMP presents a practical approach for identifying water resource projects and assembling these projects into a progressively integrated whole using the Dynamic Planning Approach. The Dynamic Planning Approach, the engine of the Plan, provides a practical way to first formulate a complete plan, and then to refine the plan, based on regional and local expertise, integration planning, advancements in science and technology, and enhanced stakeholder collaboration.

The IRCWMP proposes a simple prioritization process that recognizes the key multipurpose and integrated projects that accomplish Regional Performance Objectives.. Each viable project will have a completed project information form that will include a work plan to move the project from concept to implementation.

The IRCWMP is a valuable tool, allowing watershed managers to move forward with a comprehensive program that balances the needs of all our water resources. The IRCWMP is especially useful for highlighting partnerships and will serve as a tool in preparing funding strategies to accomplish tasks over the next 20 years.

The governance structure, led by an Executive Committee composed of elected officials and other major stakeholder representatives, supports meaningful collaboration among stakeholders. In addition, explicitly incorporating regional and state agencies into the Dynamic Planning Approach strengthens the effectiveness of stakeholder collaboration.

Listed below are near-term tasks necessary to complete this Plan and to gear up for the next rounds of grant funding. The groundwork for longer term objectives must also be set up in the near term.

12.1 Near Term Tasks

Note that this chapter was completed in October 2008.

1. The Newport Bay Watershed Executive Committee is holding a public workshop with members of the One Water One Watershed (OWOW) Steering Committee on October 2, 2008. The Department of Water Resources has determined funding region boundaries to be used for disbursing funds from Proposition 84-Chapter 2 for Integrated Regional Water Management Plans. The Santa Ana Funding Region covering portions of San Bernardino, Riverside, and Orange Counties will receive $114 million; the Central Orange County Watershed Management Area may participate in this funding either through the OWOW Plan or by applying as the existing Central

Orange County region. This public workshop will provide an opportunity for the Newport Bay Watershed Executive Committee to discuss both planning efforts and weigh the alternatives

Based on this workshop, the Watershed Executive Committee will provide direction for:

- completing the IRCWMP,
- working with SAWPA for our complementary planning efforts,
- pursuing grant funding, and
- implementing the Plan.

2. The Watershed Executive Committee will consider expanding the composition and role of the committee, including:
   - Inviting Cities of Costa Mesa and Santa Ana to join the Executive Committee during 2008.
   - Inviting Northern and Southern Orange County agencies, which interface with the Central Orange County watershed, to participate as stakeholders in the development of future Central Orange County Watershed Plans.
   - Expanding the purpose of the Watershed Executive Committee's mission to include all Total Maximum Daily Load (TMDL) studies, work plans, and implementation projects within the watershed, including the Nitrogen and Selenium Management Program and future trading, offset and mitigation programs in 2008.
   - Expanding the purpose of the Watershed Executive Committee's mission to include coordination opportunities to seek state and federal funding in 2008
   - Expanding the purpose of the Watershed Executive Committee's mission to include oversight of the Central Orange County Integrated Regional and Coastal Water Management Plan in 2008.
3. Based on the Watershed Executive Committee's direction, Orange County Watershed Division and City of Newport Beach staff will discuss how this round of the planning process should transition and will brief the Stakeholder Committee.
4. Follow-up meetings on Regional Performance Objectives and Project Prioritization may then occur as requested by the Stakeholder Committee.
5. Project proponents will be asked to complete the Project Information Forms in order to finalize the project priority lists.
6. Per the requirements of its grant, the City of Newport Beach will complete its watershed planning efforts, including the Harbor Area Management Plan and submit deliverables to the Department of Water Resources.
7. In anticipation of several more rounds of grant funding, each project proponent should work to define a work plan and schedule in order to move that project forward. Each project proponent should also take planning integration steps as outlined in the Plan.

12.2 Longer-Term Plan Tasks

A. The Regional Performance Objectives provide a list of tasks and include the following:

1. ADDRESS FLOOD MANAGEMENT, INCLUDING:

- Conduct a study by 2010 to inspect all storm and flood conveyance systems and provide findings and recommendations regarding the potential impact of climate change on flooding, canyon and channel stability, water quality and habitat.
- Conduct a study by 2010 to provide recommendations on how to reduce peak flow in all the canyons and channels by 10 percent. The study will make recommendations on neighborhood-scale green infrastructure for water capture and treatment.
- Conduct a study by 2012 to look for opportunities to implement stream channel naturalization efforts including the use of eco-friendly engineering structures and soft-bottomed channels to promote riparian habitat and natural water quality treatment in concert with stable sediment transport and flood safety.

2. ADDRESS SITE-SCALE SURFACE WATER RUNOFF:

- By 2020, reduce the volume of stormwater urban runoff by capturing the first 0.25 inch of rainfall on site.
- Eliminate dry weather urban runoff at site scale by 2020.

3. ADDRESS SURFACE WATER RUNOFF FROM A COMMUNITY:

- Reduce peak flows for a two-year storm event at neighborhood and subwatershed scales by twenty-five percent by 2024.
- For dry-weather flows, reduce point-source discharges to streams, canyons, channels or bay to less than 50 gallons per day per acre of drainage area by 2024.

4. ADDRESS SURFACE WATER RUNOFF AT THE REGIONAL SCALE:

- Meet TMDL requirements for sediment, nutrients, fecal indicator bacteria and toxics.
- Reduce dry weather urban runoff associated with over-irrigation and wash-down activities by 50 percent by 2020.
- By 2012, prepare a study to examine commercially available nutrients, herbicides and pesticides and prepare recommendations for moving toward using less toxic substances.
- By 2012, prepare a study to consider modifying stream, canyon and channel habitats to better remove contaminants and to encourage aquatic nutrient cycling. Study the possibility of vegetated riparian buffers on either side of stream channels.
- Implement projects to reduce groundwater pollutant concentrations by 50 percent by 2024.
- Reduce peak flows for a two-year storm event at regional scale by twenty-five percent by 2024.

- Reduce peak flows for a 100-year storm event at regional scale by ten percent by 2024.
- Reduce pet waste discharge into the bay by 90 percent by 2024.

5. ADDRESS WATER SUPPLY REQUIREMENTS INCLUDING:

- Each local agency is to develop a water budget for its service area by 2012.
- Revise the county and municipal General Plans by 2020 to integrate watershed-wise strategies into all elements of a General Plan.
- Increase total local supplies of potable and recycled water to 90 percent of total normal demand by 2024.
- Increase total local supplies of recycled water to 90 percent of total normal demand by 2024.
- Reduce total potable water use by 20 percent by 2024.
- Reduce landscape irrigation by 50 percent by 2024.

6. ADDRESS HABITAT REQUIREMENTS INCLUDING:

- By 2010, prepare a region-wide invasive plant review (including garland chrysanthemum, veldt grass, pampas grass, artichoke thistle, castor bean, and *Arundo donax*) with recommendations for a systematic removal program. Study is to also include recommendations for restricting the sale and planting of problem plants as noxious weeds.
- By 2010, prepare a region-wide invasive animal review, including, but not limited to, bullfrogs, African clawed frogs and brown-headed cowbirds with recommendations for a systematic removal program. Study is to include recommendations for restricting the sale of problem animals.
- By 2010, prepare a study that examines the evidence of impacts to the fish and birds in Newport Bay and provide recommendations for setting impact targets based on a weight-of-evidence approach.
- By 2012, prepare a region-wide review of native plants and animals. The study is to identify indicator species with recommendations for targets for indicator species population, number of breeding pairs, and spatial distribution and coverage.
- By 2012, prepare a study of the marine life resources in the Critical Coastal Areas and Areas of Special Biological Significance and prepare recommendations for targets for indicator species population and diversity.
- By 2012, prepare a region-wide review of legal and illegal trails and provide recommendations for increasing the number of legal trails and eliminating illegal trails.
- By 2012, prepare a region-wide study of critical linkages between vegetation communities and provide recommendations for creating wildlife corridors and increasing buffer zones along creeks.
- By 2012, prepare a region-wide study of fire hazard areas in the wildland-urban interface (WUI) and provide

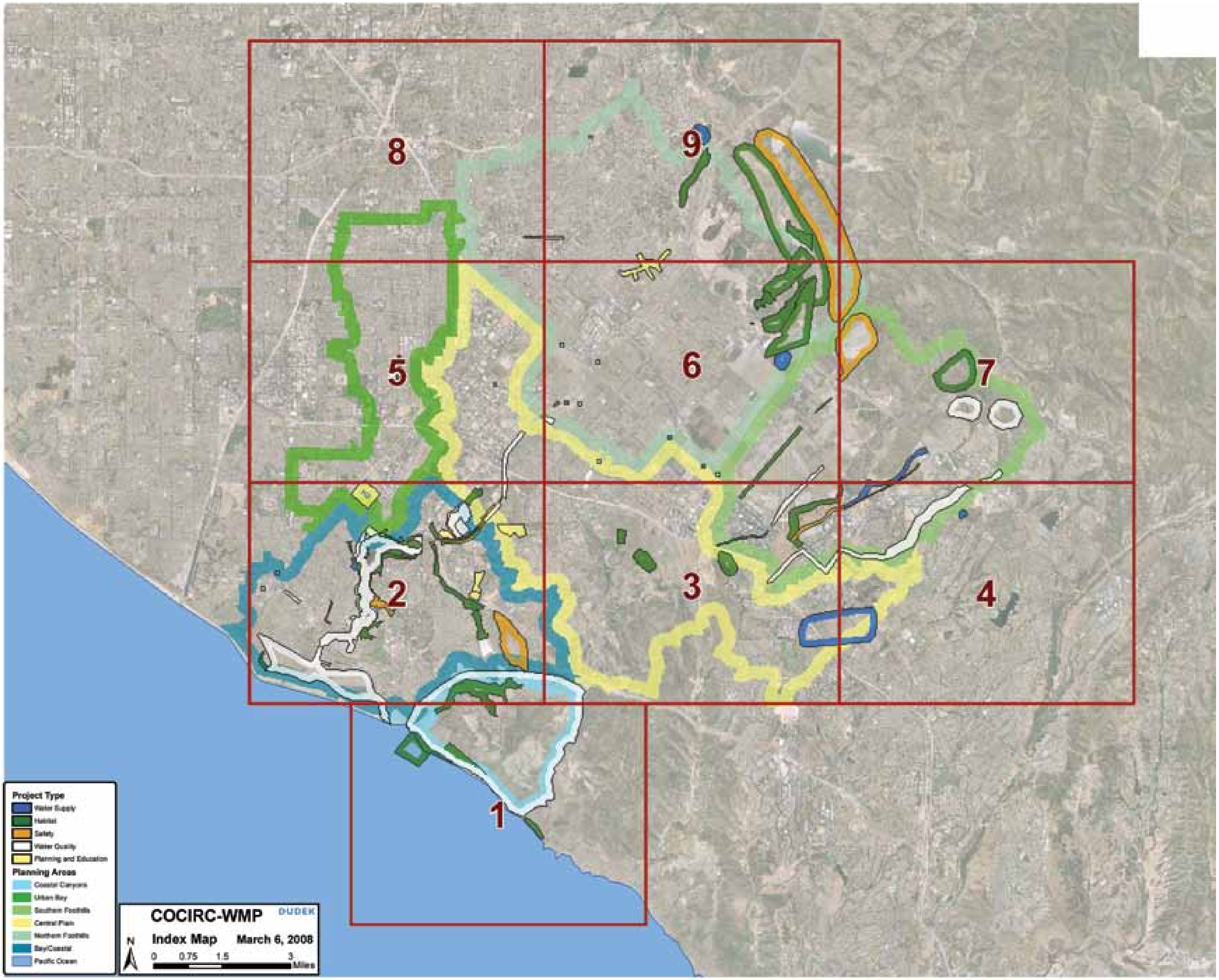
recommendations for establishing fuel modification zones, converting non-native, flashy fuel weeds and grasses to native plants, restricting access to certain critical open space areas during the fire season, strengthening building and planning requirements and reviewing fire risks due to power lines and auto traffic.

- Repair and restore 75 percent of degraded wetland/upland habitat around the bay by 2020 (added August, 2009, per Bay/Coastal water quality meeting).
- Repair and restore all degraded bay wetland and upland habitat by 2025 (added August, 2009, per Bay/Coastal water quality meeting).
- Increase freshwater riparian habitat to 50 percent high integrity habitat by 2020.

7. **ADDRESS FIRE SAFETY IN THE WILDLAND-URBAN INTERFACE (WUI).**
8. **ADDRESS ECONOMIC DEVELOPMENT FOR REAL ESTATE.** Each agency would draft planning policy as part of its General Plan by 2012 that addresses hydrologic, water supply, and habitat needs. Suggestions with regard to drainage, land use planning and pilot projects are discussed in the following sections.
9. **ADDRESS ECONOMIC DEVELOPMENT FOR BUSINESSES.** Each agency would draft planning policy as part of its General Plan by 2012 that addresses economic, hydrologic, and habitat needs. Suggestions with regard to the workforce, industry and government are discussed in the following sections.
10. **ADDRESS ECONOMIC DEVELOPMENT OF TRANSPORTATION SYSTEMS.** Each agency would draft planning policy as part of its General Plan by 2012 that addresses transportation, hydrologic and habitat needs.
11. **FOR OPERATIONS AND MAINTENANCE CONCERNS, CREATE AN UMBRELLA GROUP** by 2010 to oversee and facilitate funding for long-term maintenance & operation of all open spaces and water resources infrastructure.
12. **EACH AGENCY WOULD DRAFT WATERSHED MANAGEMENT PLANNING POLICY AS PART OF ITS GENERAL PLAN** by 2012 to highlight the partnership with the Watershed Executive Committee for effective implementation of the Vision, Goals and Regional Performance Objectives of the IRCWMP. Suggestions with regard to policy coordination, planning and public works, and NPDES requirements, are discussed in the following sections.
13. **EACH AGENCY WOULD DRAFT WATERSHED MANAGEMENT PLANNING POLICY** as part of its General Plan by 2012 to promote social networking, including areas of environmental justice, financial, regulatory and data networks.
14. **EACH AGENCY WOULD DRAFT WATERSHED MANAGEMENT PLANNING POLICY** as part of its General Plan by 2012 to build local capacity in watershed management through citizen involvement and public education.

