

AN ABSTRACT OF THE DISSERTATION OF

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Oregon is a state with great social and ecological diversity. Unfortunately however, Oregon's water-rich reputation is more rumor than reality. As with many Western states, Oregon struggles with water scarcity, especially during dry summer months. Recent efforts by the state to develop an integrated water resource strategy (IWRS) to manage present and future water demand in Oregon signifies the very real concern that water is no longer as abundant and available as it once was. With the predicted impacts of climate change and population growth, the already-strained water supply will unlikely sustain current water needs. Using a statewide mail survey of 1,537 Oregon residents (2010), a second survey of 390 water stakeholders (2011), and 12 semi-structured interviews conducted in 2010 and 2011 of stakeholders and elected officials this dissertation examined the role of sociodemographic attributes and environmental values pertaining to concern about Oregon's water supply, climate change, water conservation behaviors, and prioritization of water use. Data analysis (regression analysis) revealed that to varying degrees gender, age, education, income, concern about water scarcity and belief in the New Ecological Paradigm (NEP) proved reliable predictors of concern about that water quantity is a problem, that Oregonians will be personally affected by water scarcity, and personal water

conservation behaviors. The dissertation further applies the Institutional and Analysis Development (IAD) framework to the current efforts by the state to create and IWRS. Recommendations for successful application of the IWRS are discussed, specifically use of adaptive governance in basin and sub-basin planning efforts.

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Addressing the Future of Water in Oregon: A Look at the Human and Institutional
Factors Shaping Oregon Water Management

by
Erika Allen Wolters

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APPROVED:

Major Professor, representing Environmental Science

Director of the Environmental Sciences Graduate Program

Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Erika Allen Wolters, Author

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*For Adia and Tyler
Thank you for your patience*

Oregon Water: A Review of Oregon Water History and the Attributes, Values, and Frameworks that Shape Water Management

Justification for Research

Water management in the West has a long and sometimes notorious history. In recent years, both climate change and population growth have made water management more difficult and unpredictable. While Oregon has the most Federally designated Wild and Scenic Rivers in the nation, in summer months many of Oregon's surface waters are fully or over allocated (Bastasch 2006). Although demand exceeds supply, there does not exist an accounting system designed to understand how much water exist or how much water is actually being used (Oregon Public Broadcasting 2011). Perhaps in part due to this lack of knowledge, or because the public is ill-informed about water management (Bastasch 2006), Oregon is one of the few states lacking a water management strategy.

In 2008, Oregon State University's Institute for Water and Watersheds (IWW), Oregon Sea Grant Extension, OSU Institute for Natural Resources (INR) and the Oregon House Committee on Energy and the Environment spearheaded the Statewide Water Roundtables to understand what Oregonians' knowledge was pertaining to Oregon water quantity, quality, economic, ecological and social issues. Five Roundtables were conducted throughout the state, with 301 self-identified participants. Of the many issues that were identified, developing an "integrated long

range planning and management at the basin level within a statewide framework” (Oregon State University Institute for Water and Watersheds et al. 2008) was a key finding.

Subsequently, in 2009 the state legislature passed HB 3369 tasking Oregon Water Resources Department (OWRD) to develop a statewide, integrated water management strategy in order to outline a water strategy plan for current and future water management. It is the development of Oregon’s water that has helped the state with flood control, irrigation, hydropower, and fish and wildlife, allowing for greater economic opportunities and increases in population to the state (Oregon Water Resources Department). Ironically, it is due to these developments that the state is now being challenged to provide water to meet all of Oregon’s water needs. Thus, research into water management issues in Oregon is salient to current statewide water management efforts and to the changing physical conditions within the state that are changing water availability.

The purpose of this dissertation is to examine three distinct, yet interconnected water issues in Oregon. The dissertation utilizes the manuscript format providing three separate papers that stand alone as an academic work, but collectively provide a more comprehensive look at water issues in Oregon. This chapter provides background applicable to the succeeding papers by providing a historical context of water issues as well as examining the sociodemographic attributes and environmental values that

can potentially impact Oregonians' concern over water scarcity, climate change, water prioritization, water use and water conservation activities. In addition, this chapter provides a brief description of the Institutional and Analysis Development (IAD) Framework (Ostrom, Gardner, and Walker 1994) that is used in the final paper as a means of detailing how stakeholders and current water laws (and rules) affect water policy in Oregon. Further, this chapter provides a general review of methodology used in each paper. Finally, the chapter concludes with a more detailed outline of the dissertation.

Background

In the West, of course, where water is concerned, logic and reason have never figured prominently in the scheme of things. - (Reisner 1986, 14)

The history of the American West is intricately tied to the management, movement, and infrastructure built around water. In Reisner's (1986) seminal book, *Cadillac Desert*, Reisner illustrates in great detail the politics, corruption, battles, and epic projects the West has undertaken in order to control and manipulate water to sustain burgeoning populations and industries. Water development in the 19th and early 20th century focused on "conquest and control" (Groenfeldt 2010), with major projects like dams and river diversions regularly being undertaken. Cities like Las Vegas rose out of the desert due to water diversions that allowed water from the Colorado River to be siphoned into the desert for urban development. Indeed, even the residents of Las Vegas were under the illusion of water abundance. In the 1980's, Las Vegas per

capita water consumption was 350 gallons per day “double that of New York City, which gets ten times the rainfall of Las Vegas” (Glennon 2009).

However, the story of the American West and water is changing due to two pervasive events. The first is population growth. Once primarily developed for agriculture and ranching, the West is now a hub of population growth and thus both shifting demands for water and necessitating increased quantities of water for urban uses. The second is the impacts of climate change that are now visibly altering the landscape of the planet (Intergovernmental Panel on Climate Change 2007) . Both population growth and climate change have spurred numerous international conferences and scientific panels to determine how existing resources will meet the growing needs of human populations while limiting negative impacts on the natural world. Because climate change is in large part a result of human actions, the consequences of more people living in ecologically unsustainable ways could potentially become disastrous for the earth and all of its inhabitants. The Intergovernmental Panel on Climate Change (IPCC) has identified numerous impacts from human induced climate change like an overall warming trend in global temperatures, decreased snow and ice accumulations, and widespread melting of snow and ice resulting in increases in sea level (2007). While the exact consequences of this change cannot be determined, the prevailing thought is that both terrestrial and aquatic ecosystems will be significantly modified and humans will have to adapt to these changes.

The State of Oregon feels like an anomaly to these concerns. Oregon is perceived as a water rich state, a cultural icon of fresh water and abundant rain. Oregon is also seen as having vast forested, uninhabited areas in the 95,996.79 square miles that constitute the state (U.S. Census Bureau 2011). With 39.9 people per square mile in 2010, it seems that Oregon has room to spare for population growth (U.S. Census Bureau 2011). However, it is stressors like population growth and climate change that are now dramatically altering the face of the landscape, and particularly the myth of abundant, free-flowing water (Climate Impacts Group 2010). Population in the Pacific Northwest (PNW) continues to steadily increase with current estimates of 35 million people moving to the region within the next 50 years, a large increase from the current 15 million people currently residing in the PNW. In Oregon, Deschutes County alone has already experienced a population jump in the 1990s from 75,000 to 115,000, an increase of 50% (Aylward and Newton 2006). Although in 2007 Oregon fell into an economic recession that slowed population growth to the region, Oregon is still growing in population each year. And, with continued (albeit currently slow) population growth to the state, demand for water is on the rise. Further, although domestic use only accounts for roughly 6% of water withdraw, competition for water for residential use can focus public attention and pressure on water managers to prioritize domestic water use (Oregon Public Broadcasting 2011).

In addition to changes due to population growth and expansion, climate change will also affect the physical environment of Oregon. Although the more extreme effects

of climate change are often seen in other places in the United States, the Pacific Northwest is not immune from climate change impacts. Already the effects of climate change are evident, particularly in regard to observed winter snow packs. As temperatures rise in the region, reduced winter snow pack and longer summers will greatly alter the timing and volume of runoff throughout the year (Graves and Chang 2007), thereby affecting the predictability of availability for use and allocation of water. The Oregon Climate Change Research Institute (2010) notes several other anticipated and observed changes in Oregon due to climate change such as the retreat of seven glaciers on Mt. Hood (which has lost roughly 34 percent of glacial area between 1907 and 2004), the potential impacts to hydroelectric power due to rising temperatures and decreased snow pack, and the general impacts on fish and wildlife due to variations in water quantity, temperature, river and stream flows. Ironically, while much of the state will face water scarcity during certain times of the year, climate change will also exacerbate current flooding events (Oregon Water Resources Department 2011a). Further, climate change is predicted to increase sea levels resulting in increased erosion and increased impacts of storms with wind erosion and flooding (Oregon Water Resources Department 2011a). Due to these events, water quality among the coast is a concern since they will put added pressure on “water treatment plants, diversion facilities, and wastewater plants” (Oregon Water Resources Department 2011a, 68).

With changes to water availability and population growth to the region, demand for water is expected to increase existing conflict between water users (Climate Impacts Group 2010, 2). Oregon is not without a history of water conflict and protectionism. In the late 1970s efforts by southern California, Nevada, and Arizona to pipe water from the Columbia River met with stern warnings by then Senator Mark Hatfield who essentially warned that “Oregon and Washington must be prepared to justify their claims to all of the Columbia water or risk losing it” (Orr and Orr 2005, 205). While as recently as 2008 Oregon Republican Senator David Nelson (R-Pendleton) released a legislative agenda that, among other proposals, sought to store excess water from the Columbia River to sell out-of-state (Oregon Senate Republicans 2008-2009). Aside from the numerous complications selling water out of state entails, the idea that as recently as 2008 Oregon legislators considered selling Oregon’s water indicates a clear disconnect from Oregon’s water issues.

While Oregon has had to protect water from leaving the state, it has also witnessed conflict within the state over water allocation in the Klamath River Basin. As Wolf et al. (2006) state “within a nation, users – farmers, hydroelectric dams, recreational users, environmentalists – are often at odds and the probability of a mutually acceptable solution falls as the number of stakeholders rises” (1). This was the case in 2001 when in the Klamath River Basin a perfect storm of water conflict came to a head and resulted ultimately in economic losses to agriculture and commercial fisheries and a decline in salmon populations that resulted in a cultural loss to

Klamath tribes. The conflict in the Klamath now serves as a cautionary tale of the potential for more water conflicts in Oregon should population growth coupled with climate change result in increased demand and less availability and abundance for both people and ecosystem needs. Therefore, managing the use of water for all interests (human and non-human) will require finessing the current allocation, storage, and distribution of water in Oregon.

With climate change potentially altering the timing and availability of water, management has become even more of an imperative.

Water is a primary medium through which climate change will have an impact on people, ecosystems and economies. Water resources management should therefore be an early focus for adaptation to climate change. Water resources management does not hold all of the answers to adaptation, a broad range of responses will be needed. But water is both a key part of the problem, and an important part of the solution. It is a good place to start. – (Sadoff and Muller 2009)

While there have been previous to develop water plans, lack of funding has prevented OWRD from develop an integrated water resource strategy (IWRS) to plan for current and future water needs. However as aforementioned, in 2009 Oregon State University's Institute for Water and Watersheds (IWW), the Institute for Natural Resources (INR) and Oregon Sea Grant Extensions in conjunction with the Oregon House Committee on Energy and the Environment conducted the Statewide Water Roundtables in several regions in Oregon to ascertain concerns, goals, and recommendations of attendees regarding Oregon water management. The

Roundtables spanned five distinct hydrological regions in Oregon (Central, Coastal, Eastern, Southern, and Western/Willamette Valley Oregon) in an attempt to further understand regional water interests and concerns. The results of the Statewide Water Roundtables were then presented to the Oregon Water Resources Department (OWRD) as well as the Oregon legislature that provided evidence of concern among Oregon stakeholders and residents pertaining to the future of Oregon water. Subsequently, in 2009 the Oregon Legislature passed HB 3369, a measure that authorizes the OWRD, the Department of Environmental Quality (DEQ), and the Oregon Department of Fish and Wildlife (ODFW) to develop an integrated water resource strategy (IWRS) for Oregon. The goal of this strategy is to meet Oregon's present water needs and projected demand for water over the next 50 years. The OWRD Strategic Plan 2001-2003(2001) report bluntly states Oregon's water challenge:

Put very simply, there is not enough water where it is needed, when it is needed, to satisfy both existing and future water uses. This situation jeopardizes the high level of livability that Oregonians enjoy. It seriously limits the ability of Oregon's economy to grow, and threatens existing users' water supplies and the sustainability of the natural systems on which our economy relies. (6)

However, it is important to remember that the IWRS for Oregon is a water management strategy, a guideline of recommendations for water management. It does not inherently modify existing laws or cultural practices that have codified water rights and uses. In addition, one huge omission from the IWRS draft strategy is a way to reconcile land use planning with water management. Currently, of the

nineteen statewide land planning goals fifteen mention water resources (Bastasch 2006). In accordance to these planning goals, water should be taken into account “when planning to preserve agricultural land, manage forestlands, and protect natural resources, or when providing for economic development, housing, transportation, and recreation” (Bastasch 2006, 288). However, land use planning (that requires planning for water supply) does not work with state water management planning, and certainly not basin-wide planning. Thus, “it is all too possible for jurisdictions to target water sources that may already be fully appropriated and effectively off-limits to development” (Bastasch 2006, 288). Under current conditions then “there is no meaningful analysis of how a particular land use permit application affects water sustainability in a basin, and no cumulative analysis of the impact” (Mabbott 2006). Until land use planning and water management are inherently linked “the intricate and imposing systems designed to manage these resources may work at cross-purposes” (Bastasch 2006, 289). Therefore, until land and water management coordinate management goals and strategies they will remain separate processes that may result in conflict rather than cooperation. Dealing with water quantity specifically, this alone could present additional challenges to water supply for both current and future use.

