

***Toward a Working TMDL: A Watershed Plan for  
The Van Duzen River Basin  
Agreement # 06-149-551-0***

***Watershed Management Plan  
September 2010***



***Van Duzen Watershed Project***

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## ***Executive Summary***

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The Van Duzen River runs through 74 miles of Coastal Mountains, from an elevation of 5,906 feet at its headwaters, to its confluence with the Eel River at an elevation of 62 feet above sea level. The Van Duzen is one of the few remaining free-flowing rivers in California and is included in the state's Wild and Scenic Rivers system. The lower part of the Van Duzen River (VDR) Basin comprises the scope of the Van Duzen Watershed Project or VDWP. The dimensions of the project area extend from the town of Bridgeville, CA upstream, to the point where the Van Duzen River reaches the Eel River near the town of Alton. This area includes the large Yager Creek drainage system, which is a major tributary of the Van Duzen River. The lower basin is approximately 244 square miles in area, which is about 155,990 acres, and 631 square kilometers.

The Van Duzen Watershed Project was developed in response to the progressive impairment of the streams and watersheds within the Lower Van Duzen River Basin, as observed by local residents, fisheries and watershed scientists, and other members of the community at large. Within the last 40 years, a number of reports have addressed watershed conditions of Van Duzen River Basin (Mensch et. al. 1977, Kelsey 1977, Kelsey 1980, US Forest Service 1998b, Pacific Lumber Company 1999, Pacific Watershed Associates 1999, USEPA 1999, Tetra Tech 2002a & 2002b, Humboldt County Resource Conservation District 2002b, NCRWQCB 2005). Some of the information presented in this management plan cites these other documents.

The intricate relationships between geology, vegetation, climate, hydrology, terrestrial and aquatic organisms, and human activities make it very difficult to understand the mechanisms of impairment within the lower basin and why the system behaves as it does. Factors affecting watershed conditions are extremely important because they directly affect the reproduction and survival of native cold water salmonid species including coho and Chinook salmon and Steelhead Trout that are of fundamental importance to life in this area (NCRWQCB 2005). Our project was an effort to extend our knowledge of the Van Duzen River and its tributaries, and to develop and support ways in which this ecosystem can be restored and maintained.

While individual salmonid populations in isolated stream systems may have experienced dramatic fluctuations in numbers (even near extinctions) resulting from natural cataclysmic events throughout geologic time (e.g., geologic uplifting, glaciers, etc.), never has there been such large scale demise of these species (especially coho salmon) across such an extensive area (i.e., nearly the entire Pacific Northwest). The Van Duzen River Basin embodies a diverse array of biotic and abiotic interactions that, before the intervention of European Americans, had remained relatively unchanged for thousands of years.

Water quality, in the Van Duzen River and its tributaries, is especially important as it relates to what is now only historic, but was once a vibrant cold water fishery, more specifically, extraordinary runs of salmon and steelhead. Huge populations of these anadromous fish

undoubtedly have existed throughout the early evolution of this region for over tens of thousands of years. Therefore, the question becomes, why and how is it that we have witnessed the decline of these species to the brink of extinction within a single human lifetime? Most experts on the subject agree that the predominant reason for the loss of these populations was due to the loss of required freshwater habitat, resulting in reduced reproduction and survival of these animals.

It is well acknowledged that the flood of 1955 and especially the flood of 1964 caused catastrophic amounts of sediment to be deposited in the Van Duzen River and its tributaries (Kelsey 1977, Pacific Watershed Associates 1999). The results of this inundation of sediment from those two years can still be seen today in the choked and sediment-filled streams within the lower basin. However, it must be reasonably assumed that storm events of equal or greater magnitude must have occurred throughout the early natural history of the basin, and yet prior to at least 1900, these streams were pristine and salmon populations vibrant. So what was it about the 1964 flood (and to a lesser degree the 1955 flood) that resulted in such devastation, more than had ever occurred during the thousands of years prior to that point? Evidence suggests that removal of the forests and other management-related destabilizing changes to the land in that relatively short period of time (50 to 100 years prior to the flood) had actually set the stage for the catastrophe that followed.

From the late 1800s and into the mid and late 1900s, logging continued and proliferated in the Lower Van Duzen River Basin (as well as in the Eel River Basin as a whole). It is generally accepted that timber harvest practices during that time did not consider the environmental consequences (externalities) of those activities, or entertain the concept of sustainable forestry. Harvest methods were designed for expediency and maximization of profit, and resulted in outcomes that while hard to accept, are not surprising. These outcomes included loss of stream integrity (e.g., stream crossings without proper bridges or culverts), loss of protective ground cover with accompanying accumulation of slash and debris, severe eroding, and ecological damage from indiscriminant construction of roads and skid trails.

Photos of hillsides following early logging operations often depicted sterile and exposed ground, slag heaps, tree stumps, and in general, a barren landscape in areas where ancient forests had once stood. Roads and skid trails scoured the slopes, all heading downhill to the streams, and culverts when used, often failed during rainy winter months. The general lack of concern for, or even an awareness of the externalities of logging, especially clear cutting, undoubtedly could have been predicted, as no information or legislation preventing it existed at the time.

One can argue that the stage was set for the catastrophes that followed the historic floods. All of the bedrock, etc. on the hillsides was primed and ready to move. All that was necessary for the ultimate disaster was a storm event big enough to move it, and that came in 1964. That disaster and others like it have resulted in land and debris slides, huge earth flows, high levels of erosion resulting in the deposition of tons of sediment into the streams, and in general, mass wasting of

hillsides and stream banks of great proportions. However, this was not a natural disaster – it was largely human caused and exacerbated by human activity.