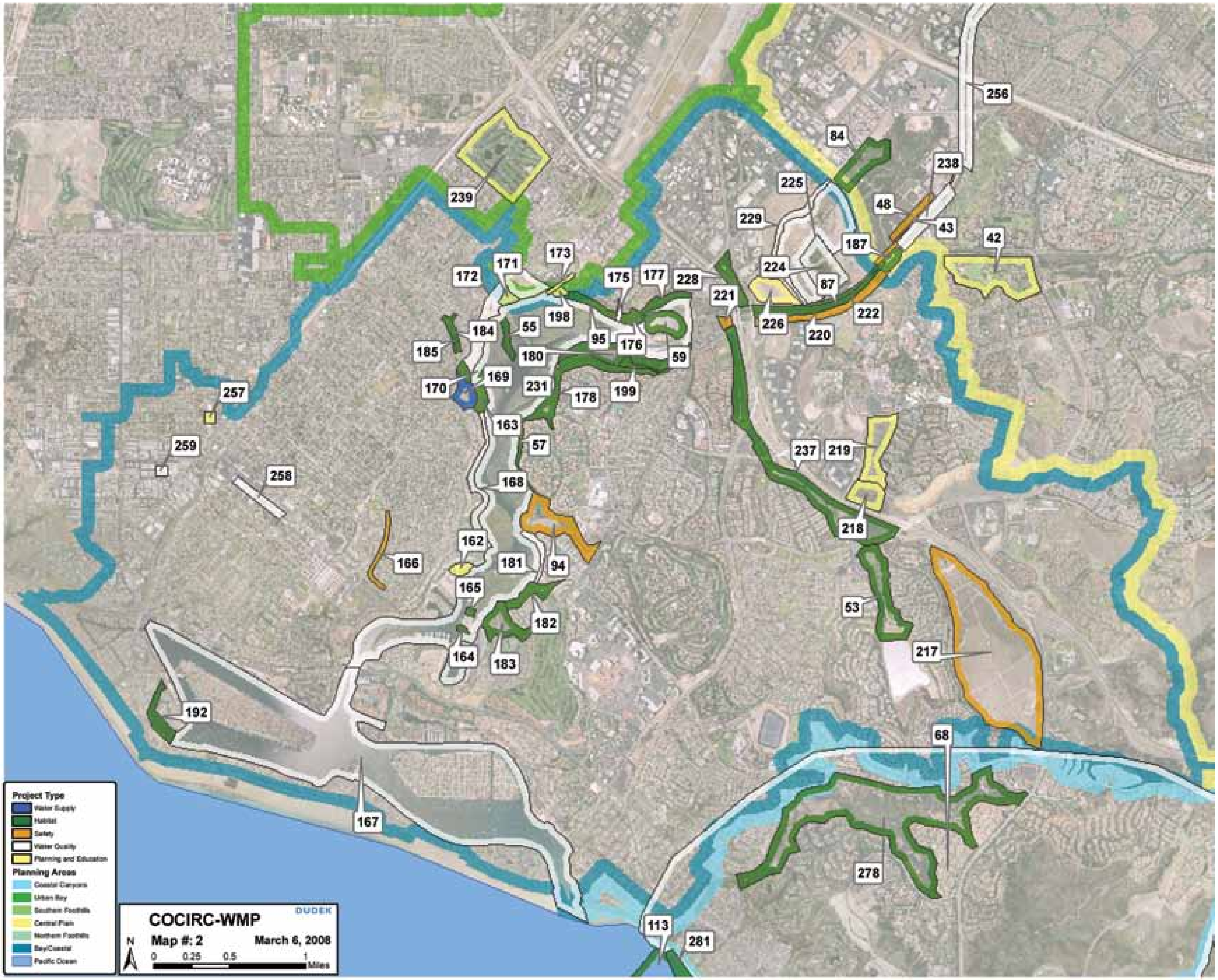
B. There are a number of discussions, studies, plans, projects, programs, partnerships and policies that could be initiated. Examples include:

1. **CONSIDER WHETHER THE STORMWATER MANAGEMENT (DAMP) PROGRAM SHOULD BE EXPANDED** to incorporate some of the recommendations of this Plan.
2. **INITIATE A CONVERSATION WITH OCFCD** to look at the potential of expanding its role in watershed management planning.
3. **INITIATE A WORKSHOP AMONG THE COUNTY AND CITY PLANNING DEPARTMENTS** to begin discussions on incorporating a watershed element into General Plans by 2020. Consider developing sustainable land use design pilot plans.
4. **INITIATE DISCUSSION ON INTEGRATION PLANNING** at the Planning Area level.
5. **CREATE A REGIONAL WATER BUDGET** for all water resources by 2012.
6. **PREPARE A STREAM NATURALIZATION HYDROLOGIC STUDY** by 2012 to determine the required in-stream flow volumes and characteristics that would enable both riparian restoration and flood safety. This study should identify required flow rates and volumes, as well as channel areas that present the greatest constraints.
7. **PREPARE A STUDY OF THE FINANCIAL COSTS** of the necessary retrofits, which will be needed in order to identify the scale costs of achieving sustainable water resources. This will enable the development of a variety of financing strategies.
8. **BY 2012, INSTITUTE A MECHANISM THAT WILL FUND AN ACCOUNT** to be used for paying for the next dredging of the bay, anticipated no earlier than 2030 (added August, 2009, per Bay/Coastal water quality meeting).