In the meantime Oregon’s water management follows two guiding principles the Oregon Water Code and the prior appropriation doctrine. The Oregon Water Code is based on four principles: water belongs to the public, water is allocated by permit

system, permits are granted according to the prior appropriation doctrine (first in time, first in line), and permits are only granted for “beneficial use without waste” (Bastasch 2006, 55). When the state of Oregon grants a water permit, the applicant is given a water right. The OWRD is responsible for approving water rights, and as of 2006 has approved over eighty-two thousand water rights (Bastasch 2006).¹ While on paper the Oregon Water Code seems to establish reasonable principles, the practice has not always exemplified the best use of water. For instance, once water rights are established, the right lasts indefinitely unless the water is not used (after five years of non-use water rights are forfeited) thereby indirectly encouraging permit holders to use their water even if they do not have a need. There is also very little incentive for water conservation. If you are a priority water permit holder, then it is logical to take more than you might need in order to ensure adequate water supply. Further, the perception of water abundance has failed to deter over-appropriation of water rights:

Viewed as an unlimited resource by Oregonians, water was consumed lavishly to supply needs and encourage growth, and recent unmistakable signs of depletion in both surface and groundwater have failed to limit the approval of new water rights permits by the Water Resources Department. Today the actual number of legitimate water rights permits frequently leads to over allocation or over appropriation – a condition where the quantity of surface or groundwater is not available to meet needs during a certain period (Orr and Orr 2005, 221).

¹ For a detailed description of Oregon’s water laws, history and management see Bastasch’s *The Oregon Water Handbook: A Guide to Water and Water Management*.

Therefore, a critical question that will need to be addressed is how to manage Oregon's water in spite of current laws that, at present, over-allocate Oregon's surface water.

In theory, the Oregon Water Code is the state's current water planning program. Enacted in 1909 with Senate Bill 77, the Oregon Water Code established that the state has the right to "regulate, distribute, and use water" what was subsequently deemed public water (with the passage of House Bill 192) (Oregon Water Resources Department 2009). Prior appropriation was (and is) the guiding principal of water management to be monitored and regulated by what is now the OWRD. However, with the IWRS the Oregon Water Code will be the basis for a larger water management strategy, one that hopefully incorporates a more integrative, holistic plan that can guide water management not only in terms of rights, but also for current and future water needs.

The difficulty for policy makers is to incorporate technical, scientific, and other information in a way that best reflects an accurate representation of the current water situation in Oregon and viable options for future management of water. Perhaps an even greater challenge is determining if Oregon residents are knowledgeable of Oregon's water quandaries, and whether their knowledge and behaviors toward water reflects the policy objectives of the state and the concerns of stakeholders. The following literature review examines the influence of personal attributes such as age,

gender, education, and place of residence and the role of Postmaterialism² on these attributes. The literature review reveals that to varying degrees sociodemographic variables and Postmaterialism in the United States relate to environmental concern and behavior. Two of the chapters in this dissertation examine how these variables pertain to Oregonians environmental concern as it relates to water quantity as well as reported water conservation behaviors. There are two benefits to this information. First, ascertaining concern among Oregonians means that the issue is more politically salient. This is important as the State of Oregon develops a statewide water management strategy. Second, by determining what variables impact concern and behavior, it is possible to identify areas where the State may need to direct educational or other efforts to improve water knowledge and gain support for the water management strategy, which will rely in part on voluntary actions by citizens.

In addition, the literature review will also provide a description of a policy framework, the Institutional and Analysis Development (IAD) Framework. The use of the IAD framework elevates the discussion beyond individual attributes to interactions among actors in a larger policy arena and provides a greater context in which to understand the role of the public and stakeholders. Essentially the IAD helps to capture a policy situation at a moment in time. Regarding Oregon's efforts to develop a statewide integrated water resource strategy (IWRS), the IAD framework

² Postmaterialism is characterized by a society that having its basic needs met is primarily focused on quality of life and material goods and services.

describes how the public, stakeholders, and other actors (like elected officials) contribute to the development of an IWRS in light of existing rules, laws and norms that guides current water policy development and can both hinder or assist in future water policies in the state.

Factors affecting attitudes and preferences about water policy

Why Study Public Opinion and Behavior?

Environmental issues have become increasingly dominant in American politics since the 1970s (Dunlap 1995). As a result, public policy began to reflect the interest in environmental issues through seminal pieces of federal legislation and high-profile court cases. The driver of this focus in environmental policy was in part due to public opinion that began to demonstrate concern over perceived environmental problems. Although the force of public support for environmental policy ebbs and flows, and inherent conflicts and challenges arise pertaining to specific issues, it is evident that environmental policy is now well established in the public policy arena.

Public policy, specifically whether action or inaction on an environmental issue takes place, is presumably linked to the degree to which public opinion is favorable to a particular outcome (Kraft and Vig 2006). Although it is difficult to correlate the degree of public opinion to policy outcomes, environmental policy is generally

believed to be largely influenced by public opinion (Dunlap 1995). Public opinion is dependent on many variables such as socioeconomic status (SES), gender, age, policy knowledge, geography, political ideology, and personal worldviews and values.

Thus, understanding public opinion and the variables that help shape those opinions because “what people believe, and what they do about those beliefs, affect the creation of public policy” (Brooker and Schaefer 2006, xvi).

Sociodemographics

Dietz et al. (1998) identify two primary focuses of environmental literature “studies focused on sociodemographic factors associated with environmentalism and studies of values, beliefs and other social psychological constructs related to environmentalism” (450). Specific sociodemographic variables included in this environmental literature are: age and cohort, education, political ideology, income, social class, occupation, gender, religion, and place of residence (Berenguer, Corraliza, and Martin 2005). These sociodemographic factors can illustrate potential differences in support for environmental issues (Mahler et al. 2004). Arcury (1990) determined that “of sociodemographic factors only age, education, urban residence, and political ideology have consistently found to have statistically significant although moderate associations with environmental attitude” (301). Specifically, “younger, better educated, urban, liberal individuals tend to be more concerned about the environment and to have more positive attitudes toward the environmental

movement” (Arcury 1990, 301). Other research has substantiated that younger people with a higher level of education and a liberal political belief correlates with proenvironmental behaviors (Jones and Dunlap 1992; Dunlap et al. 2000). In addition, research has also found that personal income has “direct and relatively strong associations with each measure of environmental attitude and knowledge” (Arcury 1990, 302). Steel (1996) finds that in terms of individual involvement in environmental policy “research consistently indicates that participation is greatest among those with the highest socio-economic status” (29).

This section will review literature related to sociodemographic factors that act as independent variables in beliefs and opinion on environmental policy. Specifically, this section will examine the role of age, gender, political ideology, and place of residence (rural vs. urban).

The Determinants of Age

The relationship between age and environmental concern presents an interesting study on whether older individuals have less environmental concern than younger people due to their socialization as an age group, or alternatively due more to a particular life-stage. The presumption is that older people have less environmental concerns for two reasons. The first is based on Mannheim’s (1972) theory of generations wherein generational cohorts are unified by important historical events (particularly major events like war, Civil Rights movement, etc.). Specifically, “individuals who belong

to the same generation, who share the same year of birth, are endowed, to that extent, with a common location in the historical dimension of the social process” (Mannheim 1972, 290). It is this “location” that essentially puts them commonly “in the social and historical process, and thereby limit them to a specific range of potential experience, predisposing them for a certain characteristic mode of thought and experience, and a characteristic type of historically relevant action” (Mannheim 1972, 291). Age cohorts represent groups that are born in similar time periods that are influenced by the shared experiences of their youth. Current older generations then, have less exposure as an age cohort to the multitude of environmental issues, particularly because our understanding of environmentalism arose primarily during the 1970s and on.

Major historical events, particularly during formative years of 17-25 (Mannheim 1972), can imprint on an age cohort that conditions attitudes in the future (Schuman and Rieger 1992). Specifically, this “impression from the past be consensual enough that most people regard the event in a similar way, at least at some level of collective memory” (Schuman and Rieger 1992, 316). Shuman and Rieger (1992) applied Mannheim’s theory of generations to a study of two different age cohorts (cohorts to World War II and the Vietnam War) and their respective support for the Persian Gulf War. They found limited support for Mannheim’s theory. Specifically, while there were strong connections to the war most associated with a particular age cohort, this

association was limited in affecting policy choices in the Persian Gulf War (Schuman and Rieger 1992). Shuman and Rieger (1992) ultimately found that

...rather than past experience controlling the present, the present controlled the past, as most Americans of all generations came to accept the analogy to World War II—an analogy that justified massive military action against an enemy that was almost unknown a few months earlier (325).

Applying Mannheim's generational hypothesis to war may be the extreme example of cohort effect, especially since a nation engaging in war relies not just on historical associations, but also on nationalism, protectionist attitudes, humanitarian concerns, and so forth. Thus, using the age cohort analogy with other social or environmental issues may find more of a strong correlation with age.

Ryder (1965) argues that the age cohort is what precipitates change within a society. Specifically, "each fresh cohort is a possible intermediary in the transformation process, a vehicle for introducing new postures. The new cohorts provide the opportunity for social change to occur. They do not cause change; they permit it." (844). In addition, "the continual emergence of new participants in the social process and the continual withdrawal of their predecessors compensate the society for limited individual flexibility" (Ryder 1965, 844). Ryder (1965) also observes that shared experiences within age groups and thus, the different perspectives of age groups relative to those experiences are not limited to the United States alone, but are

observable in other cultures, indicating that the cohort theory may be more universal in scope. Though the limitation to this may be the industrialization of society.

The post-war era of World War II ushered in great societal change in the United States. This post-industrial era witnessed a period of growth no longer strictly associated with meeting basic needs. Kanagy et al. (1994) (citing Schnaiberg, 1977 and Buttel, 1979) write:

...as a result of these and other social transformations occurring during the period, people entering their adult years after 1965 brought with them collective memories of gardens and yards, family vacations in state and national parks, summer camps, increasingly extensive media coverage of ecological process and problems, and until more recently, liberal political orientations (806).

In addition, social identities became more ingrained in hierarchical structures, solidifying older generations into positions of prestige and power that could lessen the likelihood of pushing for larger societal changes (Ryder 1965).

As older generations die off Kanagy et al. (1994) question whether younger cohorts, as they age, will still demonstrate environmental concern. If this is the case, then we should expect that environmental concern, over several decades, would become relatively ingrained in both younger and older cohort groups. Alternatively, Kanagy et al. (1994) question “whether the environmental enthusiasm of younger cohorts dampens as they settle down, have children, enter higher tax brackets, and so on” (811).

In a meta-analysis conducted by Hines, Hungerford, and Tomera (1986-1987) of ten studies on the relationship of age and environmental behavior, the researchers found that younger people were only slightly more likely to engage (reportedly) in environmental behaviors. Yet subsequent studies (Arcury 1990; Jones and Dunlap 1992; Dunlap et al. 2000) have found that age is inversely related to environmental concern. Further, Van Liere and Dunlap (1980) conclude that using Mannheim's theory of generations, with "continued exposure to alarming information on environmental deterioration...has left an indelible imprint on many young people...forming an ecology-minded generation whose commitment to environmental reform should not disappear as they move into adulthood" (183). The relationship between age and environmental concern seems to demonstrate relatively consistent findings suggesting that age is an important variable to consider when measuring environmental concern. Perhaps Dietz et al. (1998) say it most succinctly: "the strongest and most consistent predictor of environmentalism is age or birth cohort" (451).

Gender

While the factor of age is one variable possibly determining an inverse relationship to environmental concern, gender is a variable that could potentially represent a constant in environmental concern. Taken together, Steel (1996) finds that women were more likely to express environmental concern and behavior and that that behavior is more

pronounced in younger cohorts. This would seem to indicate that while age is a component, gender might have an overarching influence on environmental concern. In fact, several studies suggest that when gender is a factor women are more likely to hold stronger environmental attitudes (Bord and O'Connor 1997; Jones and Dunlap 1992; Steel 1996; Zelezny, Chua, and Aldrich 2000). In an examination of 13 studies on gender and proenvironmental behavior by Zelezny et al. (2000), the authors found that studies over the previous decade (of their study) women reported higher levels of participation in environmental behavior and activism (445).

There are two theories attempting to explain gender differences in environmental attitudes. Bord and O'Connor (1997) suggest that the difference is due to a greater perception of environmental risk by women. Because women perceive ecological threats as posing greater personal and social ramifications, "women are... somewhat more likely to both evaluate these environmental problems as serious and to report intentions to take voluntary actions to address the problem" (Bord and O'Connor 1997, 838). The other explanation by Zelezny et al. (2000) is that women are socialized to be more "expressive, to have a stronger 'ethic of care', and to be more interdependent, compassionate, nurturing, cooperative, and helpful in caregiving roles" (445).

In an examination of gender, value orientations and environmental concern, Stern et al. (1993) explore the possible arguments for why women are more likely to

demonstrate more environmental concern than men. Their findings suggest (based on a study of a population of undergraduate students) that one theory is particularly plausible. That is the idea that women are more aware of the consequences of environmental problems and are more likely to make connections between action and consequences. Thus, women see the potential of harm to themselves, people at-large, and other species and ecosystems, or the “inherent interconnections” as opposed to men who do not make these same interconnections (Stern, Dietz, and Kalof 1993). Their findings substantiate feminist environmental theory that claim that women are more biocentric in their values (Merchant 1979; Diamond and Orenstein 1990) and that it is this inherent connection to nature as women that focus their ethic of care.³

However, other studies discount the ecofeminists arguments (Steger et al. 1989) instead giving greater credence to differences in socialization between men and women. Specifically, Guagnano and Markee (1995) find that environmental issues necessitate discussion of issues with terminology grounded in science and technology, which has historically been more of the “male domain” (146). Further, because women generally have more time constraints (often juggling work and family duties) and lower levels of education, they lack as many opportunities to increase

³ Another interesting aspect of environmental concern is what is called the “mother effect” wherein women, as they become mothers, are more aware of the local environment and subsequent ecological impacts of human activities. Although perhaps beyond the scope of this literature review (and a variable that I did not account for in my research), it is a compelling a note-worthy consideration. For a more detailed description, see Stern et al. (1993) and Blocker and Eckberg (1989).

environmental knowledge as men have (Guagnano and Markee 1995, 146).

However, this does not necessarily mean there is less environmental concern, just perhaps less willingness or ability to take direct actions or become politically involved.

