POLITICAL ECOLOGY OF THE 2001 WATER CRISIS IN THE UPPER KLAMATH BASIN: A CASE STUDY IN NARRATIVE POLICY ANALYSIS

by

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Title: POLITICAL ECOLOGY OF THE 2001 WATER CRISIS IN THE UPPER KLAMATH BASIN: A CASE STUDY IN NARRATIVE POLICY ANALYSIS

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Narrative Policy Analysis, as developed by Emery Roe, is a method for analyzing issues of high uncertainty, complexity, and polarization by articulating and comparing the dominant narratives regarding a specific policy issue. This paper uses Narrative Policy Analysis as a framework to study the water crisis that occurred in Oregon's Upper Klamath Basin in 2001. The analysis begins by describing the dominant opposing policy narratives: the story told by pro-irrigation groups and individuals, and the counterstory told by the Klamath Tribes, environmental organizations, and down-stream commercial fishermen. The paper then describes two of the key "nonstories" that played a major role in the controversy: water rights and science. These stories and nonstories are then compared and analyzed to create a new "metanarrative" that highlights the primary sources of conflict and uncertainty surrounding the controversy. Finally, the metanarrative is critiqued for its applicability to future policy making.

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Special thanks to the residents of the Klamath Basin who have shared their perspectives with me; especially Jack O'Connor, Jaqui and David Krizo, Don Gentry, and Bud Ullman. With such varied perspectives, I cannot expect that each of you will agree with my analysis and conclusions. But I hope that I have accurately conveyed some of your views and concerns. You each have my utmost respect for the hard work you do in confronting the ongoing challenges in the Klamath Basin.

My deepest gratitude goes to my family for supporting me along this path. Thank you for your unending love and patience. I am forever grateful for the many sacrifices you have made to allow me to have this opportunity to explore and grow.

Lastly, with a complex environmental controversy, such as this case study of the Klamath Basin, any findings are tentative and are drawn from incomplete information. Future research may produce different conclusions. I take responsibility for any errors that may be found within this thesis.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

In April 2001, the Bureau of Reclamation made a decision to curtail irrigation water to approximately 1,200 farms in the Klamath Irrigation Project in order to protect three species of fish with protected status under the Endangered Species Act. Tensions in the Klamath Basin reached a crisis situation in the months that followed as farmers' fields went dry and frustrated citizens turned to civil disobedience in attempts to obtain irrigation water. Protesters forcibly opened the headgates to the A-Canal, the main irrigation canal for the Klamath Project, four times before armed federal marshals were called in to protect the headgates.

The crisis at the headgates of the A-Canal drew national media coverage that repeatedly oversimplified the causes for the crisis in terms of polarized arguments of "fish versus farmers," "farmers versus scientists," "farmers versus Indians," or "farmers versus government." These polarized arguments often belied the complexity and interconnectivity of the changes in the Klamath Basin that led to the crisis situation. The oversimplification of the issues also suggested policy decisions that would not have addressed the underlying issues that perpetuate the controversy in the region. This thesis will attempt to provide a more comprehensive understanding of the controversy by way of a narrative policy analysis of the prevailing stakeholder perspectives on the crisis. I will analyze the key policy narratives of the controversy to answer the question: What were the physical, political, and socio-cultural changes in the Upper Klamath Basin that led to the crisis situation at the headgates of the A-Canal in 2001?

Framework

I will use "Narrative Policy Analysis" as my framework for this thesis. This is a method for policy analysis developed by Emery Roe which is articulated in his 1996 book, *Narrative Policy Analysis: Theory and Practice*. This method utilizes comparisons of policy narratives to analyze controversies that are wrought with uncertainty, complexity, and polarization. I believe that this method is particularly well-suited for a case study of the Upper Klamath Basin due to the conflicting nature of several well-developed policy narratives endorsed by opposing stakeholders in the controversy.

The Narrative Policy Analysis approach contains four steps. The first step is to identify the "primary narrative," the story that dominates the issue in question. The second step is to identify the "counterstories" and "nonstories". As one might presume, counterstories run counter to the primary narrative. Nonstories are narrative fragments that do not fit the typical definition of a story because they lack a clear beginning, middle, or end. The third step is to generate a "metanarrative" by combining, comparing, and contrasting the existing stories/nonstories. This metanarrative is intended to recast the existing narratives in a new way that may be more amenable to decision making and policymaking. The final step is to critique the metanarrative for its usefulness to future policymaking.

For this case study, I will treat the pro-irrigation perspective as the primary narrative, and the opposing view as the counterstory or "counter narrative." I will also discuss two "nonstories" of water rights and science. I will then generate a metanarrative and finally a critique of the metanarrative. I will not attempt to prove or disprove each of the stories as I move through the chapters because the narrative approach is intended to

accept the uncertainty, complexity, and polarization of the controversy and to treat each argument as an equally valid element of a social-political dynamic. Only when I reach the metanarrative will I begin to analyze the problems and the causal relationships expressed by each story. This analysis is not designed to resolve the tensions from the water crisis in 2001. Rather, it is designed to help the reader understand the controversy more thoroughly and to offer possible insights for future policymaking.

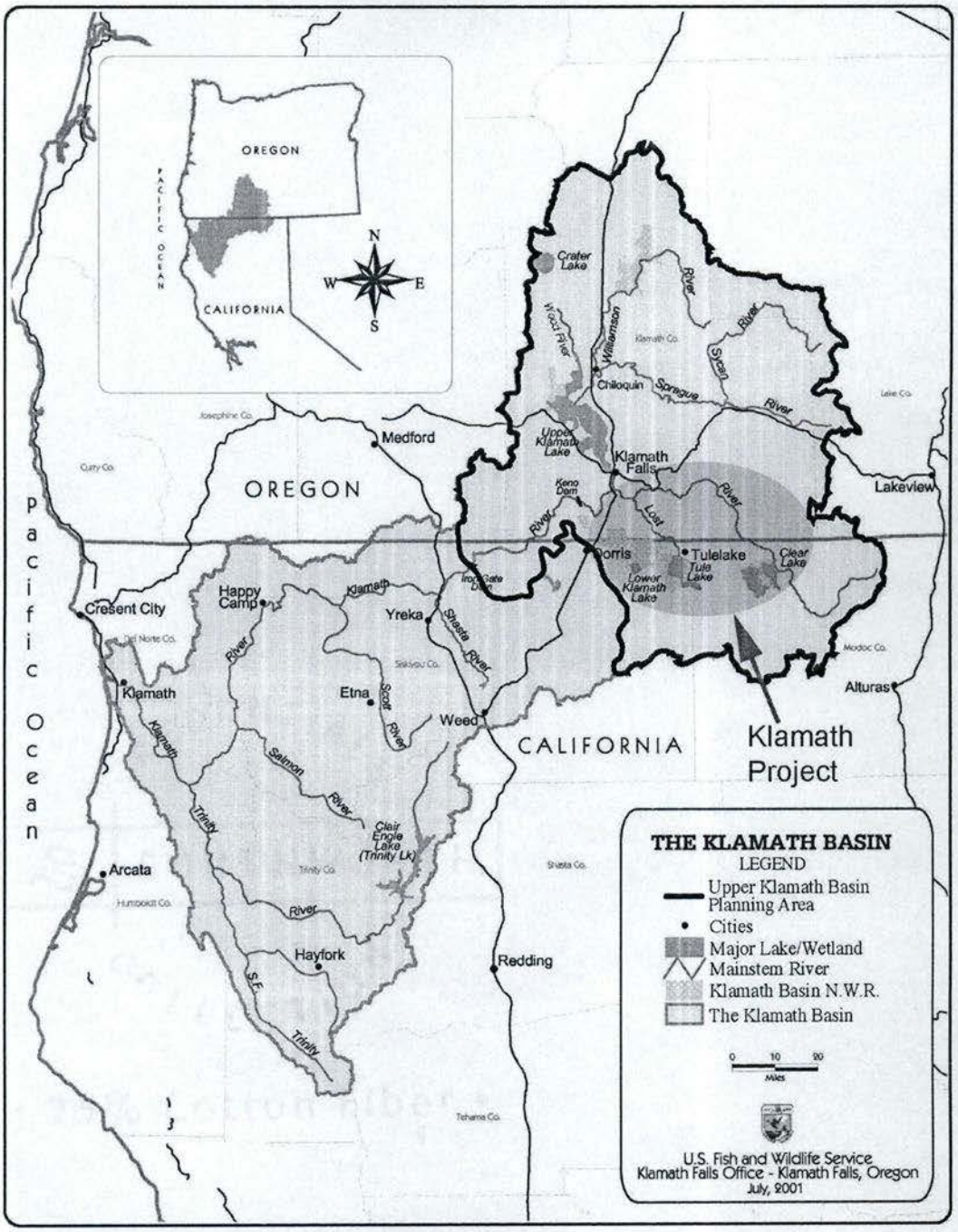
Study Area

The Klamath Basin is approximately 15,600 square miles (Giannico and Heider 2003). It extends from the Cascade Mountains near Crater Lake in Oregon to the mouth of the Klamath River on the California coast. For the purposes of this study, I will focus primarily on the upper basin, defined here as the area upstream of Iron Gate Dam in California (see Figure 1). The upper basin is approximately 5,700 square miles, (Lewis et al. 1994) and it contains the largest lake in Oregon, Upper Klamath Lake, as well as the second oldest large-scale reclamation project in the United States, the Klamath Project.

Although the water issues of the upper and lower basins are inextricably intertwined, I am separating them here for the sake of brevity and because the sub-basins contain major topographic, climactic, and cultural differences. The upper basin contains relatively little topographic relief compared to the lower basin. As a result of this topography, the upper basin contains several large lakes, vast marshes, and slow, meandering rivers; while the lower basin contains mountains, steep canyons, and fast-moving rivers. The two sub-basins also have very different climates. The upper basin sits primarily in the rain shadow of the southern Cascades, and is considerably drier than

the lower basin. The upper basin provides only 12% of the total annual runoff in the watershed (Lewis et al. 2004), whereas the lower basin receives substantial precipitation in the mountains of the Northern Sierras.

The two sub-basins are also culturally distinct. The upper basin was historically populated by native tribes that derived their livelihoods from the lakes and marshes. These tribes included: the Klamaths, the Modocs, and the Yahooskin band of the Snake Indians (Stern 1965). The lower basin was historically populated by native tribes that derived their livelihoods from the rivers. These tribes included: the Yurok, Hupa, and Karuk tribes (American Indian Technical Services 1982). Today, the upper basin is populated predominately by Euro-Americans in the farming towns in the Klamath Project and the city of Klamath Falls. The lower basin contains small reservations for the Yurok, Hupa, and Karuk tribes. However, the majority of the lower sub-basin is sparsely populated due to the predominance of wilderness and National Forest lands.



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Jones & Stokes

Figure 1: **Map of the Study Area** (Stern and Staunton 2002)

Background

The Klamath Project sits on the Oregon-California border and crosses into three counties: Klamath County in Oregon, and Modoc and Siskiyou Counties in California. Authorized as a reclamation project in 1905, the project was envisioned to be the "cheapest and greatest enterprise by the government in the west." It was expected to cost $4.4 million and irrigate 320,000 acres (History of Central Oregon 1905, 973).

The project began providing irrigation water in 1907, and it took approximately 50 years to build into its modern form. The project is now a hydraulic labyrinth containing 7 dams, 45 pumping stations, 185 miles of canals, 516 miles of irrigation ditches, and 728 miles of drains (LaDuke 2002, OWRD 1999). The Klamath Project irrigates approximately 130,000 acres in Oregon and 70,000 acres in California (Marbut 2003). The project contains approximately 1,400 farms and produces annual crops valued at over $109 million (Weber and Sorte 2003).

Prior to the Klamath Project, most of the farmland that is now the Klamath Project was covered by two large lakes: Lower Klamath Lake, which received its water from the overflow of the Klamath River, and Tule Lake, which received its water from Clear Lake via the Lost River. Before reclamation, Lower Klamath Lake was often larger than Upper Klamath Lake (Lewis et al. 2004). It fluctuated in size seasonally between 94,000 and 30,000 acres (Lewis et al. 2004). Lower Klamath Lake is now managed to maintain approximately 30,000 acres of open water/marsh habitat (USFWS 2004). Tule Lake was also often larger than Upper Klamath Lake, fluctuating between

50,000 and 110,000 acres (Jarvis 2003). Tule Lake now consists of two sumps totaling approximately 13,000 acres (Lewis et al. 2004). Figure 2 below illustrates the changes to the water surface area in the upper basin due to reclamation.

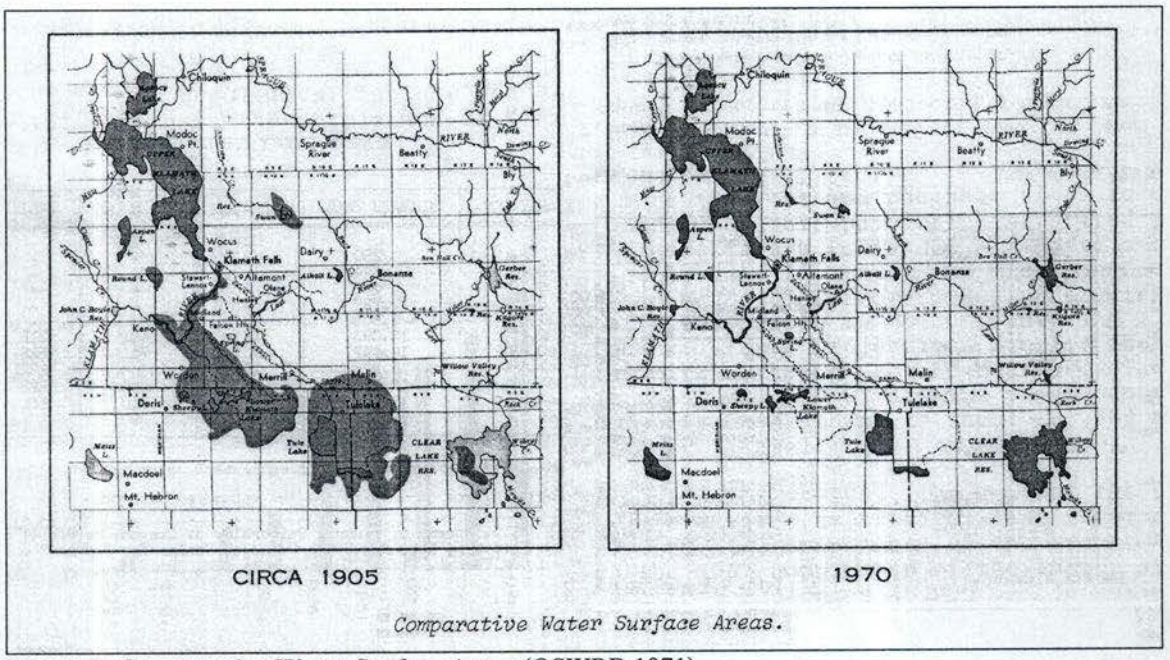


Figure 2: Comparative Water Surface Areas (OSWRB 1971)

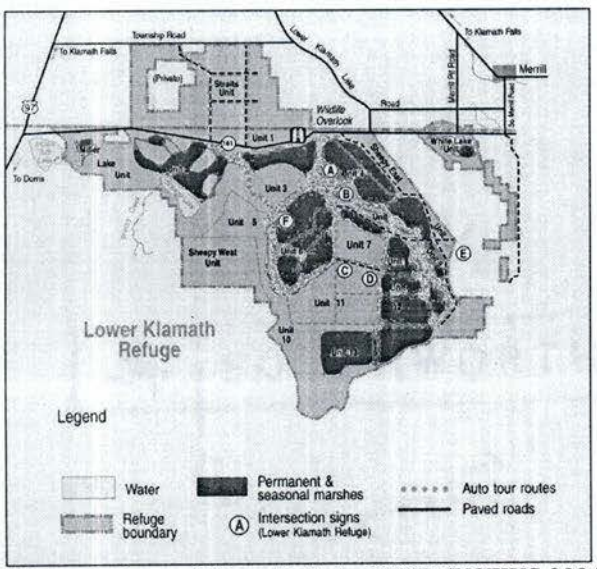


Figure 3: Lower Klamath Lake NWR (USFWS 2004)

Marsh acreage in the Lower Klamath Lake National Wildlife Refuge has increased since the 1970 map shown in Figure 2. A current map of the marsh areas is shown in Figure 3 to the left.

The Klamath Project receives most of its water from Upper Klamath Lake. This lake is one of the largest lakes in the west, fluctuating between 60,000-90,000 acres; but it is a very shallow lake, averaging only 7 ft deep in summer (Carlson et al. 2003). Prior to the Klamath Project, there was a natural basalt sill (commonly called a reef) at the outlet to the lake that held back the water in the lake, and lake levels historically fluctuated approximately three feet (Lewis et al. 2004). This sill was removed during the construction of the Link River Dam. With the dam, the lake levels can fluctuate 6 feet, providing additional water resources for irrigation or other downstream uses. The Link River Dam provides active storage of 525,000 ac-ft (USACE 1979)

The following maps show the irrigated areas surrounding the Klamath Project (Figure 4) and a schematic of the flow of water around the Project area (Figure 5).

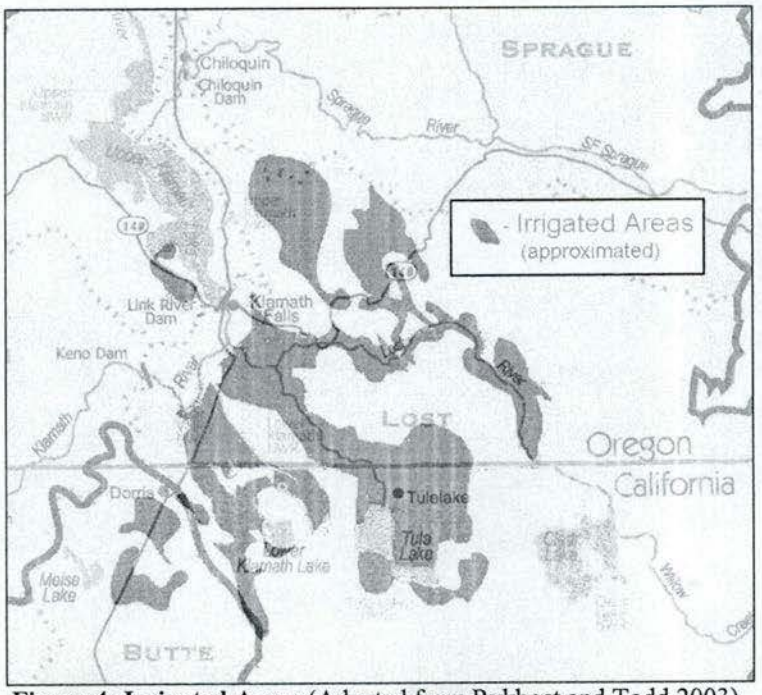


Figure 4: Irrigated Areas (Adapted from Rykbost and Todd 2003)

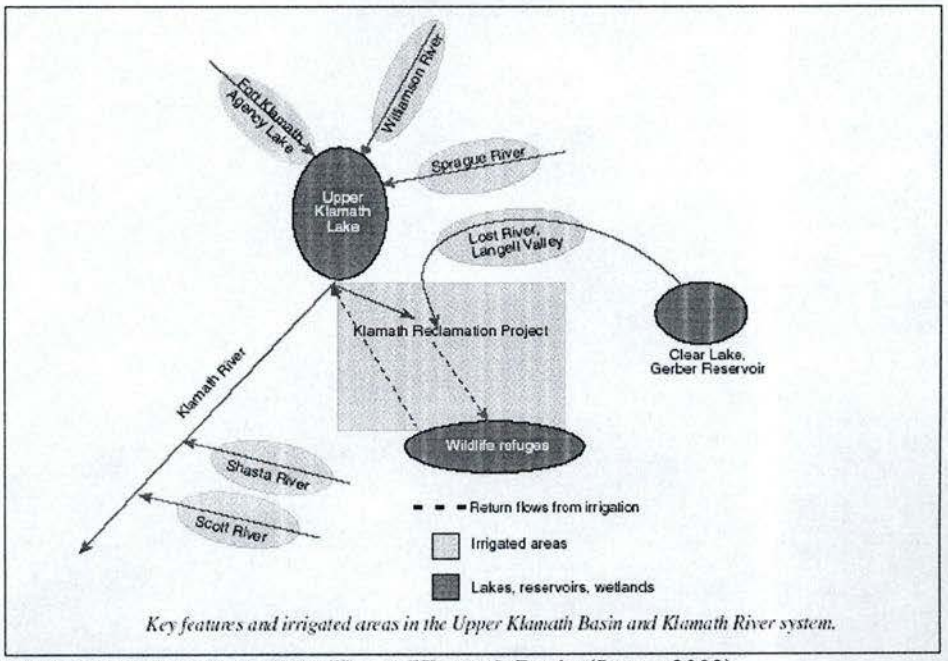


Figure 5: Water Flow in the Upper Klamath Basin (Jaeger 2003)

Environmental Controversy

The Klamath Project has generated environmental controversy since its early beginnings. In 1908, President Theodore Roosevelt signed an executive order designating all of Lower Klamath Lake as a "preserve and breeding ground for native birds" (Foster 2000, 154) intending that there would be no settlement within the refuge (Lewis et al. 2004). However, since Congress had already designated the area as a federal reclamation area in 1905, the Bureau of Reclamation proceeded to reclaim Lower Klamath Lake for agriculture despite protests by conservationists that it would ruin the wildlife refuge. The Bureau interpreted the refuge boundaries as permanent water boundaries. Thus, if the water was drained, the refuge could be eliminated. In 1915

President Woodrow Wilson withdrew 15,000 acres from the refuge for homesteading, and in 1917, water was completely cut off from the refuge in order to facilitate reclamation (Foster 2000).