Today, residents as well as visitors to the area who enjoy river ecosystems (e.g., fishing, swimming, etc.) are experiencing the problems created by earlier mistakes. Streams within the Van Duzen watersheds are still choked with the coarse sediment that came down in 1964, and that still comes down every winter season. The situation has not abated. Considerable attention has been given lately to a process called best management practices (BMPs), which are designed to facilitate and ensure that all processes related to human activity (i.e., logging) will be designed to maximize watershed integrity and minimize damaging effects leading to sedimentation problems that have occurred in the past. However, vigilance must be maintained to protect and improve the watersheds along the North Coast, including those of the Van Duzen River Basin.

Through the work of volunteers, Friends of the Van Duzen River (FOVDR) has been monitoring streams of historic significance to salmon since 2001. As an offshoot of FOVDR, the Van Duzen Watershed Project engaged in continued monitoring of water quality by volunteers and cooperation between our research activities and state agencies. Monitoring efforts were intended to record water quality conditions, including levels of suspended sediment and turbidity, and to better understand the relationship between water quality and land use within the basin. This document describes the development and results of the Van Duzen Watershed Project, which was in operation from the winter of 2006 through fall of 2008. Discussions, observations, and recommendations with regard to conditions in the Lower Van Duzen River Basin are also provided.

## ***Forward***

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Water quality problems within the lower VDR basin are in some ways fairly straightforward and are for the most part, the result of unregulated logging practices. The lower basin has not, as yet, experienced heavy urbanization, and does not exhibit severe problems resulting from toxic waste, although some sightings have been reported in the upper basin. With the exception of gravel mining in the lower reaches of the main stem Van Duzen River (which degrades channel integrity), most of the negative side effects of upslope mining, such as mine tailings do not appear to be severe problems. The overriding cause and existing state of decline resulting in the loss of salmon in the lower basin has been the result of high rates of sedimentation from hillsides into the streams, and the secondary effects stemming from that sediment, including elevated stream temperatures, chronic turbidity, decreased oxygen, siltation of spawning areas, and loss of habitat.

A proposal for the Van Duzen Watershed Project was developed to address some of these problems facing the Van Duzen River and its tributaries within the lower basin. This proposal for a water quality monitoring project was developed over the course of one year prior to being

submitted to the Water Quality Control Board. During development of the goals and objectives and the timeline for project accomplishments, a plan for how the project would proceed was established. It was recognized that the project would involve numerous FOVDR and FOER staff, landowners within the lower basin, and other interested individuals and stakeholders.

A Technical Advisory Committee (TAC) was formed and was described in the original proposal to the Water Quality Control Board. The TAC was organized during the initiation of the project and met quarterly to oversee technical planning elements and to oversee proper use of experimental design throughout the monitoring part of the project. Members of the TAC were also available for guidance on the writing of the watershed management plan, and to review and critique the various drafts as they are produced. The TAC was comprised of agency representatives from the CA Department of Fish & Game, non-profit organizations such as Salmon Forever, the professional sciences including Hydrology, Geology, and Engineering, and educational and research institutions including College of the Redwoods and Humboldt State University.

Our project was designed to provide information on the current state of health of the watersheds within the basin, and culminate in a watershed management plan for this area. The following document embodies that plan and provides for the recommendations that have evolved from the study. Chapters within this plan are designed to provide critical information on the state of the watersheds, including turbidity, sediment, temperature, habitat, and other indices of water quality within the lower basin, as well upslope conditions in the surrounding hillsides. Additionally, these chapters provide recommendations for actions that relate to these topics as they are discussed throughout the document.

Chapter 1 is an introduction to the Van Duzen Watershed Project and includes a discussion of the history and background of the Van Duzen River Basin, which as part of the Eel River Hydrobasin, also shares its history with the Eel River. Not surprisingly, more information exists about the history of the Eel River than about the history of the Van Duzen River. This chapter also describes the State of the Watersheds and the Causes and Sources of Sediment problems within the basin.

Chapter 2 is a review of the CA Department of Fish & Game habitat surveys for many of the most important tributaries to the Van Duzen River. These tributaries include Cummings Creek, Hely Creek, Stevens Creek, Grizzly Creek, Lawrence Creek, and the North, Middle, and South Forks of Yager Creek. This chapter also includes the results of habitat typing data collected on the main stem of the Van Duzen River in 2008 for the Van Duzen Watershed Project. The last part of this chapter briefly addresses some of the problems incurred as a result of gravel mining in the lower alluvial plain of the main stem Van Duzen River.

Chapter 3 is a review of upslope conditions within the lower basin, from a planning watershed perspective. The first part of this chapter reviews the effort to improve the 1:24,000 scale road

database, traditionally used by GIS analysts. Based on relatively high resolution aerial photography (1 meter resolution) obtained from the National Agricultural Imagery Program (NAIP), available road data appeared to be markedly in error with respect to road density and often, also road location. Therefore, a major effort was made to improve this database by adding new arcs where for missing roads and moving arc to the correct location for roads that were in error. Calculations of road data before and after editing showed that the editing process increased the accuracy of the data by as much as 64%. Summary statistics are provided on numerous biological and physical conditions on a per watershed basis. Some of these indices include road density, road-streams crossings, and numerous vegetative, physical, and land use indices.

Chapter 4 is a review of upslope conditions within the lower basin, from a rainfall catchment area (or drainage system) perspective. Knowing the location of a monitoring site and the elevation of the associated hillsides, an analyst can program GIS software to define all of the upslope area that contributes water and runoff to that particular point in the stream. Therefore, having spatially recorded the locations of all 11 monitoring sites within the project boundary and having DEM grid data for the entire area, it is possible to define the shapes and sizes of each catchment area associated with each monitoring site. Calculation of these georeferenced catchment areas allowed delineation of numerous kinds of data and the calculation of summary statistics on a per catchment area basis. These data are similar to those analyzed on a per watershed basis, but on a different spatial scheme that, in this case, allows for the calculation of associations and correlations between conditions on the hillsides (upslope) and turbidity in the streams. These relationships add another dimension to the project and offer additional information on the relationship between water quality, slope stability, and human activities in the watersheds.