There is, at this point, a distinction that warrants mentioning between environmental concern and environmental behaviors/actions. While research on gender and environmental concern appear to draw a relationship between women having more concern for the environment (Van Liere and Dunlap 1980; Steel 1996; Tindall, Davies, and Mauboules 2003), it is questionable whether this concern translates into behaviors or actions (political work, environmental volunteerism, etc.). Studies are somewhat mixed (in part because behavior and actions are either clearly delineated or seen as one factor). However, some studies suggest that gender does influence environmental behavior (intention to act or actually purported behavior). For example, Stern and Dietz (1994) found that women have stronger behavioral intentions, in addition to expressing stronger environmental beliefs and values (77). Further, in a cross-national study by Hunter et al.(2004), the authors found “substantial evidence” for gender influences in environmental behaviors such as recycling, driving less, and making more environmentally friendly purchases (691), perhaps lending evidence for the assertion that women are more engaged in local environmental concerns (Blocker and Eckberg 1989; Mohai 1992).

While the findings are somewhat inconsistent, there is a growing assumption that women are more likely to have a higher risk perception of environmental concerns, particularly local issues, and hold a more biocentric view of nature. However, while women may indeed report a higher level of concern, it is unknown whether this corresponds to more activism or environmental participation. Tindall et al. (2003) summarize this question as follows:

...women are more concerned about environmental issues, but this greater concern does not translate into higher levels of activism...women actually engage in more day-to-day conservation behavior and appear to make closer connections between various dimensions of environmentalism (928).

Postmaterial Values, Socioeconomic Status, and Environmental Concern

In 1968 Garrett Hardin wrote the seminal piece, *The Tragedy of the Commons*, in which he asserts that the increase in global population will result in an increase in resource use that will strain natural resources to the point of creating a global crisis of the commons (collectively owned or shared resources such as water). Thus, in a finite world of resources, population growth will require per capita share of resources to decrease (Hardin 1968). *The Tragedy of the Commons* is inherently difficult to contend with because actions by individuals impact the larger ecosystem collectively, but a change in one person's behavior may not have noticeable effects and instead extract more commitment from an individual with very little return. The problem is that reducing per capita share of natural resources will require, if not consensus, then

a majority agreement to reduce resource use for the overall betterment of local and global society.

The Tragedy of the Commons, in part, is a result of living in a postmaterialist society wherein with basic human needs addressed, more esoteric questions about individual and larger societal roles in managing natural resources are contemplated. Shindler (1999) summarizes Inglehart (1977) and Galston's (1992) key characteristics of postmaterial or postindustrial societies as follows:

Postindustrial societies are characterized by a number of traits, including economic dominance of the service sector over manufacturing and agriculture, complex nationwide communication networks, a high degree of economic activity based on an educated workforce that employs scientific knowledge and technology, a high level of public mobilization (including the rise of new social causes such as the environmental movement), increasing population growth and employment in urban areas, and historically unprecedented societal affluence (29).

Postindustrial societies are more likely to address "higher order" needs pertaining to quality of life and aesthetics. Steger et al. (1989) describe the postmaterial/postindustrial society as follows:

The relative prosperity reigning in these societies assures that the basic material and security needs of most of their populations are well satisfied. The further use of natural resources for the development of additional economic capacity is increasingly challenged on the basis of 'higher order' values such as aesthetic qualities of the environment and the self-development benefits derived from public involvement in the determination of public policy (236).

Thus, postindustrial societies are more likely than less industrialized nations (or materialist nations) to support a more holistic view of themselves in relation to their environment (Steger et al. 1989) and therefore demonstrate a notable shift away from what is known as the Dominant Social Paradigm (DSP) in relation to ecological concerns. Meaning, individuals and societies in postmaterial states should show a greater support for values represented by the New Ecological Paradigm (NEP) (biocentric values) and a gradual shift away from the DSP (anthropocentric values).

The NEP is one measurement tool used to determine whether individuals subscribe to more biocentric values as they relate to ecological concern, and can be an indicator of the shift in values in postmaterial societies. In advanced, industrialized societies the move away from materialist values has altered not only the way in which the environment is perceived, but also in actions of individuals that directly impact the environment. Inglehart (1995) finds that while there is high levels of environmental concern in countries that have significant ecological issues to contend with, there are also high levels of environmental support in industrialized, Postmaterialist societies where “self-expression and the quality of life” are becoming more pronounced and demonstrating a shift away from traditional materialist concerns (57).⁴ Specifically,

⁴ Postmaterialism also coincides with the increase in domesticated pets in households. While not the scope of the research here, it would be interesting to see if there is a correlation between environmental concern and the increased connectivity and anthropocentric views people have pertaining to domestic animals. In other words, does increased exposure and relationships with domesticated animals act as a proxy to the natural world and therefore increase environmental concern based on a care ethic?

this change in values toward postmaterialism “is reshaping orientations toward work, fertility, and consumption patterns in ways that affect the environment directly—and also tend to reshape attitudes toward environmental questions” (Inglehart 1995, 62).

Postmaterialism, and the marked shift toward more environmental concern, is closely related to the perceived changes in other socio-demographic factors like age, gender, and income. Older cohorts, as previously discussed, presumably will demonstrate less concern for the environment due to the era in which they were raised. The older generations today, even in industrialized societies, still have imprints of materialist values. Inglehart (2008) finds that among six western European countries there was a notable difference in older and younger generations “among the older cohorts, ‘materialist’ values, emphasizing economic and physical security, were overwhelmingly predominant—but as one moved from older to younger birth cohorts, ‘postmaterialist’ values, emphasizing autonomy and self-expression, became increasingly widespread” (130). This research also suggests that as time moves on, older cohorts will eventually exhibit greater postmaterial values since their formative years (and their cohorts) will not have the material concerns of prior generations.

Although the research on gender and environmental concern is not as clearly defined as age and environmental concern, postmaterial values are innately connected with the advancement of women within industrialized societies. Women in industrialized societies generally have access to higher levels of education, greater job choice, and

access to family planning providing a greater choice of whether, when and how many children a woman chooses to have. Although women (in the United States) still perform the majority of household labor, the generational affect of this mentality should eventually shift to more a more equitable division of household labor as younger people get married, have children and so forth. Steel (1996) notes:

...to the extent that younger couples are moving toward more shared responsibility in the home, and are encouraged to be sensitive to environmental issues, gender differences in such behaviors should appear greater among older cohorts than younger ones (29).

Thus, although currently there may not be a definitive connection between gender and environmental concern and behavior, it is foreseeable that that distinction will become more pronounced. As a caveat though, as postmaterial societies become progressively more environmentally concerned, researchers may find that regardless of gender, the environment will be an issue of concern and attention for the majority of the public, regardless of age, gender or socio-economic status.

In the past it has been asserted that socio-economic status was related to environmental concern. Specifically, people with higher levels of income, education and occupational status would demonstrate a higher degree of environmental awareness and concern and potentially behaviors. Of these three variables, studies suggest that only education proved consistently to be related to environmental concern (Honnold 1981; Jones and Dunlap 1992; Van Liere and Dunlap 1980) with income and occupation proving inconsistent or weak predictors (Jones and Dunlap

1992; Van Liere and Dunlap 1980). While in another study “the combined effects of the three major indicators of social class—education, income, and occupation—are quite meager” (Buttel and Flinn 1978b, 445).

Although only education is consistently related to environmental concern, both income and occupation can influence environmental behaviors. In a study by Buttel (1975), he finds that people with higher levels of income, and employed outside of the resource dependent industries, are more likely to relate to support for environmental reforms or policies because they are more often economically insulated and therefore not “materially affected” (54). It should be noted however that financial support does not necessarily indicate greater environmental concern. Instead, “wealthier respondents are more likely to have the extra time or money to support the causes they believe in, but this does not necessarily reflect differences in beliefs about the importance of the causes themselves” (Klineberg, McKeever, and Rothenbach 1998, 738). Further, Jones and Dunlap (1992) apply their “economic contingency hypothesis” to the work of Buttel (1975) stating that when economic conditions worsen, people who have less fluid income are among the first to withdraw financial support from environmental causes (33).

While certainly those living more financially frugally may withdraw financial support during hard personal economic times, this does not necessitate lack of environmental concern. From this research, a more plausible assertion is that people whose

livelihoods depend on natural resource extraction and use may be less supportive of environmental policies or demonstrate environmental concern. The next section will examine the impact of rural versus urban environmental concern.

Rural Versus Urban: Is there a Divide?

To whom does the West belong—the old or the new? The contest over the answer to that question is now the political drama in the West. One observes a slow and persistent incremental advantage for the newer environmental West and a fierce but slowly losing resistance on the part of the older commodity West. – (Hays 1991, 237)

Among the questions of demographics and other personal factors that can influence an individual's environmental concern, the question of how residence impacts concern is both an important factor and one that is difficult to clearly ascertain a definitive conclusion. There are two reasons for this. First, while residency is easy to determine, responses to questions pertaining to environmental concern could be related to the other personal factors (age, gender, ideology, etc.) and not the place of residence itself (Jones and Dunlap 1992; Salka 2001; Van Liere and Dunlap 1980). Second, there are conflicting results in research on residency and environmental concern, especially among rural residents engaged in resource extracting industries (Tremblay and Dunlap 1978), exposure to environmental degradation (Tremblay and Dunlap 1978) and farmers (Freudenburg 1991; Tremblay and Dunlap 1978).

In a study conducted by Salka (2001), the author examined the support of environmental ballot measures in three states: California, Oregon and Colorado. Salka (2001) found that indeed there were differences in environmental protection between rural and urban residents, but that the differences were explained more by demographic characteristics like party affiliation, education, age, and “economic conditions” of the counties studied (46). However, Salka (2001) determined that, in Oregon, dependence on “resource-related industries” was a factor in environmental protection (i.e. those counties dependent on resource industries were less supportive of environmental protection) (46).

Alternatively, in a study by Alm and Witt (1997) of rural-urban issues in Idaho, the authors find that dependence on resource-based economies is less substantial than other factors in predicting environmental support. Specifically, they find that population growth in general explains willingness to spend money on environmental issues since both rural and urban areas are experiencing growth and therefore willing to spend more on environmental issues(Alm and Witt 1997). This leads to another argument that urban residents are more supportive of environmental policies because they are more disconnected to nature and more likely to have direct experience with pollution and other negative environmental issues.

Urban residents generally lack the day-to-day encounters with nature than people living in rural areas. Thus, according to Nash (1984) “appreciation of wilderness

began in the cities” (44) because it was the proclivity of urban residence to romanticize wilderness and therefore “combined with the primitivistic idealization of a life closer to nature, these ideas fed the Romantic movement which had far-reaching implications for wilderness” (Nash 1984, 44). Specifically, some argue that urban resident’s drive many ecological policies to conserve rural resources or species and thus perpetuate the concept of a rural-urban divide in concern for the environment.

Bennett and Mcbeth (1998) argue that the supposed rural-urban environmental divide is created and even perpetuated by the media and their portrayal of the rural west as “being dominated by a frontier lifestyle, rugged individualism, and fierce independence” (371). They contend that this Western “myth” has benefited those in the extractive-commodity industries because the political system has capitalized and supported the myth that the West is inherently, and to some extent entirely, dependent on resource extraction for economic stability. Yet some researchers find that there is more diversity in rural communities both economically and in concern for the environment (Bennett and McBeth 1998; Brunson, Shindler, and Steel 1997b). Specifically “rural resource-dependent communities are changing, and rigid support for resource extraction, if it ever existed, is no longer the norm” (Brunson, Shindler, and Steel 1997b, 92).

In an article examining whether the social basis of environmental concern had changed, Jones and Dunlap (1992) focus on “the broadening base” hypothesis. Jones

and Dunlap (1992) state, “the broadening base hypothesis suggests that sociopolitical variables in general, and not just socioeconomic variables, will become poorer predictors of environmental concern through the years” (33) due, in large part, to the establishment of environmental issues in the public arena and therefore on the mindsets of a broader spectrum of individuals. Thus, “over time the less educated, residents of rural areas, older adults, and political conservatives should become as concerned about environmental quality as are their counterparts” (Jones and Dunlap 1992, 33).

Political Ideology

The broadening base hypothesis put forth by Jones and Dunlap (1992) indicates that political ideology may also become less of a determinant in environmental concern. However, like the other sociodemographic factors discussed here, the relationship between political ideology and environmental concern has met with mixed results. In a study of University of Oregon students in 1970, Riley E. Dunlap (1975) surveyed the students on attitudes and actions pertaining to environmental concern. The study determined that “Republican and Conservative students consistently indicated lower rates of pro-environmental attitudes and actions than their Democratic and Liberal-Left counterparts” (Dunlap 1975, 448). Further, Dunlap (1975) hints at an inherent relationship between political ideology and environmental concern that people who are predisposed to be more politically liberal have a belief system that intuitively makes them more aware of and concerned about environmental issues (449). This

would then open the door to exploring the reasons why people chose to belong to a particular party, or the socialization that occurs for someone to choose to identify with Liberal/Democrat or Conservative/Republican ideals. Although beyond the scope of this paper, research into this question would involve a deeper look into family groups, socialization and other aspects that would impact formative years of development. However, it makes for an interesting question as to whether, as Dunlap suggests, people who are Liberal/Democrat are more predisposed to a belief system that makes them more environmentally concerned.

However, it is also necessary to parcel out party identification and political ideology, because it is possible for someone to identify as Liberal but not a Democrat or Conservative but not a Republican. In fact, political ideology can be more of a predictor of environmental concern than party identification. In their paper, Buttel and Flinn (1978a) make the distinction between party identification and political ideology as an indication of environmental concern. In their statewide study of Wisconsin residents they found no discernible difference in environmental concern and party identification. Instead, they find that any difference that does exist is explained more by political ideology with Liberals being more concerned for environmental issues than Conservatives. Further, their findings also suggest (and echo other findings of other studies) that environmental concern among Liberals is further stratified by level of education and income (e.g. the more educated, middle-class Liberals demonstrate higher levels of environmental concern).