Objections by conservationists continued as the flooded area in the refuge shrank from 84,000 acres to 4,700 acres. In response, President Calvin Coolidge designated the remaining sump at Tule Lake as a wildlife refuge in 1929 to substitute for the loss of the Lower Klamath Refuge. In 1936 President Franklin D. Roosevelt tripled the size of the Tule Lake Refuge to 37,000 acres (Foster 2000). Nonetheless, protests to reflood Lower Klamath Lake continued until 1942 when the lake was partially reflooded using excess water from the Tule Lake sump.

Controversy continued over the next two decades as homesteaders pressured the government to open more land from the refuges for homesteading. The backlash against this movement by conservation organizations and duck hunters became known as the "farmer vs. duck" controversy during the 1950's (Foster 2000). This debate persisted until the passage of the Kuchel Act in 1964 which prohibited further homesteading on refuge land. The controversy continues, however, as environmental groups repeatedly raise objections to lease farming on the refuges. In 2003, environmental groups prompted two congressional representatives to propose a bill to prohibit all farming on the refuges. This bill was unsuccessful, and lease farming continues on approximately 22,000 acres of the refuges.

Environmental controversy has continued on other topics such as the use of pesticides and the types of crops authorized for farming on the refuges. However, the largest controversies in recent years have centered on the protection of three species of

fish with protected status under the Endangered Species Act. In 1988, the U.S. Fish and Wildlife Service (USFWS) listed two species of suckers endemic to the upper basin as endangered species under the Endangered Species Act. These fish were abundant prior to the construction of the Klamath Project, and they were a staple food source for the Klamath Tribes. In 1997, the National Marine Fisheries Service (NMFS) listed wild Coho salmon in the Klamath River system as a threatened species. Environmental groups, downstream fishermen, and native tribes began to blame human alterations to the hydrology of the basin as the primary cause for the decline of these fish species, singling out the Klamath Project as the largest disruption to the hydrologic system.

Edging Toward Crisis

The 1990's was a particularly bad decade for the upper basin. A severe drought in 1992 driven by El Niño weather effects forced the Bureau of Reclamation to restrict irrigation deliveries to parts of the Klamath Project for the first time in history, despite drawing down Clear Lake Reservoir to its lowest recorded level (Blake, Blake, and Kittredge 2000). A similar drought in 1994 again curtailed irrigation deliveries and lowered Upper Klamath Lake to its lowest level in recorded history (Lewis et al. 2004). A series of mass fish kills, stemming from water quality problems in 1995,1996, and 1997, reduced the populations of endangered suckers in Upper Klamath Lake to critical levels, killing an estimated population of more than half of the adult spawners (Lewis et al. 2003).

Environmental organizations stepped up their pressure on the Bureau of Reclamation with a series of lawsuits beginning in the mid-1980's aimed at reducing

irrigation deliveries to the Klamath Project. The government responded to the rising controversies by creating the Klamath Basin Fisheries Restoration Task Force in 1986 and the Hatfield Working Group in 1994 (Blake, Blake, and Kittredge 2000). Although each of these groups achieved success in several restoration projects, neither was able to prevent the crisis in 2001.

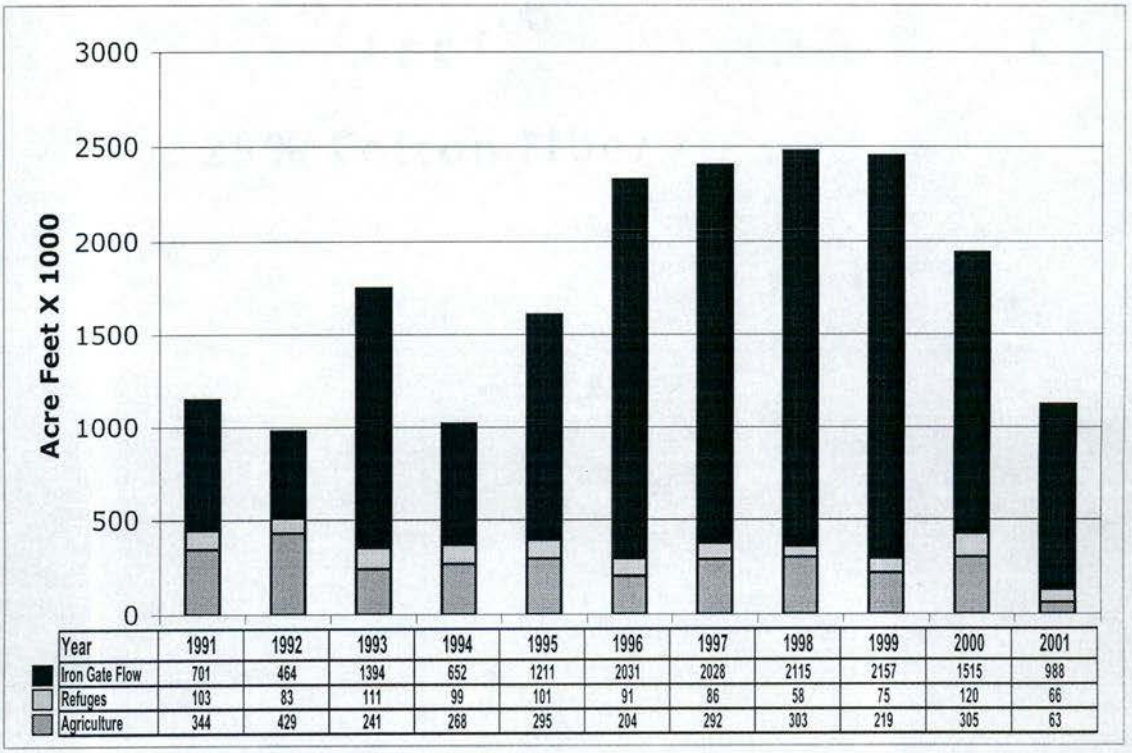
2001 Events

In 2001, the environmental controversy over the Klamath Project kicked into high gear due to the combination of an important court decision, new biological assessments, and another severe drought. On April 3, 2001, the 9th Circuit Court ruled in favor of the Pacific Coast Federation of Fishermen with charges that the Bureau of Reclamation had violated procedures required by the Endangered Species Act. The court issued an injunction disallowing irrigation until these procedures were satisfied. (Klamath Water Users Association 2003). On April 6th, the USFWS issued a new Biological Opinion for endangered suckers that recommended raising the minimum lake level by three feet, and NMFS issued a new Biological Opinion for threatened Coho salmon recommending flows through Iron Gate Dam that were lower than the previous Biological Opinion, but higher than (FERC) minimums. FERC minimums are minimum flow requirements for dams regulated by the Federal Energy Regulatory Commission

In the face of these circumstances, and predictions that the region would experience the worst drought on record, the Bureau of Reclamation was forced to notify irrigators that there would be no water available for irrigation until further notice. Without water from Upper Klamath Lake, 170,000 acres of farmland went dry at the beginning of the irrigation season (Klamath Basin Water Crisis 2004).

Throughout the summer, farmers and their supporters held demonstrations to protest the federal curtailment of irrigation water. The largest protest was the May 7th demonstration by the "Bucket Brigade." 8,000 people gathered for this demonstration, including Congressman Greg Walden and Senator Gordon Smith, in a symbolic action of civil disobedience to pass 50 buckets of water from Upper Klamath Lake into the A-Canal (Range Magazine 2001). Demonstrators engaged in other acts of defiance with four separate attempts to illegally open the headgates to the A-Canal. Ultimately, federal marshals were called in to protect the headgates. The marshals protected the gates for nearly two months until the end of the irrigation season.

Late summer rains allowed the release of 75,000 ac-ft in late July, but this was too little, too late for most of the farms. The Klamath Project received only 22% of average water deliveries in 2001, and the lower wildlife refuges, which receive their water primarily from agricultural runoff, received only 30% of normal deliveries (Hathaway and Welch 2003). The water shortage affected 1,200 farms, approximately 85% of the Klamath Project lands (Hathaway and Welch 2003). Figure 6 shows the dramatic decrease in water allocations for agriculture in 2001. In comparison to the more severe drought years of 1992 and 1994, agriculture received less than a quarter of customary water allocations.



Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Iron Gate Flow	701	464	1394	652	1211	2031	2028	2115	2157	1515	988
Refuges	103	83	111	99	101	91	86	58	75	120	66
Agriculture	344	429	241	268	295	204	292	303	219	305	63

Figure 6: **Klamath Lake Water Allocation for Iron Gate Dam flows, refuges, and agriculture, 1991-2001** (Rykbost and Todd 2003)

Narratives

The environmental controversies in the Upper Klamath Basin produced a high degree of animosity between resource user-groups. Farmers blamed environmental groups and the government. Environmental groups, native tribes, and downstream fishermen blamed the farmers and the government. Conspiracy theories abounded, ranging from corruption in scientific studies to high-level government schemes to seize private land. As the polarization of 2001 intensified, conversation between the user groups degraded to adversarial posturing, and the stories told and retold by the stakeholders became tailored to sway public opinion for their respective positions. These stories became increasingly consistent as they were repeated in the local newspaper and

on the various web pages maintained by the stakeholder groups. This thesis is not intended to prove whether or not the stakeholders believe the stories being told, or whether or not the stories are being used as propaganda. Further research may be warranted to answer these questions, but that is beyond the scope of this study. Instead, this thesis will focus on articulating and analyzing the prevailing stories, or narratives, as a means of understanding the uncertainty and complexity of the conflict.

CHAPTER 2

PRIMARY NARRATIVE

Introduction

Throughout the spring and summer of 2001, irrigators in the Klamath Project protested the federal water shutdown with support from other members in the community. These individuals and families joined together for demonstrations, parades, and protest rallies. They also engaged in acts of civil disobedience by forcibly opening the headgates at the A-Canal in attempts to bring water to their fields. The protestors were motivated by obvious factors such as anger, frustration, and fear of losing their accustomed livelihoods. Their actions were also motivated by more subtle factors such as their interpretations of history, science, and law; their perceptions of the environment; and their personal norms and values. The numerous stories promulgated by the irrigators and their supporters are aggregated here as the primary narrative in this narrative policy analysis. Although portions of this narrative may not be completely representative for every irrigator in the Klamath Project, it does represent the most publicized narrative based on articles from newspapers, magazines, and local pro-irrigation websites. This narrative is important to articulate and analyze because it shapes people's perceptions on various sides of the issues and it is a starting point for understanding the motivating factors of the pro-irrigation stakeholders.

Explanation of Sources

To examine the pro-irrigation story I have drawn primarily from local sources such as the Klamath Falls newspaper, and local pro-irrigation websites such as the "Klamath Bucket Brigade", the "Klamath Water Users Association", and "Klamath Basin Water Crisis." (www.klamathbucketbrigade.org, www.kwua.org, www.klamathbasincrisis.org). These sources presented stories and viewpoints from the supporters of irrigated agriculture in the Klamath Project. They were also highly accessible for disseminating information to the irrigators during the crisis of 2001. The "Klamath Basin Water Crisis" website, for example, peaked at about 1,500 visitors per day during the time of the Bucket Brigade (Klamath Basin Water Crisis 2004), and the Klamath Falls Newspaper, "The Herald and News", had a circulation of approximately 18,000 during the summer of 2001 (Herald & News 2004). I have also included references from prominent agricultural magazines with a broader distribution, such as AgLife Northwest and Range Magazine, because these magazines featured articles about the water crisis with pieces written by Klamath Project irrigators or from interviews with the irrigators.

Historical Interpretations

As one of the first large reclamation projects in the country, the Klamath Project has a long and complex history. The various interpretations of this history shape the perceptions of stakeholders on all sides of the issue. Some of the key historical interpretations that influence the primary narrative are the interpretations of settlement, Indian affairs, and environmental change.

The historical interpretations of settlement emphasize the settlement by Euro-American homesteaders. According to the narrative, the federal government initiated the reclamation project, and homesteaders were invited to farm the land to secure the west and feed a hungry nation (Blake, Blake, and Kittredge 2000, Staunton 2001). A key element of this history is that many of the homesteaders in the project were veterans of WWI and WWII. There were numerous land openings throughout the first 50 years of the Project (Turner 1987), but the most famous and most emphasized in the primary narrative is the 1946 land opening on Tule Lake. In 1942, the federal government prepared 86 homesteads and held the land for returning veterans of WWII. The federal government sent out 15,000 public notices encouraging veterans to apply for homesteads in the Klamath Project, and on December 18th, 1946, the winners were chosen by lottery and announced on radios across the country (Williamson 1947).

The homesteaders' story is a tale of promises, dreams, hard work, and rewards (Blake, Blake, and Kittredge 2000). Reclaiming the lakebeds and converting the soil to farmable acreage was a very difficult process. Many of the homesteaders had little prior knowledge of irrigation and farming, and few had familiarity with methods required for growing crops in a climate that has produced killing frosts during every month of the year (Tomlinson 2002). Despite the hardships, the farmers pulled together, learned from each other, and gradually built the small communities that are now scattered across the Klamath Project. The current generations of farmers are inspired by the accomplishments of these early homesteaders to fight for the right to continue farming on the land. The owner of the "Klamath Basin Water Crisis" website, for example, is a

daughter of a veteran Tule Lake homesteader. She explains that her motivation for maintaining the website is to preserve "the freedoms for which our fathers and forefathers fought" (Klamath Basin Water Crisis 2004).

Historical interpretations of Indian affairs are also an important component of the primary narrative. Some accounts recall amicable relationships between the farmers and the Tribes. Paul Christy, a veteran farmer in the Project recalls that "Until now we have all lived together as friends and neighbors – Indians, fishermen, homesteaders, and ranchers" (Christy 2001). Other accounts emphasize a more troubled history with the Indians. The primary narrative asserts that the Tribes gave up their rights to water when they voluntarily terminated their tribal status to receive substantial payments for their reservation lands (Klamath Basin Water Crisis 2004). The narrative also recounts stories that Indians squandered their payments in drunken escapades and through buying and crashing expensive cars one after another. A recent fictional book titled *Buy the Chief a Cadillac* illustrates this historical perspective (Steber 2004).

The historical interpretations of environmental change are fundamental to understanding the irrigator's perspective. The irrigators share many common assumptions with regard to the hydrology, water quality, and the scope of landscape change. One key belief is that the water quality in Upper Klamath Lake has always been poor and that it has not changed significantly since the beginning of the reclamation project. The irrigators often quote a passage from John C. Fremont's 1840's journal that states that the water in Upper Klamath Lake was "foul" (Klamath Basin Water Crisis 2004). Another oft-quoted reference is Henry L. Abbott's 1854 diary that states "the water from the lake had a dark color, and a disagreeable taste" (Ransom 2002).

A second key belief about water is that the Klamath Project artificially elevates water levels in the Klamath River during the dry season. The narrative explains that the water levels in Upper Klamath Lake are higher than historic levels and the water impounded behind the dam would not have been available without the Project (Klamath Basin Water Crisis 2004). The irrigators, therefore, argue that mandates for higher discharges to support Coho salmon are historically unfounded. As evidence for this position, the irrigators cite historic accounts that the Link River, the outlet from Upper Klamath Lake and the headwaters of the Klamath River, occasionally went dry and that Upper Klamath Lake would drain causing the shoreline to recede up to a mile (O'Connor 2001, Klamath Basin Water Crisis 2004, Ransom 2002). The narrative also explains that Tule Lake and Lower Klamath Lake lie in closed basins and that the water flowing from the Project area into the Klamath River would not have occurred prior to the reclamation project (Klamath Basin Water Crisis 2004).

Wetland loss is another area of contention from the irrigators' perspective. According to the primary narrative, environmental groups are making false claims when they report that the Klamath Basin has lost 75-80% of its wetlands. To support this position, the narrative points to the thousands of acres that have been converted from agriculture to wetlands in recent decades. One report claims that there are 47,061 more acres of wetlands than in 1905 (Klamath Basin Water Crisis 2004).

Interpretations of Science

The primary narrative also contains several important scientific interpretations that influence the irrigators' perspective on the water crisis. These interpretations are often at odds with the science that was used by federal agencies as a basis for decision-making in 2001. Key criticisms of science stem from beliefs concerning the amount of water used by crops, the effects of farming on water quality, perceptions of bias or incompetence, and confidence in local knowledge over scientific knowledge.

One of the major vantages illustrated in the irrigators' narrative is the belief that crops are the most efficient use of water. According to the narrative, a water body evaporates three to four ac-ft over a given area over the course of a growing season, whereas most crops require only 2.5 ac-ft of annual irrigation (Klamath Basin Water Crisis 2004). The narrative also states that wetlands consume almost twice as much water as crops (Klamath Basin Water Crisis 2004). Farmers are, therefore, concerned that creating more wetlands adjacent to Upper Klamath Lake will detract from the amount of available water for farmers in the project.

The largest source of contention, however, is the science concerning Lost River and shortnose suckers. The irrigators express puzzlement that government scientists can report that suckers are endangered without being able to say how many there are, or how many there should be. They also question the validity of scientific claims that report higher water levels in Upper Klamath Lake are beneficial to suckers. According to the primary narrative, sucker mass mortality events are not correlated with low water, and the greatest fish kill of shortnose suckers came at a time when the lake was at its highest level (Range Magazine 2001). Due to these trends, and local experiences seeing suckers

living in irrigation ditches, the narrative claims that it is a myth that suckers need higher water. In fact, many irrigators endorse an opposite view: that "sucker fish flourish in low water levels, not high." (O'Connor 2001).

The primary narrative claims that the science used in making the biological opinions for suckers and Coho salmon is wrought with bias and that it was produced by scientists with questionable experience and expertise (Range Magazine 2002). They also question the objectivity of the data and the objectivity of scientists who have published key reports used to create the biological opinions. The "Hardy Flow Phase I" report published by Utah State University biologist Thomas Hardy has generated the most controversy on this matter. Irrigators assert that this report was used as the basis for setting minimum flows to the Klamath River for Coho salmon, and that the report was neither field-tested nor peer-reviewed (Vogel 2003). Furthermore, the narrative claims that the use of science in the Basin has been politically motivated and that Thomas Hardy, in particular, is a "scientist for hire by environmentalists" (Range Magazine 2001, 11W). The narrative does not discount science in its entirety; instead it makes appeals for "real" unbiased science. James L. Moore, executive director of the Klamath Water Users Association, demonstrated this view when he exclaimed to an interviewer, "Farmers want real science. We want it!" (McIntyre 2001).

Legal Interpretations

The primary narrative contains important legal interpretations that helped to fuel the controversy over water rights. These interpretations claim that the federal government did not have that right to withhold water from the Klamath Project. It claims

that such an action constitutes a taking of their private property. Furthermore, it claims that the Endangered Species Act is inherently flawed because environmental groups can use it to shut down important industries.

The narrative asserts that the federal government bestowed water rights to irrigators when it promised 2 1/2 ac-ft of water per year in perpetuity to the homesteads in the Klamath Project (Klamath Basin Water Crisis 2004). The Klamath River Basin Compact legally affirmed the use of water for irrigation, according to this narrative. This compact is an agreement between the State of Oregon and the State of California that designated priorities for water permits. The use of water for irrigation is declared in the compact to have a priority second only to domestic water use (OSWRB 1971). The Klamath River Basin Compact was ratified by both states and consented to by U.S. Congress in 1957. As a consequence of these interpretations of legal authority, the primary narrative asserts that the federal action to deny water constituted a regulatory taking deserving of compensation.

The primary narrative pins the blame for this perceived taking on the "flawed" Endangered Species Act (ESA). According to the narrative, the ESA is flawed because it inflicts exorbitant costs on agriculture and on private individuals. An online petition with 37,343 signatories titled "Let the Irrigation Water Flow in the Klamath Basin of Oregon" claims "The Endangered Species Act is an unconstitutional encumbrance on the lives of local citizens all over this nation which interferes with their God-given rights to life, liberty and the pursuit of happiness." (Head 2002) Another article in the local newspaper

describes the ESA as a "relentless machine … rolling across the Basin, bent on destruction, crushing agriculture in the name of saving some obscure fish most Americans have never heard of." (Bragg 2001).

Perceptions of Nature / Ethics

In the primary narrative, the environment is perceived in very different ways than in the opposing views. For the most part, the local environment is not viewed as threatened. The irrigators draw on their experiences living in the area and working the land. They see abundant wildlife in and around their fields, and they perceive minimal negative impacts of their irrigation activities on fish populations. Any declines in populations are typically attributed to other factors such as natural predators (Walker 2000, Klamath Basin Water Crisis 2004). Based on these perceptions, the primary narrative claims that the federal water shutdown was completely unnecessary, and that there would have been nothing wrong with continuing the prior status quo of water deliveries.