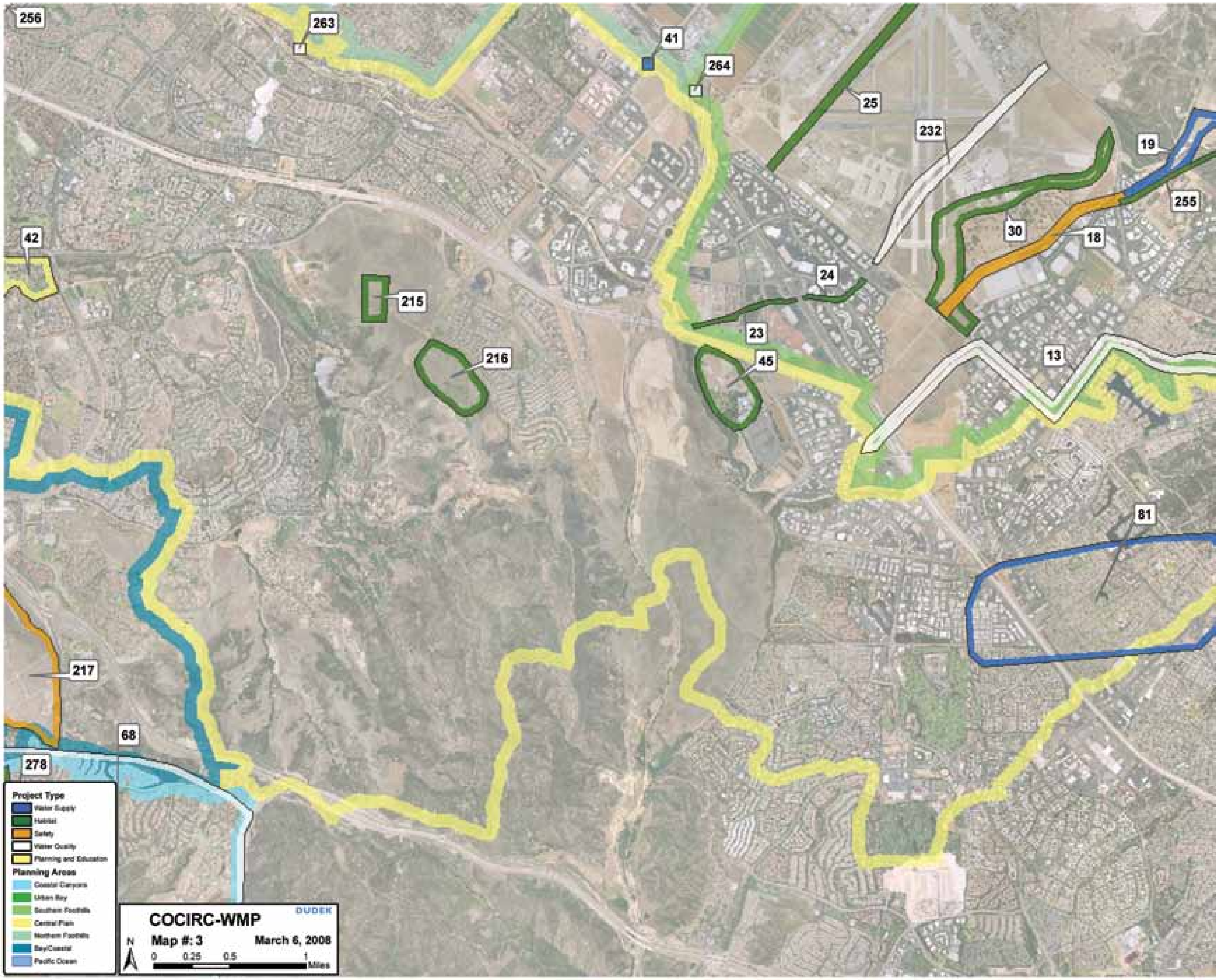


Project Index

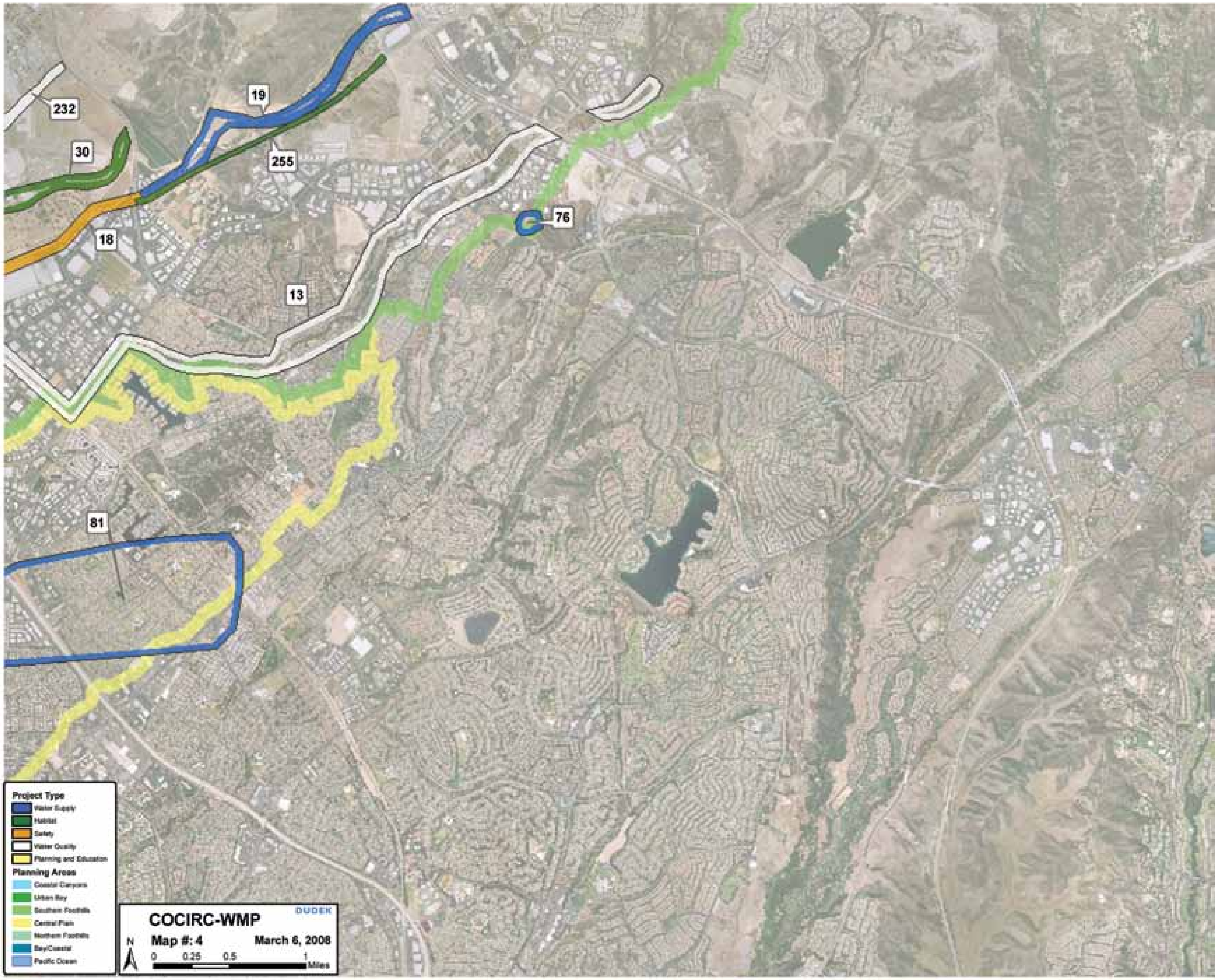
Project Map 1



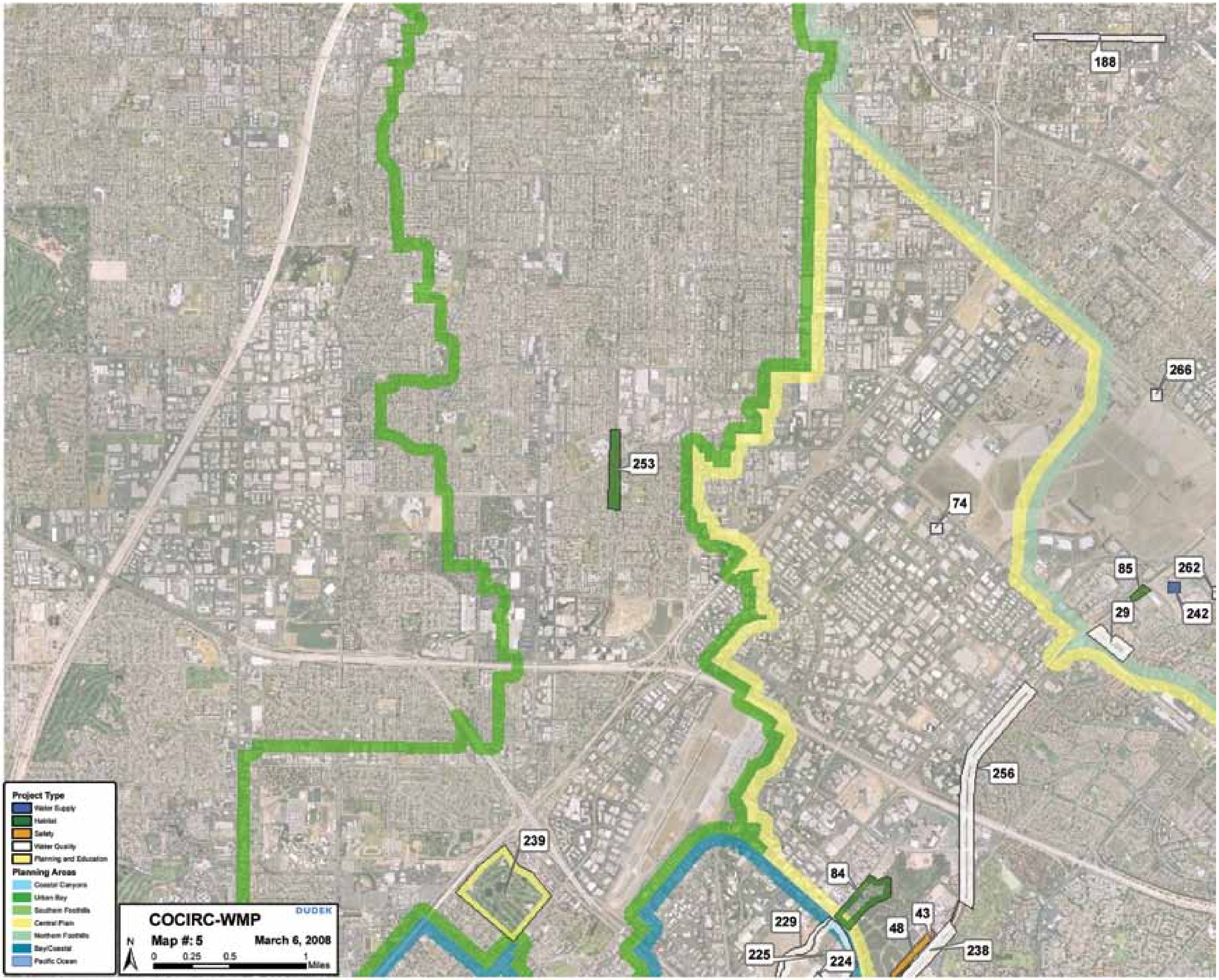
Project Map 2



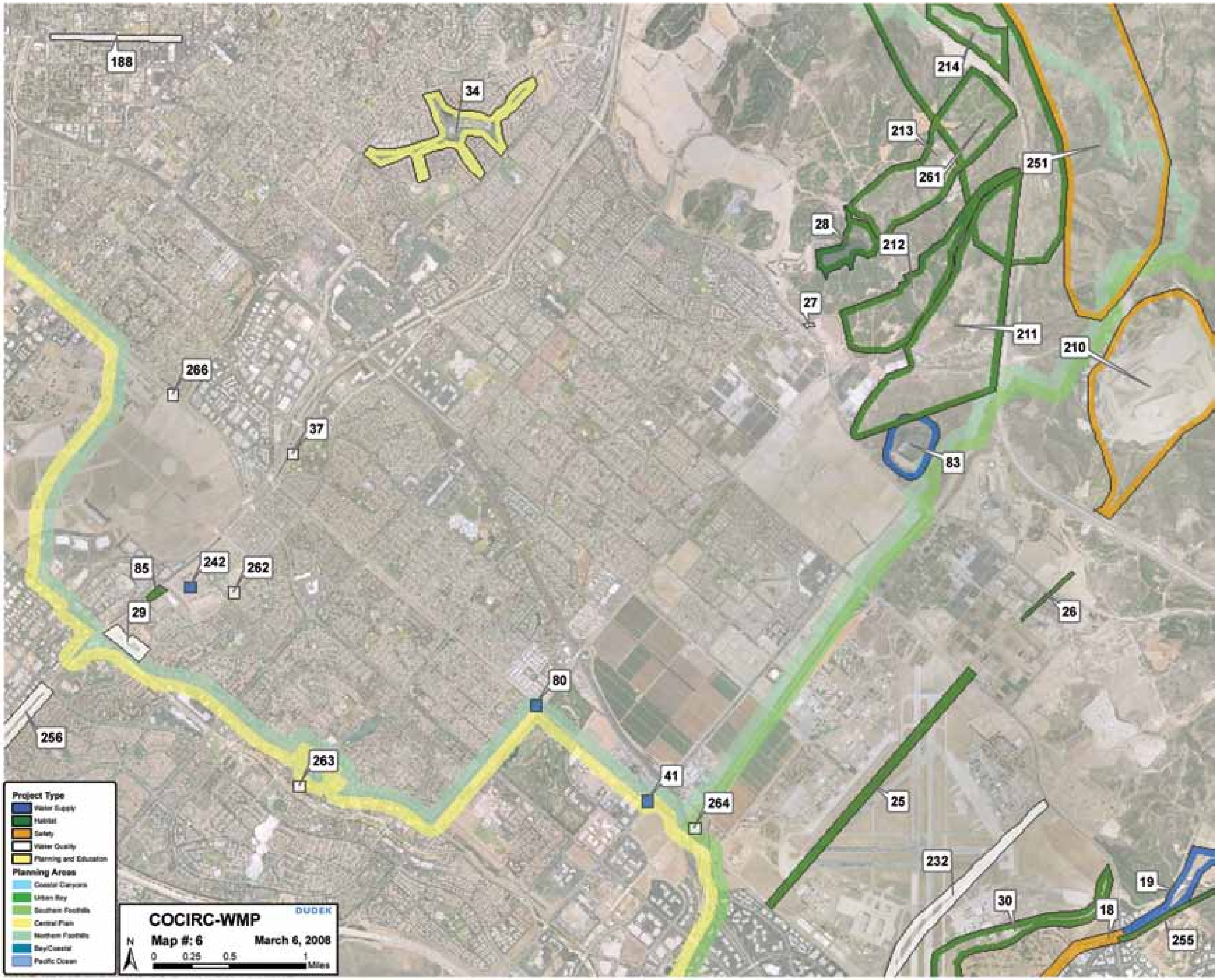
Project Map 3



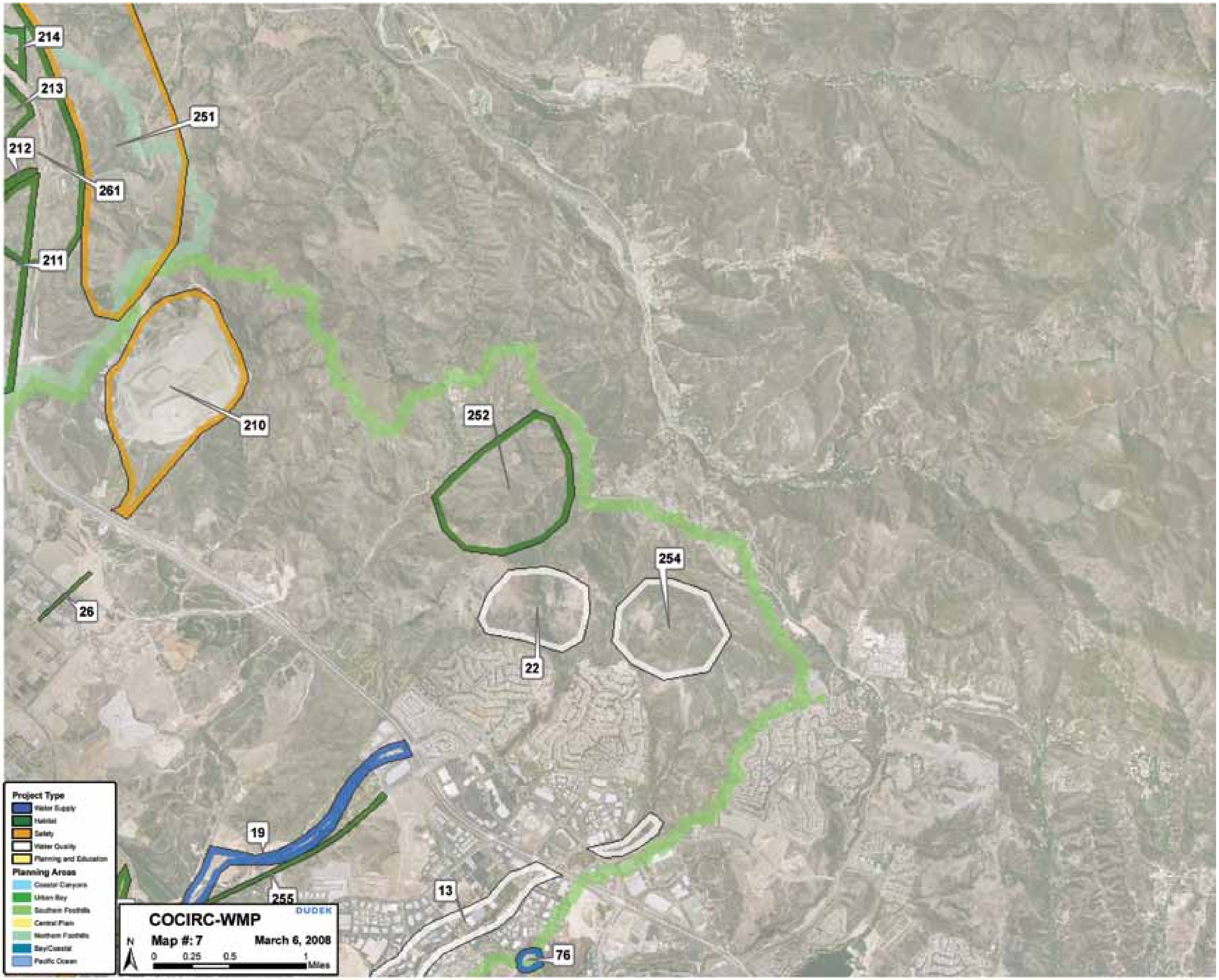
Project Map 4



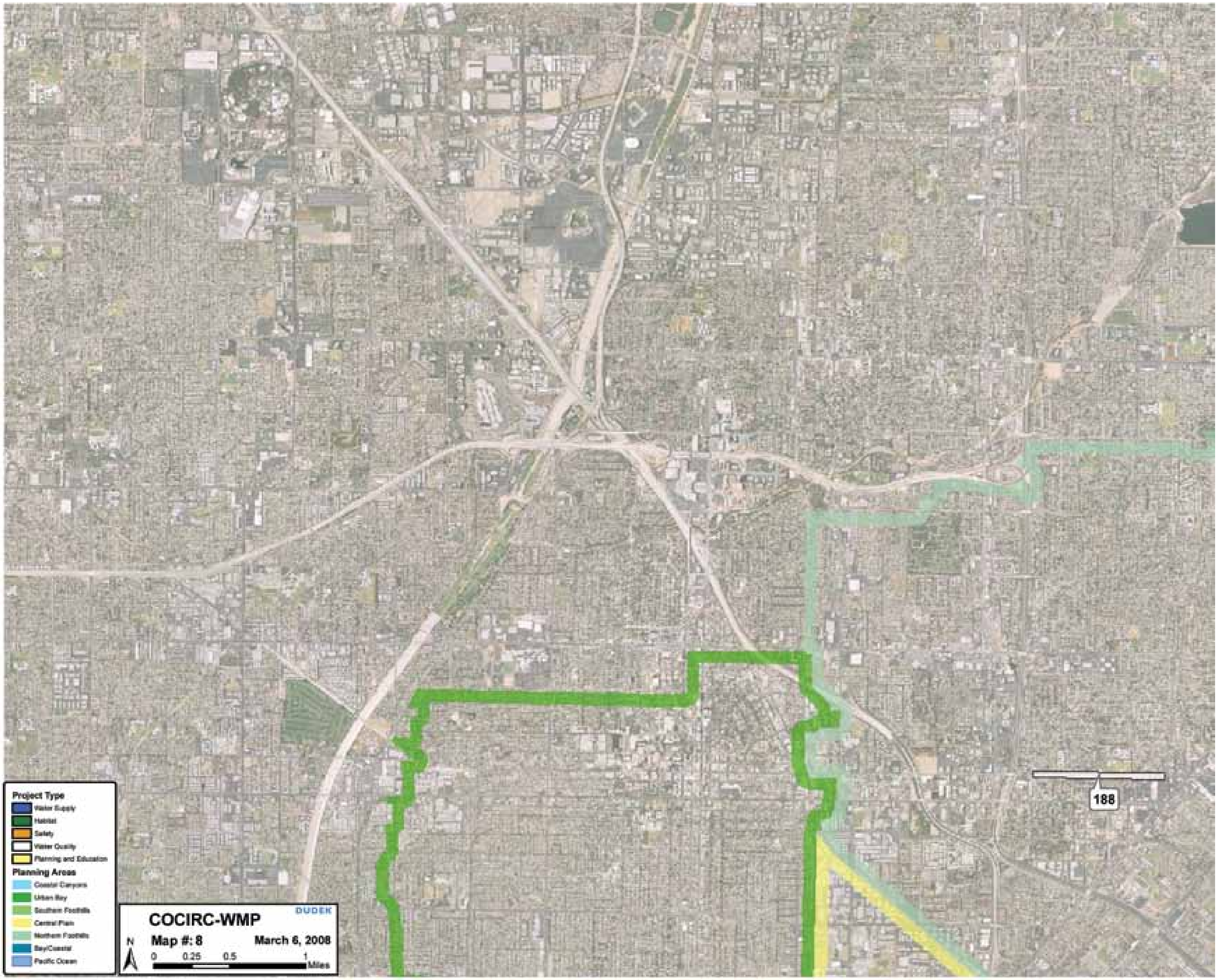
Project Map 5



Project Map 6



Project Map 7



Project Map 8

Project Map 9

Central Orange County IRCWP Provisional Project Rankings — September 15, 2009 — page 1 of 5