In a provocative article by Howell and Laska (1992), the authors' conduct a longitudinal study of data from the 1980s from the National Election Studies' surveys (although they note that the wording of the question they used changed slightly and they focused on one question regarding environmental spending). Their results find education to be the best predictor of environmental attitudes (141). However, they conclude that, perhaps due to increasing media attention, environmental issues will be less of a partisan issue and that "indeed, we may see the parties competing for control of this issue" (141). Finally, Howell and Laska (1992) argue that,

...the highly educated population has always been an influential one and the source of most of our public officials and opinion leaders. The support of this group for environmental protection, whether they are Democrats or Republicans, bodes well for the future of the environment (141).

Whether education will be the factor that makes political party identification a non-issue in environmental concern remains to be seen. Samdahl and Robertson (1989) find that political liberalism remains a significant variable in measuring environmental concern, specifically as it relates to pro-regulatory liberalism. Indeed, the authors' indicate that belief systems are a better variable to focus on than sociodemographic, residence and political ideology generally since "they are largely inadequate in explaining the variance in perceptions of environmental problems or ecological behavior" (Samdahl and Robertson 1989, 78). In light of this, Samdahl and Robertson (1989) recommend Dunlap and Van Liere's study on the New

Ecological Paradigm (NEP) as a measurement tool quantifying values and belief systems as a means of determining environmental concern.

New Ecological Paradigm

The shift in environmental values was first formally identified in the late 1960s and 1970s. During this time, the environmental movement came into focus due to seminal pieces of environmental legislation (like the Endangered Species Act, the Clean Air Act, and the National Environmental Policy Act) and major publications like *Silent Spring*, outlining the deleterious effects of DDT, and the *Population Bomb*, that highlighted the ills of the human population explosion and consequent toll on the earth's limited resources. In 1978 Dunlap and Van Liere proposed that a New Environmental Paradigm (NEP) was emerging and thus developed a 12-question scale to determine if people were embracing the NEP or holding to the traditional Dominant Social Paradigm (DSP) beliefs. In this way, the NEP could measure if a shift away from the DSP was occurring as predicted by Dunlap and Van Liere.

The DSP was identified as the leading worldview until the 1960s-1970s. The DSP represents a more utilitarian worldview that is historically connected to early conservationists like Gifford Pinchot (U.S. Forest Service). Pinchot espoused "wise and efficient use" of natural resources while dominating nature to serve people (Nash 1989). However, unlike the preponderance of excessive use perpetuated by early

Judeo-Christian attitudes of dominion over nature, utilitarianism, as expressed by conservationists like Pinchot, did conceive of protecting nature because nature would take care of people (Nash 1989). Smith (1995) states that the main tenets of the DSP are individualism, growth and progress, a faith in science and technology, and free market economics (7). Further, Smith (1995) states that research indicates that individuals subscribing to the DSP demonstrate lower levels of ecological concern (8). Therefore, individuals identifying with the biocentric worldview of the NEP would most likely also have a higher level of ecological concern.

The shift toward environmental support (or the NEP) also has historical roots in the preservationist viewpoints of people such as Aldo Leopold and John Muir. Muir, for example, took the position that nature had a right in and of itself to exist and therefore saw intrinsic value in nature and thus argued for the preservation of nature for nature's sake alone. Aldo Leopold (1966) eloquently put this belief into writing in his famous essay "A Land Ethic" wherein he states, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (262). The beliefs of these early preservationist ideals are now reflected in the biocentric view of the NEP.

Table 1.1. Characteristics of Conflicting Environmental Worldviews

Dominant Social Paradigms	New Ecological Paradigm
Anthropocentric	Biocentric
Nature to produce goods and services primarily for human use	Nature for its own sake
Emphasis on commodity production over environmental protection	Emphasis on environmental protection over commodity production
Compassion for present generation (short-term perspective)	Compassion for future generations (long-term perspective)
Science and technology will solve problems of resource scarcity	Science and technology create as many problems as they solve
Economic and population growth need not be restricted	Economic and population growth must be limited
Emphasis on competition and markets	Emphasis on economic, political, and social cooperation
Old politics, determination by experts	New politics, consultative and participative
Centralized and hierarchical decision making	Decentralized and participatory decision making

Source: Revised from Steel (1997)

The New Ecological Paradigm (NEP) has been a widely used, effective tool for measuring ecological values (Dunlap 2008; Dunlap et al. 2000; Lundmark 2007) that can lend valuable insight into whether values impact knowledge, and subsequent behavior related to that knowledge. It is uncertain to what degree belief in the NEP correlates with environmental behavior. Corral-Verdugo et al. (2003) assert that the NEP, while providing insight into potential for environmental behavior, it is not necessarily a reliable predictor of environmental actions. However, Corral-Verdugo et al. (2003) found a limited number of studies that confirm a direct relation between the NEP-DSP worldview and environmental behavior (Corral-Verdugo, Bechtel, and Fraijo-Sing 2003, 248). Nooney et al. (2003) buttress these findings citing research that finds that the NEP has predictive influence on environmental behaviors. And yet another study, by Kilbourne et al. (2001) finds that their model of the role of

Dominant Social Paradigm (DSP) on behavior, “suggests that environmental attitudes are directly influenced by an individual’s position on the DSP” (2020) and that this position influences the ability and openness to change.

The NEP scale, although revised slightly over the years, focuses on questions that help ascertain biocentric and anthropocentric attitudes. The NEP (both original and revised) utilize a 4-point Likert scale (strongly agree, mildly agree, mildly disagree, strongly disagree) that explores three main environmental attitudes “a belief in (1) humans’ ability to upset the balance of nature, (2) the existence of limits to growth, and (3) humans’ right to rule over the rest of nature” (Hawcroft and Milfont 2010, 144). The higher the score on the NEP, the more biocentric the respondent, the lower the NEP score, the more anthropocentric the respondent is.

Table 1.2. The New Environmental/Ecological Paradigm Scale

New Environmental Paradigm 1978	New Ecological Paradigm 2000
<ol style="list-style-type: none"> 1. We are approaching the limit of the number of people the earth can support. 2. The balance of nature is very delicate and easily upset. 3. Humans have the right to modify the natural environment to suit their needs. 4. Mankind was created to rule over the rest of nature. 5. When humans interfere with nature it often produces disastrous consequences. 6. Plants and animals exist primarily to be used by humans. 7. To maintain a healthy economy we will have to develop a “steady-state” economy where industrial growth is controlled. 8. Humans must live in harmony with nature in order to survive. 9. The earth is like a spaceship with only limited room and resources. 10. Humans need not adapt to the natural environment because they can remake it to suit their needs. 11. There are limits to growth beyond which our industrialized society cannot expand. 12. Mankind is severely abusing the environment. 	<ol style="list-style-type: none"> 1. We are approaching the limit of the number of people the earth can support. 2. Humans have the right to modify the natural environment to suit their needs. 3. When humans interfere with nature it often produces disastrous consequences. 4. Human ingenuity will insure that we do NOT make the earth unlivable. 5. Humans are severely abusing the environment. 6. The earth has plenty of natural resources if we just learn how to develop them. 7. Plants and animals have as much right as humans to exist. 8. The balance of nature is strong enough to cope with the impacts of modern industrialized nations. 9. Despite our special abilities humans are still subject to the laws of nature. 10. The so-called “ecological crisis” facing humankind has been greatly exaggerated. 11. The earth is like a spaceship with very limited room and resources. 12. Humans were meant to rule over the rest of nature. 13. The balance of nature is very delicate and easily upset. 14. Humans will eventually learn enough about how nature works to be able to control it. 15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Source: Modified from Hawcroft and Milfont (2010, 145)

Further modifications to the NEP scale occurred in 1982 when Dunlap and Van Liere developed a six-item NEP for use in a national survey (Dunlap et al. 2000). The six-item scale “provided a balanced measure of each of the three facets identified in the original NEP Scale: balance of nature (items 1 and 4), limits to growth (items 2 and 5), and human’s right to rule (items 3 and 6)” (Hawcroft and Milfont 2010, 145). In addition, there was a modification to the Likert scale using a 5-point scale (strongly disagree, mildly disagree, neutral, mildly agree, strongly agree) as opposed to the 4-point scale used in other NEP surveys.

Table 1.3. Revised Six-Question NEP Scale

NEP Statement	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree
The balance of nature is very delicate and easily upset by human activities.	1	2	3	4	5
Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
We are approaching the limit of people the earth can support.	1	2	3	4	5
The so-called “ecological crisis” facing humankind has been greatly exaggerated.	1	2	3	4	5
Plants and animals have as much right as humans to exist.	1	2	3	4	5
Humans were meant to rule over the rest of nature.	1	2	3	4	5

Source: Derived from Dunlap et al. (2000)

The NEP has repeatedly been tested for its ability to measure environmental value and therefore provides a viable tool for survey research conducted for this study. It also provides a basis of comparison and potential linkages with the socio-demographic variables discussed above and the knowledge variable discussed in the next section. By using the NEP then, the study is grounded in the analysis of environmental values as they relate to knowledge, socio-demographic factors, and other variables that help define an individuals environmental concern.

The purpose of this literature review is to provide a foundation for the research questions addressed in this dissertation. Fundamental to the questions explored in this research is the underlying question of how values, socio-demographic variables, post-industrialization and knowledge interact to define both an individuals and a

societies level of environmental concern. As the State of Oregon embarks on the creation of a statewide integrated water resource strategy, the residents of Oregon can, and arguably should, have a say in the policy process to create this strategy (as the Statewide Water Roundtables established). Whether or not the residents will participate in this policy formation is not the intent of this research, but rather the question is whether there exist the underlying variables that could act as motivators for participation in this strategy development or environmental issues in general. From past research, the prevailing theories are that young, urban, well-educated liberals are more environmentally concerned. Certainly those theories will be tested in this research and also reveal more of Oregonians knowledge and values as they pertain to water issues in the State of Oregon.

Political Factors

Exploring the personal variables that can impact individuals' attitudes about water issues helps to ascertain both potential obstacles to water management and acknowledgement of areas where the public is in-line with state goals. However, the political arena for amending or shifting current water use and demand involves those more directly involved in actual policy-making. This section explores how the Institutional and Analysis Development (IAD) framework can help provide order to the policy-making process by identifying key actors in the water policy arena.

Institutional Analysis and Development (IAD) Framework

The political realm is complex and often difficult to comprehend. As such, in order to understand more accurately the policy process, there needs to be a method of simplifying the complexity (Sabatier, 2007). Utilizing policy frameworks provides a means of simplifying seemingly unmanageable numbers of actors, opinions, values, and facts. For this dissertation, the Institutional Development and Analysis (IAD) framework will provide that policy management tool specifically related to water management in Oregon.

The IAD framework provides a method to comprehend and explain a policy process, especially as it relates to common pool resources like water. The IAD is especially useful in analyzing decision networks pertaining to water because of five things (Imperial 1999, 453):

1. The IAD recognizes the full range of transaction costs associated with implementing policies;
2. The IAD draws attention to contextual conditions that influences institutional design and performance (e.g., physical, biological, social, economic, cultural, etc.);
3. The IAD does not contain a normative bias with respect to institutional arrangements; it does not presume that a centralized hierarchical arrangement is more effective than a decentralized or polycentric arrangement;
4. The IAD posits using a variety of criteria to identify the strengths and weaknesses in different institutional arrangements; and
5. The IAD focuses on rules rather than the policies themselves, which broadens the analysis to address a wider range of organizational relationships.

The main unit of analysis in the IAD is the “action arena.” The action arena incorporates individuals and organizations that make resource management decisions based on the information about how actions are connected to possible results (outcomes) and to the costs and benefits attached to actions and outcomes (Imperial 1999, 454). More concisely, the action arena is comprised of two variables, the action situation and the actor themselves (Ostrom 2007). Describing the action arena often includes analysis of: 1) the set of participants; 2) roles of participants; 3) allowable actions; 4) potential outcomes; 5) amount of control of participants; 6) participant information about action situation; and 7) the costs and benefits of actions (Ostrom 2007).

The use of the IAD framework in this dissertation is to make inferences about potential outcomes of Oregon water policy as it relates to the OWRD’s work on the statewide, integrated water resource strategy. Ostrom (2007) suggests that analysts from different fields of study regard variables differently with environmentalists focusing of how “physical and biological systems interact and create opportunities or constraints on the situations human beings face” and that political scientists focus more on “how specific combinations of rules affect incentives” (Ostrom 2007, 35). As an environmental policy researcher, my analysis will be a blend of analyzing how physical and biological factors constrain water quantity and how existing rules and norms of water use and rights offer incentives or disincentives to policy reform.

Methods

For this research, two separate surveys were conducted along with supplementary interviews of key actors in water policy in Oregon. The first mail survey was conducted between May and June of 2010 on Oregon residents using a random sample technique. The sample list was provided by a national survey sampling company. For the survey, the “Total Design Method” constructed by Dillman (1978) was utilized wherein three waves of mailings, including an introductory postcard announcing the survey and two subsequent waves of the questionnaire and cover letter were sent. The survey was sent to 1,537 Oregon residents with the criteria that they are Oregon residents and 18 years of age or older. A total of 808 completed surveys were collected yielding a response rate of 52.6 percent.⁵

The survey included several questions pertaining to residents’ level of concern over water scarcity, water conservation behaviors, sociodemographic information, and environmental values assessed by the NEP. Also included were general questions pertaining to beliefs about water, and priority water uses within the state.

A second survey was sent in the spring of 2011 to stakeholders, elected officials, and other actors in water policy decision-making in Oregon. Twelve sectors were surveyed: state agencies, elected officials, county commissioners, irrigation districts, industry, energy, water utilities, agriculture, watershed councils, Native American

⁵ This is considered a good response rate.

tribes, environmental organizations, and recreation. The survey was sent to a purposive sample of 390 individuals within the state of Oregon during the months of April and May 2011. The purpose of the survey was to assess stakeholder attitudes and opinions toward water use and policy in Oregon. For the survey distribution an abbreviated “Total Design Method” constructed by Dillman (1978) was employed with one wave of mailings, including an introductory postcard announcing the survey. The survey was sent to 390 stakeholders, of those 147 responded, resulting in a response rate of 40.4%.⁶

In addition, beginning in the winter of 2010, a series of interviews with identified stakeholders and elected officials were conducted. The interviewees were asked a series of open-ended semi-structured questions, allowing them to respond in full to the question, and elaborate on any points they felt necessary. The purpose of the interviews was to enhance our understanding of water management goals for different sectors of stakeholders. Interviews lasted from 20 to 60 minutes, with one researcher asking questions, and a second researcher taking detailed notes of the conversation. While most interviewees did not ask for confidentiality, those who requested that their responses remain confidential agreed only to be identified based on the water sector they represented (i.e. agricultural community, environmental organization, irrigation district, etc.).