Chapter 5 is a review of data gaps that are considered to exist with respect water quality and watershed conditions within the Lower Van Duzen River Basin. Some of these data gaps include more data that are needed with regard to total maximum daily load (TMDL), especially that which constitutes naturally occurring backgrounds for the types of indices relating to water quality, including turbidity, sediment, temperature, habitat, fish, and hydrology (flow).

Chapter 6 represents the culmination of efforts to analyze water quality and watershed health within the Lower Van Duzen River Basin, and develop action plans for implementation projects that are based on the information collected and recovered throughout the planning grant project. Organized to provide information as recommended by Water Quality Control Board guidelines, this chapter addresses critical aspects of the Watershed Management Plan, and specifically lists information relating to the key elements as outlined in the Required Elements for Watershed Based Plans per CWA Section 319 of Appendix A. Other than the first element, which is addressed in Chapter 1, these elements are addressed in Chapter 6. These elements are 1) Causes and Sources of Impairment, 2) Expected Load Reductions, 3) Management Measures, 4) Technical and Financial Assistance, 5) Information/Education, 6) Schedule (and Implementation Prioritization), 7) Measurable Milestones, 8) Evaluation of Progress, and 9) Monitoring (of Efficacy of Restoration Efforts).

Chapter 7 addresses, in specific terms, implementation goals and strategies, which was designated as a deliverable in the original planning grant proposal. The topics that are addressed in this chapter include 1) The long term vision for the Van Duzen River Basin, 2) Short term and long term goals, 3) Strategies for future activities in watersheds (land use, planning, regulation, and partnerships), 4) Regulatory strategies, 5) Restoration projects to benefit watersheds, 6) Research and monitoring to fill data gaps, 7) Educational strategies, 8) Impact of the watershed plan on future decision-making processes, and 9) Chances for success.

Chapter 8 is a listing of the References Cited throughout the Watershed Management Plan.

Chapter 9 is a listing of Appendices

## ***Acknowledgments***

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## ***Table of Contents***

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|  |             |
|--|-------------|
| <b>Executive Summary</b> .....   | <b>ii</b>   |
| <b>Forward</b> .....   | <b>iv</b>   |
| <b>Acknowledgments</b> .....   | <b>viii</b> |
| <b>List of Contributors</b> .....  | <b>viii</b> |
| <b>Table of Contents</b> .....   | <b>xi</b>   |
| <b>List of Tables</b> .....  | <b>xvi</b>  |
| <b>List of Figures</b> .....   | <b>xix</b>  |
| <b>Chapter 1: State of the Watersheds - Causes and Sources of Impairment</b> ..... | <b>1-1</b>  |
| Basin History .....  | 1-1         |
| History of the Van Duzen River Fishery .....                                       | 1-2         |
| Fishing as a Limiting Factor .....   | 1-3         |
| Hatchery Supplementation of the Van Duzen River .....                              | 1-5         |
| Status of Van Duzen River Anadromous Fish .....                                    | 1-5         |
| Coho Salmon .....  | 1-5         |
| Chinook Salmon .....   | 1-7         |
| Steelhead .....  | 1-7         |
| Coastal Cutthroat .....  | 1-9         |
| Green Sturgeon .....   | 1-10        |
| Pacific Lamprey .....  | 1-10        |
| Invasive Species .....   | 1-11        |
| Causes and Sources of Impairment (Element 1) .....                                 | 1-13        |
| The Beginning of Logging Culture in the VDR Basin .....                            | 1-13        |
| Geology .....  | 1-16        |
| Climate and Vegetation .....   | 1-20        |
| Impact of Management Practices on Aquatic Systems .....                            | 1-21        |
| Causes and Sources of Impairment .....   | 1-22        |
| Sediment: Natural versus Management-Related .....                                  | 1-22        |
| Problems Related to Sediment .....   | 1-25        |
| Habitat .....  | 1-25        |
| The Riparian Zone .....  | 1-27        |
| Temperature .....  | 1-28        |
| The Channel Migration Zone .....   | 1-28        |
| Priorities of the Van Duzen Watershed Project .....                                | 1-30        |

|  |            |
|--|------------|
| Scope .....  | 1-30       |
| Goals .....  | 1-30       |
| Objectives .....   | 1-32       |
| Anticipated Outcomes (Milestones) .....                        | 1-33       |
| <b>Chapter 2: Stream and Riparian Habitat Management .....</b> | <b>2-1</b> |
| Habitat Typing .....   | 2-1        |
| Cummings Creek .....   | 2-3        |
| Hely Creek .....   | 2-7        |
| Grizzly Creek .....  | 2-9        |
| Stevens Creek .....  | 2-12       |
| Lawrence Creek .....   | 2-14       |
| North Fork Yager Creek .....                                   | 2-16       |
| Middle Fork Yager Creek .....                                  | 2-19       |
| South Fork Yager Creek .....                                   | 2-21       |
| Main Stem Yager Creek .....                                    | 2-22       |
| Main Stem Van Duzen River .....                                | 2-23       |
| Historical Aspects of Stream Conditions .....                  | 2-26       |
| Hydrology and Water Temperature .....                          | 2-26       |
| Aquatic Habitat Diversity .....                                | 2-27       |
| Historic Use by Pacific Salmon .....                           | 2-28       |
| Natural Disturbance Regimes .....                              | 2-29       |
| Pacific Salmon Metapopulation Response to Disturbance .....    | 2-30       |
| History of Human-Caused Disturbance .....                      | 2-30       |
| Trends in the Condition of the Van Duzen River Basin .....     | 2-31       |
| Pacific Salmon Population Status and Trends .....              | 2-32       |
| Coho Salmon .....  | 2-32       |
| Chinook Salmon .....   | 2-34       |
| Steelhead .....  | 2-35       |
| Pathways to Recovery of Pacific Salmon .....                   | 2-36       |
| Invasive Species – The Pike Minnow .....                       | 2-37       |
| Rainfall, Flow, and Water Use .....                            | 2-38       |
| Rainfall Interception and Peak Flows .....                     | 2-38       |
| Water Diversions .....   | 2-39       |
| Erosion from Roads and Compaction .....                        | 2-39       |
| Gravel Mining in the Lower Van Duzen River .....               | 2-39       |