ID #	Rank	Project Title	Draft Score	PIF?	Lead Agency	Project Category	Cost	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
277	1	ID_277 Newport Bay Upland Restoration Program (17 Projects)	322	NO	County of Orange and City of Newport Beach	3			X	X	X	combination of projects
59	2	ID_59 Upper Newport Bay Ecosystem Restoration	282	Yes	County of Orange	3	$ 10,000,000				X	Restoration of the storage capacity of existing in-bay sediment detention basins
62	3	ID_62 Buck Gully Restoration	238	Yes	City of Newport Beach	3	$ 2,600,000		X		X	Reduce sediment loads, Erosion Control and Bank Stabilization, Riparian Corridor Restoration Construction of Natural Treatment System at Poppy Lane and Buck Gully to reduce nutrient sediment and bacterial loads entering SWQPA # 32
13	4	ID_13 Serrano Creek Reaches 2,3, and 4	230	Yes	Lake Forest,County	3	$ 15,000,000				X	Fire Prevention by using native habitat which is naturally adapted to fire.
251	5	ID_251 Tollroad Foothills Fire Prevention	213	Yes	County/ TCA	3	$ 7,500,000				X	San Joaquin Marsh Reserve, 1.25 miles upstream of Upper Newport Bay, represents one of the last remnants of freshwater wetlands that once covered much of Orange County's flood plain. The reserve includes various wetland habitats, including freshwater mar
225	6	ID_225 San Joaquin Marsh Ph2	212	NO	UCI	3	$ 2,000,000		X		X	These features will provide flood protection, significant habitat creation and restoration along .
252	7	ID_252 Limestone Whiting Ranch Habitat Restoration	212	NO	County	3					X	0
57	8	ID_57 Santa Ana Delhi Channel Repair	207	NO	County, Newport Beach	3	$ 3,000,000	X	X		X	Stabilize channel banks, introduce native habitat, and create brackish water wetlands
84	9	ID_84 San Joaquin NTS	206	Yes	IRWD	3	$ 2,300,000		X			Construct a new 10-acre wetland for urban runoff treatment serving the entire San Diego Creek watershed in Central Orange County
40	10	ID_40 Peters Canyon Wash Restoration and WQ Treatment	201	NO	County, Irvine	3	$ 10,000,000		X		X	Borrego Canyon restoration
232	11	ID_232 Agua Chinon Inlet/Outlet and all Reaches (5)	200	Yes	None	3	$ 20,000,000	X	X		X	includes Reach 2
70	12	ID_70 Invasive Plant Removal Project	192	NO	County, DFG and NROC	2	$ 500,000				X	Riparian restoration
68	13	ID_68 Newport Coast Runoff Reduction Project	186	NO	City of Newport Beach	3	$ 875,000		X	X	X	Implementation of a Pilot BMP for Dry weather and low wet weather flows that will consist of a treatment train approach. BMP will first remove gross solids and then separate the coarse and fine fraction sediments that will allow coarse fraction sediments
55	14	ID_55 Santa Ana Delhi Estuarine Wetland Restoration	185	NO	County, Newport Beach, CDFG	3	$ -		X		X	Phase I (47) is sequenced after Phase II (23)
23	15	ID_23 Borrego Habitat Corridor	182	NO	Great Park, County, Lake Forest, Irvine	3	$ 1,000,000	X	X		X	Borrego Habitat Corridor: Complete the wildlife corridor b/w mountain & coastal. Complete corridor south of the 5. Restore habitat.
228	16	ID_228 Caltrans Riparian Restoration	176	NO	None	3	$ 300,000				X	0
189	17	ID_189 Citrus Park Improvements	174	Yes	City of Tustin	3	$ 245,000				X	Canyon Restoration
224	18	ID_224 San Joaquin Marsh Ph1	172	NO	UCI	3			X		X	Reducing sediment and other pollutant loads to Newport Bay by source controls, drought tolerant landscapes and low impact development retrofits.
192	19	ID_192 Rhine Channel Remediation Project (Phase 1)	163	Yes	City of Newport Beach	3	$ 2,000,000		X			Habitat restoration
18	20	ID_18 Borrego Canyon Wash	162	NO	Great Park, County, Lake Forest, Irvine	3		X	X		X	Water quality widening of San Diego Creek West Bank
210	21	ID_210 Upper Bee Canyon Restoration	162	NO	County	3			X		X	0
258	22	ID_258 Dover Shore Source Control	162	NO	City of Newport beach	3			X			0
222	23	ID_222 University Ave Bullrush Rehab	161	NO	County of Orange	3					X	Planning and education
256	24	ID_256 Widening West Bank of San Diego Creek	161	NO	City of Irvine	3			X		X	0
43	25	ID_43 Michelson Water Reclamation Plant Flood Wall	160	Yes	IRWD	3	$ 7,623,000	X				The Nitrogen and Selenium Management Program is addressing this problem through testing and experimental BMPs, including the Cienega pilot selenium removal project currently being built.
29	26	ID_29 Cienega Filtration Project	153	Yes	IRWD	3	$ 25,000,000		X			Water quality by removing a plank barrier in the San Diego Creek at Jamboree, the tidal prism into the creek can be re-established. A future study will indicate restoration options along the reach of San Diego Creek which could include rehabilitation of
191	27	ID_191 Newport Bay Copper Reduction Project	153	Yes	City of Newport Beach	2	$ 560,000		X		X	Streambed down cutting and canyon bank erosion in Serrano Creek threatens to undermine houses and damage sewer and electrical facilities. The County and other stakeholders are spearheading efforts to stabilize these canyons using eco-friendly materials
243	28	ID_243 ET Controllers - Costa Mesa	153	NO	None	2	$ 700,000		X	X	X	0

Central Orange County IRCWP Provisional Project Rankings — September 15, 2009 — page 2 of 5

ID #	Rank	Project Title	Draft Score	PIF?	Lead Agency	Project Category	Cost	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
244	29	ID_244 ET Controllers - Lake Forest	153	NO	None	2	$ 700,000		X	X	X	0
245	30	ID_245 ET Controllers - Santa Ana	153	NO	City Santa Ana	2	$ 700,000		X	X	X	UC Cooperative Extension is researching drought tolerant grasses to ascertain wear resistance and fertilization needs.
246	31	ID_246 ET Controllers - Newport Beach	153	Yes	IRWD	2	$ 700,000		X	X	X	Habitat restoration via urban design requirements will need to be tailored to accommodate the special ecological needs of that area.
74	32	ID_74 Nitrogen and Selenium Management Pilot Program	152	NO	County of Orange	3	$ 2,000,000		X			Landfill projects include coastal sage scrub restoration , adjacent to the UCI campus, and along Bonita Canyon Creek . Additional enhancement efforts will provide protection from flooding at Jamboree Road.
238	33	ID_238 San Diego Creek-Michelson Fresh Water Marsh	152	NO	City of Newport Beach	3			X		X	The flood management system is a function of the hydrology of the region. When stormwater is directed off of the land into nearby streams, stream flood risk increases, thus increasing the need to reinforce the banks and replace riparian habitat with drai
241	34	ID_241 Eel Grass Restoration	152	NO	County	3			X		X	0
254	35	ID_254 Serrano Creek Headwaters Retention Oak and Riparian Protection	152	NO	County	3			X		X	0
30	36	ID_30 Irvine Wildlife Corridor	152	Yes	Great Park	3	$ 125,000,000				X	Provide a dedicated open space for wildlife migration between natural habitats located within and adjacent to the City of Irvine
226	37	ID_226 UCI Landfill Multi Benefit	151	NO	0	3			X		X	0
279	38	ID_279 Pelican Canyon Rehabilitation	151	NO	State Parks	3					X	0
41	39	ID_41 Sand Canyon Grade Separation	151	Yes	City of Irvine	3	$ 50,000,000		X			Construction of the Sand Canyon Avenue undercrossing of the railroad
80	40	ID_80 Jeffrey Road_RR Grade Separation	151	Yes	City of Irvine	3	$ 50,000,000		X			Construction of the Jeffrey Road undercrossing of the railroad
36	41	ID_36 Peters Canyon Reservoir Conversion to Recycled Water Storage	150	Yes	IRWD	3	$ 14,000,000			X		Acquire and Convert imported water storage for agricultural use to storage of recycled water for agricultural use.
76	42	ID_76 Baker Pipeline Regional Water Treatment Plant	150	Yes	IRWD	3	$ 48,700,000			X		Flood Protection
78	43	ID_78 District-Wide Recycled Water Expansion Project	150	Yes	IRWD	3	$ 6,820,000			X		Design And Construction Of Expanded Recycled Water Distribution System
81	44	ID_81 Lake Forest Recycled Water Expansion Project	150	Yes	IRWD	3	$ 6,820,000			X		Expansion of IRWD Recycled Water System into Lake Forest
83	45	ID_83 Siphon Reservoir Conversion	150	NO	IRWD	3	$ 7,000,000			X		Habitat restoration by constructing soft bottomed naturalized channels using gabion or other eco-friendly engineered structures.
242	46	ID_242 MCAS-Tustin Potable Wells	150	NO	IRWD	3	$ 5,000,000			X		Water quality treatment project
24	47	ID_24 Agua Chinon Corridor Connector	144	Yes	Great Park, Irvine, County	3	$ 5,300,000				X	Canyon Restoration
27	48	ID_27 Hicks Canyon Wash	141	NO	City of Irvine, County	3	$ 200,000				X	Natural treatment system
175	49	ID_175 Mesa Drainage Diversion Project	141	Yes	County of Orange	3	$ 150,000				X	Natural treatment system
221	50	ID_221 University Ave Flood Protection	141	NO	County of Orange	3		X			X	Natural treatment system
94	51	ID_94 Big Canyon Creek	137	NO	City of Newport Beach and DFG	3	$ 4,000,000		X		X	Natural treatment system
28	52	ID_28 Rattlesnake Reservoir	136	NO	IRWD	3	$ 400,000			X	X	Create wetland and upland habitats surrounding the reservoir
253	53	ID_253 Soft Bottom Habitat Restoration	132	NO	City of Santa Ana	3			X		X	Restoration
262	54	ID_262 Harvard-Columbus Grove NTS Location	132	NO	IRWD	3			X		X	Removal of a plank barrier in the San Diego Creek at Jamboree, the tidal prism into the creek can be re-established . A future study will indicate restoration options along the reach of San Diego Creek which could include rehabilitation of light-footed
263	55	ID_263 Woodbridge NTS Location	131	NO	None	3	$ 750,000		X		X	Water supply conservation
264	56	ID_264 Marine Way NTS Location	131	NO	None	3	$ 750,000		X		X	Water supply
265	57	ID_265 El Modena Park NTS Location	131	NO	None	3	$ 750,000		X		X	Restoration area

Central Orange County IRCWP Provisional Project Rankings — September 25, 2009 — page 3 of 5

ID #	Rank	Project Title	Draft Score	PIF?	Lead Agency	Project Category	Cost	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
266	58	ID_266 Edinger-Tustin Marine Base NTS Location	131	NO	None	3	$ 750,000		X		X	Canyon Restoration
26	59	ID_26 Bee Canyon Wash 1-Headwaters to Irvine Blvd	127	NO	City of Irvine, County	3	$ 4,500,000				X	Restoration area
187	60	ID_187 Tidal Influence San Diego Creek	123	NO	County Flood Control, UCI	3	$ 400,000	X			X	Planning and education
211	61	ID_211 Siphon Reservoir Vireo Habitat Restoration	122	NO	None	3					X	Planning and education
212	62	ID_212 North Jeffrey Road Restoration Area	122	NO	Irvine Ranch Conservancy (IRC)	3					X	Habitat restoration
213	63	ID_213 Rattlesnake Reservoir Area Restoration	122	NO	None	3					X	Park restoration includes linkages and existing use areas to enhance biological connectivity, restoration, monitoring, research.
214	64	ID_214 Upper Hick Canyon Restoration Area	122	NO	IRC	3					X	0
215	65	ID_215 Quail Hill Restoration Area	122	NO	None	3					X	Creek Restoration
216	66	ID_216 Upper Shady Canyon Restoration Area	122	NO	0	3					X	0
218	67	ID_218 UCI Ecological Reserve Mitigation Area-South	121	NO	UCI	3					X	0
219	68	ID_219 UCI Ecological Reserve	121	NO	UCI	3					X	0
220	69	ID_220 University Ave Marsh Rehab	121	NO	County of Orange	3					X	Re-establishment of the tidal prism further strengthens the connectivity with the San Joaquin Marsh.
260	70	ID_260 Crystal cove State Park Restoration	121	NO	None	3					X	Habitat restoration
285	71	ID_285 Great Park Upper Canyon Sub-Surface Wetlands	120	Yes	The Great Park	3			X		X	The Wetlands will draw the Irvine Regional Water District's (IRWD) tertiary treated wastewater into a sub-surface wetland as a polishing step in water reclamation. The polished reclaimed water will then be discharged into the Park's stream and lake syste
42	72	ID_42 Sand Canyon – Mason Regional Park	112	NO	County	3	$ 800,000				X	Create an effective habitat linkage and improve the riparian and upland habitats within the park over what currently exists
217	73	ID_217 Coyote Creek Restoration	112	NO	County of Orange	3					X	0
58	74	ID_58 Restoration of SWQPA #32 and Ecosystem Impact Metric	111	NO	City of Newport Beach	3	$ 400,000		X			Removal of Invasive Brown Algae in Rocky Inter-tidal to enhance re-establishment of native algae, Eelgrass restoration, Assessment of Success of ongoing restoration activities and invasive removal program SWQPA Impact Metric Assessment of Potential Impact
73	75	ID_73 Economic value for ecosystem restoration for Big	111	NO	City of Newport Beach	3					X	Conduct a study to Identify Economic value for ecosystem restoration. (Talk to UCI contact for more information)
229	76	ID_229 San Joaquin Marsh Buffer	111	NO	County of Orange	3					X	0
237	77	ID_237 San Joaquin Hills Habitat Restoration Area	111	Yes	City of Newport Beach	3	$ 2,000,000		X			Widening of Irvine Avenue where crosses Santa Ana Delhi Channel.
25	78	ID_25 Bee Canyon 2 Irvine Blvd to Metrolink	110	NO	City of Irvine, County	3					X	Create a continuous habitat corridor from the upper reaches of the Bee Canyon Wash to the Agua Chinon, Borrego Canyon, Serrano and San Diego Creek habitat areas.
31	79	ID_31 Peters Canyon 1-Regional Park	110	NO	County	3	$ 4,100,000				X	Preserve areas not yet developed and create and enhance aquatic and upland habitats within the limits preserved for open space
179	80	ID_179 Vista Point Project	110	Yes	City of Newport Beach	3	$ 70,000				X	0
261	81	ID_261 Los Lomas Hills Oak Woodlands protection	110	NO	County	3					X	0
60	82	ID_60 Study of Nutrient Load in Bay and Algae Blooms	105	Yes	City of Newport Beach	3	$ 450,000		X		X	Assess cause of algae blooms and correlation to high nutrients load into the Bay Conduct Cross Contamination Model to evaluate migration of nutrient to SWQPA Jetty modification study Fertilizer management program
37	83	ID_37 Peters Canyon Wash Improvements	218	Yes	City of Irvine	3			X			Habitat restoration within the Central Planning Area.
85	84	ID_85 Como Wetland Project	102	Yes	City of Irvine	3			X		X	Construct wetland to reduce the levels of nitrogen and selenium discharged at the City of Irvine's roadway undercrossings
45	85	ID_45 San Diego Creek 1– Lion Country Safari	101	NO	Irvine Company	3	$ 3,000,000				X	HAMP to address beach replenishment
48	86	ID_48 San Diego Creek Levee System FEMA Certification Study	101	Yes	IRWD	1	$ 145,000	X				Water quality