⁶ Again, due to the purposive nature of the survey and the one wave of mailings, this is a good response rate.

Outline of Dissertation

This dissertation is divided into three separate but related papers pertaining to Oregon water policy and to citizen and stakeholder concerns, beliefs and values concerning water quantity. This chapter provided contextual background on Oregon water, particularly the stressors to Oregon water quantity and explores how attributes and values of people can impact water quantity management in the state. Chapter 2 (the first paper) “Determinants of Concern Over Water Scarcity and Climate Change in Oregon” explores whether sociodemographic attributes and environmental values have an effect on Oregonians’ concern about water scarcity, their belief in climate change, and their prioritization of water use for Oregon. Chapter 3 (the second paper) “Attitude-Behavior-Consistency in Household Water Consumption: An Oregon Case Study”, delves deeper into how attitudes shape water conservation behaviors. Specifically, the paper explores possible connections between concern that there is a water scarcity problem in Oregon and sociodemographic and environmental value variables with actual self-reported water conservation behaviors. Chapter 4 (the final paper), “Applying the Institutional and Analysis Development (IAD) Framework to Oregon Water Policy”, I applied the Institutional and Analysis Development (IAD) framework to current efforts led by the Oregon Water Resource Department to create a statewide, integrated water management strategy. This paper reflects on the involvement of stakeholders (actors) in the creation of a water management strategy (action arena) and potential outcomes of this endeavor. Further, the paper analyzes the policy implications on water quantity in Oregon. The final chapter will provide a

synopsis of the research findings in all three papers. Lastly, the final chapter will discuss the future of water policy in Oregon and the implication of the OWRD integrated water resource strategy.

Determinants of Concern Over Water Scarcity in Oregon

Abstract

In the West, where water is a commodity often fought for, scarcity of the “Oregon’s oil” is monitored intensely. Since much of the water in the West is used for agriculture, lack of water signifies trade-offs for other water uses like fish and wildlife. Yet in Oregon, where many people consider water to be abundant, the urgency of water scarcity is often not on the minds of residents. Using a survey conducted in the spring of 2010, this paper seeks to determine whether Oregonians view water scarcity as a problem for the state or for themselves personally and to determine how Oregonians prioritize water use.

Keywords

Public opinion, water quantity, NEP, sociodemographics, Oregon water

Introduction

The Pacific Northwest has long held the reputation of being water abundant.

However, a quick glance at Oregon precipitation levels reveals an obvious imbalance in the amount and consistency of rainfall within the State. Oregon’s unique geography spans several different ecoregions and watersheds, some of which are closed and shared with other states, and exhibits great variation in weather patterns.

The Cascade mountain range essentially defines the precipitation patterns in Oregon, with the Eastern side of the Cascades often dry and arid, and the Western side boasting ample rain. The annual precipitation between western Oregon (receiving 40-140 inches) and eastern Oregon (receiving 10-20 inches) is a dramatic contrast and stark reminder of variable water quantity and availability in the state (Bastasch 2006).

It was the lack of available water in the Klamath River Basin in 2001 that led to the infamous “water war” in the region. The Klamath water war illustrated the complexities of water management when a drought challenged the water needs of irrigators, commercial fisheries, Native Americans, and endangered species. The fight that ensued over the “liquid gold” is still being negotiated a decade later. However, the struggle in the Klamath over water distribution now serves as a stark reminder of the value of water in the West, even in a purported water-rich state.

Most research on western water issues focuses on the arid intermountain and Rocky Mountain regions, or areas that historically have water scarcity and management challenges. However, few studies focus on the West coast states, particularly the Pacific Northwest where water issues are perceived to be non-existent. In Oregon, much of this perception is because the public generally knows very little about water management in the state, let alone water quantity issues (Bastasch 2006). Water quality, while important, is not a component of this research because, true to Oregon’s reputation Oregonians have some knowledge about water quality (Bastasch 2006). In short Oregonians “know there are laws and somebody to call if they see water pollution” (Bastasch 2006, vi). Therefore the purpose of this paper is to explore whether Oregon residents believe that there is a water quantity problem. Further, this paper examines the distinguishing socioeconomic/demographic attributes or cultural values that lend insight into which residents are more likely to believe there is a water problem in the state.

Using a survey conducted in the spring of 2010 of Oregon residents, this study will explore whether variables like the New Ecological Paradigm, education, political ideology, place of residence (rural or urban), age or gender is indicative of people's beliefs and concern about water scarcity issues in Oregon. And, insofar as these divisions exist, explore how Oregon public's responses substantiate or contradict prior research on the effects of socioeconomic/demographics and environmental values on environmental policy issues. Lastly, this paper will discuss how Oregonians prioritize water use and the potential policy implications of those findings.

Background and justification for research

In 2001, the Oregon Water Resources Department (OWRD) released a Strategic Plan outlining the goals for water management in the state. Within the plan, the OWRD stated:

Put very simply, there is not enough water where it is needed, to satisfy both existing and future water uses. This situation jeopardizes the high level of livability that Oregonians enjoy. It seriously limits the ability of Oregon's economy to grow, and threatens existing users' water supplies and the sustainability of the natural systems on which our economy relies. (Oregon Water Resources Department 2001, 6).

While this statement reflects the concern the OWRD has in meeting water needs in the state, it goes against the perception of abundance. Bastasch (2006) describes this disconnect saying, "despite chronic water difficulties through the decades, the

perception of Oregon as a water-rich state has prevailed. For the most part, water supply has simply not been worth worrying about” (59). The reality for Oregonians is that in parts of the year surface water is either fully or over-allocated (Oregon Water Resources Department 2010b) and the resulting dependence on groundwater to fill demand is now depleting groundwater levels in several places in the state (Oregon Water Resources Department 2011a) creating challenges for water management. Adding pressure to already stressed water availability is population growth within the state and the changing weather patterns due to climate change.

Recent efforts by academic institutions, legislative bodies and independent researchers have attempted to understand Oregonians’ knowledge about water and assess where Oregonians’ believe water would/should be best utilized. The Institute for Water and Watersheds (IWW), the Institute for Natural Resources (INR) and Oregon Sea Grant Extensions at Oregon State University in conjunction with the Oregon House Committee on Energy and the Environment conducted the Statewide Water Roundtables in several regions in Oregon in 2009 to assess attendees primary water concerns. The participants were self-identified (301 people attended) and attended meetings based on personal interest in water issues and spanned five distinct hydrological regions in Oregon (Central, Coastal, Eastern, Southern, and Western/Willamette Valley Oregon).

Participants in the Roundtables represented rural areas (56%) slightly more than urban areas (44%). Further, they represented 13 different sectors, with agriculture (15%) and non-governmental organizations (14%) as the top two participant groups (Oregon State University Institute for Water and Watersheds et al. 2008). The Roundtables found that overall, water quantity (33%) was the issue residents were most concerned about, followed by water quality (25%), and ecological water concerns (25%) (Oregon State University Institute for Water and Watersheds et al. 2008). Concern over water quantity was for both current use and future use for both residents of Oregon and Oregon wildlife needs. In response to the statement, “In 2008 Oregonians have enough water to cover their needs, including wildlife” and “In 2028, I believe Oregonians will have enough water to cover all of their basic needs, including the needs of wildlife”; most participants disagreed or disagreed strongly (Oregon State University Institute for Water and Watersheds et al. 2008, 10). Although regionally the emphasis on water varied (for example in the coastal regions water quality was a high concern, whereas in the eastern area of Ontario, water quantity was the primary focus) the efforts of the Statewide Water Roundtables illustrate the need for Oregon to address water issues.

In another study researchers conducted a region-wide survey in 2004 of Pacific Northwest (Alaska, Idaho, Oregon and Washington) residents. The goal was to understand what were the residents’ level of awareness, attitude, and priorities concerning water use (Mahler et al. 2004). The researchers found that over two-

thirds of survey respondents felt that watershed restoration was a high priority, and that a majority of respondents felt that quality of water (clean drinking water, clean groundwater, and clean rivers) is an extremely important issue (Mahler et al. 2004). However, in response to the question, “Do you regard water quantity (having enough water) a problem in the area you live?” the majority of respondents chose “no, not a problem” or “probably not a problem” (Mahler et al. 2004, 8). Since this survey was conducted throughout the Pacific Northwest, survey results varied based on geographic location and coincided with amount of precipitation in the state (Mahler et al. 2004).

The differences in responses between the Statewide Water Roundtables and the general survey to Pacific Northwest Residents could be explained by the fact that the Roundtable participants’ were self-identified. But, there are also differences expressed within the survey conducted by Mahler et al. (2004) indicating that priorities differ according to a number of factors like gender, length of residency, education and age. In either case, it is clear that more research is needed to determine what Oregonians’ know about water in Oregon and determine whether water management preferences reflect personal values.

Water Stressors

Recent growth in Oregon has been steady and relatively rapid. In the years between 1980 and 2006, Oregon’s population increased 40.5 percent (from 2.6 million

residents to 3.7 million residents) (Albrecht 2008). Most of this growth has occurred in the greater Portland metropolitan area (including the Vancouver and Beaverton region) (Albrecht 2008). From 1980 to 2006, growth in this metropolitan region went from 1.1 million to 1.7 million, over a 50 percent increase in population (Albrecht 2008). Regionally, the area is expected to gradually increase in population. For example, there are 20,000 Californians moving to Oregon annually (Lang 2008). Among many infrastructure concerns, the projected population growth would exceed current water supplies (Lang 2008). For the Portland metropolitan area alone it is estimated that by 2040, the increased need for water due to climate change will amount to 50% of that required to meet the needs of a growing population (Climate Impacts Group 2010).

Although uncertainty exists as to the extent climate change will have on the region, it is clear that Oregon will be affected. Under current conditions, the Pacific Northwest is expected to have an increase of temperature between 1-5°F by 2050 due to climate change (Oregon Department of Fish and Wildlife 2008). It is likely that Oregon will experience a change in hydrology with increased rainstorms and snowstorms in the winter and drier, longer summer conditions. Spring runoff will most likely come earlier in the year, thus altering flood patterns and changes to the availability of water for irrigation (Oregon Department of Fish and Wildlife 2008). Other potential outcomes are increased frequency and intensity of forest fires, more heat waves, loss

of indigenous plants and animals, and increased invasive species, disease and pests (Oregon Department of Fish and Wildlife 2008).

The majority of Oregon's water is held in snowpack and glaciers in the Cascades. Already, there are notable decreases in snowpack and the retreat of glaciers in the Cascade Range (Oregon Global Warming Commission 2009). It is estimated that the anthropogenic increases of greenhouse gas has reduced spring snowpack by around 20% (Oregon Global Warming Commission 2009). In addition, earlier spring snow melt at low-to-middle elevations "has increased the risk of spring flooding, while reducing summer stream flows when fish and farmers both depend on those streams for water" (Oregon Global Warming Commission 2009, 2). It is further estimated that changes to the hydrological cycle due to climate change will: decrease water availability and quality, degrade habitat for native fish, increase flooding, and lead to the drying of wetlands (Oregon Department of Fish and Wildlife 2008). Aside from the possibility of increasing conflict among water users, the landscape of Oregon's riparian systems and fish and aquatic species could dramatically change.

Climate change and water quality and quantity concerns are intricately connected. Add to this the projected population growth (including climate refugees from other parts of the U.S.), increased demand for water and potential reallocation of current water use, Oregon water issues may become much more contentious. For example, Getches (2003) states:

Whereas demographic change and effects of current policy create stresses that set the stage for water crises, the perception of a crisis will almost always be triggered by a climatic event. Thus the occurrence of climatic events will be the most readily identifiable antecedent to a crisis of magnitude sufficient to attract the political attention needed for significant water-policy reform. (215)

In other words, climate change could create a water crisis in which the issue will become salient for Oregonians to address.

Alternatively, instead of waiting for a crisis to precipitate water reform, Oregon has the opportunity to plan for climate variability and related impacts. In 2010, the State of Oregon released their “Oregon Climate Change and Adaptation Framework” which stated “over the next few decades, indicators show that Oregon’s natural resources, infrastructure, and people will likely face more severe impacts from climate change” (State of Oregon 2010, i). However, anticipation of these impacts and the costs and consequences can be planned for (State of Oregon 2010), including impacts to water resources.

Perhaps it is in part due to the greater knowledge about water quantity problems in Oregon that the state has now funded the OWRD to develop a statewide-integrated water resource strategy (IWRS). While the Oregon Water Code has directed water planning for roughly the last 100 years, it is no longer sufficient to meet the challenges to water quantity due to climate change, population growth and demand for fish and wildlife, agriculture and other needs of the state. As such, the current

effort by OWRD to develop an IWRS will attempt to address water management in Oregon in light of both demographic and physical changes impacting water resources. The goal is not to change prior appropriation laws, or substantively alter current water rights or uses (or the Oregon Water Code), rather the intent is to account for current water uses and project water needs for the next 50 years. The state's goals for the IWRS are to develop a strategy "to help Oregon meet its future water quantity, water quality, and ecosystem needs, while taking into account other factors such as population growth, changes to land use and climate conditions" (Oregon Water Resources Department 2010a, 1).

One key interest of the OWRD is assessing the public's input on the IWRS and Oregon water issues. As such, the OWRD has conducted 12 open house meetings in various locations throughout the state in order to find out what issues the public are most concerned about. However, there is a lack of evidence to suggest that Oregon residents understand the water issues facing the state.

Using a survey conducted in the spring of 2010 of Oregon residents, this paper will seek to rectify the knowledge gap and help ascertain what Oregonians think about water, who is concerned about water, and the policy preferences of Oregonians for water use.