|  |            |
|--|------------|
| Gravel Mining in Our Rivers: One Stop Shop for Destruction .....                                     | 2-40       |
| Observations and Recommendations for Habitat Improvement<br>in the Lower Van Duzen River Basin ..... | 2-46       |
| Flow Rate, Temperature, and Habitat .....  | 2-47       |
| <b>Chapter 3: Upslope Conditions – A Plan for Watersheds .....</b>                                   | <b>3-1</b> |
| Geographic Information Systems (GIS) .....   | 3-1        |
| Road Density .....   | 3-2        |
| Effect of Editing Skid Roads .....   | 3-4        |
| Editing Road Data – Effect on Accuracy .....   | 3-5        |
| Road Density and Planning Watersheds .....   | 3-9        |
| Road-Stream Crossings .....  | 3-11       |
| Topology of the Lower Van Duzen River Basin .....  | 3-15       |
| Vegetation Size Class .....  | 3-15       |
| Landcover / Landuse .....  | 3-27       |
| Canopy Cover .....   | 3-33       |
| Vegetation Change (Change Detection) .....   | 3-40       |
| Timber Harvest .....   | 3-49       |
| Recommendations .....  | 3-55       |
| Objectives for Forest Health and Improvement of Upslope Conditions<br>in the Lower Basin .....       | 3-56       |
| <b>Chapter 4: Upslope Conditions – A Plan for Water Quality .....</b>                                | <b>4-1</b> |
| Catchment Areas .....  | 4-1        |
| Road Density .....   | 4-3        |
| Road-Stream Crossings .....  | 4-7        |
| Topology and Vegetation Size Class .....   | 4-8        |
| Landcover / Landuse .....  | 4-12       |
| Canopy Cover .....   | 4-13       |
| Timber Harvest .....   | 4-14       |
| Geology .....  | 4-19       |
| Factors Affected by Watershed Impairment .....   | 4-22       |

|  |            |
|--|------------|
| Average Turbidity .....  | 4-22       |
| Effects of Road and Road-Stream Crossing Densities .....   | 4-26       |
| Effect of Timber Harvest – Silviculture and Yarding Methods .....  | 4-27       |
| Effects of Geology .....   | 4-29       |
| Multiple Effects .....   | 4-30       |
| Preliminary Recommendations .....  | 4-32       |
| Turbidity-Discharge Function .....   | 4-33       |
| Annual Sediment Load .....   | 4-34       |
| Multiple Effects .....   | 4-36       |
| Analysis Overview .....  | 4-38       |
| Recommendations and Objectives for Cummings Creek – Turbidity and<br>Sediment Sampling .....             | 4-41       |
| Recommendations and Objectives for the Lower Van Duzen River<br>Basin – Turbidity and Sediment .....     | 4-41       |
| Recommendations and Objectives for Water Quality Improvement in the<br>Lower Van Duzen River Basin ..... | 4-42       |
| <b>Chapter 5: Data Gaps .....</b>  | <b>5-1</b> |
| Total Maximum Daily Load (TMDL) .....  | 5-1        |
| In-Stream Water Quality Data .....   | 5-7        |
| Turbidity .....  | 5-7        |
| Sediment .....   | 5-9        |
| Hydrology .....  | 5-12       |
| Meadows and Gullies .....  | 5-14       |
| <b>Chapter 6: Recommendations and Implementation .....</b>   | <b>6-1</b> |
| Naturally Functioning Ecosystems and Beneficial Uses .....   | 6-1        |
| The TMDL .....   | 6-3        |
| Implications of the Forest Practices Act .....   | 6-6        |
| Expected Load Reductions (Element 2) .....   | 6-7        |
| Improving Best Forest Management Practices .....   | 6-9        |
| Management Measures (Element 3) .....  | 6-9        |
| On-the-Ground Measures (Upslope Conditions) .....  | 6-10       |
| In-Stream Measures (Restoration) .....   | 6-10       |
| Potential for Improvement .....  | 6-11       |
| Upper Van Duzen River Watershed Recovery Actions .....   | 6-13       |
| Benefits of Intact Forests .....   | 6-15       |