The irrigators continue to view the area as a "wildlife paradise" (Klamath Basin Water Crisis 2004). According to the narrative, farming and wildlife are complimentary. Irrigators see ducks feeding on grain from their fields, and eagles feeding on the ducks, and they express pride in their role in maintaining this functioning ecology (Carlson 2001). They see suckers living in their drainage ditches and believe that the drainage system provides great sucker habitat (O'Connor 2003). From this perspective, the Klamath Project is constructed in a balanced way that ensures water efficiency and plentiful habitat for wildlife.

The primary narrative expresses the belief that irrigation is a good use of water for this area. According to this view, the water would otherwise be "wasted" by evaporating or flowing to the ocean (Klamath Basin Water Crisis 2004). The irrigators perceive themselves to be very efficient with the water, by pointing to studies that show a 98% efficiency for the project (Klamath Basin Water Crisis 2004). They also contend that the project consumes less than 5% of the water from the Klamath River (Klamath Basin Water Crisis 2004). These interpretations of water use enable the irrigators to view themselves as good stewards of water, and lead to resentment toward outsiders who say they are wasteful. They claim that they "take what [they] need and no more" (Walker 2000).

From the irrigators' perspective, local farmers are better judges of natural balance than government agencies and outsider environmental groups. The narrative explains that in the past there was flexibility to share the water when it became scarce, and they explain how farmers voluntarily reduced their water use during the drought years of 1992 and 1994 to accommodate wildlife. Deb Crisp, executive director of the Tulelake Growers Association, explains that in these years there were no fish kills and farmers were able to get enough water to sustain a crop (Souza 2001). The primary narrative shows that the irrigators perceive themselves to be good stewards of the land and wildlife. They are proud of their role in sustaining waterfowl populations with grains from their fields, and many were angry that the water shutdown also shut off water to the wildlife refuges that receive their water from agricultural runoff from the Project. According to the narrative, "trillions" of birds were left without feed from crops (Range Magazine 2001, 4w).

The primary narrative asserts that a decision to choose between fish and farmers would not have been necessary if there had been more flexibility in the ESA. However, in 2001, flexibility was not an option, and farmers were forced to choose between supporting fish protection or protecting their accustomed way of life. In the face of this challenge, the primary narrative articulates that most of the irrigators believed their way of life was more important. For many, it was a clear and easy decision. A newspaper column linked from the Klamath Basin Crisis Website, exclaimed "What could be easier than choosing between desperate farmers and a couple of ugly fish?" (Schlafly 2001). Many irrigators clearly identified with this anthropocentric view, and they became frustrated when it appeared that the government favored fish over the farmers and ranchers of the community (Range Magazine 2002).

Sense of Entitlement

Irrigators engaged in actions of civil disobedience to take the water because they believed they were rightfully entitled to it. From the primary narrative, it is clear that irrigators believe they paid for water rights through both financial payments and through years of effort in creating the irrigation project. The narrative illustrates extreme anger and feelings of betrayal that the federal government broke its promises after the irrigators spent years of their lives helping to build the federal project.

According to the primary narrative, the homesteaders paid the entire cost of the irrigation project and they continue to pay annual operation and maintenance fees (Klamath Basin Water Crisis 2004). Irrigators stress that they settled the area in a trust

relationship with the government and that they have lived up to all their commitments. They claim that "every ditch [and] every pump" was paid for by the farmers who use the water, and they adamantly contest any claims that water is subsidized (Walker 2000, Range Magazine 2002)

Irrigators in the project feel betrayed by the broken promises of the federal government. According to the primary narrative, the irrigators diverted water from the lower lakes and placed that water into storage in Upper Klamath Lake. The irrigators therefore feel entitled to this stored water in Upper Klamath Lake at the federally promised quantity of 2.5 ac-ft/yr (Klamath Basin Water Crisis 2004). For more than 90 years, the Bureau of Reclamation delivered on this promise, and farmers grew to trust the Bureau of Reclamation to serve agricultural interests (Blake, Blake, and Kittredge 2000). However, in the spring of 2001, when ESA requirements forced the Bureau to shift priorities in favor of biological interests, the irrigators were left with feelings of resentment and betrayal (Range Magazine 2002). WWII veterans, in particular, expressed resentment that the government could treat them with apparent disregard after they had risked their lives for their country (Range Magazine 2002).

Perceived Threats to Power / Livelihoods

The primary narrative asserts that the water crisis of 2001was artificially created, and it blames other groups for creating the conditions for the crisis. It contains allegations of blame toward several entities including environmental organizations, urban outsiders, Indian tribes, and the federal government. Each of these groups presents a threat to the power and livelihoods of the irrigators in the Klamath Project.

The biggest threat from the irrigators' perspective is the growing influence of environmental organizations. The narrative explains how well-funded environmental groups have singled out the Klamath Basin since the 1970's (Range Magazine 2001). The struggling farmers in the Klamath Project feel extremely vulnerable that these groups have them grievously outnumbered and out-resourced (Blake, Blake, and Kittredge 2000). They are especially resentful of the tax-exempt status enjoyed by environmental groups that allows them to have additional money for publicity, lawsuits, and executive directors (Walker 2000).

According to the primary narrative, the water crisis of 2001 was not about saving fish; it was about removing people. The primary narrative endorses a conspiracy theory that environmental groups are plotting to take over the American West, move people off the land, and "destroy rural America" (Schlafly 2001, Lach et al. 2003). Leading environmentalists in the region are labeled as "deranged environmental extremist[s]" (Range Magazine 2001, 8W) or "haters of mankind" (Woiceshyn 2004). The narrative urges Americans to rise up against this "tide of green totalitarians" to protect the rights of people to engage in productive activities on their land (Schlafly 2001, Range Magazine 2001).

The primary narrative also contains strains of outsider/insider tension. The narrative claims that urban outsiders fund many of the environmental groups, and that these urbanites have no conception of farming or the real issues of the Klamath Basin. The narrative contains resentment toward "urban folks" who vilify farmers and take their cheap food for granted (Walker 2000)

The Indian tribes are another challenge to the irrigators' power in the region. Interestingly however, the views toward the tribes contain considerable variability. Some claim that the tribes want all the water in the basin for themselves based on statements from the Klamath Tribes that assert that all water flowing through the Tribes' jurisdiction should be protected for the Tribes (Krizo 2004). Others claim that the Indians are motivated by profit and that they are "experts at working the system" (Howe 1992, 140). Still others claim that white lawyers are manipulating the Indians and that the Indians don't care about conservation at all (Blake, Blake, and Kittredge 2000). What is consistent in these views is the perception that the Indians are not motivated out of concern for sucker populations.

The federal government is viewed as a coconspirator in the primary narrative. Farmers believe that environmentalists have taken over many of the government agencies, and that these agencies are trying to circumvent prior agreements for irrigation (Furber 2001). Range Magazine claims that the biological opinions were part of a "bureaucratic coup" against President George W. Bush, alleging that letters to halt the Bureau of Reclamation came from Clinton appointees one day before Bush's inauguration (Range Magazine 2001). Others see larger conspiracies at work in agreements such as the United Nation's "Agenda 21" that urges the development of environmental legislation around the world. According to one farmer in the Project, these "environmental laws that place needs of endangered species ahead of farmers' needs constitute a continuous siege and attacks on private land" (Bragg 2001). Another irrigator claims that the United States, which began as a "government for the people" became a government against people (O'Connor 2001).

Conclusion

The views and emotions presented here in the primary narrative highlight the extreme complexity of water issues in the Klamath Basin. By understanding the assumptions that underlie the actions of the irrigators, it is possible to comprehend the rationale behind their protests in 2001. The primary narrative offers one perspective on the various interpretations of history, science, rights, and ethics that surround the water issues in the Klamath Basin. This thesis will continue the narrative policy analysis approach by articulating other perspectives on these issues in order to elucidate the fundamental sources of polarization and conflict.

CHAPTER 3

COUNTER NARRATIVE

Introduction

In the summer of 2000, the Pacific Coast Federation of Fishermen's Association (PCFFA), in conjunction with environmental organizations, filed suit against the Bureau of Reclamation claiming violations of the Endangered Species Act by the Bureau's 2000 Operations Plan for the Klamath Project. This lawsuit, combined with the 2001 Biological Opinions by the U.S. Fish and Wildlife Service, led to an injunction against irrigation deliveries for the majority of the Klamath Project in the summer of 2001 (KWUA 2003). The narrative argued by the PCFFA and affiliated environmental and tribal groups in opposition of the Klamath Project is aggregated here as the counter narrative for this narrative policy analysis. As in the primary narrative in the previous chapter, the counter narrative is also well publicized through magazines, newspaper articles, and websites. This narrative presents alternative interpretations for the Klamath Basin water crisis that further increase the uncertainty, complexity, and polarization of the issues surrounding the Klamath Project.

Explanation of Sources

To examine the counter narrative, I have drawn from articles in the local Klamath Falls newspaper and from the websites of the Klamath Tribes and the member organizations of the Klamath Coalition. The Klamath Coalition is an alliance of local, regional, and national organizations formed in 1999 to advocate environmental change in

the Klamath Basin. The coalition was founded by eight organizations ranging from the Pacific Coast Federation of Fishermen's Association to the Oregon Chapter of the Sierra Club. Although each of these stakeholder groups have their own individual discourses, they share common ground in their criticism of the Klamath Project and through their collective action in lawsuits aimed at reducing irrigation deliveries. Comparing the individual narratives of these groups could create a more thorough narrative policy analysis. However, for the sake of brevity, I am treating them as a single narrative for this thesis.

Historical Interpretations

The counter narrative contains different interpretations of history than those in the primary narrative. These interpretations are important to articulate because they underwrite the perceptions that follow for science, law, ethics, and stakeholder relationships. The historical interpretations differ with respect to the events that are emphasized, the historical representations, and the duration of the historical perspective. In general, the history in the counter narrative tends to be comparative. It uses conditions prior to the construction of the Klamath Project as a baseline for measuring the amount of change that has occurred in the Klamath Basin over the past century.

One of the primary historical interpretations in the counter narrative is the perception of substantial loss of wildlife and of devastation to communities that depend on wildlife. The narrative claims that the Klamath River was the third most productive river in the United States for salmon, and that these abundant salmon runs sustained a large downstream fishing economy (Grader and Spain 2001). The narrative also

emphasizes an abundance of mullet prior to Euro-American settlement that sustained the Klamath Tribes from "time immemorial." (The counter narrative typically refers to Lost River suckers and shortnose suckers as mullet or by their Indian names "*c'wam*" and "*qapdo*" due to the negative connotations associated with the word "sucker").

According to the counter narrative, the loss of wildlife in recent decades has been extreme both in measure and effects. The narrative emphasizes the endangered status of *c'wam* and *qapdo* as evidence of declining wildlife. The Tribes explain that these fish were harvested as a staple food for thousands of years, and that they are now allowed to catch only one *c'wam* per year for ceremonial purposes. According to the counter narrative, the culture of the Klamath Tribes is threatened by the loss of this food source, along with the depletion of other traditional foods such as mule deer and wocus (wocus are seeds from a variety of water lily found in the region's marshes) (Miller 2001, Foreman 2001).

The counter narrative also emphasizes a dramatic reduction of salmon. From this historical perspective, large salmon populations were vital for sustaining downstream fishing communities. They were a staple food source for the Klamath River tribes: the Yurok, Hupa, and Karuk tribes. They also sustained commercial Euro-American fishing communities along the West Coast from Coos Bay, Oregon to Fort Bragg, California (Klamath Coalition 2000). The narrative claims that salmon runs were abundant and stable at the beginning of the 20th century but are now less than 8% of historic numbers (Grader and Spain 2001). According to EarthJustice, a member organization of the

Klamath Coalition, the crash in salmon populations has caused the loss of 3,780 family wage jobs and more than $78 million per year to the fishing economies (EarthJustice 2004).

The counter narrative attributes most of the reduction in wildlife to alterations in the hydrology and land uses in the Basin. According to this historical perspective, these changes have been expansive. The counter narrative blames several factors such as logging, ranching, and dam construction. However, the Klamath Project is singled out for causing the most extreme environmental alterations to the ecosystem (Grader and Spain 2001).

According to the counter narrative, the construction of the Klamath Project resulted in vast reductions in the amount of wetlands in the Basin. This narrative claims that the Basin once contained 350,000 acres of water and wetlands, and that 80% of these areas have been drained for agriculture (ONRC 2004). The narrative also asserts that the Project has fundamentally altered the hydrology of the system by lowering the levels of Upper Klamath Lake and reducing flows to the Klamath River during critical times of the year. The Pacific Coast Federation of Fishermen's Association states that it is a myth that the Klamath Project takes only a small portion of the water from the river system, claiming irrigation in the Upper Klamath Basin can impound over 30% of the flow from the Klamath River during particularly dry months (Grader and Spain 2001).

Interpretations of Science

Surprisingly, the counter narrative contains relatively few scientific assertions, which is likely due to the fact that claims are difficult to prove in such a complex system.

Instead it emphasizes contrasts between the historical environment and current conditions to argue for a return to pre-development conditions. For example, the counter narrative does not try to prove a scientific relationship between higher lake levels and mullet survival. Instead it argues for a return to natural flow conditions that existed prior to the construction of the Klamath Project, implying that this will foster a recovery of mullet populations. The same argument is extended to restoring the "normative functions" of wetlands, the hydrology of the lower lakes, and flows to the Klamath River as a means for rehabilitating waterfowl and salmon populations (Klamath Coalition 2000).

One of the few scientific claims in the counter narrative is the assertion that agriculture and ranching have degraded the water quality of the system. The narrative blames ranching operations upstream of Upper Klamath Lake for introducing cattle waste into the lake and the worsening the problems of eutrophication (Blake, Blake, and Kittredge 2000). It also blames private reclamation activities upstream of the Klamath Project for hastening the eutrophication of Upper Klamath Lake through conversions of wetlands for agriculture. The narrative claims that these wetlands around the periphery of the lake filtered out much of the natural nitrogen and phosphorus entering the water system. The counter narrative also claims that the Klamath Project impairs the water quality of the Klamath River. Member organizations of the Klamath Coalition blame the Project for releasing agricultural runoff that is too warm and "laced with pesticides" to favor salmon survival (ONRC 2002).

The counter narrative champions specific scientific reports that are aligned with its views for increasing summer lake levels and higher Klamath River flows. Reports

such as the Hardy Flow Reports and the 2001 biological opinions from the U.S. Fish and Wildlife Service and the National Marine Fisheries Service are praised for affirming increased water for wildlife (Grader and Spain 2001). Contrary reports, such as the 2002 National Resources Council Interim Report on the Klamath Basin, are denounced as "flawed" for questioning the presumed relationship between higher water levels and fish survival (Klamath Coalition 2003).

Legal Interpretations

The counter narrative articulates a legal interpretation that federal law supports managing the water in the Klamath Basin for endangered fish over irrigation interests. This interpretation is based on specific case law that is believed to validate the preeminence of Native American treaty rights. The interpretation is also based on ESA case law that prioritizes species protection over economic interests and mandates precaution in agency policies affecting endangered species.

The belief in the preeminence of tribal water rights stems from the "Treaty of 1864" that established the Klamath Reservation. From the tribes' perspective, this treaty did not grant new rights to the tribes. Rather, it preserved their existing rights to fish, hunt, and gather in exchange for ceding 19 million acres of their ancestral homeland (Klamath Tribes 2004). This treaty pre-dates all water rights to irrigation in the Klamath Basin and forms the basis for tribal seniority in water rights claims.

The counter narrative points to an "unbroken line" of court decisions and congressional legislation that affirm the Tribes' rights for water to support tribal fisheries (Klamath Tribes 2003). Key court decisions include: *Kimball vs. Callahan (1979),* which

ruled that tribal harvest rights were not lost when the tribe was terminated. Also cited are *United States v. Adair (1984), Klamath Water Users Association v. Patterson (2000),* and *Kandra v. United States (2001)* that reaffirmed the seniority of tribal water rights over irrigation rights. (Klamath Tribes 2004)

The counter narrative also finds vindication in case law involving the Endangered Species Act. In *Pacific Coast Federation of Fishermen's Association v. Bureau of Reclamation (2001),* the 9th circuit court ruled that the Bureau of Reclamation would violate the Endangered Species Act with its 2000 Operation Plan for the Klamath Basin. The PCFFA heralded this decision as a "smashing victory for the fish" (Grader and Spain 2001). The counter narrative also finds support through past judicial rulings such as *Tennessee Valley Authority v. Hill (1978)* that require agencies to avoid jeopardy to species "whatever the cost" (Aiken 2001).

Perceptions of Nature \ Ethics

Perceptions of nature and environmental ethics are also important for understanding the perspectives of the counter narrative. These views are often in stark contrast to those in the primary narrative and are a source of extreme polarization on the issues of water allocation. The counter narrative takes a decidedly different stance on the perceptions of threats to the environment and toward the value of "naturalness." The counter narrative also differs by the inclusion of spiritual aspects into its ethical framework.

In contrast to the primary narrative, the counter narrative perceives numerous problems with continuing the status quo for irrigation. The Klamath Basin is portrayed

as a place that is in peril of destruction, and it urges citizens to take action to protect what remains (ONRC 2002). The Wilderness Society, one of the founding members of the Klamath Coalition, listed the Klamath Basin as one of the most endangered wild places in 1997 (Blake, Blake, and Kittredge 2000). Six years later, American Rivers, another member organization in the Coalition, named the Klamath River as the 2nd most endangered river in the United States, claiming that "polluted agricultural runoff is causing the river's ecosystem to collapse" (American Rivers 2002).

The counter narrative clearly considers agriculture, as it exists in its current form, to be incompatible with the environment in the Klamath Basin. Klamath Coalition members have repeatedly sued the federal government to ban pesticide use within the wildlife refuges due to the perception that these chemicals are threatening wildlife. In 1998, these lawsuits were successful in bringing about the Integrated Pest Management Plan for Klamath Refuges (Blake, Blake, and Kittredge 2000). However, coalition groups continue to urge for a complete phase-out of commercial agriculture on the wildlife refuges (Klamath Coalition 2000).

Commercial agriculture is portrayed as having very little comparative value throughout the counter narrative. This perspective sees much greater value in maintaining natural systems and in creating more ecologically sustainable economies. The counter narrative bolsters this perspective with economic reports that buoy the benefits of environmental restoration and minimize the financial contributions of agriculture to the local economy. The narrative cites a report by the U.S. Geological Survey that claims returning irrigation water to the river would generate 30 times more economic benefit than the agriculture in the Klamath Project (Fault Line 2002). The

narrative also cites a report stating income from farm and agricultural services comprise only 1% of total personal income in Klamath County, with 8% in Modoc County, and 3% in Siskiyou County (PCFFA 2002).

For the proponents of the counter narrative, restoring the Klamath Basin is more than economically justified; they also view restoration as a moral imperative (ONRC 2002). The Klamath Tribes claim a spiritual connection to the fish that necessitates protective action. According to the tribes, their culture is inextricably tied to the fate of the *c'wam* and *qapdo*. They refer to these fish as sacred gifts of the Creator, and they tell a story how the Creator made the fish and told the people that when the fish were no more, the Klamath people would be no more (Barnard 2002). Non-Indians in the counter narrative also articulate a spiritual connection to the biotic community. William Kittredge, author of *Balancing Water: Restoring the Klamath Basin*, gives an example of this spiritual claim with his statement that "Birds in the sky over Lower Klamath are to me sacred" (Blake, Blake, and Kittredge 2000, 4).

Based on the spiritual connections articulated in this narrative, one might expect that arguments for environmental restoration would be justified with biocentric ethics and claims of "intrinsic value" of non-human species. However, most of the arguments for environmental restoration are framed with anthropocentric constructions and claims of instrumental values of resources for human use. Protecting *c'wam* and *qapdo*, for example, is argued for saving the culture of the Klamath Tribes, restoring salmon is argued for preserving fishing communities, and restoring wetlands and waterfowl is agued for providing recreation and economic benefits.

Sense of Entitlement

As in the primary narrative, the counter narrative articulates a sense of entitlement to the water. Proponents of this narrative have engaged in legal actions to take water from irrigators due to this sense of entitlement. The narrative bases this stance on perceived injustice against the Klamath Tribes and on the belief that public interests outweigh the interests of private industry. The counter narrative also attacks the merits for entitlement by the opposition with claims that farmers in the Klamath Project receive unwarranted federal subsidies.

From the vantage of the counter narrative, the government has swindled the Klamath Tribes out of their property numerous times in their history, and the Tribes are entitled to take back what should rightfully be theirs. According to the narrative, the treaty of 1864 established a 2.5 million acre reservation for the tribes but the government then whittled down the reservation to 1.1 million acres due to erroneous land surveys. The tribes claim that the United States has never recognized the boundary lines that are described with landmarks in the original treaty (Klamath Tribes 2001). The Tribes allege that the government extorted them to take their remaining lands through termination policies in 1954. According to this narrative, termination was not a willing buyer/seller transaction. The tribes claim that termination was an experiment imposed on them by the federal government and "at no time did the Klamath Tribes agree to termination and condemnation of their lands" (Foreman 2000, HO-17).