Sociodemographic and Cultural Variables

In order to understand how people perceive an ecological issue, like water scarcity, it is necessary to understand why people think a certain way. Previous research suggest several variables that influence how people think about environmental issues like age, gender, education, place of residence, political ideology and environmental values often measured by the New Ecological Paradigm (NEP) scale. It is these variables that can determine what and why people think about environmental issues. It also reveals potential policy preferences or even personal lifestyle choices pertaining to environmental issues. Therefore, it is both necessary to ask what people believe, but also why.

Postmaterialism and Social Change

It is difficult, if not impossible, to describe the potential impact of sociodemographic variables without acknowledging a major shift in societal values following World War II. This era, recognized as a postmaterial (or postindustrial) time, exhibits divergent beliefs, values, and issue salience then the earlier materialist period. During the time of materialism (also known as the industrial era), individuals were concerned primarily with meeting their basic needs: food, shelter, security, and employment. However, after World War II, improved economic conditions combined with technological advancements allowed people in the United States (and other developed nations to varying degrees) to shift their focus away from survival and security to more post-material concerns like job satisfaction, recreation, leisure,

and quality of life. Postmaterial societies are also more likely to focus on “higher order” needs pertaining to quality of life and aesthetics. Steger et al. (1989) note:

The relative prosperity reigning in these societies assures that the basic material and security needs of most of their populations are well satisfied. The further use of natural resources for the development of additional economic capacity is increasingly challenged on the basis of ‘higher order’ values such as aesthetic qualities of the environment and the self-development benefits derived from public involvement in the determination of public policy (236).

Thus, in all variables described in this paper: age, gender, education, place of residence, political ideology, and environmental values are influenced by some degree by the societal shift from a material to a postmaterial society.

Age

In 1972, Mannheim’s *Essays on the Sociology of Knowledge* introduced his ‘theory of generations’ as a means of understanding why people of different age cohorts may see things differently from one another. This theory suggests that generational cohorts are collectively shaped by historical events and thus socially imprinted by the events and prevailing attitudes at the time of formative years of 17-25 (Mannheim 1972). These age cohorts represent groups that are born during similar time periods and are influenced by the shared experiences of their youth. Pertaining specifically to environmental issues current older generations have had less exposure as an age cohort to the multitude of environmental issues that have been more on the collective mindset of people since the 1970s. Thus, it would follow, according to Mannheim’s

theory, that older generations would be less likely to be concerned about environmental issues, since these were not prevailing problems during their youth.

Further, older generations experienced their youth during the materialist era. In a recent study by Inglehart (2008) on value changes in western societies he finds great variation in the values of older and younger generations. Specifically,

Among the older cohorts, 'materialist' values, emphasizing economic and physical security, were overwhelmingly predominant – but as one moved from older to younger birth cohorts, 'post-materialist' values, emphasizing autonomy and self-expression, became increasingly widespread (Inglehart 2008, 130).

However, while there is great difference between the older and younger generations, Inglehart (2008) finds that difference is becoming less apparent, “the birth cohorts born before World War II continue to place significantly more emphasis on materialist values than to the younger cohorts...but the post-war cohorts show relatively similar values” (Inglehart 2008, 145).

In an earlier cross-national study by Inglehart (1995) concerning public support for environmental protection, he finds that changes from a materialist to postmaterialist society results in greater support for environmental policies. Further, Inglehart (1995) substantiates Mannheim's theory of generations with the finding that in each of the countries examined (over a time period of 22 years) there were fewer Materialists and an increase in Postmaterialists since the younger cohorts were becoming more abundant and the older cohorts less so.

Several studies have determined that age is inversely related to environmental concern (the older the person, the less environmental concern, the younger the person, the more concern) (Arcury 1990; Jones and Dunlap 1992; Dunlap et al. 2000). As younger cohorts replace older cohorts, it is expected that the age effect will have less of an impact on environmental concern since those coming of age in a postindustrial society will replace the older generations that hold to materialists' ideals. However, the current relationship between age and environmental concerns seems to demonstrate relatively consistent findings. Since currently "the strongest and most consistent predictor of environmentalism is age or birth cohort" (Dietz, Stern, and Guagnano 1998, 451) age remains an important variable to consider when measuring environmental concern.

Gender

While age is one variable potentially illuminating an inverse relationship to environmental concern, gender is a variable that represents a constant in environmental concern. Taking them together, Steel (1996) finds that women were more likely to express environmental concern and behavior, and that environmental behavior is more pronounced in older cohorts. This would seem to indicate that while age is a component, gender might have an overarching influence on environmental concern. In fact, several studies suggest that when gender is a factor, women are more likely to hold stronger environmental attitudes (Bord and O'Connor 1997; Jones and Dunlap 1992; Steel 1996; Zelezny, Chua, and Aldrich 2000).

There are two theories attempting to explain gender differences in environmental attitudes. First is that women are more susceptible to environmental risk. Because women perceive ecological threats as posing greater personal and social ramifications, “women are...somewhat more likely to both evaluate these environmental problems as serious and to report intentions to take voluntary actions to address the problem” (Bord and O'Connor 1997, 838). The second theory contends that women are socialized to be more “expressive, to have a stronger ‘ethic of care’, and to be more interdependent, compassionate, nurturing, cooperative, and helpful in caregiving roles” (Zelezny, Chua, and Aldrich 2000, 445). Thus, women see the potential harm to themselves (higher risk perception), people at-large, and other species and ecosystems, or the “inherent interconnections” as opposed to men who do not make these same inferences (Stern, Dietz, and Kalof 1993). Feminist environmental theory has also stated that because women are more biocentric in their values (Diamond and Orenstein 1990; Merchant 1979) this inherent connection to nature substantiates their ethic of care.

While the findings are somewhat inconsistent, there is a growing assumption that women are more likely to have a higher risk perception pertaining to ecological issues, particularly local issues, and hold a more biocentric view of nature. Tindall et al. (2003) explain that while women might not be politically environmentally active “women actually engage in more day-to-day conservation behavior and appear to make closer connections between various dimensions of environmentalism” (928).

Education

In a review of impacts of socio-economic status relating to environmental concern, higher levels of income, education and occupational status, research suggests that only education was consistently related to environmental concern (Van Liere and Dunlap 1980; Honnold 1981; Jones and Dunlap 1992) with income and occupation proving inconsistent or weak predictors (Jones and Dunlap 1992; Van Liere and Dunlap 1980). Essentially, “those individuals with higher levels of education are significantly more likely to have value orientations sympathetic to environmental concerns when compared to individuals with less formal education” (Steel, List, and Shindler 1994, 141).

Presumably, higher levels of education reflect exposure to greater knowledge about environmental issues and by extension raises an individual’s awareness and concern about the environment. Education is also related to higher voter turnout (Project Vote 2011), suggesting that the more educated a citizen is, the more engaged in political issues, including environmental issues.

Although only education is consistently related to environmental concern (Klineberg, McKeever, and Rothenbach 1998; Kanagy, Humphrey, and Firebaugh 1994; Howell and Laska 1992), both income and occupation can influence environmental behaviors. In an older study by Buttel (1975), he finds that people with higher levels of income, and employed outside of the resource dependent industries, are more likely to relate

to support for environmental reforms or policies because they are more often economically insulated and therefore not “materially affected” (54). More recent studies focusing on employment on resource dependent industries explore the rural-urban differences in environmental support since rural areas are more resource dependent an expected outcome would be less environmental support from those areas.

Place of Residence: Rural-Urban

To whom does the West belong—the old or the new? The contest over the answer to that question is now the political drama in the West. One observes a slow and persistent incremental advantage for the newer environmental West and a fierce but slowly losing resistance on the part of the older commodity West. —(Hays 1991, 237)

It has long been believed that individuals in resource-dependent rural communities are ideologically conservative, adhere more toward traditional views of controlling landscapes, and hold political power due to the economic contributions they often contribute to western economies (Sheridan 2007). This “old West” is also characterized by less industrialization and generally lower socioeconomic status due to the economic dependence on natural resource extraction as the primary employment opportunities.

With the ushering in of postindustrialism after World War II, Oregon began to witness many of the key traits of postindustrial growth: economic dominance of the

service sector over agriculture, a high degree of economic activity based on an educated workforce, an influx in population growth and employment in the urban areas with a subsequent decline in many rural areas, and higher levels of societal affluence (Clucas, Henkels, and Steel 2011; Galston 1992; Inglehart 1977). The postindustrial growth impacted Oregon by further illustrating the divide between the old and the new West:

As the urban areas have generally moved into a post-industrial society, many rural areas retaining strong agrarian roots have seen their economic base deteriorate. As a result, rural and urban areas of the state hold considerably different perspectives on society and the role that government ought to play. Demographic shifts, technological advances, and other changes have reinforced these economic disparities, making the political divide between rural and urban areas even more pronounced (Clucas, Henkels, and Steel 2011, 114).

Postindustrial, urban residents are more likely to focus on quality of life issues, since their economic livelihoods are not intricately connected to resource-dependent industries. Thus, often environmental restrictions on land and water use originate for urban centers “as environmentalists have become more influential, those who represent the region’s older economic activities have been strident in their defense of timber, mining, grazing, and irrigation agriculture” (Hays 1991, 231). As newer, urban residents begin to challenge that control over land by enforcing environmental constraints and trying to create a new aesthetic and recreational use for rural land “a cultural as well as political divide between the urban and the rural is growing ever deeper, with explosive political and ecological consequences” (Sheridan 2007, 123).

Yet some authors challenge the authenticity of the depiction of the rural-urban divide claiming instead that the supposed environmental divide is created and even perpetuated by the media and their portrayal of the rural west as “being dominated by a frontier lifestyle, rugged individualism, and fierce independence” (Bennett and McBeth 1998, 371). Bennett and McBeth (1998) contend that this Western “myth” has benefited those in the extractive-commodity industries because the political system has capitalized and supported the myth that the West is inherently, and to some extent entirely, dependent on resource extraction for economic stability. Indeed, some researchers find that there is now more diversity in rural communities both economically and in concern for the environment (Bennett and McBeth 1998; Brunson, Shindler, and Steel 1997a).

Simply using place of residence can be problematic for two reasons. First, while residency is easy to determine, responses to questions pertaining to environmental concern could be related to other personal factors (education, ecological values, ideology, etc.) and not the place of residence itself (Salka 2001; Jones and Dunlap 1992; Van Liere and Dunlap 1980). Second, there are conflicting results in the research on residency and environmental concern, especially among rural residents engaged in resource extracting industries (Tremblay and Dunlap 1978), exposure to environmental degradation (Tremblay and Dunlap 1978) and farmers (Freudenburg 1991; Tremblay and Dunlap 1978).

In a study conducted by Salka (2001), the author examined the support of environmental ballot measures in three states: California, Oregon and Colorado. The author found that indeed there were differences in support of environmental measures between rural and urban residents, but that the differences were explained more by demographic characteristics like party affiliation, education, and “economic conditions” of the counties studied (Salka 2001, 46). However, results in Oregon showed that dependence on “resource-related industries” was a factor in environmental protection (i.e. those counties dependent on resource industries were less supportive of environmental protection) (Salka 2001, 46).

Political Ideology

The relationship between political ideology and environmental concern has historically illustrated that individuals who identify as conservative are less environmentally oriented than their liberal counterparts (Buttel and Flinn 1978a; Dunlap 1975; Samdahl and Robertson 1989). Dunlap et al. (2001) state that this relationship is because “support for free enterprise, *laissez-faire* government and the *status quo* are core elements of conservative ideology, it also seemed logical to expect political conservatives to be less pro-environmental than their liberal counterparts” (24-25).

While political ideology may be an indicator of environmental concern, studies suggest that even over time the significance of these findings will most likely

diminish. In 1992, Jones and Dunlap wrote about their “broadening base” hypothesis stating “the broadening base hypothesis suggests that sociopolitical variables in general, and not just socioeconomic variables, will become poorer predictors of environmental concern through the years” (33). In part, this is due to the general establishment of environmental issues in the public arena and therefore on the mindsets of a broader spectrum of individuals. Thus, “over time the less educated, residents of rural areas, older adults, and political conservatives should become as concerned about environmental quality as are their counterparts” (Jones and Dunlap 1992, 33).

However, in a more recent study Dunlap et al. (2001) note that the environmental movement itself may have a broad base of support, but that support still has a significant liberal identification. Indeed, political ideology as it relates to environmental concern indicates value assumptions underlying conservative and liberal orientations:

This social or cultural dimension of political ideology may be related to views of the Environmental Movement to the extent that environmentalism represents a significant challenge to our traditional understandings of the role of humans in nature, as Americans have historically taken a very anthropocentric view emphasizing that humans have the right to use the environment to suit their needs... This leads us to expect that those who are ‘socially conservative’ will have less positive views of the Environmental Movement than will their more liberal counterparts (Dunlap, Xiao, and McCright 2001, 34).

Using the 2000 Gallup Survey, Dunlap et al. (2001) test several variables related to ideological support for environmental issues. They found that:

...partisan and ideological differences exist not only on specific policy issues or questions such as strong enforcement of environmental regulations or increased government spending on environmental protection, but are apparent in attitudes towards and involvement with the Environmental Movement (Dunlap, Xiao, and McCright 2001, 45).

Thus while older studies have found that political ideology is a determinant in environmental concern, it is evident that time alone has not influenced a broadening base of concern beyond political ideology. Most likely this is due to the findings of Dunlap et al. (2001) that political ideology and environmental concern go beyond political beliefs, and instead touch on the very core of beliefs pertaining to people's relationship to nature.

New Ecological Paradigm (NEP)

The NEP has been a widely used, effective tool for measuring ecological values (Lundmark 2007; Dunlap 2008; Dunlap et al. 2000) that can lend valuable insight into whether values impact knowledge, and potentially subsequent behavior related to that knowledge. The NEP scale, although revised slightly over the years, focuses on questions that help ascertain biocentric and anthropocentric attitudes. The NEP (both original and revised) utilizes a Likert scale measurement that explores three main environmental attitudes: "a belief in (1) humans' ability to upset the balance of nature; (2) the existence of limits to growth; and (3) humans' right to rule over the

rest of nature” (Hawcroft and Milfont 2010, 144). The higher the score on the NEP, the more biocentric the respondent, the lower the NEP score, the more anthropocentric the respondent is believed to be. It is also important to note that even with slight alteration “the reliability and validity of both the original and revised NEP Scales as a general measure of EA [environmental attitudes] are well established” (Hawcroft and Milfont 2010, 146).