|  |      |
|--|------|
| Recommendations on HRC Property .....  | 6-15 |
| Conservation Easements or Acquisitions .....   | 6-16 |
| Roads .....  | 6-16 |
| Timber Harvest .....   | 6-17 |
| Instream Channel Enhancement .....   | 6-17 |
| Agricultural and Industrial Activities in the Lower Floodplain .....   | 6-18 |
| Gravel Mining .....  | 6-18 |
| Van Duzen Restoration and the Eel River Basin .....  | 6-19 |
| Monitoring Watershed and Channel Recovery .....  | 6-19 |
| Prudent Risks to Land Management .....   | 6-20 |
| Van Duzen Firesafe Council Strategies .....  | 6-25 |
| Opportunities for Restoration .....  | 6-26 |
| Species Distribution and the Role of Refugia .....   | 6-26 |
| Objectives for Action Plans within the Lower Basin .....   | 6-29 |
| Action 1: Sustainable Forest Management and Policy .....   | 6-29 |
| Action 2: Upland Management .....  | 6-32 |
| Action 3: In-Stream and Riparian Habitat .....   | 6-32 |
| Action 4: Water Quality .....  | 6-34 |
| Action 5: Cost Effectiveness (Budget and Sources) .....  | 6-35 |
| Technical and Financial Assistance (Element 4) .....   | 6-36 |
| Action 6: Information/Education (Element 5) .....  | 6-41 |
| Classroom and Field Events .....   | 6-41 |
| Volunteer Monitoring Program – The Citizens Monitoring Group .....   | 6-43 |
| Community Outreach .....   | 6-43 |
| Internet .....   | 6-43 |
| Action 7: Schedule and Implementation Prioritization (Element 6) .....   | 6-44 |
| Action 8: Measurable Milestones (Element 7) .....  | 6-52 |
| Short Term Milestones (5 – 20 Years) .....   | 6-52 |
| Long Term Milestones (20 – 50 Years) .....   | 6-53 |
| Action 9: Evaluation of Progress (Element 8) .....   | 6-54 |
| Chances for Restoration Success .....  | 6-54 |
| Potential for Recovery .....   | 6-55 |
| <br>   |      |
| Action 10: Monitoring Efficacy of Restoration Efforts (Element 9)<br>(Tracking Objectives and Reaching Milestones) ..... | 6-56 |

|  |            |
|--|------------|
| <b>Chapter 7: Watershed Management Goals and Strategies</b> .....  | <b>7-1</b> |
| Long Term Vision for the Van Duzen River Basin .....   | 7-1        |
| Short Term and Long Term Goals .....   | 7-2        |
| Strategies for Future Activities in Watersheds (Land Use, Planning,<br>Regulation, and Partnerships) .....                               | 7-2        |
| Regulatory Strategies .....  | 7-3        |
| Restoration Projects to Benefit Watersheds .....   | 7-4        |
| Research and Monitoring to Fill Data Gaps .....  | 7-5        |
| Educational Strategies .....   | 7-6        |
| Impact of the Watershed Plan on Future Decision-Making Processes .....   | 7-7        |
| Chances for Success .....  | 7-9        |
| <b>Chapter 8: List of References</b> .....   | <b>8-1</b> |
| <b>Chapter 9: Appendices</b> .....   | <b>9-1</b> |
| Appendix A: Silvicultural methods from 1991 - 2007 - proportion of each watershed in the<br>Lower VDR Basin (CDF) .....                  | 9-1        |
| Appendix B: Categories of silvicultural methods from 1991 – 2007- proportion of catchment<br>area within the Lower VDR Basin (CDF) ..... | 9-4        |

***List of Tables***

---

|  |      |
|--|------|
| Table 1-1 Relationship of sub basins to planning watersheds in the Lower VDR Basin . . . .   | 1-30 |
| Table 2-1. Summary of habitat statistics for all eight streams sampled by CDFG within the<br>Lower Van Duzen River Basin (1991 – 2006), plus statistics from habitat typing on the Main<br>Stem Van Duzen River in 2008 .....                  | 2-5  |
| Table 2-2. Summary of results of sampling for salmonids (Steelhead) for all eight streams<br>sampled by CDFG within the Lower Van Duzen River Basin (1991 – 2006) .....  | 2-6  |
| Table 3-1. Comparison of road data for the Lower VDR Basin, before and after editing. Based<br>on calculating mileage of roads that were either added or moved, editing constituted as much<br>as a 64% increase in accuracy of the data ..... | 3-8  |
| Table 3-2. Summary Statistics of baseline data, presented as a proportion of each of 22 planning<br>watersheds that comprise the Lower Van Duzen River Basin. Horizontal lines separate sub<br>basins .....                                    | 3-12 |



Table 3-3. Categories of tree size (DBH), presented as a proportion of each planning watershed within the Lower Van Duzen River Basin (Imagery obtained from USFS 1999) . . . . . 3-18

Table 3-4. Ratios of larger tree size (DBH) categories to smaller tree size categories, for each planning watershed within the Lower Van Duzen River Basin (original data from U. S. Forest Service 1999) . . . . . 3-21

Table 3-5. Categories of tree size (DBH) within 90 meters of streams at 1:24,000 scale, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin (Imagery obtained from USFS 1999) . . . . . 3-24

Table 3-6. Ratios of larger tree size categories to smaller tree size categories within 90-meter buffers of 24,000 scale streams in each planning watershed within the Lower Van Duzen River Basin (USFS 1999) . . . . . 3-25

Table 3-7. Categories of Landcover/Landuse as a proportion of each planning watershed within the Lower Van Duzen River Basin (Imagery as Grid data obtained from EPA 2001) . . . 3-30

Table 3-8. Percentage Canopy Cover as a proportion of each planning watershed within the Lower Van Duzen River Basin (Imagery as Grid data obtained from EPA 2001) . . . . . 3-36

Table 3-9. Percentage Canopy Cover including clear cut areas from 2001-2007, as a proportion of each planning watershed within the Lower Van Duzen River Basin (EPA 2001) . . . . 3-37

Table 3-10. Change in Percentage Canopy Cover after combining original data with Clear Cuts from 2001-2007, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin . . . . . 3-38

Table 3-11. Percentage Canopy Cover in the Riparian Zone (within 30 meters of streams), including clear cuts from 2001-2007, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin (EPA 2001) . . . . . 3-39

Table 3-12. Categories of vegetation change (detected), presented as a proportion of each planning watershed within the Lower Van Duzen River Basin from 1994 through 1998 (CDF FRAP) . . . . . 3-43

Table 3-13. Categories of vegetation change (detected), presented as a proportion of each planning watershed within the Lower Van Duzen River Basin from 1998 through 2003 (USFS) . . . . . 3-46