Central Orange County IRCWP Provisional Project Rankings — September 15, 2009 — page 4 of 5

ID #	Rank	Project Title	Draft Score	PIF?	Lead Agency	Project Category	Cost	Project Type: Hydrology	Water Quality	Water Supply	Habitat	Description
209	87	ID_209 Bommer Canyon	101	NO	County of Orange	3			X		X	ET Controllers Programs
255	88	ID_255 Alton Parkway Extension Habitat Rehabilitation	101	NO	County	3					X	ET Controllers Programs
53	89	ID_53 Bonita Canyon Habitat Linkage	100	NO	Newport Beach, County	3	$ 1,000,000				X	ET Controllers Programs
249	90	ID_249 Beach Replenishment Project	100	NO	City of Newport Beach	3		X			X	ET Controllers Programs
170	91	ID_170 Santa Isabella Wetland	93	Yes	County of Orange, City of Newport Beach and DFG	3			X		X	Planning and education
162	92	ID_162 Aquatic Center Renovation	75	NO	County of Orange and City of Newport Beach	3			X		X	0
87	93	ID_87 University Ave Bioswale	72	Yes	City of Irvine	3			X		X	Add two lanes to University Drive between Campus Drive and SR 73. Treatment controls will be construction in conjunction with road work due to the project's proximity to the San Diego Creek
22	94	ID_22 Foothill Open Space Erosion Prevention	71	NO	Great Park, County, Lake Forest	3		X	X		X	This project will install numerous small-scale BMPs along trails, stream-crossings, road cuts, gullies/channels and any other features that exhibit excessive erosion in the open space foothill areas (includes Whiting/Limestone Park, Irvine Open Space, and
268	95	ID_268 UC Cooperative Extension-Drought Tolerant Grass Research	70	NO	UCI	1	$ 100,000			X	X	0
278	96	ID_278 Buck Gully Resource Management Plan	70	NO	City of Newport Beach	1	$ 200,000	X	X	X	X	0
61	97	ID_61 Copper Elimination	65	Yes	City of Newport Beach	3	$ 1,140,000		X			Implement boat paint management program to reduce presence of toxic paints in CCA #69, SWQPA #33 and SWQPA #32.
19	98	ID_19 Borrego Canyon Detention Basin	62	NO	Great Park, FAA, CDFG, County, Lake Forest	3		X	X		X	Borrego Wash does not have a detention basin to address increased flows from urbanization. This project will secure land area and divert storm flows into the Basin
190	99	ID_190 County Trash Reduction	62	Yes	Coastkeeper	2	$ 355,408		X			Project added 1/30/08
39	111	ID_39 Peters Cyn Wash Stormwater and Sediment Detention Basin	61	NO	County, Irvine	3			X			This project will create stormwater and sediment detention basins to address upstream flows. The Basin should be located near the Former MCAS Tustin, as this is where stormwater used to collect naturally. The installation of Basins like this will compens
193	113	ID_193 Newport Bay Watershed Foothills Infiltration BMP Project	61	Yes	Coastkeeper	3	$ 420,481	X	X		X	Planning and education
259	114	ID_259 Pomona Street Detention Vault	61	NO	City of Costa Mesa	3			X	X		Habitat restoration by constructing soft bottomed naturalized channels using gabion or other eco-friendly engineered structures.
275	115	ID_275 Weather Indexing	61	NO	None	3	$ 100,000		X	X		The use of native plant palette reduces water demand significantly, prevents dry weather runoff, and is consistent with the need to improve habitat in urban areas.
66	116	ID_66 Newport Coast Runoff Reduction Project for SWQPA #33	60	NO	IRWD/ City of Newport Beach	3	$ 2,070,000		X	X	X	Landscape certification
231	117	ID_231 Least Tern Island - Lookouts	60	NO	County of Orange	3					X	Channel restoration
271	118	ID_271 Landscaping Auditing Program	60	NO	IRWD	1	$ 100,000		X	X	X	Initiating pilot demonstration projects illustrating sustainable design and low impact development. UC Cooperative Extension Field Station model irrigation and landscape project where three gardens, traditional, retrofit and California Friendly, have be
272	119	ID_272 California Friendly Landscaping Program	60	NO	MWDOC	1	$ 125,000		X	X	X	0
276	120	ID_276 Landscape Certification Program	60	NO	None	1	$ 250,000		X	X	X	0
284	121	ID_284 Botanical Garden At Great Park	55	Yes	The Great Park	3					X	59 acre display of a world-class botanic garden. The building in the garden will be one with the lanscape; carved into the canyon terraces and earthen on all sides with a green roof and sky lights on top.
166	122	ID_166 Costa Mesa Channel Restoration	53	Yes	County of Orange	3	$ 500,000		X		X	0
267	123	ID_267 UC Cooperative Extension-Model Landscape Gardens	52	NO	UCCE	2	$ 100,000		X	X	X	0
67	124	ID_67 County-Wide Pharmaceutical No Drugs Down Drain	51	Yes	Orange County Sanitation District	1	$ 390,000		X			Habitat restoration

Central Orange County IRCWP Provisional Project Rankings — September 15, 2009 — page 5 of 5

ID #	Rank	Project Title	Draft Score	PIF?	Lead Agency	Project Category	Cost	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
72	125	ID_72 Study to Determine Priority Areas for the Removal of Exotic Animals	51	NO	County, DFG and NROC	1					X	Conduct a study to determine areas with exotic animal problems and establish priority areas for exotic animal removal
185	126	ID_185 Cherry Lake Section Upgrade Project	51	Yes	City of Newport Beach, Costa Mesa and County of Orange	2			X			0
239	127	ID_239 Costa Mesa Golf Course Irrigation	51	NO	City of Costa Mesa	2			X	X		Costa Mesa Golf Course Water Quality Treatment and Ecosystem Modification
34	128	ID_34 Tustin Ranch Golf Course Irrigation	50	NO	Tustin	2			X	X		Maximize riparian habitat in areas where it will not interfere with golf play
82	129	ID_82 Main Street RO_IE Facility Improvements	50	Yes	City of Tustin	3	$ 150,000			X		Design and Construction of process control equipment to increase efficiency
188	130	ID_188 Irvine Boulevard Improvements	50	Yes	City of Tustin	3	$ 250,000		X			Project added 1/30/08
184	131	ID_184 Santiago Bio Swale Project	42	NO	County of Orange, City of Newport Beach and DFG	3			X			Habitat restoration low-impact design elements such as bioswales.
281	132	ID_281 Rocky Intertidal Protection Program	41	NO	City of Newport Beach	3	$ 125,000				X	Habitat rehabilitation by reducing public impacts to the rocky intertidal areas
114	133	ID_114 Bight 08 - Sediment Toxicity (Coastal Ecology)	36	NO	None	1					X	Environmental Study
286	134	ID_286 The Orchard Parking Lot at the Great Park	32	Yes	The Great Park	3			X		X	The Orchard Park Lot (Lot) will be an approximately 85 acre sustainable parking lot at the Orange County Great Park that contains rows of citrus orchards designed to mimic the natural heritage of the County. Sustainable features will include permeable pa
95	135	ID_95 Laguna Canyon Wetlands	26	NO	County and DFG	3			X		X	Laguna Canyon Wetlands.
270	136	ID_270 UC Cooperative Extension-Herbicide and Pesticide Research	22	NO	UCCE	1	$ 100,000		X		X	Supporting research on green construction and sustainability practices. UC Cooperative Extension is researching drought tolerant grasses to ascertain wear resistance and fertilization needs.
247	137	ID_247 AP Environmental Sciences Class	22	NO	City of Newport Beach	1		X	X	X	X	0
51	138	ID_51 San Diego Creek Watershed-Scale Pesticide Runoff Mitigation	21	NO	City of Newport Beach	1	$ 400,000		X			This project will reduce stormwater toxicity in Newport Bay by surveying pesticide use at all large land parcels (parks, shopping centers, golf courses, municipal facilities, educational facilities, etc) and designing & implementing VOLUNTARY BMPs to redu
71	139	ID_71 Watershed Urban Forest Long Term Conversion Study	21	NO	County	1				X	X	Study to investigate the replacement of non native plants with native plants as the opportunity arises.
113	140	ID_113 Bight 08 - Coastal Ecology	21	NO	None	1	$ 150,000				X	Environmental Study
240	141	ID_240 Watershed Training for Planning Engineers	21	NO	County	1	$ 200,000	X	X	X	X	Watershed Training for Planners
257	142	ID_257 Lions Skate Park	20	NO	City of Costa Mesa	2					X	0
273	143	ID_273 SCE Shade Tree Energy Conversion Program	20	NO	City of Santa Ana?	1	$ 200,000				X	Southern California Edison has an excellent tree planting program that promotes the planting of trees on property to provide shade and, as a consequence, reduces energy needs associated with cooling and heating.
173	144	ID_173 Horse Arena Project	12	Yes	County of Orange and City of Newport Beach	1	$ 150,000		X			Water quality
79	145	ID_79 Jamboree Road Irrigation System Replacement	11	Yes	City of Tustin	3	$ 170,000		X			Design and installation of WICK irrigation system to replace/modify existing system
269	146	ID_269 Integrated Waste Management - Green Waste Reduction Program	11	NO	County	1	$ 150,000				X	Orange County Waste Management is conducting research on reducing green waste at the source by using improved fertilization techniques.
274	147	ID_274 Landscaping Education Program	10	NO	None	1	$ -				X	Planning and education

Central Orange County IRWCMP Category 1 Projects — page 1 of 2

							Project Type				
ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Hydrology	Water Quality	Water Supply	Habitat	Description
207	52	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
261	53	ID_261 Los Lomas Hills Oak Woodlands protection	110	County		1	0	0	0	X	0
209	78	ID_209 Bommer Canyon	101	County of Orange		1	0	X	0	X	0
163	94	ID_163 23rd Street Mudflat Recreation	0	County of Orange and City of Newport Beach		1	0	0	0	0	0
164	94	ID_164 South Shellmaker Demonstration Marsh Project	0	County of Orange and DFG		1	0	0	0	0	0
165	94	ID_165 North Shellmaker Habitat Restoration Project	0	County of Orange and DFG		1	0	0	0	0	0
167	94	#N/A	#N/A	County of Orange and DFG		1	#N/A	#N/A	#N/A	#N/A	0
171	94	ID_171 West Bay Phase I (Barranca 2 (8 acre) Project)	0	County of Orange, City of Newport Beach and DFG		1	0	0	0	0	0
178	94	ID_178 Eastbluff Habitat Restoration Project	62	County of Orange and City of Newport Beach		1	0	0	0	X	0
230	129	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
203	135	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
204	138	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
205	139	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0

Central Orange County IRWCMP Category 1 Projects — page 2 of 2

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
206	140	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
200	141	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
201	142	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
208	143	#N/A	#N/A	County of Orange		1	#N/A	#N/A	#N/A	#N/A	0
247	144	ID_247 AP Environmental Sciences Class	22	City of Newport Beach		1	X	X	X	X	0
257	145	ID_257 Lions Skate Park	20	City of Costa Mesa		1	0	0	0	X	0