The NEP was developed in part as a response to the prevailing attitude (at the time) of the Dominant Social Paradigm (DSP). The DSP described in detail by Pirages and Ehrlich (1974) represents a utilitarian view of the environment. Specifically, belief in the DSP represents adherence to seeing nature as a resource for humans, that people should have control over nature, and that science and technology will resolve ecological problems thereby disregarding the need for explicit protection and preservation of wilderness and wildlife. Thus, an individual’s support of the DSP would indicate less of an interest in environmental problems and protection.

In a study by Kilbourne et al. (2001) of a multinational sample of university students in Denmark, the United States and England, they found “as beliefs in the elements of the DSP increase, the perception of the existence of environmental problems decreases” and “as a result of this decrease, perceived changes necessary to alleviate environmental problems also decreases” (210). Alternatively, Kilbourne et al. (2001) found “as the perception of the significance of environmental problems increases,

respondents' perceive that more change is required if the problems are to be alleviated" (223).

Because the NEP is recognized as a good measure of environmental attitudes, it is also used as a basis for assessing whether adherence to the NEP is a predictor of an individual's environmental behaviors or actions. Research conducted by Slimak and Dietz (2006) identify a number of studies that find support for environmental policy is correlated with adherence to the NEP. Specifically, they state that adherence to the NEP often is reflective of people who are more knowledgeable of environmental consequences and risk (Slimak and Dietz 2006).

Although it is uncertain to what degree belief in the NEP correlates with environmental action, there appears to be a relationship between the NEP and environmental concern including support for environmental policies. Researchers have found, through varying degrees, a direct relationship between the NEP worldview and environmental behavior (Corral-Verdugo, Bechtel, and Fraijo-Sing 2003; Nooney et al. 2003; Kilbourne et al. 2001). Therefore, use of the NEP scale to determine values of Oregon residents may be more revealing of environmental concern than other sociodemographic variables.

Hypotheses

Oregon is currently undergoing a physical and social transformation. While the extent of climate change and population growth effects have yet to be realized, the lack of available water for all of the state's interests is already evident.⁷ Oregonians' reside in a state with varying geographical attributes, population centers, and social and political needs. The central question of this paper is whether these variables influence Oregonians reported concern (or lack thereof) about water quantity both for the state and on a personal level.

Based on the literature, there is the expectation that concern about water scarcity and prioritization of water use would relate to age, gender, education, rural or urban residence, political ideology, and ecological values (measured by the NEP).

Specifically, that age has an inverse relationship to environmental concern and that female, urban, educated, liberal, biocentric individuals are more likely to be concerned about environmental issues. However, to what degree these variables influence concern is questionable since there is little research into Oregon residents and water issues, and in one study pertaining to water and Pacific Northwest residents, the question, "Do you regard water quantity (having enough water) a problem in the area you live?" the majority of respondents chose, "no, not a problem" or "probably not a problem" (Mahler et al. 2004, 8) illustrating a disconnect from

⁷ Ironically, while much of the state will suffer more drought-like conditions, increased losses of wetlands due to climate change will increase the likelihood of flooding for some parts of Oregon (State of Oregon 2010).

both water issues and variables that would seemingly influence greater concern or awareness of the problem.

In order to determine whether these variables impact water issues in Oregon, the following hypotheses are explored:

HQ1: There is a positive relationship between female, younger, more educated, political liberal people who reside in urban settings and concern about water quantity in Oregon.

HQ2: Biocentric people are likely to be more concerned about water quantity issues in Oregon than anthropocentric people.

Methodology

Residents in the State of Oregon were the primary focus of this study due to the two factors. First, Oregon has been engaged in water planning for many years as an adjunct to Oregon's legendary land use laws; more recently conducting listening sessions across the state through the aforementioned Statewide Water Roundtables and is currently engaged in the development of a statewide-integrated water management strategy making the issue salient and prime for research. Second, while the state is actively engaged in development of a water strategy, the public may not even be cognizant of the problems facing the state. The larger question is whether public input can influence water policy if the general public is largely unaware of the issue.

Methods

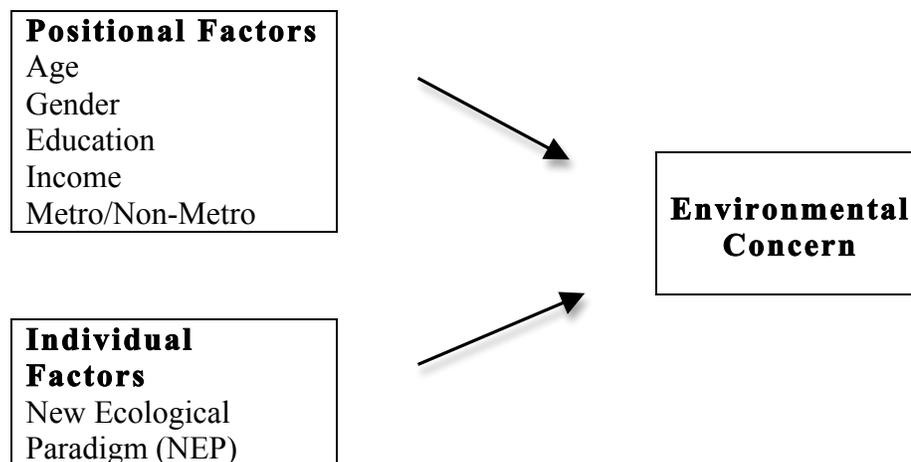
In the spring of 2010, a mail survey was conducted of Oregon residents' age 18 and older. Participants were picked using a random sample provided by a national sampling company. For the survey distribution an abbreviated "Total Design Method" constructed by Dillman (1978) was utilized with three waves of mailings, including an introductory postcard announcing the survey and two subsequent waves of the questionnaire and cover letter. The survey was sent to 1,537 Oregon residents, of which 808 responded, providing a 52.6 percent response rate.

The dependent variables in this paper are whether Oregonians feel there is a water quantity problem in Oregon and if Oregonians are concerned that water scarcity will affect them personally (see Table 2.1). For the question about perception of a problem, respondents could chose "Yes" (coded 1), "No" (coded 2), or "Don't know" (coded 3). Responses were then recoded where "Yes"= 1, and "No" and "Don't know" were recoded as simply "Else"= 0. For the question pertaining to concern, the responses were coded "Not concerned"=1, "Slightly concerned"=2, "Don't know"=3, "Concerned"=4, and "Very concerned"=5.

Based on the literature review, variables such as age, gender, education, political ideology, rural vs. urban residency and belief in the NEP potentially determine whether individuals 1) believe that there is an environmental problem (water scarcity) and 2) express concern that they will be personally impacted by water scarcity. The

theoretical model implies that positional factors (sociodemographics) and individual factors (NEP) influence environmental concern (see Figure 1).

Figure 2.1. Theoretical Model Personal Attributes and Environmental Concern



Source: Olofsson and Ohman (2006)

Therefore the independent variables in this study are sociodemographic (age, gender, education, political ideology and rural vs. urban residency) attributes as well as the NEP (see Table 2.2). Age was recoded from the initial range 19 to 93 years old to census distributions with 1= 18 to 19, 2= 20 to 24, 3= 25 to 34, 4= 35 to 44, 5= 45 to 54, 6= 55 to 59, 7= 60 to 64, 8= 65 to 74, 9= 75 to 84, and 10= 85 years and older. The NEP index measured the cultural variable by using a five-point scale ranging from “Strongly Disagree” as 1 to “Strongly Agree” as 5. A biocentric, or pro-NEP position, consists of agreement with the first three statements and disagreement with the last three statements. The three DSP variables were therefore recoded in order to compute the index so where they ranged from “Strongly Agree” = 1 to “Strongly

Disagree” = 5. These six variables combined created the NEP scale that ranged between 6 through 30, with 6 being “strongly anthropocentric” and 30 being “strongly biocentric”.

Results

The survey included questions related to beliefs about Oregon water quantity. Frequencies were run for two opinion (dependent variable) questions: 1) Do you feel water quantity (having enough water) is a problem in Oregon? And 2) How concerned are you that water scarcity (having enough water) will affect you personally? (See Table 2.1). The question “Do you feel water quantity (having enough water) is a problem in Oregon?” the majority of respondents (55.7%) answered “yes”. In response to, “How concerned are you that water scarcity (having enough water) will affect you personally?” 46.6% of respondents indicated “Not concerned” (11.3%) or “Slightly concerned” (35.3%), and only 35.1% of respondents answered “Concerned” (29.3%) or “Very concerned” (5.8%). These responses indicate that a majority of Oregonians are concerned about water quantity problems in Oregon. However, respondents did not seem to make as strong of a connection to being personally affected by water scarcity.⁸

⁸ Water scarcity is defined here as insufficient water to meet demand with the causes being (but not limited to): population growth, food production, climatic change and variability, water demand, etc. (Abrams 2000)

Table 2.1. Dependent Variables

Variable Name	Variable Description	Mean (s.d.)
Oregon Water Quantity	Do you feel water quantity (having enough water) is a problem in Oregon?*	1.613 (.7597) n=808
	Yes	55.7%, n=450
	No	27.4%, n=221
	Don't Know	17%, n=137
	How concerned are you that water scarcity (having enough water) will affect you personally?	2.831 (1.1412) n=533
	Not concerned	11.3%, n=60
	Slightly concerned	35.3%, n=188
	Don't know	18.4%, n=98
	Concerned	29.3%, n=156
	Very concerned	5.8%, n=31

*For water quantity question, a "No" and "Don't know" response was recoded as "Else"=0, "Yes"=1. For water scarcity question, the responses were coded as ordinal values with "Not concerned"=1, and "Very concerned"=5.

A key element of this study is to understand how sociodemographic variables serve as predictor variables. The sociodemographic variables included age, gender, education, political ideology, residency (rural or urban), and environmental values measured by the NEP. Table 2.2 provides a distribution summary of these variables.

Table 2.2. Independent Variables

Variable Name	Variable Description	Mean (s.d.)
Sociodemographic:		
Age	Respondent Age in Years* (Range: 19 to 93 years)	6.16 (1.98) n=792
Gender	Dummy Variable for Respondent Gender 1= female, 0= male	.529 (.500) n=800
Education	Formal Education Attainment 1=Grade School to 7=Graduate School	5.029 (1.25) n=796
Political Ideology	Respondent Ideology on Domestic Policy 1=Very Liberal to 5=Very Conservative	2.935 (.968) n=758
Rural	Urban or Rural Residence of Respondent 1=Urban, 2=Rural	1.2537 (.435) n=808
Cultural:		
NEP	New Environmental Paradigm Index 6=Low support for environmental protection 30=High support for environmental protection	21.96 (5.32) n=780

*Age was recoded to census with range of 1=18 to 19 years of age to 10=85 years or older.

The average age for respondents was 56 years. Overall, slightly more females responded to the survey than males. In terms of education, the mean corresponds to respondents having “some college”. Respondents were on average politically moderate. In addition, significantly more urban respondents participated than rural. The results from this survey indicate that the majority of respondents are moderate to slightly biocentric.

In order to determine how or whether sociodemographics (measured together and independently) and environmental values predicted responses to the two dependent variables both logistical and linear regression was used. In the first question, “Do you feel water quantity (having enough water) is a problem in Oregon?” significant predictors were gender, age, education level, and the NEP. These variables were associated with a positive response ($p < .05$), indicating a statistically significant finding (see Table 2.3). Taken together, the independent variables predicted an affirmative response in approximately 10 percent of the time (according to the Nagelkerke model value of .102). The hypothesis predicted that there would be a positive relationship between female, younger, more educated, politically liberal people who reside in urban settings and concern about water quantity. The results here indicated that gender (males) and age (as people age they are more likely to be concerned) were predictors but predicted the opposite of the hypothesis that female, younger people would be more concerned. Higher education and belief in the NEP proved accurate predictors of concern, while political ideology and place of residence (rural vs. urban) were not significant predictors.

Table 2.3. Logistical Regression Predicting Whether Oregonians Feel Water Quantity is a Problem (Q2)

Independent variables	Dependent variable: Feel Water Quantity is a Problem					
	B	Standard error	Wald χ^2	df	<i>p</i> -value	Odds
Political Ideology	-.083	.092	.827	1	.363	.920
Gender	-.579	.161	12.908	1	.001	.560
Education	.170	.065	6.935	1	.008	1.186
Age	.100	.040	6.096	1	.014	1.105
Rural-Urban	.245	.185	1.747	1	.186	1.277
NEP	.086	.017	25.829	1	.001	1.090

Regression model had a Nagelkerke value of .102

For the question “How concerned are you that water scarcity (having enough water) will affect you personally?” linear regression was utilized due to the Likert scale response options (1=Not concerned to 5=Very concerned). For this question only age and NEP were significant variables ($p < .05$) and predicted responses in approximately six percent of the responses (according to the Adjusted R^2 at .064) (see Table 2.4). Here again, only one predictor, belief in the NEP, was significant according to the hypothesis, but political ideology, education, gender, and rural vs. urban residency were not. However, again age was a predictor, but predicted the opposite of the hypothesis finding that as people age they tend to be more personally concerned about water scarcity affecting them.

While age was a predictor in concern, further analysis was conducted to determine if age groups (younger or older) predicted concern. Cross tab analysis showed no statistically significant difference between age groups.

Table 2.4. Linear Regression Estimates for Concern Water Scarcity will Personally affect Oregonians

Independent variables	Personal Concern Coefficient (SE)
Political Ideology	-.001 (.025) <i>p</i> =.979
Gender	.050 (.043) <i>p</i> =.236
Education	.011 (.018) <i>p</i> =.611
Age	.038 (.011) <i>p</i> =.001***
Rural-Urban	-.017 (.049) <i>p</i> =.731
NEP	.021 (.005) <i>p</i> =.001***
<i>F</i> -Test	6.643
Adjusted R ²	.064
<i>N</i>	737

p* ≤ .05; *p* ≤ .01; ****p* ≤ .001

Lastly, frequencies were run to determine how Oregonians prioritize water use. The question, “In your opinion, what are the most important water uses in Oregon?” respondents were asked to select the top three important water uses out of six options.