Table 3-14. Categories of vegetation change (detected) as a proportion of each planning watershed within the Lower Van Duzen River Basin from 2003 through 2007 (US Forest Service) . . . . . 3-48

Table 3-15. Categories of the eight most used silvicultural methods, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin from 1991 through 2007 (CDF) . . . . . 3-51

Table 3-16. Categories of yarding methods, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin from 1991 - 2007 (CDF) . . . . . 3-54

|  |      |
|--|------|
| Table 4-1. Summary Statistics of baseline data for catchment areas that correspond to the 11 monitoring sites within the Lower Van Duzen River Basin turbidity monitoring project . . . . .  | 4-5  |
| Table 4-2. Categories of tree size (DBH), presented as a proportion of each catchment area within the Lower Van Duzen River Basin (Imagery obtained from USFS 1999) . . . . .  | 4-9  |
| Table 4-3. Categories of tree size (DBH) within 90 meters of streams at 1:24,000 scale, presented as a proportion of each catchment area within the Lower Van Duzen River Basin (Imagery obtained from USFS 1999) . . . . .                                    | 4-11 |
| Table 4-4. Categories of Landcover/Landuse, presented as a proportion of each catchment area within the Lower Van Duzen River Basin (Imagery as Grid data from EPA 2001) . . . . .   | 4-12 |
| Table 4-5. Percentage Canopy Cover, presented as a proportion of each catchment area within the Lower Van Duzen River Basin (Imagery as Grid data obtained from EPA 2001) . . . .  | 4-14 |
| Table 4-6. Categories of the nine most used silvicultural methods, presented as a proportion of each catchment area within the Lower Van Duzen River Basin from 1991-2007 (California Department of Forestry) . . . . .  | 4-15 |
| Table 4-7. Categories of yarding methods, presented as a proportion of each catchment area within the Lower Van Duzen River Basin from 1991-2007 (California Department of Forestry) . . . . .   | 4-17 |
| Table 4-8. Categories of geologic formations, presented as proportions of each catchment area within the Lower Van Duzen River Basin (Irwin 1997) . . . . .  | 4-20 |
| Table 4-9. Summary statistics on water quality indices for 11 monitoring sites within the Lower Van Duzen River Basin . . . . .  | 4-25 |
| Table 4-10. Results of simple linear regression of seven separate independent variables on Average Turbidity (NTU) at nine monitoring sites within the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . .                             | 4-27 |
| Table 4-11. Results of simple linear regression of seven separate independent variables on Average Annual Sediment Loading (tons/sq. mi./year) at nine monitoring sites within the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . . | 4-35 |
| Table 5-1. Types of sampling data and how they relate to data gaps - information that could be collected as indices of water quality in the Lower Van Duzen River Basin . . . . .  | 5-6  |
| Table 6-1. Estimates of potential load reductions and/or improvements for key parameters of water quality and habitat in the Lower Van Duzen River Basin . . . . .   | 6-8  |
| Table 6-2. Recommended targets for watershed conditions . . . . .  | 6-21 |
| Table 6-3. Recommended TMDL Implementation Trend Monitoring Methods and Locations . . . . .  | 6-23 |

|   |      |
|---|------|
| Table 6-4. Streams within the Van Duzen Watershed Project area of highest priority for Action Plans, based on potential for reduction of sediment delivery . . . . .                        | 6-29 |
| Table 6-5. Draft Budget for Implementation of Recommended Actions over a ten-year period . . . . .  | 6-36 |
| Table 6-6. List of Funding Sources for Watershed and Water Quality Programs throughout California and the U.S. (Gold Ridge RCD 2010) . . . . .  | 6-37 |
| Table 6-7. Streams within the Van Duzen Watershed Project area of highest priority for Action Plans, based on potential for habitat restoration, water quality, and accessibility . . . . . | 6-57 |

**List of Figures**

---

|   |      |
|---|------|
| Figure 1-1. Horse seine catch on the Eel River prior to 1880 . . . . .  | 1-4  |
| Figure 1-2. Summer steelhead in the Middle Fork Eel River. 1988 . . . . .   | 1-8  |
| Figure 1-3. Adult cutthroat trout . . . . .   | 1-10 |
| Figure 1-4. Green sturgeon can attain a length of greater than six feet and weight of over 500 pounds . . . . .   | 1-11 |
| Figure 1-5. Juvenile northern pikeminnow can be distinguished by the strong, purple lateral line midway down the fish’s sides . . . . .   | 1-12 |
| Figure 1-6. Yager Creek electrofishing survey results from 1991 CDFG habitat typing survey. Dominance of warm water adapted California roach shows advanced habitat degradation . . . . .   | 1-12 |
| Figure 1-7. Earthflow along the mainstem of the Van Duzen River during Summer of 2007 . . . . .   | 1-19 |
| Figure 1-8. Widening of the Van Duzen River channel, aggradation, and areas of bank failure in the lower basin alluvial flood plain at the mouth of Yager Creek and just upstream from intersection with the Eel River . . . . .                                    | 1-19 |
| Figure 1-9. Map of the alluvial plain of the lower basin, where the Van Duzen River merges with the Eel River near the town of Alton, CA. Clearly evident is the large aggradation of sediment represented as sandbar in the channel migration zone (CMZ) . . . . . | 1-20 |
| Figure 1-10. Map of the Van Duzen River Basin to the Eel River Basin, which is larger than the Van Duzen Watershed Project area by about 10:1 . . . . .   | 1-23 |
| Figure 1-11. Grizzly Creek in the summer of 2006, near the where it merges with the Van Duzen River. Note high degree of aggradation, and that the stream is nearly dry . . . . .   | 1-26 |
| Figure 1-12. Lower Yager Creek in the summer of 2007. Note the high degree of aggradation and that the stream is nearly dry . . . . .   | 1-26 |