Based on these claims, the counter narrative asserts that the tribes are justified to take control of their water rights. The narrative claims that the Indians paid a far greater price than the farmers for their water rights by giving up 20 million acres of their land for

guarantees of water for fisheries (Foreman 2001). Allen Foreman, chairman of the Klamath Tribes, claims that "harvesting fish is our heritage and our legal right, as important to our livelihood as harvesting any other crop grown in the Basin." (Foreman 2001)

The counter narrative makes further claims for entitlement to water in the name of public interests. It espouses a view that public lands should be managed to benefit all of the public, and that wildlife refuges should be managed with wildlife as the primary focus. The counter narrative claims that the public has greater interest in maintaining public lands for recreation and wildlife, and it feels disenfranchised that in some years scarce water has been allocated to crops for commercial agriculture while marshes in the wildlife refuges were allowed to go dry (Klamath Coalition 2000).

The counter narrative perceives great inequity in supporting agriculture in the Klamath Project with tax-payer money. According to the narrative, Klamath Project irrigators receive numerous subsidies to produce low value crops that rob wetlands of needed water (PCFFA 2002). The narrative cites direct agricultural subsidies such as price supports and low-rate loans from the U.S. Department of Agriculture. It also claims that irrigators receive subsidized water because irrigators are charged only for the delivery costs of their water and these costs are kept low via reduced electricity rates. The narrative refutes claims that irrigators paid the full cost of the irrigation system, noting that payments did not include interest on the construction loans for the project.

Perceived Threats to Power / Livelihoods

As with the primary narrative, the counter narrative blames other entities for causing the water crisis in 2001. The counter narrative attributes partial blame to the extreme drought conditions of 2001, but the majority of the blame is attributed to dramatic environmental alterations designed to promote irrigated agriculture in the Klamath Project. Interestingly however, the counter narrative shies away from blaming irrigators directly. Instead, it blames the federal government for creating the conditions that led to crisis through years of delays, denials, and mismanagement of resources. The narrative perceives continued government antagonism as the biggest threat to their attempts to change the status quo. It also views attempts to weaken environmental laws as a threat to the balance of power.

The primary charge against the government is that it continues to pursue an imprudent goal to "let the deserts bloom" without considering the cultural and ecological ramifications of this policy (Grader and Spain 2001). According to the counter narrative, the large, shallow lakes and vast wetlands in the Upper Klamath Basin created an illusion that water supplies were abundant when in reality there are portions of the Basin that receive an average annual rainfall of less than 12 inches per year (Grader and Spain 2001). The narrative claims that the government allowed demands for water to exceed supply, in the context of this illusion, by creating the immense Klamath Irrigation Project and over-allocating the water. It blames the federal government for enticing farmers to the area without informing them about Indian water rights, and it blames state governments for issuing permits without regard for the tribes or for the health of the natural environment (Foreman 2001).

The counter narrative believes that the Klamath Project is ultimately unsustainable at present levels, and it blames the government for failing to take timely action to rectify the situation. It points to government delays on required actions to protect endangered species, such as the failure to screen the A-Canal, the failure to designate critical sucker habitat, and the failure to make repairs to the Link River Dam by the prescribed dates (USFWS 2001). It also blames the government for "decades of ineffective resource management" (Foreman 2001). These delays and mismanagement are viewed as continued threats to habitat and species restoration.

The counter narrative derives most of its power from federal environmental legislation. Thus, any attempts to circumvent or alter these environmental laws are also viewed as potential threats. In the summer of 2001, farmers urged the Bush administration to order the Endangered Species Committee to intervene and grant an exemption from endangered species protection for the Klamath Project. However, the administration declined to involve this powerful committee, often referred to as the "God Squad," to act on the farmers' behalf. Farmers continue to pressure legislators to change the Endangered Species Act to make the ESA more responsive to human economic considerations. The counter narrative views such actions as counter productive to finding real long-term solutions for water problems in the Basin (Schoch and Bailey 2001).

In response to charges that environmental organizations have destroyed farmers' livelihoods, the counter narrative claims that the decline in the region's farming should be attributed to other causes such as changes to the local economy, transportation costs, trade agreements, and globalization (Wood 2001). In a letter from the Oregon Natural Resources Council sent to every irrigator in the Klamath Project, the ONRC asserts that

the causes of the water crisis are numerous and include: mismanagement, new laws, old laws now enforced, changed social conditions, and changed government polices (Ward 2003).

Conclusion

The convictions presented here in the counter narrative provide a fundamentally different perspective on the Klamath Project than the views discussed in the primary narrative. By articulating these two narratives, the complexity of the issues becomes increasingly apparent as well as the potential sources of uncertainty and polarization. While many of these differences may be irreconcilable differences in opinion, others can be compared with knowledge of history, science, or law to assess the validity or legality of the perspectives. The chapters that follow will explore two specific areas in more detail that correspond to areas with high amounts of disagreement between the narratives: water rights and science. By highlighting the consensus and uncertainty in each of these subject areas, a more effective metanarrative can be developed for future policy-making.

CHAPTER 4

WATER RIGHTS NONSTORY

Introduction

Water rights disputes have been a mainstay in the politics of the Upper Klamath Basin for over a century. While many disputes have been settled over the years, several unresolved disputes continue to polarize the stakeholders in the basin. The narratives in the previous chapters illustrate that stakeholders continue to disagree over the priorities for water use and the authority for water allocations. Specifically, the primary narrative claims that water allocations for irrigation are guaranteed through homesteading agreements and that the Klamath River Basin Compact established irrigation as a top priority for water use. The counter narrative claims that wildlife protection is a higher priority for water management than irrigation and that increased allocations for in-stream uses are required to satisfy reserved rights for wildlife refuges, treaty obligations, and endangered species. This chapter will examine these conflicting claims and compare them to the history of water rights in the Klamath Basin to illustrate the complexity and ambiguity of water rights that has produced these conflicting claims.

This chapter and the chapter to follow are both termed "nonstories." This is a confusing term in the language of Narrative Policy Analysis that warrants further clarification. The term "nonstory" is used when the narrative does not conform to the definition of a story because it does not have a clear beginning, middle, and ending. Unlike the narratives in previous chapters which attempt to tell the complete story of the 2001 crisis from their perspectives, this chapter focuses on one specific topic in relation

to the existing stories. The "nonstory" of water rights is an important topic for understanding the controversy, but it does not provide a complete story about the water crisis when considered alone.

Prior Appropriation & The Klamath Project

The primary narrative asserts its claim for irrigation water based on promises from the federal government that irrigators in the Klamath Project would receive 2.5 acre-ft of water for their farms per year in perpetuity. In many cases, this was more than a verbal promise; it was expressly written in their homestead agreements that were signed by the president of the United States. An agreement signed by the president would seem to be paramount and indisputable, however this agreement, like all agreements, is subject to other existing laws and regulations.

At the inception of the Klamath Project, Oregon and California were already operating under state water allocation laws governed by Prior Appropriation Doctrine. This doctrine, which is still used in most of the western states, issues water rights on a "first come, first served" basis. Water is owned by the public and is subject to appropriation for "beneficial use" by the state. Seniority in water claims is based on the date of diversion using a "first in time, first in right" philosophy. Under this system, in times of water scarcity, junior water claims must yield to claims that have a higher seniority.

Due to Prior Appropriation Doctrine, the seniority of water rights for the Klamath Project is relative to the dates of other water claims in the Basin. Congress authorized the Klamath Project as the nation's second large-scale irrigation project in 1905, and on May

19th of that year the Reclamation Service gave notice to the State Engineer stating that the United States intended to use *all* waters of the Klamath Basin for the purposes of the Klamath Project (Marbut 2003). To move forward with the project, the Reclamation Service needed to gain control of the water and land within the project area. First, it needed to buy out the water rights to the existing private canals in the project area, which it was able to do for most (but not all) of the canals with fairly large financial settlements (Clark and Miller 1999). It also needed the State of Oregon to permit adjustments to the water level of Upper Klamath Lake, and it needed both Oregon and California to cede rights and title to the land under Lower Klamath Lake and Tule Lake which were both to be reclaimed. Oregon and California agreed to these terms through the Cession Acts in 1905. Through these legal proceedings, the federal government gained control of the land and established a water claim for the Project dating to 1905.

As mentioned previously, the Klamath Project was not the first irrigation in the region. Water development in the Klamath Basin commenced with the first irrigation diversion by George Nurse and Joseph Conger in 1868 and continued with numerous diversions thereafter by private individuals and ditch companies including: the Linkville Water Ditch Company, the Klamath Irrigation Company, the Van Brimmer Ditch company, and the Klamath Canal Company (Clark & Miller 1999). Although the federal government bought out most of the senior water claims within the project area, many early diversions outside of the project area are still in use today, and form the basis for claims that pre-date the Klamath Project.

It is worthwhile to note that the quantities of these early diversions were significant. As an example, Seven Mile Creek, one of the tributaries to Upper Klamath

Lake, is estimated by the Oregon Water Resources Division to have been fully appropriated as early as 1891 (Bastash 1998). In total, there were approximately 13,000 acres of irrigated land in the upper basin by 1903 (Lewis et al. 2004). Despite the Reclamation Service's notice that it intended to use *all* of the water in the basin for the Klamath Project, the state laws of Prior Appropriation still apply to the federal government. The Klamath Project is therefore junior to all claims in the Basin vested prior to 1905. Due to severe drought conditions, and the existence of claims that are more senior to the Klamath Project, water was cut off to parts of the Klamath Project during the severe droughts of 1992 and 1994 (Lewis et al. 2004).

Reserved Rights

The counter narrative claims that water rights for the Klamath Tribes are even older than the earliest diversions for irrigation, and should therefore have seniority according to Prior Appropriation Doctrine. In 1864, the Klamath Tribes signed a treaty with the federal government through which they ceded land to the United States, retained land for themselves for a reservation, established annuities for services, and protected existing rights to fish, hunt, and gather. According to the counter narrative, this protection of fishing rights implies a reserved right for water to support tribal fisheries.

The primary narrative objects to this claim for two reasons. First, because water rights for in-stream uses were not historically recognized under Prior Appropriation Doctrine. Under this doctrine, water must be diverted and used for one of several designated "beneficial uses." Until recently, beneficial uses were strictly consumptive uses, and were limited to mining, agriculture, industry, municipal use, domestic use,

stock-raising, and hydropower. In-stream uses, such as water to sustain fisheries, were disqualified (Wilkinson 1992). The primary narrative also rejects the tribal claims to water arguing that the Tribes gave up their reserved rights when they terminated their tribal status in 1954 and gave up their reservation.

Despite these arguments, the courts have ruled in favor of supporting tribal claims to water. In *Kimball v. Callahan (1974),* the 9th Circuit Court ruled that the Klamath Tribes retained hunting and fishing rights on the former Klamath Reservation despite termination (Klamath Tribes 2003). In *U.S. v. Adair (1984)* the court ruled that these fishing rights imply reserved in-stream water rights to support their fisheries. Furthermore, it declared that these rights have a priority of "time immemorial" since they were rights that were retained, not granted, by the Treaty of 1864 (KWUA 2003). Thus, the federal courts have ruled that the Tribes do have the most senior water rights in the basin. However, the courts left the quantification of those rights to be determined by the state. Since these reserved rights have yet to be quantified, there remains a great deal of uncertainty over how much water these rights should entail.

Adjudication

One of the primary reasons for the contention between the narratives is that water rights in the Klamath Basin have never been completely adjudicated. Prior Appropriation Doctrine is designed to be a straightforward system of rights based on seniority. However, the system is complicated by the fact that numerous water claims were never quantified or prioritized. The State of Oregon did not begin its water permitting process until 1909, and vested water rights existing prior to 1909 were never adjudicated.

Likewise, the water claims to support fisheries for the Klamath Tribes were never adjudicated. In 1904, when the Secretary of Interior determined that the Klamath Basin was suitable for an irrigation project, he announced that he would authorize the project on four conditions; one of these conditions was that all conflicting and vested water rights be adjudicated (Blake, Blake, and Kittredge 2000). It is interesting to note that in 2004, a full century after this announcement, adjudication of water rights in the Klamath Basin is still incomplete (OWRD 2004).

In 1975, the Oregon Water Resources Division finally began an adjudication process to quantify and prioritize these unresolved claims throughout the state. For nearly 30 years, the Oregon Water Resources Board has worked to resolve water claims in the Upper Klamath Basin through the "Klamath Basin Adjudication" process. In recent years, the state has also attempted a less formal process called "Alternative Dispute Resolution." The federal government filed suit to be exempt from the adjudication process but was denied an exemption by the courts (Powers & Adams 1999). There are 700 claims in the Klamath Basin Adjudication, and 400 of these claims are by government agencies or the Klamath Tribes (Hathaway and Welch 2003). Although some of the smaller sub-basins were settled several years ago, the largest claims still remain to be adjudicated (Hathaway and Welch 2003). Carl Ullman, an attorney for the Klamath Tribes, estimates that it will take another 10 years or more to complete the Klamath Basin Adjudication (Ullman 2004).

Refuges

In addition to the claims for reserved rights for the Klamath Tribes, the counter narrative also claims that national wildlife refuges hold reserved water rights. It bases this claim on case law that has established that public lands have implied reserved rights for water to sustain them for their intended purpose. Although the courts recognize reserved rights for public lands, these rights remain subject to the laws of seniority determined by Prior Appropriation Doctrine. Like the homesteaders in the Klamath Project, the wildlife refuges were also promised water by the president of the United States, but these promises are limited by the amount of water in the system and the pre-existing laws for water allocation.

Theodore Roosevelt established the nation's first large wildlife refuge in 1908 with an executive order to designate 81,619 acres of Lower Klamath Lake as a preserve for birds (Foster 2000). Despite this order for preservation, the refuge suffered from the fact that it was superimposed on land that had already designated as part of the Klamath Irrigation Project in 1905. Homesteaders had already claimed one third of the land in the refuge under the Swamp Land Act, and the Reclamation Service had plans to completely drain the lake and reclaim it entirely for agriculture (Foster 2000). Due to the seniority of the Klamath Project's claim, little could be done to protect the refuge, and in 1917 the Reclamation Service closed off the water supply to Lower Klamath Lake. By 1922 all that remained of Lower Klamath Lake was a 365-acre sump at the south end of the lake (Foster 2000). Lower Klamath Lake was eventually partially re-flooded in 1942, not out of concern for wildlife, but from a need to store water that was flooding another part of the Klamath Project at Tule Lake (Foster 2000).

Today there are two national wildlife refuges within the Klamath Project, and there are an additional four refuges in other parts of the Upper Klamath Basin. Conflict between reclamation and conservation has been ongoing since the inception of these refuges due to opposing priorities for water use. The U.S. Fish and Wildlife Service worked to maintain water as a priority for the refuges, but without laws recognizing non-consumptive uses as "beneficial uses," little could be done to counteract increasing allocations for agriculture. Until the 1960s, agricultural interests received exclusive priority due to the seniority of the Klamath Project and the structure of state water laws. But in 1964, the refuges were finally protected from further homesteading with the passage of the Kuchel Act which declared that the wildlife refuges should be managed for the major purpose of wildlife management (Huston 1999). The Kuchel Act did not, however, stop existing agricultural activities within the refuges.

Even though the courts have determined that public lands have reserved water rights to sustain them for their intended purpose, these rights are limited by pre-existing water allocations. Due to Prior Appropriation Doctrine, the wildlife refuges in the Klamath Basin only have reserved rights to water out of the amount of water remaining in the system at the date of their creation. Since the Klamath Project has a senior claim to water, and since the hydrology of the Basin has been restructured so that Lower Klamath Lake receives nearly all its water from agricultural runoff from the Project, the Bureau of Reclamation must supply water to the lower refuges only when it is available as excess (Hathaway and Welch 2003).

Priorities

Compounding the complications of water rights, water users continue to struggle over the prioritization of water uses. The primary narrative maintains that irrigation should remain a top priority for water use as determined by the Klamath River Basin Compact. The counter narrative maintains that endangered species protection is now a higher priority than irrigation. This conflict over prioritization stems from changes in the political climate that have shifted priorities for water use in response to changes in the economy, social values, and legislation. The conflict also illustrates the controversy that results when user groups disagree with the changing political climate and the reprioritization of established uses.

Prior to Euro-American settlement, the small Native American population placed little pressure on the natural water system. Native Americans perceived water to be plentiful, and they saw its importance for sustaining their food supply of fish, waterfowl, and wocus seeds. Later, as Euro-Americans settled the area and moved the Tribes onto reservations, Euro-Americans set new priorities for water use. Euro-Americans found that the water could be used for irrigation to expand their food supply, and to produce additional personal income by shipping goods to far-off markets. With the connection of the railroad after the turn of the century, commercial agriculture boomed in the Basin. Irrigation became the top priority for water use, leaving in-stream uses for wildlife a secondary priority.

As the Basin's population became increasingly urban in the first half of the 20th century, water for domestic use became the highest priority, but this priority was easily satisfied since domestic use consumed a small fraction water in comparison to irrigation.

In the 1950's, the Klamath Project neared completion and residents began to realize the limitations of water resources in the Basin. In response to pressure for additional allocations of water for power generation and for out-of-basin irrigation in California's Central Valley, Oregon and California created a commission to prioritize future water allocation in the Basin (Clark 1999). The commissioners believed that an additional 300,000 acres could be irrigated if irrigation was given a higher priority than other "beneficial uses" such as power generation. The commission developed the Klamath River Basin Compact in 1957 declaring priorities for future water development as follows: #1 – Domestic Use, #2 – Irrigation, #3 – Recreational Use including Fish & Wildlife, #4 – Industrial Use, #5 – Power Generation, #6 – Other Uses (Clark 1999). This compact was ratified by both states and consented to by Congress. It is important to note, however, that the dominant Euro-American population established these priorities for water use with little regard for tribal priorities. The political influence of the Klamath Tribes was minimal in comparison to this dominant population, especially at the time of the Klamath River Basin Compact since the Tribes were terminated in 1954.

Changes in national social values in the 1960's and 70's led to new environmental legislation and a renewal of sovereignty for Native American cultures. These changes eventually produced legal standing for reserved water rights for endangered species and tribal treaty obligations. Key environmental legislation, such as the Endangered Species Act; government actions, such as the listing of three endangered/threatened species of fish; and key court cases, such as *U.S. v. Adair* (1994) established new priorities for water use in the Basin. These new priorities trumped the preexisting priorities established through Prior Appropriation Doctrine and the Klamath River Basin Compact.

Government agencies are now forced to follow a prioritization for water use that places treaty obligations as preeminent, followed by protection of endangered species (Hathaway and Welch 2003).

Control

The primary narrative and the counter narrative also differ over perceptions of authority for control of water resources. The primary narrative demonstrates that many irrigators viewed water as a part of their property rights, and they perceived their loss of water as a federal "taking" of their private property. The counter narrative demonstrates a belief that water is owned by the public unless otherwise owned by the Tribes. These views are complicated by the ambiguity of control over water resources between the state government and the federal government.

The primary narrative's perception of water ownership is understandable given the history of water allocation in the region. Under Prior Appropriation Doctrine, states allocate water rights to landowners based on the seniority of water claims. These rights can be sold along with real property. They can also be retained indefinitely as long as the water is used at least once every five years. Due to this system of water rights, and the guarantees for irrigation water contained in their homesteading deeds, irrigators grew believe that their water rights are as defensible as property rights. However, in the case of the Klamath Project, irrigators in the project do not hold individual water rights. Rather, the Bureau of Reclamation holds the water right and irrigators have a contract for deliveries with the Bureau through irrigation districts (Marbut 2003).

Another issue of control is the decline of the state's power to control water. At the inception of the Klamath Project, states held the authority to control water within their borders except in cases of navigability. In recent decades, this absolute authority has diminished due to federal regulations to protect endangered species and treaty obligations. With these obligations and the fact that the Klamath Project and most of the large dams in the Basin are federally regulated, the federal government has become the defacto allocator for most of the water in the Klamath Basin (Woodward and Romm 2003).

During the water crisis of 2001, water users protested losing control of water resources to the federal government. Prominent political officials demonstrated resentment to federal control as they protested alongside the activists in the Bucket Brigade. Local police also demonstrated an unwillingness to accept federal control as they stood by while protestors illegally opened the headgates of the A-Canal (L.A. Times 2001). Ultimately federal marshals were called in to enforce the federal control of water.

Conclusion

Water appropriation in the Upper Klamath Basin began with a straightforward system following Prior Appropriation Doctrine. This "first in time, first in right" doctrine fit with early goals to encourage settlement of the West and maximize production. However it established a consumption pattern for water that held little regard for the protection of wildlife or respect for Native American treaty obligations. With changing social values, water rights in the Basin became increasingly complex and ambiguous due to overlapping claims and changes in priorities for allocations. State and federal

government agencies charged with managing water resources must now proceed in a mixed legal system that prioritizes water use both by seniority and by recent laws and court decisions pertaining to reserved rights for tribes and endangered species. The context in which these government agencies operate remains tentative due to the ongoing claims disputes in the Klamath Basin Adjudication. Given the complexity and ambiguity of water rights in the Upper Klamath Basin, it is understandable that there are conflicting claims between the primary narrative and the counter narrative. Resolution of these claims will likely continue as a lengthy, expensive, and contentious process due to a lack of shared goals among the stakeholders.

CHAPTER 5

SCIENCE NONSTORY

Limitations of Science

Science is an imperative component for decision-making in any issue of natural resource management, yet the limitations of science should be readily acknowledged. First and foremost, science is a tool for investigation; it is not a panacea for problem solving. Even in situations with fairly conclusive scientific agreement, there are typically other points of disagreement that cannot be handled entirely by science. This is especially true in a politically charged environment such as the Klamath Basin. Real decision-making takes place on the political level, and it requires consideration of numerous factors in addition to science. Such factors may include, but are not limited to economics, law, ethics, and values.