Central Orange County IRWCMP Category 2 Projects — page 1 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
251	1	ID_251 Tollroad Foothills Fire Prevention	213	County/ TCA	$ 7,500,000	2	0	0	0	X	Fire Prevention by using native habitat which is naturally adapted to fire.
13	3	ID_13 Serrano Creek Reaches 2,3, and 4	230	Lake Forest,County	$ 15,000,000	2	0	0	0	X	Approximately 1.2 miles of Bank Stabilization within the City of Lake Forest. This is a source control project reduce sediment reaching and the Back Bay, CCA #69, and SWQPA #32 and prevent loss of property and life.
57	4	ID_57 Santa Ana Delhi Channel Repair	207	County, Newport Beach	$ 3,000,000	2	X	X	0	X	Widening of Irvine Avenue where crosses Santa Ana Delhi Channel.
94	5	ID_94 Big Canyon Creek	137	City of Newport Beach and DFG	$ 4,000,000	2	0	X	0	X	Fish passage projects. Steel head wasn't historic here. But should we have them here now? New layout of Big Canyon includes fish
232	7	ID_232 Agua Chinon Inlet/Outlet and all Reaches (5)	200	None	$ 20,000,000	2	X	X	0	X	includes Reach 2
192	9	ID_192 Rhine Channel Remediation Project (Phase 1)	163	City of Newport Beach	$ 2,000,000	2	0	X	0	0	Project added 1/30/08
70	10	ID_70 Invasive Plant Removal Project	192	County, DFG and NROC	$ 500,000	2	0	0	0	X	Invasive removals, Arundo, Artichoke Thistle, Ice Plant…. In each Habitat area.
74	11	ID_74 Nitrogen and Selenium Management Pilot Program	152	County of Orange	$ 2,000,000	2	0	X	0	0	Pilot Program testing the BMP Implementation for the management Nitrogen and Selenium
40	12	ID_40 Peters Canyon Wash Restoration and WQ Treatment	201	County, Irvine	$ 10,000,000	2	0	X	0	X	Project will remove concrete lining and install BMPs to remove nitrogen from groundwater seeping into Peters Cyn Wash. Riparian vegetation will be used as part of the treatment
68	15	ID_68 Newport Coast Runoff Reduction Project	186	City of Newport Beach	$ 875,000	2	0	X	X	X	Implementation of a Pilot BMP for Dry weather and low wet weather flows that will consist of a treatment train approach. BMP will first remove gross solids and then separate the coarse and fine fraction sediments that will allow coarse
242	16	ID_242 MCAS-Tustin Potable Wells	150	IRWD	$ 5,000,000	2	0	0	X	0	4 wells
83	17	ID_83 Siphon Reservoir Conversion	150	IRWD	$ 7,000,000	2	0	0	X	0	Acquire and Convert imported water storage for agricultural use to storage of recycled water for agricultural use.
103	22	#N/A	#N/A	County of Orange		2	#N/A	#N/A	#N/A	#N/A	The Nitrogen and Selenium Management Program is addressing this problem through testing and experimental BMPs, including the Cienega pilot selenium removal project currently

Central Orange County IRWCMP Category 2 Projects — page 2 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Water Quality	Water Supply	Habitat	Description
225	23	ID_225 San Joaquin Marsh Ph2	212	UCI	$ 2,000,000	2	0	X	0	X	San Joaquin Marsh Reserve, 1.25 miles upstream of Upper Newport Bay, represents one of the last remnants of freshwater wetlands that once covered much of Orange County's flood plain. The reserve includes various wetland habitats, including freshwater marshlands,
243	24	ID_243 ET Controllers - Costa Mesa	153	None	$ 700,000	2	0	X	X	X	ET Controllers Programs
244	25	ID_244 ET Controllers - Lake Forest	153	None	$ 700,000	2	0	X	X	X	ET Controllers Programs
245	26	ID_245 ET Controllers - Santa Ana	153	City Santa Ana	$ 700,000	2	0	X	X	X	ET Controllers Programs
246	27	ID_246 ET Controllers - Newport Beach	153	IRWD	$ 700,000	2	0	X	X	X	ET Controllers Programs
277	29	ID_277 Newport Bay Upland Restoration Program (17 Projects)	322	County of Orange and City of Newport Beach		2	0	X	X	X	combination of projects: 163, 164, 165, 168, 169, 171, 172, 174, 176, 177, 178, 180, 181, 182, 183, 198, 199
187	30	ID_187 Tidal Influence San Diego Creek	123	County Flood Control, UCI	$ 400,000	2	X	0	0	X	Removal of a plank barrier in the San Diego Creek at Jamboree, the tidal prism into the creek can be re-established . A future study will indicate restoration options along the reach of San Diego Creek which could include rehabilitation of light-footed clapper rail or least
19	31	ID_19 Borrego Canyon Detention Basin	62	Great Park, FAA, CDFG, County, Lake Forest		2	X	X	0	X	Borrego Wash does not have a detention basin to address increased flows from urbanization. This project will secure land area and divert storm flows into the Basin
51	32	ID_51 San Diego Creek Watershed-Scale Pesticide Runoff Mitigation	21	City of New port Beach	$ 400,000	2	0	X	0	0	This project will reduce stormwater toxicity in Newport Bay by surveying pesticide use at all large land parcels (parks, shopping centers, golf courses, municipal facilities, educational facilities, etc) and designing & implementing VOLUNTARY
228	33	ID_228 Caltrans Riparian Restoration	176	None	$ 300,000	2	0	0	0	X	Riparian restoration

Central Orange County IRWCMP Category 2 Projects — page 3 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
45	34	ID_45 San Diego Creek 1–Lion Country Safari	101	Irvine Company	$ 3,000,000	2	0	0	0	X	Enhance /expand existing riparian corridor, improve Interstate-405 crossing, enhance adjacent upland habitat
263	35	ID_263 Woodbridge NTS Location	131	None	$ 750,000	2	0	X	0	X	Natural treatment system
264	36	ID_264 Marine Way NTS Location	131	None	$ 750,000	2	0	X	0	X	Natural treatment system
265	37	ID_265 El Modena Park NTS Location	131	None	$ 750,000	2	0	X	0	X	Natural treatment system
266	38	ID_266 Edinger-Tustin Marine Base NTS Location	131	None	$ 750,000	2	0	X	0	X	Natural treatment system
210	39	ID_210 Upper Bee Canyon Restoration	162	County		2	0	X	0	X	Canyon Restoration
23	40	ID_23 Borrego Habitat Corridor	182	Great Park, County, Lake Forest, Irvine	$ 1,000,000	2	X	X	0	X	Borrego Canyon restoration
24	41	ID_24 Agua Chinon Corridor Connector	144	Great Park, Irvine, County	$ 5,300,000	2	0	0	0	X	Restoration
221	42	ID_221 University Ave Flood Protection	141	County of Orange		2	X	0	0	X	Flood Protection
275	44	ID_275 Weather Indexing	61	None	$ 100,000	2	0	X	X	0	Weather forecast in newspaper to include recommendation for adjusting irrigation controller
202	45	#N/A	#N/A	County of Orange		2	#N/A	#N/A	#N/A	#N/A	Planning and education
276	46	ID_276 Landscape Certification Program	60	None	$ 250,000	2	0	X	X	X	Landscape certification
224	47	ID_224 San Joaquin Marsh Ph1	172	UCI		2	0	X	0	X	Phase I (47) is sequenced after Phase II (23)
258	48	ID_258 Dover Shore Source Control	162	City of Newport beach		2	0	X	0	0	Reducing sediment and other pollutant loads to Newport Bay by source controls, drought tolerant landscapes and low impact development retrofits.

Central Orange County IRWCMP Category 2 Projects — page 4 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Water Quality	Water Supply	Habitat	Description
39	50	ID_39 Peters Cyn Wash Stormwater and Sediment Detention Basin	61	County, Irvine		2	0	X	0	0	This project will create stormwater and sediment detention basins to address upstream flows. The Basin should be located near the Former MCAS Tustin, as this is where stormwater used to collect naturally. The installation of Basins like this will
191	51	ID_191 Newport Bay Copper Reduction Project	153	City of Newport Beach	$ 560,000	2	0	X	0	X	Project added 1/30/08
18	54	ID_18 Borrego Canyon Wash	162	Great Park, County, Lake Forest, Irvine		2	X	X	0	X	Bank Stabilization within the City of Lake Forest. Controls reduce sediment into Back Bay and prevents loss of property and life.
211	55	ID_211 Siphon Reservoir Vireo Habitat Restoration	122	None		2	0	0	0	X	Water supply conservation
212	56	ID_212 North Jeffrey Road Restoration Area	122	Irvine Ranch Conservancy (IRC)		2	0	0	0	X	Water supply
213	57	ID_213 Rattlesnake Reservoir Area Restoration	122	None		2	0	0	0	X	Restoration area
214	58	ID_214 Upper Hick Canyon Restoration Area	122	IRC		2	0	0	0	X	Canyon Restoration
215	59	ID_215 Quail Hill Restoration Area	122	None		2	0	0	0	X	Restoration area
216	60	ID_216 Upper Shady Canyon Restoration Area	122	0		2	0	0	0	X	Canyon Restoration
252	61	ID_252 Limestone Whiting Ranch Habitat Restoration	212	County		2	0	0	0	X	These features will provide flood protection, significant habitat creation and restoration along .
217	64	ID_217 Coyote Creek Restoration	112	County of Orange		2	0	0	0	X	Creek Restoration
241	65	ID_241 Eel Grass Restoration	152	County		2	0	X	0	X	Eel grass study addresses several important issues facing the harbor including potential sea level rise, navigational concerns, eel grass protection, sediment and water quality management practices, and beach replenishment

Central Orange County IRWCMP Category 2 Projects — page 5 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
268	68	ID_268 UC Cooperative Extension-Drought Tolerant Grass Research	70	UCI	$ 100,000	2	0	0	X	X	UC Cooperative Extension is researching drought tolerant grasses to ascertain wear resistance and fertilization needs.
226	69	ID_226 UCI Landfill Multi Benefit	151	0		2	0	X	0	X	Landfill projects include coastal sage scrub restoration , adjacent to the UCI campus, and along Bonita Canyon Creek . Additional enhancement efforts will provide protection from
27	70	ID_27 Hicks Canyon Wash	141	City of Irvine, County	$ 200,000	2	0	0	0	X	Improve habitat connectivity of the foothill transportation corridor and improve quality of riparian habitat
53	71	ID_53 Bonita Canyon Habitat Linkage	100	Newport Beach, County	$ 1,000,000	2	0	0	0	X	Create a habitat linkage between the riparian and wetland habitats below the reservoir to the open space areas within the sub-watershed above the reservoir
218	73	ID_218 UCI Ecological Reserve Mitigation Area-South	121	UCI		2	0	0	0	X	Planning and education
219	74	ID_219 UCI Ecological Reserve	121	UCI		2	0	0	0	X	Planning and education
253	75	ID_253 Soft Bottom Habitat Restoration	132	City of Santa Ana		2	0	X	0	X	Habitat restoration by constructing soft bottomed naturalized channels using gabion or other eco-friendly engineered structures.
66	77	ID_66 Newport Coast Runoff Reduction Project for SWQPA #33	60	IRWD/ City of Newport Beach	$ 2,070,000	2	0	X	X	X	Incentive Program for Residential ET Controllers. Drought tolerant planting, Enforcement, Develop Impact Metric to assess improvement of SWQPA #33 biomarker species from lower dry weather fresh water flows. Improvements to reduce
229	79	ID_229 San Joaquin Marsh Buffer	111	County of Orange		2	0	0	0	X	Re-establishment of the tidal prism further strengthens the connectivity with the San Joaquin Marsh.
254	80	ID_254 Serrano Creek Headwaters Retention Oak and Riparian Protection	152	County		2	0	X	0	X	Streambed down cutting and canyon bank erosion in Serrano Creek threatens to undermine houses and damage sewer and electrical facilities. The County and other stakeholders are spearheading efforts to stabilize these
260	81	ID_260 Crystal cove State Park Restoration	121	None		2	0	0	0	X	Park restoration includes linkages and existing use areas to enhance biological connectivity, restoration, monitoring, research.
271	82	ID_271 Landscaping Auditing Program	60	IRWD?	$ 100,000	2	0	X	X	X	Habitat restoration by constructing soft bottomed naturalized channels using gabion or other eco-friendly engineered structures.

Central Orange County IRWCMP Category 2 Projects — page 6 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
279	83	ID_279 Pelican Canyon Rehabilitation	151	State Parks		2	0	0	0	X	The flood management system is a function of the hydrology of the region. When stormwater is directed off of the land into nearby streams, stream flood risk increases, thus increasing the need to reinforce the banks and replace riparian habitat with drainage facilities. Canyon erosion, sediment accumulation, threats to endangered species, and water quality problems within the Newport Bay Watershed are all symptoms that
31	84	ID_31 Peters Canyon 1-Regional Park	110	County	$ 4,100,000	2	0	0	0	X	Preserve areas not yet developed and create and enhance aquatic and upland habitats within the limits preserved for open space
162	85	ID_162 Aquatic Center Renovation	75	County of Orange and City of Newport Beach		2	0	X	0	X	Planning and education
262	86	ID_262 Harvard-Columbus Grove NTS Location	132	IRWD		2	0	X	0	X	Water quality treatment project
25	87	ID_25 Bee Canyon 2 Irvine Blvd to Metrolink	110	City of Irvine, County		2	0	0	0	X	Create a continuous habitat corridor from the upper reaches of the Bee Canyon Wash to the Agua Chinon, Borrego Canyon, Serrano and San Diego Creek habitat areas.
26	88	ID_26 Bee Canyon Wash 1-Headwaters to Irvine Blvd	127	City of Irvine, County	$ 4,500,000	2	0	0	0	X	Create a habitat link from Bee Canyon Wash at the transportation corridor to Lambert Reservoir, improve wetland and riparian habitat within and surrounding reservoir, create a new channel and riparian corridor from the reservoir that would
42	89	ID_42 Sand Canyon – Mason Regional Park	112	County	$ 800,000	2	0	0	0	X	Create an effective habitat linkage and improve the riparian and upland habitats within the park over what currently exists
113	90	ID_113 Bight 08 - Coastal Ecology	21	None	$ 150,000	2	0	0	0	X	Environmental Study