|  |      |
|--|------|
| Figure 2-1. Three reaches sampled for habitat type in Cummings Creek (CDFG 2006) . . . . .   | 2-3  |
| Figure 2-2. Three reaches sampled for habitat type on Hely Creek (CDFG 2006) . . . . .   | 2-7  |
| Figure 2-3. Three reaches sampled for habitat type on Grizzly Creek (CDFG 2006) . . . . .  | 2-10 |
| Figure 2-4. Three reaches sampled for habitat type on Stevens Creek (CDFG 2006) . . . . .  | 2-12 |
| Figure 2-5. Three reaches sampled for habitat type on Lawrence Creek (CDFG 2006) . . . . .   | 2-14 |
| Figure 2-6. Seven reaches sampled for habitat on NF Yager Creek (CDFG 2003) . . . . .  | 2-16 |
| Figure 2-7. Three reaches sampled for habitat type on MF Yager Creek (CDFG 1991) . . . . .   | 2-19 |
| Figure 2-8. Three reaches sampled for habitat type on SF Yager Creek (CDFG1991) . . . . .  | 2-21 |
| Figure 2-9. Three reaches sampled for habitat type on the Main Stem Van Duzen River (VDWP<br>2007) . . . . .   | 2-23 |
| Figure 2-10. Stream orders in the Lower Van Duzen River Basin . . . . .  | 2-24 |
| Figure 2-11. Results of recording habitat characteristics on the Main Stem Van Duzen River in<br>late summer 2007 . . . . .                                | 2-25 |
| Figure 2-12. Results of recording habitat and embeddedness characteristics on the Main Stem<br>Van Duzen River in late summer 2007 . . . . .               | 2-26 |
| Figure 2-13. Coho salmon intrinsic potential (IP) map with higher values (> 0.66) indicating<br>areas most likely with the greatest historic use . . . . . | 2-29 |
| Figure 2-14. Habitat typing survey data from 2006 . . . . .  | 2-33 |
| Figure 2-15. Habitat typing survey data from the 1990s and 2006 . . . . .  | 2-33 |
| Figure 2-16. Carcass survey results by tributary for coho salmon . . . . .   | 2-34 |
| Figure 2-17. Eel River survey fall Chinook live fish counts by stream from 2002-2008 . . . . .   | 2-35 |
| Figure 2-18. Electrofishing survey results associated with CDFG habitat typing conducted in<br>2006 . . . . .  | 2-36 |
| Figure 2-19. Van Duzen River downstream of Yager Creek shows very poor channel<br>conditions for cold water fisheries . . . . .                            | 2-40 |
| Figure 2-20. Bulldozing gravel along the Lower Van Duzen River . . . . .   | 2-41 |
| Figure 2-21. Loss of channel integrity and depth in the Lower Van Duzen River, exacerbated by<br>gravel mining . . . . .                                   | 2-42 |
| Figure 2-22. Large trucks used to haul away gravel from the river bar in the Lower Van Duzen<br>alluvial plain . . . . .                                   | 2-43 |
| Figure 2-23. Roads constructed along the river Channel Migration Zone for the purpose of<br>transporting extracted gravel from the river bar . . . . .     | 2-44 |

|  |      |
|--|------|
| Figure 2-24. Evidence of gravel mining down to the river’s edge in the Lower Van Duzen River Basin . . . . .   | 2-45 |
| Figure 2-25. Temporary bridge constructed to allow additional mining and gravel extraction from both sides of the river . . . . .  | 2-45 |
| Figure 3-1. Map of names and locations of 22 planning watersheds within the Lower Van Duzen River Basin . . . . .  | 3-2  |
| Figure 3-2. Effect of digitizing skid roads on overall accuracy of the road database . . . . .   | 3-4  |
| Figure 3-3. Original road data overlaid onto an aerial photograph (NAIP) of a portion of Blanton Creek & SF Yager Creek watersheds . . . . .                                     | 3-5  |
| Figure 3-4. Edited road data overlaid onto a color aerial photograph (NAIP) depicting same area as shown in Figure 3-3 . . . . .   | 3-6  |
| Figure 3-5. Changes in average road density as a result of editing 1:24k road data pertaining to each of 22 planning watersheds within the Lower Van Duzen River Basin . . . . . | 3-7  |
| Figure 3-6. Flagging road arcs to designate old and newly digitized road data . . . . .  | 3-7  |
| Figure 3-7. Remaining arcs representing roads that were either added or moved, after removing all other arcs that were not changed as a result of editing road data . . . . .    | 3-8  |
| Figure 3-8. Road and road-stream crossing densities calculated for each of 22 planning watersheds within the Lower Van Duzen River Basin . . . . .                               | 3-9  |
| Figure 3-9. Criteria for ecological and hydraulic risk from road densities developed for the Interior Columbia River Basin by the US Forest Service (1996) . . . . .             | 3-10 |
| Figure 3-10. Ranking of Planning Watersheds within the Lower Van Duzen River Basin using road density per square mile of watershed . . . . .                                     | 3-10 |
| Figure 3-11. Locations of road-stream crossings in the Lower Van Duzen River Basin, calculated using 1:24,000 road and stream data . . . . .                                     | 3-14 |
| Figure 3-12. Ranking of Planning Watersheds within the Lower Van Duzen River Basin, based on number of road-stream crossings per stream mile . . . . .                           | 3-14 |
| Figure 3-13. Vegetation represented as tree size (DBH) categories in the Lower Van Duzen River Basin . . . . .   | 3-17 |
| Figure 3-14. Spatial extent or range of the Coastal Redwood Ecological Zone within the Lower Van Duzen River Basin . . . . .   | 3-20 |
| Figure 3-15. Vegetation as tree size (DBH) within 90 meters of streams (1:24,000 scale) in the Lower Van Duzen River Basin . . . . .   | 3-23 |
| Figure 3-16. Landcover/Landuse in the Lower Van Duzen River Basin . . . . .  | 3-29 |
| Figure 3-17. Elevation derived from 10-meter resolution DEM data for the Lower Van Duzen River Basin . . . . .   | 3-31 |