Environmental issues, are, by nature, wrought with uncertainty and complexity. Science can be helpful to bring a degree of clarity to this uncertainty and complexity. However, science is limited as a remedy for conflict. Science changes over time due to advances in knowledge or technology, it contains uncertainty due to inherent limitations in data collection, it is open to different interpretations, and it can become extremely political through the studies that are chosen and by the way the results are used.

Science is used and misused in the both the primary and counter narrative to garner political support, discredit opposition, or obfuscate reality. This chapter cannot attempt to bring clarity on all of the scientific issues in question. Instead, it will focus on a few of the key scientific claims contained in both of the narratives and compare them to

other scientific and historic reports. In some cases, it may be clear that a particular claim is either well or poorly supported. In other cases, the science may be inconclusive due to limited knowledge or data. In all cases, particular policy decisions are required, and the degree by which scientific claims can be used should be weighed against other considerations.

Upper Klamath Lake Water Levels

One of the biggest disparities between the narratives is the historical perception of the water levels in Upper Klamath Lake. The primary narrative claims that the water levels in 2001 were higher than historic flows, whereas the counter narrative claims that these levels more accurately reflected conditions prior to the construction of the Link River Dam. Graphing the lake levels using data from the U.S. Geological Survey, one can see that the lake level in Upper Klamath Lake fluctuated between approximately 4139.6 ft and 4143.3 ft above sea level in 2001.

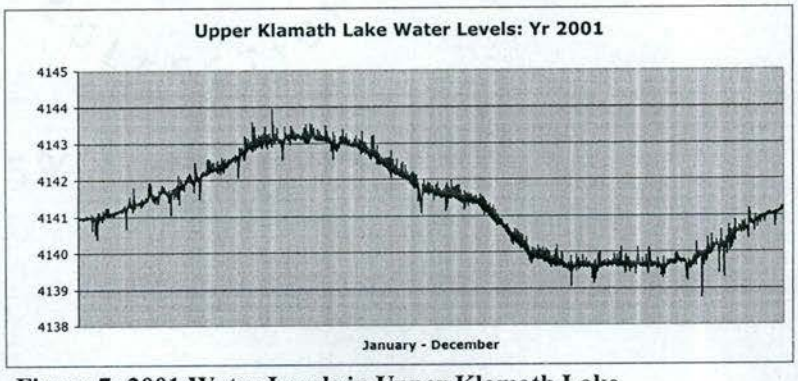


Figure 7: 2001 Water Levels in Upper Klamath Lake
(Data from U.S. Geological Survey)

The primary narrative claims that historic lake levels reached a maximum elevation of approximately 4138 feet above sea level because the water that flowed out of

Upper Klamath Lake passed over a natural basalt sill at the mouth of the Link River, and this sill is reported by John C. Boyle, an engineer on the Link River Dam, to have been at a height of approximately 4137.8 ft (Klamath Bucket Brigade 2004). This claim is based on a misinterpretation of hydrology that envisions the lake flowing over the sill as if it were a bathtub overflowing. However, the Link River is a small outlet for a large quantity of flowing water, and the water would have backed up at the sill causing water levels in the lake to be several feet higher. John C. Boyle describes the historic lake levels prior to the dam in the same book from which the elevation of the sill is cited. On page 32 of his book, *50 Years on the Klamath*, he describes:

> The maximum high-water level under natural conditions in the Upper Klamath Lake was at elevation 4143.3 feet above sea level and occurred on April 2, 1907. The minimum low-water level was 4140 in September 1908. Average natural fluctuation of the water surface was about 2 feet.
> (Boyle 1976)

Looking at the data for water levels in 2001, we see that water levels approached the pre-dam maximum during the spring of 2001 as water was held back for release later in the summer. During the summer, water levels dropped slightly below the pre-dam minimum. The lake levels in 2001 were considerably higher than in other recent drought years. However, they were not higher than historic conditions.

By removing the natural basalt sill in 1921 and constructing the Link River Dam, the Bureau of Reclamation gained the capacity to drop the level of Upper Klamath Lake three feet below the historic minimum, which it did during the critical drought years of 1992 and 1994 (Lewis et al. 2004). A difference of three feet may sound inconsequential, but since the lake is very shallow, having a mean depth of only 7 ft in the summer, a drop

in 3 feet is actually quite significant. Since Upper Klamath Lake has such a large surface area, there are huge differences in storage capacity with minor changes in elevation (Rykbost and Todd 2003). Keeping the lake levels higher in 2001 was a significant change from the way water had been managed in previous recent drought years, but it more accurately reflected the lake conditions prior to the dam.

Figure 8 graphically depicts the changes in minimum water levels and the relationship between water levels and mean lake depth. Prior to the construction of the Link River Dam in 1921, the mean lake depth reached a minimum of approximately 5.7 feet. After 1921, mean lake depth dropped to approximately 3.5 feet during critical drought years.

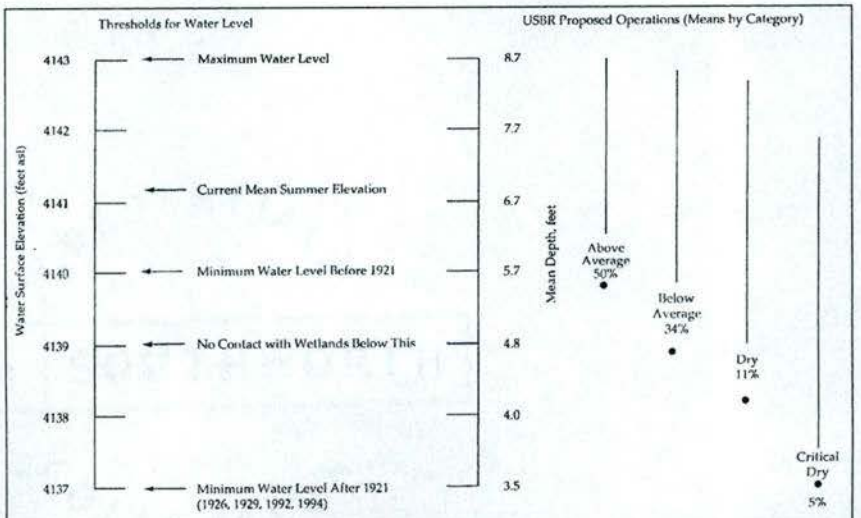


Figure 3-2. Water level of Upper Klamath Lake and mean water levels proposed by USBR for years of varying water availability. The vertical lines on the right show interannual mean operating range for an entire season (March 16-October 30). Minimums for specific years can reach below the interannual means; absolute minimums are shown as dots. Source: USBR 2002a.

Figure 8: Historic Water Surface Elevations of Upper Klamath Lake (Lewis et al. 2004)

Klamath River Flows

The federal government withheld water from farmers in the Klamath Project not only to maintain higher lake levels for suckers, but also to ensure minimum flows in the Klamath River for endangered salmon. The counter narrative blames the Klamath Project for decreasing flows in the Klamath River due to consumption of water by agriculture, whereas the primary narrative claims that water levels in the Klamath River are actually higher than historic levels. These two claims both contain flaws that overlook major alterations in the hydrology of the Upper Klamath Basin. Specifically, both narratives fail to acknowledge the historical hydrologic functions of Lower Klamath Lake.

Prior to the construction of the Klamath Project, high spring flows out of Upper Klamath Lake caused the Klamath River to routinely overflow its banks between present-day Keno and Klamath Falls. This overflow would typically occur in the spring due to high volumes of runoff from snowmelt in the upper reaches of the basin. The water would travel through the marshy Klamath Straights area and into Lower Klamath Lake. These flooding events were the primary source of water for Lower Klamath Lake (Dicken and Dicken 1985, Foster 2000).

Throughout the year, the water in Lower Klamath Lake would gradually flow back into the Klamath River through surface and groundwater flows (Dicken and Dicken 1985, Foster 2000). This dampened the fluctuations of the river much like a storm-water detention basin. The surface area of Lower Klamath Lake fluctuated widely in response to this seasonal flooding. At times, Lower Klamath Lake was even larger than Upper Klamath Lake (Lewis et al. 2004). In 1907, the railroad built a levee that cut off the flow

of water to Lower Klamath Lake and indirectly cut off an important source of water for summer flows to the Klamath River.

The primary narrative overlooks the absence of this important source of water for the Klamath River during the dry season. Instead, it maintains that flows in the Klamath River were historically very low based on perceptions of low flows in the Link River. The narrative supports this perception primarily with a picture in John C. Boyle's book that shows a group of men standing in the dry riverbed of the Link River in 1918 (Klamath Bucket Brigade 2004). This picture was taken during an unusual event called a seiche that occurs when high winds push the water so that the surface level of the lake becomes angled (Dicken and Dicken 1985). Boyle explains that high winds caused these conditions in the river in the caption for this photo. This unusual event should not be taken to suggest that this was the normal state of the river during the dry season. It may be true that higher than historic flows are now required in the Link River to ensure adequate flows downriver at Iron Gate Dam. However, the reason why these higher flows are necessary stems from the fact that large quantities of water to the Klamath River can no longer be derived from Lower Klamath Lake.

The primary narrative also cites outflow from the formerly closed Lost River Basin for artificially elevating water levels in the Klamath River. Although it is true that water is now diverted out of that formerly closed basin, the quantity of this contribution to the Klamath River is minor in comparison to the historic contributions by Lower Klamath Lake. Inflow from Clear Lake, the primary source of water in the Lost River

Basin, accounts for only 36,000 ac-ft per year to the Klamath River (Lewis et al. 2004). From the table below, one can see that this is a minor contribution compared to other sources.

Flows Under Conditions of Average Water Availability in the Upper Klamath Basin (Approximate Only: Actual Values Differ from Year to Year)

Location	Amount (acre-ft per yr)
Upper Klamath Lake outflow[a]	1,300,000
Outflow April-September	500,000
Directed to Klamath Project	400,000
Directed downstream	900,000
Clear Lake inflow[a]	117,000
Directed to Klamath Project[b]	36,000
Gerber Reservoir inflow[a]	55,000
Directed to Klamath Project	40,000
Total Klamath Project consumptive use, including refuges[a]	350,000
Total Klamath Project returns to Klamath River[a]	100,000
Nonproject irrigation diversions, upper basin[c]	420,000
Total flow at Orleans[d]	6,000,000
Trinity River flow	3,800,000
Total flow at mouth	13,400,000

[a]USBR 2000a.
[b]Evaporative losses are especially high in Clear Lake (long retention time and evaporation at about 3.8 ft/yr).
[c]NMFS 2001 (estimated from percentages).
[d]Near the mouth of the Klamath River, but above the Trinity River.

Table 1: Flow Contributions in the Upper Klamath Basin
(Lewis et al. 2004)

The counter narrative blames the Klamath Project for reducing the flows in the Klamath River through consumption of water that would have originally flowed into the river. While it is true that agriculture does consume large quantities of water, the wetlands in Upper Klamath Lake would have likely consumed more water than the crops in the Klamath Project (Lewis et al. 2004). What the Klamath Project lacks, however, is the slow release of stored water that historically came from Lower Klamath Lake. In its intense criticism of the Klamath Project, the counter narrative also downplays the numerous other anthropogenic impacts on Klamath River salmon over the past century. Most notably, it fails to emphasize the dramatic effect of dams that have cut off thousands of acres of spawning habitat and have fundamentally altered the flow regime of the river.

Water Use

The primary narrative contends that irrigators use only a small percentage of the flow from the Klamath River, while the counter narrative contends that the Project uses so much water that there is not enough water for fish. In this case, both claims are actually compatible, but equally deceptive. Both claims focus on the quantity of water consumption without looking at a more important factor: the timing of water consumption in relationship to the runoff regime of the river.

Since the Klamath River receives a large portion of its water from snowmelt in the spring, large quantities of water pass through Upper Klamath Lake prior to the beginning of the irrigation season. Additionally, several large tributaries downstream of the Klamath Project account for the majority of the total annual flow at the mouth of the river.

Although the Klamath Project uses a small percentage of the total annual flow, the Project consumes water during the summer months when inflows into Upper Klamath Lake are at their lowest and evaporation rates are at their highest. This amplifies the stress on the water system, especially during drought years, since farmers require more water for irrigation when little precipitation falls on their fields. The Klamath Project uses on average 1/3 of the available flow to the Klamath River during the summer months even though it takes a much smaller portion of the total discharge in the basin (Woodward and Romm 2003).

The hydrograph below depicts the runoff regime for the Klamath River at Iron Gate Dam and the runoff regime of the Williamson River (a tributary to Upper Klamath Lake). Note the large difference in streamflow between the spring months and the summer months for each of the rivers.

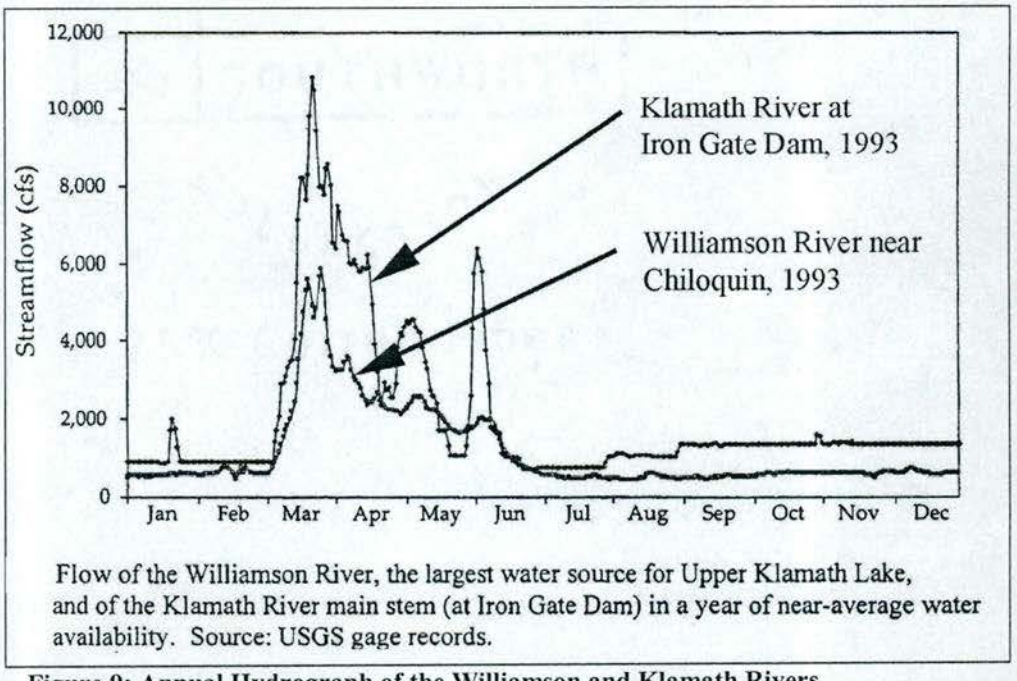


Figure 9: Annual Hydrograph of the Williamson and Klamath Rivers
(Lewis et al. 2004)

The primary narrative contends that agriculture is the most efficient use of water in the area using comparisons of water consumption between agriculture, wetlands, and evaporation to show that agriculture uses less water per acre. Although it is true that wetlands consume more water (Lewis et al. 2004), this argument fails to consider that open water and marshland also served as temporary water storage. Throughout the dry season, open water and marshlands gradually dried up and there were large fluctuations in flooded acreage between seasons. Historically, the volume of water in the upper basin

decreased over the summer, but it started at higher levels in the spring due to the large areas of flooded acreage. Agricultural fields lack this function of water storage. They start with relatively small quantities of stored water in the spring and require additions of water throughout the summer. The Klamath Project, and the wildlife refuges within its boundaries account for 57% of the total water consumption in the upper basin despite their diminished capacity for water storage of spring runoff (Lewis et al. 2004).

Drought

Although both narratives blame each other and the government for creating the water crisis in 2001, part of the crisis can be attributed to natural conditions of drought. In the spring of 2001, federal agencies began planning for water allocations amidst predictions that 2001 would be the worst drought on record (USFWS 2001). Late summer rains brought some relief to the extreme drought conditions, but 2001 was unquestionably a low water year. It was not, however, the worst drought even in recent years. As shown in Table 2, 1991 and 1994 were also critical drought years, but only in 2001 was there a major difference in the amount of water released to the A-Canal (the source of water for the Klamath Project). In 1992 and 1994, annual precipitation at the Klamath Experiment Station was less than 10 inches and releases to the A-Canal were only slightly less than average. In 2001, precipitation was 10.03 inches yet water releases to the A-Canal were approximately one sixth of the decade's mean.

Hydrologic data for the Upper Klamath Basin, 1991–2001.

Year	Total annual precip. (in)	UKL releases[a]		Klamath River diversions		Releases		Discharge	Klamath River flow	
		Link River	A-Canal	North Canal	ADY Canal	Gerber Reserv.	Clear Lake	Straits Drain	Keno Dam	Iron Gate Dam
		(1,000 acre-feet)								
1991	9.29	427	264	38	108	12	34	75	340	601
1992	11.34	400	227	28	71	1	8	31	271	469
1993	14.96	1,118	223	43	91	31	28	94	1,200	1,468
1994	7.72	480	226	28	81	37	8	61	361	556
1995	19.06	893	232	49	88	30	29	87	955	1,278
1996	19.54	1,468	252	36	71	52	32	132	1,719	2,159
1997	14.29	1,366	255	40	86	60	45	100	1,521	1,884
1998	19.51	1,418	236	28	78	53	101	128	1,896	2,218
1999	11.54	1,355	282	36	91	94	118	111	1,759	2,052
2000	11.51	1,047	273	41	93	37	57	78	1,123	1,438
Mean	**13.88**	**997**	**247**	**37**	**86**	**41**	**46**	**81**	**1,115**	**1,412**
2001	10.03	714	40	16	42	35	65	18	720	1,015

[a]Releases from Upper Klamath Lake

Data are presented on a calendar-year basis. Although hydrology data for the Project usually are presented on a water-year basis (October 1 to September 30), in some respects it is easier to visualize diversions for agricultural use on a calendar-year basis.

The Project includes other key points of diversion, which are more difficult to define and are not shown here. For example, the Lost River Diversion Channel is a major component of the system, but data sets do not indicate the direction of flows through the channel. (The channel is designed so that water can flow in either direction depending on operational requirements. See the section on the Lost River Diversion Channel, below, for additional explanation.)

Sources: Precipitation data are from the Klamath Experiment Station, and flow data are from the Bureau of Reclamation Klamath Project office.

Table 2: Hydrologic Data for the Upper Klamath Basin, 1991-2001
(Rykbost and Todd 2003)

Sucker Science

The most controversial application of science in the Upper Klamath Basin is the science pertaining to two species of endangered suckers: the Lost River sucker (*c'wam*), and the shortnose sucker (*qapdo*). While the primary narrative alleges that the science is biased or politically motivated, the real issue here is that much of the science pertaining to these fish is inconclusive. This should not, however, be taken to mean that the science is "bad." In a complex natural system, there are commonly numerous variables, and it can be difficult to find conclusive relationships between the variables. This is especially problematic when working with a limited data set. Since most of the data pertaining to these fish was gathered only after they were listed as endangered in 1988, scientists struggle to draw conclusions based on a limited set of data.

There is ample evidence to suggest that these fish were abundant prior to the construction of the Klamath Project. Historical accounts estimate that the tribes harvested 50 tons of suckers annually from the lower reaches of Lost River (Stern 1965). Suckers were also popular with the Euro-American population. In the 1890's there was a cannery for suckers on Upper Klamath Lake (Lewis et al. 2004). Recreational fishing for mullet continued until the State of Oregon closed the fishery in 1987.

There is also ample evidence to suggest that sucker populations have declined dramatically in recent decades. Between 1966 and 1985, mullet harvests dropped by approximately 95% (Markle and Cooperman 2003). Despite the closure of the fishery, sucker populations continued to plummet through the 1990's due to several major fish kills. These fish kills resulted in an estimated 80-90% reduction in spawners from 1995-1998 (Lewis et al. 2004). As much as 50% of adult population may have died in the 1996 kill alone (Lewis et al. 2004).

In 2001, the U.S. Fish and Wildlife Service presented a Biological Opinion calling for a minimum October lake level of 4140 feet above sea level. This was three feet higher than the previous minimum in the 1992 Biological Opinion (Hathaway and Welch 2003). The 2001 Biological Opinion also called for higher lake levels throughout the early spring and summer, suggesting a April-June elevation of 4142.5 feet above sea level, to protect spawning and survivability at different stages of the suckers' life cycle (Markle and Cooperman 2003). The primary narrative criticizes raising the minimum lake level because there is no correlation between lake levels and mass mortalities. However, there are several other reasons for recommending higher water levels. Higher lake levels provide more springs with sufficient depth for spawning, and they provide

more substrate and sufficient water in spawning tributaries (Lewis et al. 2004). Higher lake levels are also important for sustaining emergent macrophyte habitat at the lake margins for larval suckers (Markle and Cooperman 2003).