Central Orange County IRWCMP Category 2 Projects — page 7 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Water Quality	Water Supply	Habitat	Description
114	91	ID_114 Bight 08 - Sediment Toxicity (Coastal Ecology)	36	None		2	0	0	0	X	Environmental Study
238	92	ID_238 San Diego Creek-Michelson Fresh Water Marsh	152	City of Newport Beach		2	0	X	0	X	Water quality by removing a plank barrier San Diego Creek at Jamboree, the tidal p the creek can be re-established. A future will indicate restoration options along the San Diego Creek which could include rehabilitation of light-footed clapper rail o
255	93	ID_255 Alton Parkway Extension Habitat Rehabilitation	101	County		2	0	0	0	X	Habitat restoration within the Central Plar Area.
281	94	ID_281 Rocky Intertidal Protection Program	41	City of Newport Beach	$ 125,000	2	0	0	0	X	Habitat rehabilitation by reducing public ir to the rocky intertidal areas
28	95	ID_28 Rattlesnake Reservoir	136	IRWD	$ 400,000	2	0	0	X	X	Create wetland and upland habitats surro the reservoir
35	96	#N/A	#N/A	City of Irvine, County, Tustin		2	#N/A	#N/A	#N/A	#N/A	Creation of a riparian, wetland, and uplan complex that would support a diversity of
95	97	ID_95 Laguna Canyon Wetlands	26	County and DFG		2	0	X	0	X	Laguna Canyon Wetlands.
184	98	ID_184 Santiago Bio Swale Project	42	County of Orange, City of Newport Beach and DFG		2	0	X	0	0	Habitat restoration low-impact design eler such as bioswales.
185	99	ID_185 Cherry Lake Section Upgrade Project	51	City of Newport Beach, Costa Mesa and County of Orange		2	0	X	0	0	Habitat restoration
259	101	ID_259 Pomona Street Detention Vault	61	City of Costa Mesa		2	0	X	X	0	Water quality
272	102	ID_272 California Friendly Landscaping Program	60	MWDOC	$ 125,000	2	0	X	X	X	The use of native plant palette reduces w demand significantly, prevents dry weathe and is consistent with the need to improve
34	105	ID_34 Tustin Ranch Golf Course Irrigation	50								Maximize riparian habitat in areas where i

Central Orange County IRWCMP Category 2 Projects — page 8 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Water Quality	Water Supply	Habitat	Description
239	106	ID_239 Costa Mesa Golf Course Irrigation	51	City of Costa Mesa		2	0	X	X	0	Costa Mesa Golf Course Water Quality Treatment and Ecosystem Modification
269	107	ID_269 Integrated Waste Management - Green Waste Reduction Program	11	County	$ 150,000	2	0	0	0	X	Orange County Waste Management is conducting research on reducing green waste at the source by using improved fertilization techniques.
170	110	ID_170 Santa Isabella Wetland	93	County of Orange, City of Newport Beach and DFG		2	0	X	0	X	Water quality
267	112	ID_267 UC Cooperative Extension-Model Landscape Gardens	52	UCCE	$ 100,000	2	0	X	X	X	Initiating pilot demonstration projects illustrating sustainable design and low impact development. UC Cooperative Extension Field Station model irrigation and landscape project where three gardens, traditional, retrofit and California
278	113	ID_278 Buck Gully Resource Management Plan	70	City of Newport Beach	$ 200,000	2	X	X	X	X	Habitat restoration via urban design requirements will need to be tailored to accommodate the special ecological needs of that area.
273	114	ID_273 SCE Shade Tree Energy Conversion Program	20	City of Santa Ana?	$ 200,000	2	0	0	0	X	Southern California Edison has an excellent tree planting program that promotes the planting of trees on property to provide shade and, as a consequence, reduces energy needs associated
220	115	ID_220 University Ave Marsh Rehab	121	County of Orange		2	0	0	0	X	Habitat restoration
222	116	ID_222 University Ave Bullrush Rehab	161	County of Orange		2	0	0	0	X	Habitat restoration
240	117	ID_240 Watershed Training for Planning Engineers	21	County	$ 200,000	2	X	X	X	X	Watershed Training for Planners
270	118	ID_270 UC Cooperative Extension-Herbicide and Pesticide Research	22	UCCE	$ 100,000	2	0	X	0	X	Supporting research on green construction and sustainability practices. UC Cooperative Extension is researching drought tolerant grasses to ascertain wear resistance and fertilization
256	119	ID_256 Widening West Bank of San Diego Creek	161	City of Irvine		2	0	X	0	X	Water quality widening of San Diego Creek West Bank

Central Orange County IRWCMP Category 2 Projects — page 9 of 10

							Project Type				
ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Hydrology	Water Quality	Water Supply	Habitat	Description
58	120	ID_58 Restoration of SWQPA #32 and Ecosystem Impact Metric	111	City of Newport Beach	$ 400,000	2	0	X	0	0	Removal of Invasive Brown Algae in Rocky Intertidal to enhance re-establishment of native algae, Eelgrass restoration, Assessment of Success of ongoing restoration activities and invasive removal program SWQPA Impact Metric Assessment of Potential Impact
55	122	ID_55 Santa Ana Delhi Estuarine Wetland Restoration	185	County, Newport Beach, CDFG	$ -	2	0	X	0	X	This project will use county land downstream and/or adjacent to the golf course to widen the channel and create a wetland complex. Currently the channel is bordered by barren land. The county had prepared an EIR for flood control
71	123	ID_71 Watershed Urban Forest Long Term Conversion Study	21	County		2	0	0	X	X	Study to investigate the replacement of non native plants with native plants as the opportunity arises.
73	124	ID_73 Economic value for ecosystem restoration for Big Canyon	111	City of Newport Beach		2	0	0	0	X	Conduct a study to Identify Economic value for ecosystem restoration. (Talk to UCI contact for more information)
72	127	ID_72 Study to Determine Priority Areas for the Removal of Exotic Animals	51	County, DFG and NROC		2	0	0	0	X	Conduct a study to determine areas with exotic animal problems and establish priority areas for exotic animal removal
249	128	ID_249 Beach Replenishment Project	100	City of Newport Beach		2	X	0	0	X	HAMP to address beach replenishment
231	130	ID_231 Least Tern Island - Lookouts	60	County of Orange		2	0	0	0	X	Planning and education
22	131	ID_22 Foothill Open Space Erosion Prevention	71	Great Park, County, Lake Forest		2	X	X	0	X	This project will install numerous small-scale BMPs along trails, stream-crossings, road cuts, gullies/channels and any other features that
193	132	ID_193 Newport Bay Watershed Foothills Infiltration BMP Project	61	Coastkeeper	$ 420,481	2	X	X	0	X	Project added 1/30/08

Central Orange County IRWCMP Category 2 Projects — page 10 of 10

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
274	133	ID_274 Landscaping Education Program	10	None	$ -	2	0	0	0	X	Planning and education
190	134	ID_190 County Trash Reduction	62	Coastkeeper	$ 355,408	2	0	X	0	0	Project added 1/30/08

APPENDIX A5 — CATEGORY 3 PROJECTS

Central Orange County IRWCMP Category 3 Projects — page 1 of 3

							Project Type				
ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Hydrology	Water Quality	Water Supply	Habitat	Description
59	2	ID_59 Upper Newport Bay Ecosystem Restoration	282	County of Orange	$ 10,000,000	3	0	0	0	X	Restoration of the storage capacity of existing in-bay sediment detention basins
29	6	ID_29 Cienega Filtration Project	153	IRWD	$ 25,000,000	3	0	X	0	0	Construct a biofilter designed to remove selenium from surface water in the Peters Canyon Channel tributary of San Diego Creek
84	8	ID_84 San Joaquin NTS	206	IRWD	$ 2,300,000	3	0	X	0	0	Construct a new 10-acre wetland for urban runoff treatment serving the entire San Diego Creek watershed in Central Orange County
41	13	ID_41 Sand Canyon Grade Separation	151	City of Irvine	$ 50,000,000	3	0	X	0	0	Construction of the Sand Canyon Avenue undercrossing of the railroad
80	14	ID_80 Jeffrey Road_RR Grade Separation	151	City of Irvine	$ 50,000,000	3	0	X	0	0	Construction of the Jeffrey Road undercrossing of the railroad
76	18	ID_76 Baker Pipeline Regional Water Treatment Plant	150	IRWD	$ 48,700,000	3	0	0	X	0	Construction Of A 25 MGD Microfiltration Plant To Treat Raw Water From Santiago Lateral And/Or Irvine Lake
78	19	ID_78 District-Wide Recycled Water Expansion Project	150	IRWD	$ 6,820,000	3	0	0	X	0	Design And Construction Of Expanded Recycled Water Distribution System
81	20	ID_81 Lake Forest Recycled Water Expansion Project	150	IRWD	$ 6,820,000	3	0	0	X	0	Expansion of IRWD Recycled Water System into Lake Forest
82	21	ID_82 Main Street RO_IE Facility Improvements	50	City of Tustin	$ 150,000	3	0	0	X	0	Design and Construction of process control equipment to increase efficiency
62	28	ID_62 Buck Gully Restoration	238	City of Newport Beach	$ 2,600,000	3	0	X	0	X	Reduce sediment loads, Erosion Control and Bank Stabilization, Riparian Corridor Restoration Construction of Natural Treatment System at Poppy Lane and Buck Gully to reduce nutrient sediment and bacterial loads entering SWQPA #
87	43	ID_87 University Ave Bioswale	72	City of Irvine		3	0	X	0	X	Add two lanes to University Drive between Campus Drive and SR 73. Treatment controls will be construction in conjunction with road work due to the project's proximity to the San Diego Creek
30	49	ID_30 Irvine Wildlife Corridor	152	Great Park	$ 125,000,000	3	0	0	0	X	Provide a dedicated open space for wildlife migration between natural habitats located within and adjacent to the City of Irvine
175	62	ID_175 Mesa Drainage Diversion Project	141	County of Orange	$ 150,000	3	0	0	0	X	Divert Santa Ann - Delhi Channel to OCSD Plant #1
166	63	ID_166 Costa Mesa Channel Restoration	53	County of Orange	$ 500,000	3	0	X	0	X	Channel restoration

Central Orange County IRWCMP Category 3 Projects — page 2 of 3

							Project Type				
ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Hydrology	Water Quality	Water Supply	Habitat	Description
36	66	ID_36 Peters Canyon Reservoir Conversion to Recycled Water Storage	150	IRWD	$ 14,000,000	3	0	0	X	0	Acquire and Convert imported water storage for agricultural use to storage of recycled water for agricultural use.
60	67	ID_60 Study of Nutrient Load in Bay and Algae Blooms	105	City of Newport Beach	$ 450,000	3	0	X	0	X	Assess cause of algae blooms and correlation to high nutrients load into the Bay Conduct Cross Contamination Model to evaluate migration of nutrient to SWQPA Jetty modification study
172	72	ID_172 West Bay Phase II Project	61	County of Orange and City of Newport Beach	$ 400,000	3	0	0	0	X	Water quality treatment project
43	76	ID_43 Michelson Water Reclamation Plant Flood Wall	160	IRWD	$ 7,623,000	3	X	0	0	0	Construct flood wall to prevent inundation of MWRP from 200-year flooding from San Diego Creek
168	94	ID_168 Galaxy Slope Protection Project	62	County of Orange, City of Newport Beach and DFG		3	0	X	0	X	0
169	94	ID_169 Constellation Upland Project	62	County of Orange, City of Newport Beach and DFG		3	0	0	0	X	0
176	94	ID_176 Mesa Trail & Habitat Restoration Project	62	County of Orange		3	0	0	0	X	0
177	94	ID_177 Bay View Way Trail & Habitat Restoration Project	62	County of Orange		3	0	0	0	X	0
180	94	ID_180 Back Bay Drive Climate Change Transition Control Project	62	County of Orange and DFG		3	0	0	0	X	0
181	94	ID_181 Park Newport Slope Stabilization Project	62	City of Newport Beach and DFG		3	0	0	0	X	0
182	94	ID_182 Harbor Cove Habitat Restoration Project	62	County of Orange and City of Newport Beach		3	0	0	0	X	0
183	94	ID_183 Newport Valley Habitat Restoration Project	62	County of Orange and City of Newport Beach		3	0	0	0	X	0
198	94	ID_198 Equestrian Restoration Area	62	County of Orange		3	0	0	0	X	Project added 1/30/08
199	94	ID_199 East Bay Riparian Habitat Restoration (Removal of Brazillian Pepper Trees)	62	County of Orange		3	0	0	0	X	Project added 1/30/08
237	100	ID_237 San Joaquin Hills Habitat Restoration Area	111	City of Newport Beach	$ 2,000,000	3	0	X	0	0	Habitat restoration

Central Orange County IRWCMP Category 3 Projects — page 3 of 3

ID #	Rank	Project Title	Draft Score	Lead Agency	Cost	Project Category	Project Type: Hydrology	Project Type: Water Quality	Project Type: Water Supply	Project Type: Habitat	Description
85	103	ID_85 Como Wetland Project	102	City of Irvine		3	0	X	0	X	Construct wetland to reduce the levels of nitrogen and selenium discharged at the City of Irvine's roadway undercrossings
37	104	ID_37 Peters Canyon Wash Improvements	218	City of Irvine		3	0	X	0	0	Construction of improvements to the westerly embankment of Peter Canyon Wash between Harvard Avenue and the railroad
67	108	ID_67 County-Wide Pharmaceutical No Drugs Down Drain	51	Orange County Sanitation District	$ 390,000	3	0	X	0	0	Implementation of collection sites for unused pharmaceuticals/Education Program to Reduce of Pharmaceuticals disposed by general public into the sewer system
250	109	#N/A	#N/A	City of Newport Beach/Orange County Sanitation District		3	#N/A	#N/A	#N/A	#N/A	Programs that promote proper disposal of pharmaceuticals
173	111	ID_173 Horse Arena Project	12	County of Orange and City of Newport Beach	$ 150,000	3	0	X	0	0	Water quality
48	121	ID_48 San Diego Creek Levee System FEMA Certification Study	101	IRWD	$ 145,000	3	X	0	0	0	Geotechnical Investigation, identification of design, Construction, and maintenance of levees, and certification of levee system. The levees are vital for the protection of the Michelson Water
179	125	ID_179 Vista Point Project	110	City of Newport Beach	$ 70,000	3	0	0	0	X	0
189	126	ID_189 Citrus Park Improvements	174	City of Tustin	$ 245,000	3	0	0	0	X	Project added 1/30/08
61	136	ID_61 Copper Elimination	65	City of Newport Beach	$ 1,140,000	3	0	X	0	0	Implement boat paint management program to reduce presence of toxic paints in CCA #69, SWQPA #33 and SWQPA #32.
188	137	ID_188 Irvine Boulevard Improvements	50	City of Tustin	$ 250,000	3	0	X	0	0	Project added 1/30/08
79	146	ID_79 Jamboree Road Irrigation System Replacement	11	City of Tustin	$ 170,000	3	0	X	0	0	Design and installation of WICK irrigation system to replace/modify existing system