|   |      |
|---|------|
| Figure 3-18. Geology (geologic formations) identified within the Lower Van Duzen River Basin .....  | 3-32 |
| Figure 3-19. Percentage of canopy cover for vegetation within the Lower Van Duzen River Basin .....   | 3-34 |
| Figure 3-20. Change scene detection of forest canopy within the Lower Van Duzen River Basin, from 1994 through 1998 .....   | 3-42 |
| Figure 3-21. Change scene detection of forest canopy within the Lower Van Duzen River Basin, from 1998 through 2003 .....   | 3-45 |
| Figure 3-22. Change scene detection of forest canopy within the Lower Van Duzen River Basin, from 2003 through 2007 .....   | 3-47 |
| Figure 3-23. Timber Harvest Plans filed with CDF for the Lower Van Duzen River Basin from 1991 through 2007 .....   | 3-50 |
| Figure 3-24. Comparison of Clear Cuts versus Selection silvicultural methods, presented as a proportion of each planning watershed within the Lower Van Duzen River Basin from 1991 through 2007 .....        | 3-52 |
| Figure 3-25. Comparison of Air/Cable versus Tractor yarding methods, presented as a proportion of each planning watershed within the Lower VDR Basin, 1991 through 2007 .....                                 | 3-55 |
| Figure 4-1. Examples of catchment area shapes and sizes derived using GIS software .....  | 4-2  |
| Figure 4-2. Catchment areas associated with the 11 monitoring sites in the Lower Van Duzen River Basin .....  | 4-2  |
| Figure 4-3. Road and road-stream crossing densities calculated for the 11 monitoring site catchment areas within the Lower Van Duzen River Basin .....  | 4-4  |
| Figure 4-4. Ranking of road densities in 11 catchment areas that correspond to the monitoring sites used in the Van Duzen Watershed Project with the lower basin .....  | 4-6  |
| Figure 4-5. Ranking of road-stream crossing densities in 11 catchment areas that correspond to the monitoring sites used in the Van Duzen Watershed Project with the lower basin .....                        | 4-8  |
| Figure 4-6. Tree sizes grouped into large versus small categories, presented as a proportion of each catchment area within the Lower Van Duzen River Basin in 1999 .....                                      | 4-10 |
| Figure 4-7. Comparison of Clear Cuts versus Selection silvicultural methods of timber harvest, presented as a proportion of each catchment area within the Lower Van Duzen River Basin from 1991 – 2007 ..... | 4-17 |
| Figure 4-8. Comparison of Air/Cable versus Tractor Yarding methods, presented as a proportion of each catchment area within the Lower Van Duzen River Basin from 1991-2007 .....                              | 4-18 |

|   |      |
|---|------|
| Figure 4-9. Comparison of two geologic formations, presented as proportions of each catchment area within the Lower Van Duzen River Basin . . . . .   | 4-21 |
| Figure 4-10. Grab samples for Yager Creek during HY08, showing average turbidity . . . . .  | 4-23 |
| Figure 4-11. Comparison of average turbidity between HY07 and HY08 among 10 monitoring sites within the Lower Van Duzen River Basin . . . . .   | 4-24 |
| Figure 4-12. Potential effect of proportion timber harvest (all methods) on average turbidity in the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . .  | 4-28 |
| Figure 4-13. Potential effect of proportion clear cutting on average turbidity in the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . .   | 4-29 |
| Figure 4-14. Potential effect of proportion of Wildcat Group formation on average turbidity in the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . .  | 4-30 |
| Figure 4-15. Potential effect of proportion of Timber Harvest on sediment loading in the Lower Van Duzen River Basin for the combined years of HY07 & HY08 . . . . .  | 4-36 |
| Figure 5-1. Turbidity threshold sampling station located on Cummings Creek, which was sampled for chronic turbidity and sediment during HY07 and HY08 . . . . .   | 5-9  |
| Figure 5-2. Clear cutting in the Lawrence Creek sub basin during the Maxaam era from 1985 through 2008 . . . . .  | 5-10 |
| Figure 5-3. Example of a road constructed directly into the stream – a severe by-product of unregulated logging that should be banned . . . . .   | 5-11 |
| Figure 5-4. Slow moving and stagnant water observed in the main stem Van Duzen River, typically observed during summer months . . . . .   | 5-13 |
| Figure 5-5. Grazing land and hillslopes typical of the upper (northeastern) part of the Yager Creek sub basin, showing soil creep and movement of land mass over time . . . . .   | 5-14 |
| Figure 5-6. Gullying as a result of exposure to rainfall and runoff, causing loss of topsoil and excessive sediment delivery to streams . . . . .   | 5-14 |
| Figure 6-1. Yager Creek sub basin, showing the convergence of Yager Creek and Lawrence Creek . . . . .  | 6-24 |
| Figure 6-2. Percentage gradient through 8% for all 1:24,000 scale streams within the Lower Van Duzen River Basin . . . . .  | 6-27 |
| Figure 6-3. Distribution of salmonid species within the Lower Van Duzen River Basin . . . . .   | 6-28 |
| Figure 6-4. Planting willows to support riparian habitat along the Van Duzen River about a mile downstream from Hely Creek outlet during late summer of 2009 . . . . .  | 6-41 |
| Figure 6-5. Members of the Van Duzen Watershed Project demonstrate the use of water quality sampling and measuring equipment such as the Hach 2100P Turbidimeter to students at the AmeriCorps Field Day at Pamplin Grove, May 2008 . . . . . | 6-42 |