Scientists have worked to explain the causes for the decline in sucker populations over the past decade and a half, but there are inherent difficulties in estimating fish populations in such a large lake and in drawing conclusions from a data set that is shorter than the life span of these fish. Scientists also struggle to understand the relationships between the numerous factors affecting habitat and the life cycles of these fish. In many cases, there is a lack of sufficient data to draw clear conclusions. There are at least 11 hypotheses for sucker decline including: blocked migration to spawning areas, entrainment by water management structures, habitat degradation, overfishing, and mass mortality events caused by poor water quality (Lewis et al. 2004, Bortleson and Fretwell 1993). These hypotheses are either well supported, poorly supported, or unresolved. What is certain, however, is that mass mortality events, such as those in the 1990's, are currently the biggest threat to the survival of these species and that these events are caused by problems of water quality (Lewis et al. 2004).

Water Quality

The water quality in Upper Klamath Lake is heavily impacted by annual blooms of a species of cyanobacteria (blue-green algae) named *Aphanizominon flos-aque.* These cyanobacteria bloom in such abundance throughout the summer months that the lake turns bright green and at times the lake gives off a strong odor from the decaying blooms. As the blooms decay, the pH in the lower water column becomes extremely high, and the

dissolved oxygen at the bottom of the lake approaches zero. Even though suckers are quite tolerant of low water quality, the anoxic conditions can become lethal for these bottom-dwelling fish.

To protect suckers in Upper Klamath Lake from mass mortality events, the long-term goal for water management should be to reduce the concentration and duration of algal blooms (Markle and Cooperman 2003, Lewis et al. 2004). However, this goal will be difficult to achieve due to the naturally high levels of phosphorus in the lake and because the factors affecting the blooms are not well understood. This is an area of science where uncertainty has produced conflicts between the prevailing narratives. It is also an area where scientific advances are producing changes in policy decisions.

The primary narrative claims that the water quality in Upper Klamath Lake has always been poor based on historical accounts by early explorers in the area. Although it is likely that the water in the lake has long been unpalatable to humans, scientific studies have shown that the water quality has changed considerably over the past century. Specifically, these studies show that there has been a decrease in limnohumic acids and an increase in *Aphanizominon* (Lewis et al. 2004, Eilers et al. 2001).

Limnohumic acids are one reason why the waters of Upper Klamath Lake may have tasted bad at the turn of the century. Decaying plant material in wetlands produces these acids and they cause the water to have a dark brown color. The decrease in wetlands around Upper Klamath Lake has led to a decrease in limnohumic acids in the waters of the lake. The reduction of these acids is one hypothesis for the rise in *Aphanizominon* because they may have blocked enough light to suppress algal blooms (Lewis et al. 2004).

At the turn of the century, the phytoplankton in Upper Klamath Lake was primarily a green algae called *Pediastrum* (Eilers et al. 2001). However, as the decades progressed, *Pediastrum* was gradually replaced by *Aphanizominon*. *Aphanizominon* is estimated to have comprised 12% of the phytoplankton in 1913, but by 1957 it became ten times as abundant (Bortleson and Fretwell 1993). For the past several decades, phytoplankton in the lake has been a near-monoculture of *Aphanizominon*.

A recent study on the paleolimnology of Upper Klamath Lake used sediment cores to verify these changes in the lake (Eilers et al. 2001). This study noted that *Aphanizomenon* was not present in the lake 150 years ago, and it notes several other major changes to the lake in recent decades. Most notably, it documents a sharp decline in *Pediastrum* (green alga), the rise of *Aphanizominon*, a substantial increase in sediment accumulation rates, and marked changes in the N: P ratio. The study shows that the upper sediments are enriched by approximately 20% for nitrogen and 50% for phosphorus (Eilers et al. 2001). Conditions such as these, with high concentrations of phosphorus, are favorable to dense blooms of cyanobacteria such as *Aphanizominon* which are able to fix nitrogen from the air.

The causes for the dominance of *Aphanizominon* are not fully understood, however it is likely the result of several anthropogenic factors (Lewis et al. 2004). Scientists hypothesize that it may be the result of decreased wetlands and the corresponding decrease in humic acids (Lewis et al. 2004). However, it may also be the result of introduced fish species in the lake or the increase in phosphorus loading. (Lewis et al. 2004)

Phosphorus loading is another area of contention between the narratives. The counter narrative blames agricultural practices for adding phosphorus through chemical fertilizers and the addition of cow waste in the upstream tributaries. The primary narrative states that most of the nutrient loading is natural due to contributions from the surrounding soils that are rich in phosphorus, and it downplays the nutrient contributions of agriculture citing scientific studies that declare that past findings overestimated the impact of agriculture (Rykbost and Charlton 2001).

A recent report by the Oregon Department of Environmental Quality (ODEQ) states that 40% of the 1992-98 phosphorus load can be attributed to external loading from anthropogenic sources (Walker 2001). It cites recent findings that show that drainage from reclaimed wetlands are a major source of this external loading, and it sets conversion of these lands back to wetlands as one of its primary policy objectives for reducing the Total Maximum Daily Load (TMDL) for phosphorus (Walker 2001).

Scientists are still working to understand the links between lake levels, nutrients, temperatures, pH, and algal densities. However, it is generally accepted that reducing the phosphorus load would reduce peak algal densities and lower pH levels in the lake (Walker 2001). Table 3 below presents the major hypotheses related to water quality in Upper Klamath Lake and their status of support. It is interesting to note each hypothesis contains a degree of uncertainty; none of the hypotheses have been completely proved or disproved. Science always contains this element of uncertainty; hypotheses can only be well-supported or poorly supported.

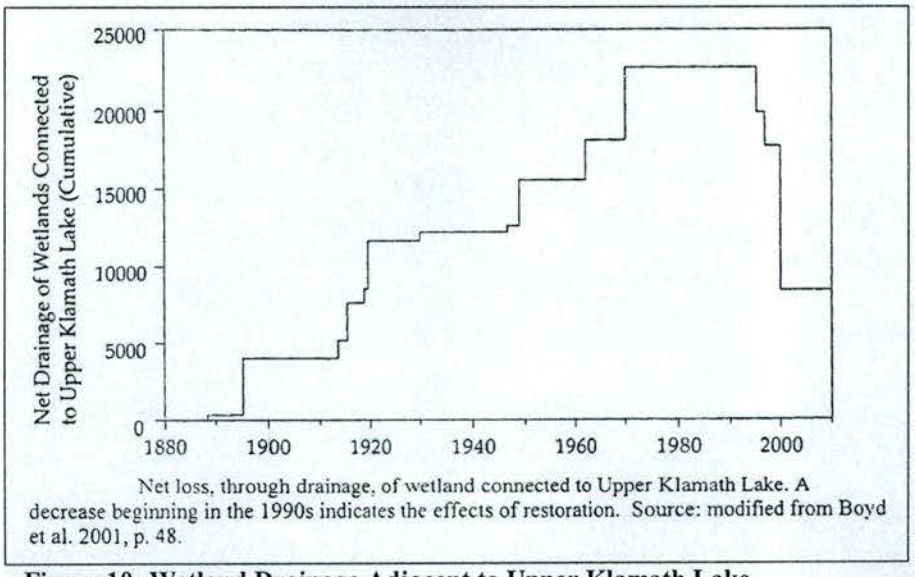
Status of Various Hypotheses Related to Water Quality of Upper Klamath Lake	
Hypothesis	Status
Algal abundance as measured by chlorophyll is positively related to total phosphorus in the water column	Well supported
Algal biomass as measured by chlorophyll is positively related to daytime pH	Well supported
Rate of early-spring development of biomass is positively related to rate of warming in the water column	Well supported
Rate of early-spring phytoplankton growth is inversely related to lake volume	Relationship weak or absent
Mean growing-season average algal biomass is inversely related to lake depth	Inconsistent with field data
Peak algal abundance is inversely related to lake depth	Inconsistent with field data
A large amount of phosphorus in the water column during the growing season originates in sediments (internal loading)	Well supported
pH is the main control on internal loading of phosphorus	Not resolved yet
Interception of anthropogenic phosphorus from the watershed will reduce algal abundance in the lake	Uncertain; unlikely
Lake water level is inversely related to pH	Inconsistent with field data

Table 3: Hypotheses Related to Water Quality in Upper Klamath Lake (Lewis et al. 2004)

Wetlands & Waterfowl

The primary narrative and the counter narrative also tell very different stories with respect to the status of wetlands and waterfowl. The counter narrative claims that 80% of the wetlands in the Klamath Basin have been reclaimed for agriculture and that this has caused a dramatic decrease in waterfowl. The primary narrative contends that these claims are false, and it emphasizes that several large wetlands restoration projects have boosted the amount of wetlands in recent years.

Looking at the Figure 10, one can see that wetlands adjacent to Upper Klamath Lake decreased until the 1970's, but have been partially restored since the late 1990's. As of 2001, when this graph was published, more than half of the reclaimed wetlands adjacent to Upper Klamath Lake had been restored.

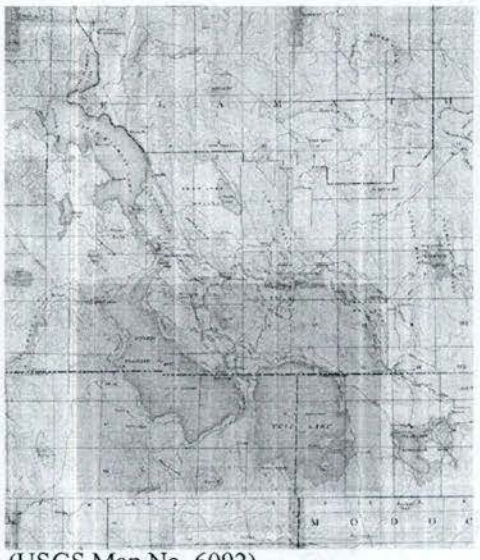


Net loss, through drainage, of wetland connected to Upper Klamath Lake. A decrease beginning in the 1990s indicates the effects of restoration. Source: modified from Boyd et al. 2001, p. 48.

Figure 10: Wetland Drainage Adjacent to Upper Klamath Lake
(Lewis et al. 2004)

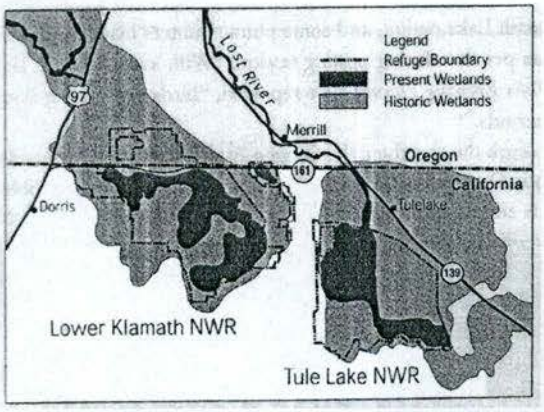
Looking at wetlands loss for the entire Upper Klamath Basin gives a very different picture. The substantial loss of wetlands at Lower Klamath Lake and Tule Lake brings total wetlands loss closer to the 80% figure cited in the counter narrative. Since these wetlands fluctuated widely in size depending on the seasons and moisture conditions, it is difficult to state exact quantities for wetlands losses. However, by comparing a 1905 map to a recent map of the area in Figure 11, one can easily see that there has been a very large reduction in open water and wetlands in the upper basin.

1905 Map of the Upper Klamath Basin



(USGS Map No. 6092)

Wetlands Comparison: 1905 to Present



(Foster 2000)

Figure 11: Wetlands/Water Comparison, 1905 – Present.

The counter narrative asserts that the loss of wetlands has caused a major reduction of waterfowl in the Basin, citing a decrease in waterfowl from 6 million to 1 million over the past 50 years (USFWS 2003). The loss of wetlands in the Upper Klamath Basin has undoubtedly affected waterfowl, but it cannot be viewed as the sole cause for the decrease in populations. Most of the waterfowl in the Upper Klamath Basin are migratory, so one must look at habitat issues throughout their respective ranges. Loss of wetlands in other areas may have played a larger role in the population declines. California, for example, has lost 90% of its wetlands (Clark 1999). Restoring wetlands in the Upper Klamath Basin is not likely to enable waterfowl populations to rebound without corresponding restoration of lost wetlands in California and Mexico.

Conclusion

During and after the water crisis of 2001 both sides chose scientific facts and studies that supported their own political positions. In many cases these claims were misleading or given out of context. Comparing these claims against each other, and against a wider body of scientific knowledge we can begin to understand the degree of validity of these claims and gain a clearer perspective on the issues surrounding the conflict. We cannot, however, expect an analysis of science to completely resolve the complexity and polarization of natural resource conflicts. As evidenced in this case study, science can also produce more complexity as we learn more about the interconnectedness of environmental variables. The complexity also increases as we understand the limitations of scientific knowledge and the inherent uncertainty in our scientific methods.

Both the primary and the counter narratives repeatedly call for science to provide rapid conclusions for settling the controversies, but science is very limited in being rapid or conclusive. Science is a methodical process; it takes time to see results, just as it takes time for nature to rebound. Science also contains inherent levels of uncertainty. Scientists need to acknowledge uncertainty in their findings and determine levels of acceptability. In many cases, resource managers must use professional judgment when the science remains inconclusive. The extent to which professional judgment should be used is a policy question that deserves careful consideration.

CHAPTER 6

METANARRATIVE

Introduction

After compiling the relevant stories and nonstories, the next step in Narrative Policy Analysis is to develop a "metanarrative" that makes comparisons between the stories and recasts the issues into a new form. Rewriting the stories into a new form is intended to create a tool for future policy-makers for understanding the uncertainty, complexity, and polarization surrounding an issue. As Emery Roe states in his book, *Narrative Policy Analysis: Theory and Practice*, "nothing in the four steps guarantees that uncertainty will be reduced, complexity simplified, or consensus reached across polarized groups" (Roe 1994, 15). Still, the metanarrative may help to explain the sources of conflict and help jump-start the decision-making process.

This metanarrative of the 2001 water crisis in the Upper Klamath Basin is designed to highlight the major differences of opinion between the primary narrative and the counter narrative and to explain some of the roots of the conflict. There are several major differences between the narratives regarding interpretations of history, science, legal standards, and ethics. There are also several factors that can be considered to be roots of the conflict, including: conflicting claims, changing priorities, interagency conflict, imperfect data, system complexity, lack of flexibility, and a failure to plan for crisis (Braunworth and Castle 2001).

As stated in Tupper Blake's book, *Balancing Water: Restoring the Klamath Basin*: "Much of the controversy in the West…is a result of people speaking different versions of what is thought to be a common language. Talk is degraded into a posturing, adversarial game. We quit listening, and only talk to those we agree with, who speak 'our language' " (Blake, Blake, and Kittredge 2000). This metanarrative is designed to bring the adversarial narratives of water policy together for comparison to see if differences can be reconciled and to see if common ground can be realized.

Historical Interpretations

The stories and nonstories in the previous chapters contain differing interpretations of history with regard to the historical periods that are emphasized and the perceptions of environmental change. Both sides make selective use of stories to build support for their respective positions. The primary narrative focuses entirely on the history following Euro-American development of the Klamath Project, particularly on the history of the early homesteaders, and it ignores preceding cultural conditions. Conversely, the counter narrative focuses chiefly on pre-settlement conditions and ignores the cultural development that has accompanied the Klamath Project. It is important to recognize both of the histories in the Basin and the effects of past policy decisions.

Euro-American settlers held little regard for Indian rights or culture during the early settlement of the Klamath Basin. Indians were banned from practicing their religious customs, their lands were taken, and their culture was suppressed in numerous ways (Zakoji 1953). The 1905 *History of Central Oregon* illustrates the disregard for

Indian culture with a passage that states: "[Klamath became the] favored county of Oregon. In the earlier days it was the dreaded Modoc country; now it is the county of happy homes. Where once resounded the blood-curling war-whoop of savage Indians, now live a contented people at peace with the world" (History of Central Oregon 1905).

It should be acknowledged in any history of the Klamath Basin that there was a culture in place prior to Euro-American settlement and that this culture lived in a manner that was compatible with the environment for up to 14,000 years. Likewise, it should be acknowledged that settlement by whites was virtually inevitable, and that the culture of the area has transformed so significantly that a return to an environment of subsistence-living people is highly unlikely.

The primary narrative is quick to accentuate the hard work of the early homesteaders while minimizing the affects that they had on the surrounding environment. As discussed in the science nonstory, environmental alterations in the Upper Klamath Basin have been extensive. Water levels in Upper Klamath Lake were lowered by as much as 3 feet during critical drought years due the removal of the natural basalt sill and the construction of the Link River Dam. Water levels in the Klamath River have decreased during the dry season due to the loss of inflow from Lower Klamath Lake. Water quality in Upper Klamath Lake has decreased due to increased nutrient loading and the emergence of massive blooms of *Aphanizominon flos-aque* that were not present in the lake 150 years ago. There have also been dramatic decreases in wildlife, not least of which are the endangered species of suckers and salmon. Claims to the contrary in the primary narrative hold little scientific or historic credibility and are either the result of

misunderstandings, misinformation, or political propaganda. These contrary claims increase the complexity and uncertainty of the conflict and should be addressed in future policy making.

The counter narrative gives a corresponding one-sided history by accentuating the scope of environmental change without acknowledging the history of homesteaders or the present culture in the Basin. The Euro-Americans that settled the project area were hardworking people, and the federal government encouraged them to transform the landscape to pave the way for further growth and prosperity (Southwick 2002). The homesteaders built the communities that dot the Klamath Project, and their descendants continue to contribute to the larger regional economy. Society still values the goods produced by the farmers in the project, and large portions of the population are not inclined to favor a return to pre-settlement conditions. Environmental organizations that perpetuate a "fall from Eden" discourse, in which everything prior to Euro-American civilization was good and everything after is bad, may want to reconsider this antagonistic mindset in order to facilitate future negotiations with the existing population in the Basin.

Interpretations of Science

Policy makers often look to science to reduce the complexity and uncertainty of issues in order to reduce polarization. However, as illustrated in this case study, science can have the opposite effect when opposing parties exploit a lack of scientific consensus to create further polarization. Scientific studies of the natural systems in the Upper Klamath Basin contain a great deal of uncertainty. This uncertainty is reasonable given

the complexity of the systems, the lack of complete data, and the numerous variables to be considered. Both of the narratives make scientific claims amidst this uncertainty based on compartmentalized studies that fail to provide clear directives for ecosystem approaches. Some of the key issues of polarization include: the value of maintaining higher lake levels, the affects of farming on water quality, and the usage rates between irrigation and natural systems.

The primary narrative claimed that suckers did not need higher lake levels in 2001 and criticized scientific claims to the contrary based on the lack of correlation in the 1990's between fish kills and low lake levels. This interpretation overlooked the complexity of the relationships between water quality, water quantity, and sucker recruitment and survival. The lack of correlation between fish kills and low lake levels does not necessarily negate the possibility that low water levels can be harmful to suckers, nor does it prove that an inverse relationship exists. Considerable scientific evidence suggests that low water levels can be detrimental to water quality and habitat (Markle and Cooperman 2003; Wood, Fuhrer, and Morace1996), and historical evidence shows that suckers thrived in pre-dam conditions with higher lake levels. Claims in the primary narrative that assert that higher lake levels are harmful to suckers are dubious due to the extremely short duration of the data set and the lack of any scientific reports explaining how high water levels would harm suckers.

Another area of scientific uncertainty relates to the impacts of agriculture on water quality. Both of these narratives make claims about the impact of agriculture, but both overlook the greatest challenge to water quality in the upper basin: controlling the dense blooms of cyanobacteria (blue-green algae) in Upper Klamath Lake. While the

science relating to these blooms contains a great deal of uncertainty, recent studies suggest that blooms are related to agricultural practices and that there are other factors that also play a role. Agriculture affects blooms by increasing external loading of nutrients. This occurs primarily from nutrients that leach from reclaimed wetlands and also from fertilizer use and increased soil erosion (ODEQ 2002). Agriculture also affects blooms by increasing internal loading through lowering lake levels and increasing sediment resuspension (Wood, Fuhrer, and Morace1996). There are other factors, such as air temperatures, that influence bloom timing and density and are entirely unrelated to agriculture.

The prevailing narratives also conflict over the perception of water use by agriculture. The primary narrative asserts that agriculture is the most efficient use of water due to scientific reports that show that agriculture uses less water per acre than wetlands. The counter narrative asserts that irrigated agriculture is the major consumer of water, and it looks to retiring agricultural lands and creating wetlands as the solution to the problems of water scarcity. Both of these assertions contain credible scientific claims that increase uncertainty for policy makers who must determine ways to reduce water scarcity. Although agriculture does use more water than wetlands on an acre-to-acre comparison, agriculture uses water during the dry season without creating temporary water storage (Lewis et al. 2004). Wetlands, on the other hand, start the dry season with stored water, and gradually loose the water over the summer due to consumption or outflow. Simply converting agricultural lands to wetlands will not create additional water storage for other uses unless the water is permitted to drain from those wetlands during the dry season.

Due to the complexity of the natural systems in the Upper Klamath Basin, there may never be complete scientific consensus on several of the controversial issues. The 1984 *Klamath County History* reports that, "educated experts have conducted 113 studies of the problems related to Upper Klamath Lake" (Klamath County History 1984). In spite of these studies and the numerous studies since 1984, a great deal of uncertainty remains. Policy makers must understand that decisions need to be made despite a lack of scientific consensus. Policy makers may be reluctant to move in a direction to resolve conflict because of the political costs, and may therefore call for additional studies to forestall controversial action (Roe 1994). However, as Emery Roe cautions, "using research uncertainties to reduce the threat of further polarization will not forestall the highly polarized political debate that will ultimately surface…" (Roe 1994, 103).