Central Orange County Integrated Regional and Coastal Water Resource Management Plan:
Proposed Rollout for Key Projects

June 29, 2009

ID	Task Name	Duration	Start	Finish	Predecessors	2004	2006
1	**Legend for the Six Planning Areas**	**0 days**	**Wed 01/01/25**	**Wed 01/01/25**			
2	**1-Northern Foothills**	0 days	Wed 01/01/25	Wed 01/01/25			
3	2-Southern Foothills	0 days	Wed 01/01/25	Wed 01/01/25			
4	3-Central Plain	0 days	Wed 01/01/25	Wed 01/01/25			
5	**4-Urban Bay**	0 days	Wed 01/01/25	Wed 01/01/25			
6	5-Bay/Coastal	0 days	Wed 01/01/25	Wed 01/01/25			
7	6-Coastal Canyons	0 days	Wed 01/01/25	Wed 01/01/25			
8	**7-County-Wide**	0 days	Wed 01/01/25	Wed 01/01/25			
9							
10	**Flood Control**	**2283 days**	**Fri 01/01/10**	**Mon 10/01/18**			
11	**Flood Protection**	**2283 days**	**Fri 01/01/10**	**Mon 10/01/18**			
12	Michelson water reclamation plant flood wall	750 days	Fri 01/01/10	Wed 11/14/12			
13	Peter's Canyon Wash restoration	500 days	Mon 01/03/11	Thu 11/29/12			
14	San Diego Creek flood conveyance improvements S/o Jeffrey	500 days	Mon 01/03/11	Thu 11/29/12			
15	Re-establishment of Agua Cinon Canyon	1000 days	Sun 01/01/12	Thu 10/29/15			
16	Widening of west bank of San Diego Creek	500 days	Tue 01/01/13	Mon 12/01/14			
17	University Avenue flood protection project	350 days	Thu 01/01/15	Wed 05/04/16			
18	**Flood Protection Re-analysis**	500 days	Tue 11/01/16	Mon 10/01/18	12,13,14,15,16,17,2		
19	**Canyon Stabilization**	**1610 days**	**Wed 09/01/10**	**Mon 10/31/16**			
20	Buck Gully	300 days	Wed 09/01/10	Tue 10/25/11			
21	Serrano Creek	1000 days	Mon 01/03/11	Thu 10/30/14			
22	Borrego Creek	1000 days	Tue 01/01/13	Mon 10/31/16			
23							
24	**Water Quality**	**4144 days**	**Mon 01/01/07**	**Wed 11/16/22**			
25	**Sediment Reduction**	**2512 days**	**Sun 01/01/12**	**Mon 08/16/21**			
26	San Diego Creek in-channel sediment traps	350 days	Sun 01/01/12	Thu 05/02/13			
27	Foothill Detention Basins	500 days	Tue 01/01/13	Mon 12/01/14			
28	Borrego/Serrano in-line detention basins	500 days	Tue 01/01/13	Mon 12/01/14			
29	**Upper Bee Canyon restoration**	500 days	Thu 01/01/15	Wed 11/30/16			
30	**Sediment reduction program re-evaluation**	750 days	Tue 10/02/18	Mon 08/16/21	26,27,28,29,18		
31	**Other TMDLs**	**3750 days**	**Fri 07/04/08**	**Wed 11/16/22**			
32	**Fecal Indicator Bacteria BMPs program**	3000 days	Fri 07/04/08	Wed 01/01/20			

Central Orange County Integrated Regional and Coastal Water Resource Management Plan:
Proposed Rollout for Key Projects

June 29, 2009

ID	Task Name	Duration	Start	Finish	Predecessors	2004	2006
33	Nutrient TMDL reduction program	3000 days	Fri 07/04/08	Wed 01/01/20			
34	Newport Bay Copper Reduction project	750 days	Mon 01/03/11	Thu 11/14/13			
35	Santa Ana-Delhi Channel flow diversion to the OCSD groundwater project	1000 days	Tue 01/01/13	Mon 10/31/16			
36	TMDL Program Re-Evaluation	750 days	Thu 01/02/20	Wed 11/16/22	32,33,34,35,40,41,4		
37	**Managing the Emerging Water Quality Issues**	**2045 days**	**Mon 01/01/07**	**Thu 10/30/14**			
38	Natural Treatment Systems (35 sites)	2000 days	Mon 01/01/07	Thu 08/28/14			
39	Cienega Pilot Filtration Plant (Nitrogen/Selenium removal)	785 days	Mon 01/01/07	Fri 01/01/10			
40	Ciegega Filtration Plant - Full Scale	500 days	Mon 01/04/10	Fri 12/02/11	39		
41	Big Canyon Creek pilot selenium removal project	1000 days	Mon 03/01/10	Thu 12/26/13			
42	Buck Gully pilot selenium removal project	1000 days	Mon 03/01/10	Thu 12/26/13			
43	Pesticide training and substitution pilot projects	1000 days	Mon 01/03/11	Thu 10/30/14			
44	**Dry-Weather Runoff Reduction**	**2761 days**	**Fri 01/01/10**	**Thu 07/30/20**			
45	Watershed-wide landscaping/irrigation ordinance	500 days	Fri 01/01/10	Thu 12/01/11			
46	CA friendly landscaping program	1500 days	Fri 01/01/10	Wed 09/30/15			
47	Smartimer Irrigation Controllers	1500 days	Fri 01/01/10	Wed 09/30/15			
48	Low impact development program	1500 days	Fri 01/01/10	Wed 09/30/15			
49	Weather Indexing	100 days	Fri 01/01/10	Thu 05/20/10			
50	Landscaping auditing program	1500 days	Fri 01/01/10	Wed 09/30/15			
51	Watershed-wide dry-weather runoff reduction program assessment	500 days	Fri 08/31/18	Thu 07/30/20	45,46,47,48,49,50,8		
52							
53	Intermediate Flood Management Objectives [Jan. 1, 2025]	0 days	Wed 01/01/25	Wed 01/01/25	18		
54	Intermediate Water Quality Objectives [Jan. 1, 2025]	0 days	Wed 01/01/25	Wed 01/01/25	30,36,51		
55	Stable Hydrologic System [Target: January 1, 2050]	0 days	Wed 01/01/25	Wed 01/01/25	53,54,56,57		
56	Intermediate Water Supply Objectives [Jan. 1, 2025]	0 days	Wed 01/01/25	Wed 01/01/25	75		
57	Intermediate Habitat Objectives [Jan. 1, 2025]	0 days	Wed 01/01/25	Wed 01/01/25	116,105,99		
58							

Central Orange County Integrated Regional and Coastal Water Resource Management Plan: Proposed Rollout for Key Projects

June 29, 2009

ID	Task Name	Duration	Start	Finish	Predecessors	2004	2006
59	**Water Supply**	**4434 days**	**Tue 01/01/08**	**Thu 12/26/24**			
60	**Groundwater protection**	**2306 days**	**Tue 01/01/08**	**Mon 10/31/16**			
61	Great Park desalter groundwater cleanup	1000 days	Tue 01/01/08	Mon 10/31/11			
62	**Tustin groundwater cleanup program**	750 days	Mon 01/03/11	Thu 11/14/13			
63	**Flow diversion to OC Sanitation District Groundwater Replenishment system**	1000 days	Tue 01/01/13	Mon 10/31/16			
64	**New Water Sources, Treatment and Reservoirs**	**3650 days**	**Mon 01/03/11**	**Thu 12/26/24**			
65	**MCAS-Tustin water supply wells**	750 days	Mon 01/03/11	Thu 11/14/13			
66	Rattlesnake reservoir	750 days	Tue 01/01/13	Mon 11/16/15			
67	Rawlings Reservoir	750 days	Thu 01/01/15	Wed 11/15/17			
68	Great Park Lakes for irrigation water storage	750 days	Thu 01/01/15	Wed 11/15/17			
69	Siphon Canyon reservoir	750 days	Thu 01/01/15	Wed 11/15/17			
70	Lake Forest recycled water expansion project	750 days	Thu 01/01/15	Wed 11/15/17			
71	Baker pipeline regional water treatment plant	1000 days	Thu 01/01/15	Wed 10/31/18			
72	San Joaquin Hill reservoir for reclaimed water storage	750 days	Fri 01/01/16	Thu 11/15/18			
73	Peter's Canyon reservoir conversion to recycled water storage	750 days	Fri 01/01/16	Thu 11/15/18			
74	**Recyled water expansion projects**	1250 days	Fri 11/16/18	Thu 08/31/23	73		
75	**Water Supply Master Plan Re-evaluation**	345 days	Fri 09/01/23	Thu 12/26/24	65,66,67,68,69,70,7		
76							
77	**Habitat Acquistion, Restoration and Protection**	**3837 days**	**Wed 01/18/06**	**Wed 09/30/20**			
78	**Open space acquistion and connectivity**	**2305 days**	**Fri 01/01/10**	**Wed 10/31/18**			
79	Buck Gully Resource Management plan	1050 days	Fri 01/01/10	Wed 01/08/14			
80	Agua Chinon wildlife corridor	1000 days	Mon 01/03/11	Thu 10/30/14			
81	Lower SDC tidal barrier removal project	350 days	Sun 01/01/12	Thu 05/02/13			
82	Irvine Wildlife Corridor	1000 days	Tue 01/01/13	Mon 10/31/16			
83	Headwaters of Hicks and Rattlesnake Canyons	1000 days	Thu 01/01/15	Wed 10/31/18			
84	Shady and Bommer Canyons habitat linkage area	1000 days	Thu 01/01/15	Wed 10/31/18			
85	**Restoration and Protection**	**2805 days**	**Fri 01/01/10**	**Wed 09/30/20**			
86	Big Canyon Creek restoration project	350 days	Fri 01/01/10	Thu 05/05/11			
87	Irvine Business Center trail and ecosystem enhancements	750 days	Mon 01/03/11	Thu 11/14/13			
88	San Joaquin Marsh restoration (Phase 1)	750 days	Mon 01/03/11	Thu 11/14/13			
89	Newport Bay wetland and riparian habitat program (11 projects)	2000 days	Mon 01/03/11	Thu 08/30/18			
90	**Watershed-wide noxious invansive plant ID and exclusion**	1000 days	Mon 01/03/11	Thu 10/30/14			

Central Orange County Integrated Regional and Coastal Water Resource Management Plan:
Proposed Rollout for Key Projects
June 29, 2009

ID	Task Name	Duration	Start	Finish	Predecessors	2004	2006
91	Rhine Channel restoration	750 days	Mon 01/03/11	Thu 11/14/13			
92	Bay habitat protection program to address rising ocean levels	750 days	Mon 01/03/11	Thu 11/14/13			
93	**Como Wetlands project**	750 days	Mon 01/03/11	Thu 11/14/13			
94	Great Park multi-use trails	1000 days	Sun 01/01/12	Thu 10/29/15			
95	Great Park native plant landscaping program	1000 days	Sun 01/01/12	Thu 10/29/15			
96	Limestone Canyon and Whiting Ranch Wilderness Park restoration	750 days	Tue 01/01/13	Mon 11/16/15			
97	Toll Road areas habitat restoration and fire suppression program	750 days	Tue 01/01/13	Mon 11/16/15			
98	Bonita Canyon Creek Restoration	750 days	Thu 01/01/15	Wed 11/15/17			
99	**Habitat Protection Needs Re-evaluation**	500 days	Thu 11/01/18	Wed 09/30/20	83,84,88,89,90,91,9		
100	**Coastal Protection**	**2743 days**	**Wed 01/18/06**	**Thu 07/21/16**			
101	ASBS tidepool protection program	900 days	Wed 01/18/06	Tue 06/30/09			
102	ASBS tidepool restoration projects	900 days	Wed 07/01/09	Mon 12/10/12	101		
103	Groin Field sand replenishment projects	350 days	Thu 01/01/09	Wed 05/05/10			
104	ASBS subtidal assessment and impact metric	900 days	Wed 01/18/06	Tue 06/30/09			
105	ASBS Protection Program (Phase 1)	700 days	Fri 11/15/13	Thu 07/21/16	102,104,114		
106	**Community Environmental Planning and Education**	**2784 days**	**Tue 01/02/07**	**Thu 08/31/17**			
107	**High School AP Environmental Science Classes**	1500 days	Tue 01/02/07	Fri 09/28/12			
108	**School tours to Big Canyon and Little Corona**	1500 days	Tue 01/02/07	Fri 09/28/12			
109	**Watershed science training for agency planners**	750 days	Mon 01/04/10	Thu 11/15/12			
110	Bight 08 Coastal Ecology investigations	500 days	Fri 01/02/09	Thu 12/02/10			
111	**UC Cooperative Extension-Herbicide and Pesticide Research**	1500 days	Tue 01/02/07	Fri 09/28/12			
112	**Landscaping Certification Program**	1500 days	Mon 01/04/10	Thu 10/01/15			
113	**UC Cooperative Extension - Drough Tolerant Grass Research**	1500 days	Tue 01/02/07	Fri 09/28/12			
114	**County-Wide Pharmacuetical No Drugs Down Drain program**	750 days	Mon 01/03/11	Thu 11/14/13			
115	**San Diego Creek - Watershed-wide pesticide runoff mitigation program**	750 days	Mon 01/03/11	Thu 11/14/13			
116	**Planning and Education Needs Assessment**	500 days	Fri 10/02/15	Thu 08/31/17	107,108,109,110,11		