Legal Interpretations

The complexity and uncertainty of water rights in the Upper Klamath Basin led to conflicting legal interpretations during the 2001 water crisis. The primary narrative used property rights theories to argue that the federal government did not have a right to take their irrigation water. Whereas, the counter narrative claimed that the government had the right to deny water based on preeminent reserved rights for tribal trust obligations and endangered species protection. These differing legal interpretations arose due to the complexity of agencies and laws affecting water claims, the uncertainty resulting from recent changes to federal priories, and the external influences of interest groups that used the conflict to push larger political agendas.

As discussed in chapter four, water allocations for the Klamath Project are incredibly complex. Water use in the Project is affected by the Reclamation Act, the Klamath River Basin Compact, FERC, the ESA, tribal trust obligations, four national wildlife refuges, contracts with irrigation districts, and individual water claims. These competing interests have produced incompatible claims for a finite amount of water in the Basin. Determining the validity of the claims requires a thorough understanding of prior appropriation doctrine, state water laws, and federal case law.

The priorities for water use in the Klamath Basin have shifted significantly over the past century, and this has produced uncertainty for water users who reject the notion that laws can change over time. Water use in the Basin initially favored consumptive off-channel uses and was governed solely by Prior Appropriation Doctrine. However, over the past 30 years, a combination of court decisions and legislation has rearranged these priorities so that reserved water rights for tribal trust obligations and protection of endangered species now trump previous allocations and priorities. Despite protests in the primary narrative, the courts have determined that federal promises to provide irrigation water to the Klamath Project, and the priorities for water use outlined in the Klamath River Basin Compact, do not hold the same legal weight as endangered species protection and tribal trust obligations.

A great deal of the polarization in 2001 stemmed from a debate over individual rights verses collective rights. The primary narrative argued for protecting individual rights to irrigate private land and the counter narrative argued for safeguarding collective rights to protect public resources. The balance between individual rights and collective rights is an ongoing national debate that is fueled by organizations on both ends of the

spectrum. Outside interest groups clearly used the 2001 crisis in the Klamath Basin as a public battleground for this ongoing national debate. Property rights groups played on farmers' distrust of government and pushed conspiracy theories about government plans to reduce individual rights. Likewise, environmental groups pushed propaganda to portray farming as heavily subsidized and ecologically destructive. The line where insider beliefs and outsider pressures meet is difficult to gage. However, it should be acknowledged that these outside groups used uncertainty to their advantage to push their respective agendas and to further polarize the debate.

Another area of uncertainty in the water debates stems from the fact that specific quantities of water to fulfill tribal trust obligations and species protection remain unquantified. The Oregon Water Resources Board is currently working to resolve these quantifications through the Klamath Basin Adjudication process. However, this adjudication process has been ongoing since 1975, and the Tribes estimate that the board is still several years from completing the adjudication process (Ullman 2004).

Quantities of water for species protection remain ambiguous due to periodic changes in the Biological Opinions by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The 2001 Biological Opinions required a significantly greater amount of water for endangered suckers and salmon than in 1992. By setting lake levels to the USFWS 1992 Biological Opinion and using the FERC minimums for flows through Iron Gate Dam, an additional 344,000 ac-ft could have been supplied to irrigation in the Klamath Project. Therefore, in absence of ESA requirements, irrigators could have received close to average water deliveries (Rykbost and Todd 2003)

Nonetheless, federal agencies are bound by ESA requirements. They have a federal mandate, known as the Precautionary Principal, to err on the side of caution. They must also use adaptive management strategies and respond to changes in the "best available science." These requirements led to more conservative Biological Opinions by the USFWS and NMFS in 2001. The USFWS and NMFS increased their recommendations for water due to precautionary policies, the failure of the Bureau of Reclamation to implement requirements contained in the 1992 Biological Opinion, evidence of greater sucker loss in the 1990's, and a greater scientific emphasis on water quality (Markle and Cooperman 2003).

Perceptions of Nature / Ethics

The water crisis of 2001 demonstrated that there are fundamental differences regarding perceptions of nature and environmental ethics between the prevailing narratives. It is debatable whether or not these differences can be reconciled, but it is important to recognize the different viewpoints because they play an important role in shaping natural resource policy and politics. The primary narrative endorses a view that nature is robust and that human impacts on the environment have been minor. Nowhere in the primary narrative is there any acknowledgement that human activities have reduced wildlife abundance. In fact, a reverse notion is endorsed: the primary narrative depicts irrigators as stewards of the refuges because they provide the refuges with water and grains. This narrative places little value on indirect uses of natural resources. Instead, it argues that resources should be used for production - that good land *should* be farmed. The counter narrative endorses an opposite view by stating that the ecosystem of the

Klamath Basin is threatened from top to bottom. It accentuates the reductions in wildlife, and attributes these reductions directly to human activities. The counter narrative places value on some direct uses of natural resources, such as commercial fishing, but it also places value on indirect uses such as recreation.

One point of commonality between the two narratives is the anthropocentric value of using natural resources to preserve livelihoods and culture. The primary narrative argues for water resources to sustain accustomed livelihoods and farming communities. Likewise, the counter narrative argues for water resources to sustain the fishing livelihoods and the cultures of native tribes and downstream fishing communities. Despite claims in the primary narrative that environmental groups are "haters of humankind," there is little evidence in the counter narrative to suggest that these groups are motivated purely by biocentric ethics to preserve fish for their own sake.

The evolution of American environmental ethics is also important in understanding the changes in federal policies over recent decades. The Klamath Project was constructed during an era that pursued conquest over natural resources to "democratize the West by peopling it with farm families… [to] fulfill the birthright of every American wanting a fresh, equal start"(Wilkinson 1992). Environmental protection measures, such as fish ladders for the first Copco Dam on the Klamath River, were considered impractical (Boyle 1976). However, in the 1960's the national culture began to shift in response to perceptions of threats to the environment. People began to perceive that society was living with an outdated ethical code that was inconsistent with our capacity for environmental change.

The shift in culture and values in the 1960's and 70's led to several national environmental laws, such as the Endangered Species Act and the Clean Water Act, began to restrict private enterprise in order to safeguard the environment and protect public interests. The shift in culture also produced different views regarding the proper use of resources. In earlier years, public lands were controlled primarily used by local resource users and production using these resources was considered to be in the public's interest. Nowadays however, a larger segment of society believes that public lands belong to everyone, including outsiders, and conservation of these resources is considered to be in the public's interest. These changes have produced conflict in the Klamath Basin where local resource users cling to an earlier era of local control of public resources.

Sense of Entitlement

In both of the prevailing narratives the stakeholders exhibit a sense of entitlement to the Basin's water resources. They each describe the reasons why they should receive resources and why opposing groups should not. Although the courts ultimately determine the validity of these claims, it is important to understand the perceptions of entitlement in each of the narratives because they provide insight into the complexity of this conflict.

The sense of entitlement in the primary narrative is based on perceived fulfillment of obligations to the federal government. According to this view, the federal government encouraged homesteaders to settle in the area and promised two and a half acre-ft of water for their farms in perpetuity under the stipulation that the irrigators must pay the costs of the reclamation project. The primary narrative claims that irrigators have paid

the entire cost of the irrigation project and that they continue to pay annual operation and maintenance fees. The irrigators feel that they entered into a trust obligation with the government and that they have lived up to their end of the obligation.

The counter narrative does not refute the claim that homesteaders were promised water by the federal government. Rather it, blames the government for not informing the homesteaders that water had already been promised to the Klamath Tribes. On the issue of payment for the Project, the counter narrative claims that irrigators did not pay the full costs of the project due to substantial subsidies from the federal government.

In truth, most of the farmers in the Project do not receive direct agricultural subsidies for their crops, but they have all benefited from indirect subsidies that are not referenced in their narrative. The largest indirect subsidies were the no-interest loans used for the construction of the Project. Irrigators in the project were required to repay construction costs within 40 years, but this payment was extended several times and no interest was ever required on the loans. In 1952, this indirect subsidy was calculated to be $10, 761, 567 (Strantz 1953). The irrigators in the project also continue to receive an indirect subsidy through extremely low electricity rates that have not increased since 1917. The Oregon Natural Resources Council claims that this subsidy amounts to $10 million annually (McCarthy 2002)

The counter narrative claims entitlement to water resources based on treaty obligations. This narrative claims that the Tribes gave up millions of acres of land for assurances of federal services and promises of water to sustain their hunting, gathering, and fishing lifestyle. The narrative claims that the government swindled them out of their land several times and finally took all their land when the Tribes were terminated in

1953. The primary narrative refutes these claims with allegations that the Tribes voluntarily chose termination and that they have been compensated several times for their lands.

While it is true that the Tribes have been paid for their lands, it is questionable whether they received fair compensation and whether the decision to terminate was entirely voluntary. The fact that the Tribes did receive some compensation for their losses is not referenced anywhere in the counter narrative. The tribes did receive $7 million from a 1926 lawsuit over lost reservation lands around Yamsay Mountain (Zakoji 1953). In 1959, the 78% of the tribal members that voted to withdraw from tribal status each received checks for $43,500. The remaining members received payments when their property assets were liquidated totaling $49 million in 1974 and $81 million in 1980. Both the withdrawing and remaining members received portions of a $16 million settlement in 1983 (Haynal 2000). In total, the Klamath people have received approximately $220 million for their lands (OWRD 1999).

Despite these payments, there is considerable historical evidence to suggest that the Tribal members were not aware of the full implications of termination when they chose to be withdrawing or remaining members. Many believed that they would not receive anything if they did accept termination since Congress had been withholding a $2.6 million settlement that had recently been awarded by a Court of Claims (Haynal 2000). Many did not understand that they would stop receiving federal services and timber sale payments. These lost services amounted to $4.3-5.6 million per year (Haynal 2000). The tribes estimate that lost timber payments from 1954-2000 totaled over $500 million (Foreman 2000). There is also evidence to suggest that the government was aware

that the tribal members were not prepared for termination. Many of the withdrawing members did not know how to manage their financial assets because they did not have a high school education or even a checking account. In 1957, prior to paying tribal members for withdrawing, a federal report acknowledged that tribal members lacked sufficient education and skills to manage their own assets (Klamath Management Specialists 1957). It is therefore little surprise that by 1972, 40% of the withdrawing members had spent their $43,000 and that over 34% of the Native American population in Klamath County was below the poverty line (Haynal 2000).

Perceived Threats to Power / Livelihoods

The water crisis of 2001 was, in many ways, a power struggle between stakeholders. Each group felt threatened by competing interests and felt compelled to take action in order to protect their accustomed livelihoods. The primary narrative perceived threats to their farming livelihoods by well-funded environmental groups and by the federal government that they argue had turned against them. Likewise, the stakeholders in the counter narrative perceived threats to fishing livelihoods and Klamath Tribes' culture due to government inaction to protect endangered species and by the continuance of the status quo for the Klamath Project. The counter narrative denied responsibility for threatening the farm economy, and instead, it pointed to external influences for causing the decline of farming. Likewise, the primary narrative denied responsibility for threatening endangered species by arguing that irrigators were willing to be flexible and reduce water use during years of drought.

It is understandable that irrigators would feel threatened by environmental groups. Environmental groups have halted several economic development plans in recent decades including the proposed ski area at Pelican Butte and the proposed Salt Caves hydroelectric project. Current efforts by land trusts to buy farmland threaten to raise production costs for the remaining farmers who must split the annual operation and maintenance costs of the Project (Jaeger 2002). Any increases in production costs are a major threat to this industry that often sits on the brink of unprofitability.

The past 30 years of economic data show that farm jobs in the Basin have been decreasing and are being replaced primarily by service-industry jobs (Weber and Sorte 2003, Lewis et al. 2004). Since crop acreage has not decreased significantly during this time frame, this suggests that technology has replaced human labor as farms in the Klamath Project have become increasingly modernized (Carlson and Todd 2003, OSWRB 1971). The replacement service industry jobs are likely to be less appealing to farmers. However, they may be the only available option since 41% of the agricultural workers in Klamath County have less than a 12^{th} grade education (Oregon Employment Department 2000).

It is also understandable that irrigators feel betrayed by the federal government. For nearly a century the irrigators grew accustomed to the power relationships in the upper basin. The Bureau of Reclamation dominated control of water resources, and their interests were closely aligned with the interest of the irrigators. However, the ESA listings in the late 1980's shifted the power structures between agencies and stakeholder groups. Environmental groups and the Klamath Tribes gained substantial leverage over irrigators, and the USFWS and NMFS gained leverage over the Bureau of Reclamation

since they are the "listing agencies" of the endangered fish. The Bureau was not traditionally concerned with species protection, but the Endangered Species Act now requires this agency to make species protection a top priority. Irrigators feel betrayed that Bureau's actions no longer reflect their interests.

From the counter narrative's perspective, the Klamath Project and the incapacity of the federal government to make changes appear as threats to restoration efforts. The counter narrative rejects the notion that farmers are willing to reduce their water use enough to protect species, noting that Upper Klamath Lake reached its lowest level in 1994 during a year when irrigators voluntarily reduced their water usage. The counter narrative calls for sweeping changes to water management in the Upper Klamath Basin, and it is highly critical of the federal government for dragging its heels on what it perceives to be minor changes – such as requiring fish screens on irrigation canals.

Conclusion

When analyzing a complex environmental controversy such as the 2001 water crisis in the Upper Klamath Basin, it is often difficult to discern fact from fiction and to develop policies that will reduce polarization. As demonstrated in this metanarrative, the stakeholder groups actively attempt to sway public opinion through partial stories, emotional appeals, and in some cases, deception or misinformation. Rewriting these narratives into a new form is not intended to solve this controversy. Rather, it is intended to allow the reader to understand some of the major points of controversy with the hope that a greater understanding will lead to improved policy decisions. This approach may be frustrating for those who seek clarity, simplicity, and resolution; but easy answers are rare in environmental controversies. Policy makers in the Klamath Basin must be aware that there will always be a degree of uncertainty, complexity, and polarization as they work to perform the difficult tasks of achieving fairness and implementing the goals of society. Policy makers should avoid seeking simple solutions to complex environmental problems and acknowledge that they will ultimately be required to make difficult value judgments that may prove to be politically unpopular.

CHAPTER 7

ANALYSIS

Introduction

The final step in Narrative Policy Analysis is to determine the applicability of the metanarrative to future policymaking. To make this determination, we must answer the questions, "Does the approach offer insights? Does it make the controversy being analyzed more understandable and tractable to decision making?" (Roe 1994). These are questions that should probably be answered by decision makers instead of the writer of the metanarrative. However, I will attempt to answer them here despite the fact that I am not an expert in the conventional analytical approaches of "microeconomics, statistics, organizational theory, law, or public management practice" (Roe 1994).

Insights & Understanding

The first questions for the analyst are: "Does the approach offer insight? Does it make the controversy being analyzed more understandable…?" To this, my answer is "yes." As an outsider to the area, and having lived overseas during the 2001 water crisis, I was quite confused by the controversy at the outset of this narrative policy analysis. However, through compiling and rearticulating the stories, nonstories, and the metanarrative, I have undoubtedly gained a better understanding of the controversy from when I started, and hopefully I have gained some insights to offer as well. This case study began as a way of analyzing the water crisis in 2001, but the narrative policy

analysis approach forced me to interrogate some of the larger, underlying issues that led to the crisis. Therefore, I believe that the approach is also helpful for broadening the scope of study when focusing on a specific event in time.

The metanarrative helps to make the controversy more understandable by pulling together the histories that are told in piecemeal through the various stories and nonstories. Listening only to the dominant narratives, policy-makers hear a disjointed version of history which can be slanted one way or another depending on the power differentials between the stakeholders. By integrating and comparing the differing interpretations of history, a more complete picture of the controversy's history is gained. In this case study, the metanarrative integrated the historical interpretations of irrigators in the Klamath Project, the Klamath Tribes, downstream fishermen, environmental science, and water rights. I believe that bringing these histories together does provide readers with a more comprehensive history than might ordinarily be attained.

The metanarrative also helps to bring some degree of clarity to the scientific uncertainty that fueled the crisis in 2001. In some cases, the metanarrative illustrates that scientific uncertainty remains unresolved, such as the lack of a clear understanding of the causes of *Aphanizominon* dominance in Upper Klamath Lake. In these cases, the metanarrative illustrates that further scientific studies may be warranted. In other cases, such as the confusion over water usage between farmlands and wetlands, the metanarrative may help the reader understand how seemingly conflicting claims can each be true. This improved understanding of scientific issues can help decision-makers improve future policy-making.

The metanarrative also clarifies the legality of the controversial federal actions in 2001. The metanarrative makes it clear to the reader that despite the property rights rhetoric, the federal government was obligated to take action to preserve endangered species due to the legal strength of the Endangered Species Act and the preeminence of treaty obligations to the Klamath Tribes. The metanarrative also explains that the government was required to take precaution in policies affecting endangered species and to err on the side of caution when faced with scientific uncertainty.

The metanarrative offers insights on the controversy through its discussion of perceptions of nature and ethics and also through its discussion of perceived threats. By comparing the narratives, we see that the stakeholder groups hold different viewpoints that may ultimately represent irreconcilable values. These viewpoints are comparable, however, and the comparison in the metanarrative allows the reader to gain a better understanding of the motivations behind the stakeholders' actions. The metanarrative makes it clear that a national shift in values in favor of environmental protection has disrupted the status quo of power relations in the Klamath Basin and that this shift has led to increased polarization because it threatens the livelihoods of the pro-irrigation stakeholders.

Impact on Policymaking

The second question for the analysis is: "Does the metanarrative make the controversy being analyzed more tractable to decision making?" To this my answer is "perhaps." I think it is possible that the metanarrative could be beneficial because the current narratives are so conflicting that they are almost paralyzing to decision-making,

and a new narrative could help to jump-start the decision-making process. However, this is a difficult question since I am not in a position to make policy decisions. Therefore, I can only make my recommendations for future policies based on my analysis of the metanarrative.

The metanarrative suggests that people are not hearing a complete history of the Upper Klamath Basin if they listen only to the dominant narrative that they hear most often. It would, therefore, be wise policy to educate the population at every opportunity on the multiple histories of the area. This might include increasing the local history component in the public schools to include histories of pre- and post-development of the Klamath Project. Cultural activities should also be sponsored throughout the community to teach people about ancient Indian customs, such as the "return of the *c'wam* ceremony" as well as to celebrate the accomplishments of the early homesteaders and current farmers in the Basin.

The science in the metanarrative suggests two major focus areas for future policy work. First, efforts should focus on improving the water quality of Upper Klamath Lake. The lake has probably been hypereutrophic since before the construction of the Klamath Project. However, the recent dominance of *Aphanizominon flos-aque* further degrades water quality to the point that endangered suckers face a serious risk of more frequent mass fish kills. Reducing bloom densities will require several policies to reduce external nutrient loading from upstream sources. Such policies might include: reducing upstream use of chemical fertilizers, increasing buffer zones along upstream tributaries, and continued restoration of reclaimed wetlands connected to the lake in order to reduce nutrient leaching and increase inputs of limnohumic acids into the lake. Policies could

also aim to reduce internal nutrient loading by maintaining lake levels above the historic low of 4140 feet above sea level in order to reduce sediment resuspension. Additional policies should fund scientific studies aimed at developing ways to suppress algal blooms in the lake.

The second major policy effort is to find ways to sustain higher flows in the Klamath River during the dry season. This is currently seriously impeded by the reduction in storage in the basin. With the loss of historic storage in Lower Klamath Lake, water inputs for the upper reaches of Klamath River must now come directly from Upper Klamath Lake. This is not a viable option due to the need to maintain higher lake levels discussed previously. Therefore, policymakers should seriously consider restoring the hydrologic functions of Lower Klamath Lake. The benefits of such a policy would be three-fold: it would sustain higher flows to the Klamath River by storing and later releasing water from high spring flows, it could create additional storage for irrigating remaining farmland in the Klamath Project, and it would create more productive wetland habitat by allowing fluctuations in the water level. If this proves to be a politically unviable option, artificial storage elsewhere in the basin should seriously be considered. Environmental groups may object to artificial storage because this would not restore "natural" flows, but they should realize that achieving "naturalness" may now require management of resources by highly unnatural means (Varner 1998). If artificial storage is developed, it should be created in a deep terrain feature to minimize evaporative losses.

The metanarrative illustrates that ambiguity in water claims is another source of continuing controversy in the Basin. Policy efforts should, therefore, be directed at reducing this ambiguity. The quickest route to resolution in this area would be to finish

the Klamath Basin Adjudication process. This process has dragged on since 1975, and the Alternative Dispute Resolution process was effectively shut down due to the increased polarization resulting from 2001. It is generally understood that the Klamath Tribes are holding out on settlement of water claims with the hope of using this power to regain their reservation lands (Ullman 2004). On this matter, I believe that serious consideration should be given to returning the lands to the Tribes. Such a policy could hasten the resolution of the Klamath Basin Adjudication and atone for past wrongs to the Tribes during the Termination Era. Restoration policies should acknowledge, however, that the Tribes have been compensated for their lands in the past. Restoration of reservation lands should come with a fee for a percentage of that previous compensation which could be taken from future timber sales. Such a fee could be made more acceptable to the Tribes if the funds were directed to habitat improvement projects throughout the upper basin.

The metanarrative shows that opposing views of nature and environmental ethics also fuel the polarization of the narratives. These opposing views seem to be irreconcilable and will likely continue despite scientific evidence. Proponents of the primary narrative are likely to continue to promote their view that farming benefits the environment and proponents of the counter narrative will likely continue to promote environmental crisis rhetoric as long as conventional farming exists in the area. To settle these opposing views, I believe that future policy might be well served by splitting the Klamath Project between the interests, whereby the historic Lower Klamath Lake area could be targeted for environmental restoration, and the remaining land in the Klamath Project could be safeguarded for conventional farming. Restoration of Lower Klamath

Lake would include removing lease farmers on the refuge, purchasing and retiring farmland in the historic lake basin, and flooding the area with water from the Klamath River during high spring flows. Safeguarding farming in the remainder of the Project would include policies to provide greater water security to the remaining farmers.

Future policies should also work to reduce polarization by reducing stakeholders' perceptions of threats. The metanarrative illustrates that environmental organizations and irrigators in the Klamath Project each perceive the other as a threat to their interests. I think these tensions are likely to continue regardless of future policy, but I think splitting the Klamath Project, as discussed previously, might ameliorate some of the tensions in the long-run because it would safeguard an area for irrigated farming, and it would also reduce the environmental impact of the Klamath Project. The other major threat, contained in both of the narratives, is the federal government. I believe that the federal government has a large burden of responsibility to reduce the threats it poses to stakeholders because it is the most culpable for creating the conditions that led to the crisis in 2001. It overextended promises of water, and it failed to plan accordingly for shortages. Future federal policy should, therefore, focus on rectifying both of these failings.

Since water is over-allocated during low summer flows, federal policy should aim to either increase water supply by creating additional storage, or by decreasing water demand. Water supply could be increased by the storage options previously discussed. Demand could be decreased through federal buyouts of water rights and by programs to increase irrigation efficiency. All farm buyouts should be at rates that respect the investments that farmers have placed into the land through their generations of labor.

Buyout policies should also consider ways to minimize the impacts to remaining farmers. For example, the federal government should subsidize the Klamath Irrigation District's operation and maintenance costs for lost revenue caused by retiring farmland. Otherwise, the rates for remaining farmers could become exorbitant.

The federal government also needs to formalize a plan for reacting to water shortages. Simply turning off the water to the Klamath Project during years of drought is not an appropriate plan because it jeopardizes the economic stability of the area and the health of the lower wildlife refuges. Even though the courts have determined that the government actions in 2001 did not constitute a "taking," I believe that the government does have a moral obligation to compensate farmers for their losses due to their role in creating the conditions that led to the crisis. The government did promise these farmers that they would have water in perpetuity. When the government was unable to fulfill these promises, it should have provided compensation. The government should establish new policies to plan for water shortages by adjusting the long-term levels of water supply and demand. Otherwise, it should establish a fund to compensate farmers when water is shut off during years of drought.

Shortcomings

The metanarrative does contain some shortcomings that should be acknowledged. First, the metanarrative is limited in its scope. It only considers the "stories" of the primary narrative and the counter narrative, and the "nonstories" of water rights and science. I have limited the scope of this study for the sake of brevity, but this poses a risk of oversimplifying the complexity of the issues and producing inaccurate conclusions. A

more complete metanarrative could be created by expanding the number of stories and nonstories considered. Additional stories/nonstories might include those by government agencies, upstream water users, downriver tribes, and regional businesses. A second shortcoming is the reliance on dominant narratives. The approach risks focusing on extreme views that may not represent the actual policy narratives that are driving the decision-making process. These views may receive the most publicity due to media sensationalizing, and may, therefore, appear to be the dominant narratives. But it is possible that more subdued narratives exist and that the narrative policy approach overlooks these narratives. Surveying the population could help verify whether or not the dominant narratives truly represent the views of the stakeholders.

Conclusion

In summary, I do believe that the narrative policy approach has tremendous value. It provides the analyst with a framework for investigating highly controversial environmental issues "where the issue could go either way, where no one involved knows what really is in their best long-run interests, and where most everyone is playing it by ear" (Roe 1994). The approach forces the analyst to be tolerant of complexity, uncertainty, and polarization; to really listen to the stories told by the user groups; and to critically reevaluate the assumptions that underwrite existing policy narratives. The approach may also be beneficial to reducing polarization by helping stakeholders gain a better understanding of opposing perspectives. This case study has been limited by my time and personal expertise, but I recommend that policy-makers in the Klamath Basin use this approach to develop a more comprehensive analysis with the combined assets

and knowledge of their agencies. As William Kittredge points out in the book *Balancing Water: Restoring the Klamath Basin*, government agencies are often staffed by "educated but locally inexperienced outsiders"(Blake, Blake, and Kittredge 2000, 19). Narrative Policy Analysis can help inexperienced outsiders learn from the perspectives of experienced insiders and use this knowledge to create more effective policies for the region.

WORKS CITED

Aiken, Ann L. 2001. Exerpts from *Kandra v. U.S.* 145 F.Supp.2d 1192 (D. Or. 2001). Online. http:://www.snowcrest.net/siskfarm/exerpts.html. Available: 14 May 2004.

American Indian Technical Services. 1982. *Anthropological study of the Hupa, Yurok, and Karok Indian Tribes of Northwestern California: Final Report*. Sacramento: U.S. Department of Interior, Bureau of Indian Affairs.

American Rivers. 2002. "America's Most Endangered Rivers Report." Online. http://www.americanrivers.org/mostendagered/klamath2002.html. Available: 25 May 2004.

Barnard, Jeff. 2002. "Shooting raises issue of racism against American Indians in Klamath Basin water wars." *Environmental News Network*. Online. http://www.enn.com/news/wire-stories/2002/01/01/01182002/ ap_46156.asp. Available: 18 January 2002.

Bastash, Rick. 1998. *Waters of Oregon: A Source on Oregon's Water and Water Management*. Corvallis: Corvallis: Oregon State University Press.

Blake, Tupper, Madeleine Graham Blake, and William Kittredge. 2000. *Balancing Water: Restoring the Klamath Basin.* Berkeley: University of California.

Bortleson, Gilbert C. and Martin O. Fretwell. 1993. *A Review of Possible Causes of Nutrient Enrichment and Decline of Endangered Sucker Populations in Upper Klamath Lake, Oregon*. USGS Report 93-4087. U.S. Geological Survey. Portland, Oregon.

Boyle, John C. 1976. *50 Years on the Klamath*. Medford, Oregon: Klocker Printery.

Bragg, John. 2001. "Drop by drop, the water crisis has grown." *Herald and News.* 7 May. Online: http://www.heraldandnews.com/articles/2001/05/07/news15129.txt. Available 14 May 2004.

Braunworth, William S. Jr. and Emery Castle. 2003. *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Carlson, Harry L. and Rodney Todd. 2003. "Effects of the 2001 Water Allocation Decisions on the Agricultural Landscape and Crop Production in the Klamath Reclamation Project." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Carlson, Harry L. et al. 2003. "Soil Resources in the Klamath Reclamation Project." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Carlson, Larry M. 2001. "Doesn't make sense." *Herald and News.* 10 July. Online. http://www.heraldandnews.com/articles/2001/07/10/news10972.txt. Available: 14 May 2004.

Christy, Paul. 2001. "Water cutoff betrays veterans." *Herald and News*. 11 June. Online. http://www.heraldandnews.com/articles/2001/06/11/news11958.txt. Available: 10 May 2004.

Clark, Mark. 1999. "The Klamath River Basin Compact." *A River Never the Same: A History of Water in the Klamath Basin.* Klamath Falls, Oregon: SmithBates Printing and Design.

Clark, Mark and Earl D. Miller. 1999. "Notes on Early Water Use in the Klamath Basin." *A River Never the Same: A History of Water in the Klamath Basin.* Klamath Falls, Oregon: SmithBates Printing and Design.

Dicken, Samuel N. and Emily F. Dicken. 1985. *The Legacy of Ancient Lake Modoc: A Historical Geography of the Klamath Lakes Basin*. Klamath Falls, Oregon: Shaw Stationery Co.

EarthJustice. 2004. "The Klamath Basin: Restoring the Klamath Basin for Fishermen, Farmers, Native Americans, and Wildlife." Online. http://www.earthjustice.org/Factsheets/Klamath 011502.pdf. Available 25 May 2004.

Eilers J. et al. 2001. *Recent Paleolimnology of Upper Klamath Lake, Oregon*. Report to the U.S. Bureau of Reclamation by JC Headwaters, Inc. Roseburg, Oregon.

Fault Line. 2002. *Administration Suppresses Economic Report Slamming Klamath Policy*. Online. http://www.faultline.org/news/2002/11/klamathreport.html. Available 14 May 2004.

Foreman, Allen. 2000. *The Klamath Tribes Economic Self Sufficiency Plan*. Presented to the Department of the Interior, 31 October.

_____. 2001. *Klamath Tribes Water Update*. News release by the Klamath Tribes Inter-office. Distributed to participants in the Presbyterian Consultation on Limited Water Resources and Takings. Medford, Oregon: 13 June 2003.

Foster, Doug. 2002. "Refuges and Reclamation: Conflicts in the Klamath Basin, 1904-1964." *Oregon Historical Quarterly* 103 (2): 150-187.

Furber, Lewis. 2001. "Wildlife Service tries to circumvent Klamath River Compact." *Herald and News*. 13 March. Online. http://www.heraldandnews.com/articles/2001/03/13/news8616.txt. Available 14 May 2004.

Giannico, Guillermo and Christopher Heider. 2003. "Coho Salmon and Water Management in the Klamath Basin." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Grader, W.F. Jr. and Glen Spain. 2001. "Why the Klamath Basin Matters." *The Pacific Coast Federation of Fishermen's Association*. Online. http://www.pcffa.org/Fn-aug01.htm. Available: 24 November 2002.

Hathaway, Ron and Teresa Welch. 2003. "Background." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Haynal, Patrick. 2000. Termination and Tribal Survival: The Klamath Tribes of Oregon. *Oregon Historical Quarterly* 101 (3): 270-301.

Head, Jeff. 2002. "Let the Irrigation Water Flow in the Klamath Basin of Oregon." Online. http://www.petitiononline.com/klamath. Available: 20 October 2002.

Herald and News. 2004. Telephone call to the circulation desk. 16 March.

Howe, Carrol B. 1992. *Unconquered, Uncontrolled: The Klamath Indian Reservation*. Bend, Oregon: Maverick Publications.

Huston, Anne E. 1999. "A History of the Lower Klamath National Wildlife Refuge." *A River Never the Same: A History of Water in the Klamath Basin.* Klamath Falls, Oregon: SmithBates Printing and Design.

An Illustrated History of Central Oregon Embracing Wasco, Sherman, Gilliam, Wheeler, Crook, Lake and Klamath Counties. 1905. Spokane: Western Historical Publishing Co.

Jaeger, William K. 2003. "Water Allocation Alternatives for the Upper Klamath Basin." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Jarvis, Robert L. 2003. "Effects on Waterfowl of the 2001 Water Allocation Decisions." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Klamath Basin Water Crisis, 2004. Online. http://www.klamathbasincrisis.org. Available: 14 May 2004.

Klamath Bucket Brigade. 2004. "Lies, Half Truths, and Misdirection Used by the Environmental Side to Propagate their Goals and Agenda in the Klamath Basin." Online. http://www.klamathbasinbucketbrigade.org./lies and mistruths.htm. Available: 14 May 2004.

Klamath Coalition. 2000. "A Conservation Vision for the Klamath Basin." http://www.klamathbasin.info. Available: 14 May 2004.

Klamath County History. 1984. Klamath Falls: Klamath County Historical Society.

Klamath Tribes. 2001. *A brief history of the dispossession of the Klamath Tribes through termination and the taking of their ancestral reservation Lands*. Letter from the Klamath Tribes. Distributed to participants in the Presbyterian Consultation on Limited Water Resources and Takings. Medford, Oregon: 13 June 2003.

Klamath Water Users Association. 2003. *Summary of Litigation and Regulatory Matters Affecting Interests of Klamath Project Water Users*. Letter from the Klamath Water Users Association dated 24 April 2003. Distributed to participants in the Presbyterian Consultation on Limited Water Resources and Takings. Medford, Oregon: 13 June 2003.

Krizo, Jacqui. 2004. "Klamath Basin Science, or Agenda? 2004." *AgLife Northwest*, March: 5.

Lach, Denise et al. 2003. "Effects of the 2001 Water Allocation Decisions on Project-area Communities." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Oregon State University Extension Service.

LaDuke, Winona. 2002. "Klamath Water, Klamath Life." *Earth Island Journal,* Spring: 26.

Lewis, William M. Jr. et al. 2004. *Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery*. National Resources Council Committee on Endangered and Threatened Fishes in the Klamath River Basin. Washington: National Academies Press.

Los Angeles Times. 2001. "Farmers Release Water in Drought Feud." 6 July.

Marbut, Reed. 2003. "Legal Aspects of Upper Klamath Basin Water Allocation." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Markle, Douglas F. and Michael S. Cooperman. 2003. "Relationships between Lost River and Shortnose Sucker Biology and Management of Upper Klamath Lake." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

McCarthy, Jim. 2002. "Rate Payer Rip-Off: Electric Power Subsidies in the Klamath Irrigation Project." *Oregon Natural Resources Council*. Online. http://www.onrc.org/programs/klamath.html. Available: 14 May 2004.

McIntyre, Jo. 2001. "Klamath Farmers Hail Decision to Review Biological Opinion." *CNSNews*. Online. http://www.cnsnews.com. Available: 4 August 2001.

Miller, Ellwood. 2001. A letter presented in opposition to plaintiff's motion for a preliminary injunction. *Kandra v. U.S.* 145 F.Supp.2d 1192 (D. Or. 2001).

O'Connor, Jack. 2001. "Demand that all biological data be considered." *Herald and News.* Klamath Falls. 30 May.

_____. 2003. "More water storage better than screens for fish populations." *Herald and News.* Klamath Falls. 3 March.

Oregon Department of Environmental Quality. 2002. *Upper Klamath Lake Drainage Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP).* Salem, Or.

Oregon Employment Department. 2000. *Regional Economic Profile. Region 11.* Salem, Or.

Oregon Natural Resources Council. 2002. "Klamath Basin" Online. http://www.onrc.org/programs/klamath/onrcposition.html. Available 25 May 2004.

Oregon State Water Resources Board. 1971. *Klamath Basin.* Salem, Or.

Oregon Water Resources Department. 1999. *Resolving the Klamath.* Online. http:// www.wrd.state.or.us/programs/klamath/summary.shtml. Available 14 May 2004.

Oregon Water Resources Department. 2004. Klamath Basin Adjudication. Online. http://www.wrd.state.or.us/programs/klamath/adj/status.html. Available: 14 May 2004.

Pacific Coast Federation of Fishermen's Association. 2002. *Myths and Facts about the Klamath Water Issues.* Online. http://www.pcffa.org/kl-myths.htm. Available 14 May 2004.

Powers, Lawrence W. and Karen Adams. 1999. "Contemporary Use of Water Resources in the Klamath Basin." *A River Never the Same: A History of Water in the Klamath Basin.* Klamath Falls, Or: SmithBates Printing and Design.

Range Magazine. 2001. "Water in the West." Online. http://www.rangemagazine.com/ archive/water/wiw0701.htm. Available: 14 May 2004.

Range Magazine. 2002. "Hopes & Dreams: Tulelake Album." Winter: 41-48.

Ransom, William C. 2002. "Wood's Commentary Wrong: Farms don't get 90 percent of water nor are 75 percent of wetlands gone. *Herald and News.* Klamath Falls. 1 July.

Roe, Emery. 1994. *Narrative Policy Analysis: Theory and Practice*. Durham: Duke University Press.

Rykbost, Kenneth A. and B.A. Charlton. 2001. *Nutrient Loading of Surface Waters in the Upper Klamath Basin: Agricultural and Natural Sources*. Corvallis: Agricultural Experiment Station, Oregon State University.

Rykbost, Kenneth A. and Rodney Todd. 2003. "An Overview of the Klamath Reclamation Project and Related Upper Klamath Basin Hydrology." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Schlafly, Phyllis. 2001. "Bush Administration Must Halt Tide of Green Totalitarians: Humans vs. Fish at Klamath Falls." *Klamath Basin Water Crisis*. Online. http://www.Klamathbasincrisis.org. Available: 14 May 2004.

Schoch, Deborah and Eric Bailey. 2001. "Klamath Farmers Thwarted in Plea for Irrigation Water." *Los Angeles Times.* 14 July.

Southwick, Brenda Jahns. 2002. "Just a Little Bit of R-E-S-P-E-C-T for Farmers." *The Environmental Forum*. March/April: 49.

Souza, Christine. 2001. "Klamath Basin growers fight for irrigation water." *California Farm Bureau Federation*. Online. http://www.cfbf.com/agalert/2001/aa-041801b.htm. Available: 18 April 2001.

Staunton, Marshall. 2001. "'Prosecution' of local irrigators slaps faces of many Americans. *Herald and News.* Klamath Falls. 23 April.

Steber, Rick. 2004. *Buy the Chief a Cadillac.* Prineville, Oregon: Bonanza Publishing.

Stern, Mark and Marshall Staunton. 2002. "Crisis to Consensus – Restoration Planning for the Upper Klamath Basin." *The Upper Klamath Bain Working Group*. Online. http:// www.fs.fed.us/r6/winema/ukbwg/crisis-consensus/fullreport.pdf. Available 14 May 2004.

Stern, Theodore. 1965. *The Klamath Tribe: a people and their reservation*. Seattle: University of Washington Press.

Strantz, Maurice K. 1953. *Reclamation accomplishments, 1905-1953, Klamath Project, Oregon-California*. Report prepared for the U.S. Bureau of Reclamation.

Tomlinson, Anders. 2002. *Homesteading in a Promised Land*. Produced and directed by Anders Tomlinson and Jacqui Krizo. 60 min. Videocassette.

Turner, Stan. 1987. *The Years of Harvest: A History of the Tule Lake Basin.* Eugene, Oregon:49th Avenue Press.

U.S. Fish & Wildlife Service. 2001. *Final Biological Opinion for Lost River Sucker, Shortnose Sucker, and Bald Eagle Habitat Regarding Operation of the Klamath Reclamation Project*. 6 April.

U.S. Fish & Wildlife Service. 2003. Visitors Center display at Lower Klamath Lake National Wildlife Refuge. Viewed 13 November 2003.

U.S. Fish & Wildlife Service. 2004. Lower Klamath Lake National Wildlife Refuge. Online. http://klamathbasinrefuges.fws.gov/lowerklamath/lowerklamath.html.. Available 14 May 2004.

U.S. Army Corps of Engineers. 1979. *Klamath River Basin Reconnaissance Report*. San Francisco District.

Ullman, Carl. 2004. Klamath Basin Water and Tribal Rights. Keynote speaker, Coalition Against Environmental Racism Conference. University of Oregon. 24 January.

Varner, Gary. 1998. In nature's interests?: Interests, Animal Rights, and Environmental Ethics . New York: Oxford University Press.

Vogel, David A. 2003. *Klamath Basin Water Crisis.* Online. http://www.klamathbasincrisis.org/science/vogelusfg100603.htm. Available: 25 May 2004.

Walker, John. 2000. "Harvest of Hope." *Herald and News*. 22 October. Online. http://www.heraldandnews.com/articles/2000/10/22/news9826.txt. Available: 14 May 2004.

Walker, William W. Jr. 2001. *Development of a Phosphorus TMDL for Upper Klamath Lake, Oregon*. Prepared for the Oregon Department of Environmental Quality.

Ward, Jay. 2003. Oregon Natural Resources Council. Letter sent to Klamath Project landowners.

Weber, Bruce and Bruce Sorte. 2001. "The Upper Klamath Basin Economy and the Role of Agriculture." *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service, 2003.

Wilkinson, Charles F. 1992. *Crossing the next meridian: land, water, and the future of the West*. Washington, D.C.: Island Press.

Williamson, Ten Broeck. 1947. History of the 1946 land opening on the Tule Lake division of the Klamath Project. Sacramento: U.S. Bureau of Reclamation, Region II.

Woiceshyn, Glenn. 2001. "Man: The Endangered Species." Our Klamath Basin Water Crisis. Online.http://klamathbasincrisis.org /Archives/archive1/glennwoiceshyn040201.htm. Available: 14 May 2004.

Wood, Tamara M., Gregory J. Fuhrer, and Jennifer L. Morace. 1996. *Relation Between Selected Water-Quality Variables and Lake Level in Upper Klamath and Agency Lakes, Oregon*. USGS Report 96-4079. Portland: U.S. Geological Survey.

Wood, Wendell. 2001. "We should stop blaming species act for problems and seek real solutions." *Herald and News*. Klamath Falls. 23 April.

Woodward, George and Jeff Romm. 2003. A Policy Assessment of the 2001 Klamath Reclamation Project Water Allocation Decisions. *Water Allocation in the Klamath Reclamation Project, 2001: An Assessment of Natural Resource, Economic, Social, and Institutional Issues with a Focus on the Upper Klamath Basin*. Special Report 1937. Corvallis: Oregon State University Extension Service.

Zakoji, Hiroto. 1953. Klamath Culture Change. M.A. Thesis, University of Oregon.