Table 6 displays the results, showing the overall top three to be: drinking water (92.8% circled), irrigation (68.3% circled), and wildlife (57.7% circled).

Table 2.5. Water Use Preferences

Water Uses	Circled (percent)	Not Circled (percent)	Total (percent)	Mean	Std. Deviation	Ranking
Drinking Water	744 (92.8)	58 (7.2)	802 (100.0)	.928	.2592	First
Irrigation	546 (68.3)	254 (31.8)	800 (100.0)	.683	.4658	Second
Wildlife	463 (57.7)	339 (42.3)	802 (100.0)	.577	.4943	Third
Power Generation	354 (44.2)	447 (55.8)	801 (100.0)	.4419	.49693	Fourth
Commercial Use	95 (11.8)	707 (88.2)	802 (100.0)	.1185	.32335	Fifth
Recreation	89 (11.2)	703 (88.8)	792 (100.0)	.1124	.31603	Sixth

Discussion

Prior research has found that sociodemographic and environmental values (expressed through the NEP scale) can be used to predict, to varying degrees, peoples environmental concern as well as beliefs. This paper explored two related environmental issues in Oregon: water scarcity and Oregonians concern that scarcity will affect state water resources and/or affect them on a personal level. In both

Oregon water scarcity questions, one pertaining to concern for the state's water quantity, and one focused on individual concern of being negatively affected by water scarcity, the independent variables examined overall had a weak association with respondents concern about water scarcity predicting roughly 6 to 10 percent of variance by the independent variables. Asked whether water quantity is a problem in Oregon the strongest predictors were gender and the NEP (p-value=.001), along with education (p-value=.008), and age (p-value=.014). For the question asking about personal concern of water scarcity the NEP had the strongest association (p-value=.001), followed by age (p-value=.001). While these variables certainly contribute to an understanding of responses, the overall model predictabilities were low, and therefore leaves between 90 to 94 percent needing explanation. Therefore, only part of my hypotheses were correct in that education and belief in the NEP were variables influencing concern about water scarcity, while political ideology and place of residence were not influencing variables at all, and gender and age had the opposite affect than predicted.

Only education and NEP had a positive relationship to concern about water scarcity in Oregon. Based on the literature review education was found to be consistently related to environmental concern (Klineberg, McKeever, and Rothenbach 1998; Kanagy, Humphrey, and Firebaugh 1994; Howell and Laska 1992), as was a biocentric orientation measured by the NEP (Slimak and Dietz 2006), so the findings in this paper are consistent with previous research.

While education and NEP were influencing variables in at least one of the hypotheses, place of residence and political ideology were not factors in any of the hypotheses. This was somewhat surprising based on the abundance of literature suggesting strong divides between rural and urban communities pertaining to environmental issues (Sheridan 2007; Hays 1991) and literature correlating political ideology with environmental concern (Buttel and Flinn 1978a; Dunlap, Xiao, and McCright 2001; Samdahl and Robertson 1989). However, the results lend more substantiation to claims that residency itself is not at the core of differences in environmental concern, but rather other personal variables like political ideology, education, etc. (Salka 2001; Jones and Dunlap 1992; Van Liere and Dunlap 1980).

Both gender and age were both reliable predictors of concern, but not in the way hypothesized. Although literature suggests that females are more likely to express concern about environmental issues than males, the results of this study show the opposite. The same is true for age. Prior research has found a relationship between younger people and environmental concern. This study found that as people age they are more likely to demonstrate a greater concern for water scarcity. However, upon further analysis there was not a statistically significant difference between age groups. In relation to gender, it is possible that the issue of water scarcity resonates more for males due to it being an issue other than exclusively environmental. Water scarcity can transcend strictly environmental concern (as other environmental issues do)

because the effects of scarcity have implications that are not only ecological. Concern about water scarcity might stem from economic concerns (especially since Oregon is a natural resource dependent state). Additionally, it could have to do with more fundamental concerns over water rights and allocation (less water, more competition for water both intra and inter state). Regardless, the findings suggest that more research into gender and concern about water scarcity may be warranted. Similarly, since as people age they were more likely to be concerned about water quantity, other explanations may be required. The generational effect could be one explanation, i.e. older people who have lived through times of drought or scarcity might be more likely to demonstrate concern. Or, again it could be an issue of water rights and allocation. Older residents (especially long-term residents) may have been employed by a resource dependent industry, or feel more of a general concern about the implications of water scarcity on water rights and use. Either way, the finding that gender and age are predictors of concern merits more research.

Lastly, while Oregonians may differ in thoughts on water scarcity, the majority of Oregonians agree in water prioritization. Specifically, Oregonians feel the top three priority water uses are: drinking water, irrigation, and wildlife. In future research, determining which, if any, variables influence water prioritization could be helpful in connecting concern to priorities.

Conclusion

Like many states in the West, Oregon is not immune (and is in fact vulnerable) to water scarcity issues. Climate change and population growth to the region could potentially exacerbate current water concerns over quantity and availability, and present greater challenges to mitigate for water scarcity in the future. This study sought to understand what, if any, factors influence Oregonians concern about water scarcity, and how Oregonians prioritize water use. Interestingly, only older age and support of the NEP were influencing variables in both questions about water quantity concerns, with males and education being a factor in general concern about water scarcity. However, the strength of association was low for all variables in both concern questions. Further, because education consistently has consistently been shown to have a positive relationship with environmental concern (Klineberg, McKeever, and Rothenbach 1998; Kanagy, Humphrey, and Firebaugh 1994; Howell and Laska 1992) the lack of a strong relationship in this study was surprising.

Moving forward with a statewide, integrated water resource strategy, especially one that will depend more on carrots rather than sticks for implementation, public concern and awareness of water scarcity issues is essential. While certain personal attributes and other sociodemographic variables are often not changeable, education could prove to be one area where the state could have some influence. While previous studies show how formal education correlates with environmental concern, informal education may also impact levels of concern and therefore support of statewide

conservation goals. As Oregon moves forward with water management efforts, it is likely that the state will need to focus on providing resources for the public to gain more insight into Oregon's water quantity concerns.

However, education alone may not be enough to warrant concern about water quantity. While a majority of Oregonians felt that water quantity is a problem, only 35 percent felt concerned that water scarcity would affect them (and of that, only 5.8 percent felt "very concerned"). Here it appears that there is a general concern, but not a sense of personal concern about being affected, there is essentially no great sense of risk. Although beyond the scope of this paper, a further research question should focus on risk and specifically what factors predict the risk perception Oregonians have toward water scarcity (if any at all).

Some authors suggest that sociodemographic and other personal attributes are no longer reliable predictors of concern (Fransson and Gärling 1999). If this is the case then the capacity for environmental concern potentially relies on other factors like perception of risk, or attitudes influenced by knowledge. Therefore, future research into Oregonians concern about water scarcity in addition to water conservation behaviors should explore risk perception, and attitude formation in order to understand more fully what variables influence water scarcity concerns among Oregonians. With current over-allocation of surface water, ground water resources fully utilized in some areas (Oregon Water Resources Department) population growth

to the state, and future water supply and availability potentially affected by climate change, the state will need the participation of concerned residents to help mitigate water supply and demand problems.

Attitude-Behavior Consistency in Household Water Consumption: An Oregon Case Study

Abstract

Oregon's reputation as an environmentally progressive state belies the fact that Oregonians are environmentally complex. The purpose of this paper is to examine whether Oregonians' environmental concern about water scarcity translates into water conservation behaviors. The paper also explores whether Oregonians' environmental values and sociodemographic characteristics influence water conservation activities. Using a survey conducted in the spring of 2010 of Oregon residents, this study explores the interaction of values; concern and sociodemographics that predict identified water conservation behaviors.

Keywords

Attitude-behavior, water conservation, New Ecological Paradigm (NEP), Oregon water, rural-urban, income, conservation behavior, gender, age, and education

Introduction

Oregon has a reputation for being an environmentally progressive state. From the enactment of the Bottle Bill in 1971 to recent goals to reduce greenhouse gas emissions to 75% less than 1990 emission levels (Governor's Advisory Group on Global Warming 2004), or the 2011 approval by the Oregon Environmental Quality Commission to issue graywater reuse permits, the state has championed several environmental policies that serve as a model for other states in the nation. In 2007, Oregon earned attention from *Forbes Magazine* when it was listed as No.2 in "America's Greenest States" (Wingfield and Marcus 2007). The assessment was based on Oregon's low carbon footprint, strong policies promoting high air quality and energy efficiency, and being among the states with the most LEED buildings

(Leadership in Energy and Environmental Design) in accordance with the U.S. Green Building Council's certification (Wingfield and Marcus, 2007).

Based on this reputation, we can infer that Oregonians are aware of environmental issues facing the state and seek to mollify problems with personal conservation behaviors. The purpose of this paper is to assess whether Oregon residents understand the problems facing Oregon's water supply and if such awareness translates into water conservation behaviors. In addition, are there certain attributes that make a person more likely to conserve water such as concern over scarcity, sociodemographics or a biocentric belief system?⁹ While attempts have been made to understand Oregonians' concern and values regarding water, there are still significant research gaps in this area. Given that Oregon has a strong environmental reputation and has been a trendsetter with environmental policies, this paper explores whether environmental behavior (water conservation) among Oregonians is consistent with the reputation and policy achievements of the state ecologically.

Oregon Water Research

Two recent studies have explored Oregon residents concern and values about water issues in the state. In a study concerning public support of water reuse in Corvallis,

⁹ The term water scarcity is defined in this paper as "a situation where there is insufficient water to satisfy normal requirements" (Abrams 2000, 1) with primary causes being climate change, population growth, demand, etc.

OR conducted by DuBose (2009), the author found that overall residents in Corvallis were very supportive of water reuse (using treated wastewater). Specifically, the study determined that several factors increased or decreased support for wastewater use like “degree of contact” where “low contact uses like irrigation of business park landscaping were more preferred than high contact uses like irrigation of edible crops” (DuBose 2009, 2). In addition, uncertainty about safety concerning reuse of wastewater was a factor in decreased support of wastewater reuse (DuBose 2009). DuBose (2009) posits that education about wastewater reuse, especially regarding safety and ecological benefits (sustainable water use) would further increase public support.

DuBose’s (2009) study focused on one city in Oregon, so whether it is generalizable to the state is debatable (which it should be noted was not the intent of the study). However, what it does reveal is that Oregonians are forward thinking about water and the benefits of reuse (even of wastewater), especially for sustainable purposes. Therefore, from this study it is feasible to suggest that Oregonians are water aware and willing to engage in personal water conservation activities because of concern about water sustainability (or, more specifically concern about water scarcity).

In the fall of 2008 Oregon State University’s (OSU) Institute for Water and Watersheds, Oregon Sea Grant Extensions, OSU Institute for Natural Resources, and the Oregon House Committee on Energy and the Environment conducted the

Statewide Water Roundtables. The Roundtables were conducted in five areas in Oregon, in order to capture the scope of interests, concerns, and recommendations of Oregonians. In response to the question “Currently (2008), I believe Oregonians have enough water to cover all of their basic needs, including the needs of wildlife” a majority of participants “disagreed” or “disagreed strongly” (Oregon State University Institute for Water and Watersheds et al. 2008, 10). In addition, when respondents were asked “When it comes to the future of Oregon and water what do you care about most?” the top factors were water quantity (33%) and water quality and ecological (tied at 25%) (Oregon State University Institute for Water and Watersheds et al. 2008, 9).

The Roundtable participants were self-identified and therefore may be more aware of water issues in Oregon. However, the results of the Roundtables indicate (similarly to the DuBose study) that concerns about water are on the minds of Oregonians. Therefore, if Oregonians as a whole are concerned about water, does this concern lead them to practice water conservation activities in their own homes? And, are there personal attributes that make someone more likely to perform water conservation acts?

Background and justification for research

Values and Behavior

According to Fishbein and Ajzen's (1975) theory of reasoned action (TRA), the strength of a behavioral intention can predict the performance of the act itself. However several factors can influence intention such as attitudes, social norms, knowledge, economic conditions, and so forth. In order to test whether attitudes influence decisions to engage in environmental behaviors, environmental attitudes must first be assessed. One way to assess attitudes toward the environment is through the New Ecological Paradigm (NEP) scale devised by Dunlap and Van Liere (1978). The NEP scale measures anthropocentric and biocentric attitudes as a way of explaining belief in the Dominant Social Paradigm (DSP) or the New Ecological Paradigm (NEP) respectively. The theory of reasoned action or behavior does not claim that attitudes influence behavior, "rather they influence behavioral intentions which in turn shape our actions" (Kollmuss and Agyeman 2002). Accordingly, a more biocentric environmental attitude should predispose people to environmental behaviors. Even though the relationship between values and actions are difficult to verify (due to the nature of self-reporting studies), researchers have found evidence supporting the connection between values and the predisposition to perform conservation activities (Nooney et al. 2003; Steel 1996).

While the NEP can help predict self-reported behavioral intentions, it is not necessarily indicative of individuals' conservation behaviors (Dunlap et al. 2000; Olli, Grendstad, and Wollebaek 2001; Chang and Jones 2010; Willis et al. 2011; Scott and Willits 1994). There are several explanations for this disconnect. One of the more intriguing is that when surveyed, people may report conservation behaviors due to social desirability factors (Steel 1996). Because certain environmental behaviors are perceived as being "good", individuals may claim they take an active role in conservation behaviors. Another explanation is that people must have more than issue knowledge to act on environmental values.

Individuals may also need to understand what actions to take and how effective each action is toward mitigating environmental problems (Frick, Kaiser, and Wilson 2004). Problems like climate change are inherently difficult for people to understand, particularly the relationship between individual actions and the dilemma at hand. And mitigation requires time, money and effort requiring individuals to make choices sometimes based on convenience. An example is recycling behaviors. When recycling is easy and convenient, such as residential curbside recycling, then people are more likely to engage in this behavior (Steel 1996). Finally, the degree of uncertainty about potential outcomes of ecological problems also impacts willingness and desire to act (Kortenkamp and Moore 2006). The higher the ecological certainty of a problem, the greater willingness to participate in conservation behaviors (Kortenkamp and Moore 2006).

In a study by Corral-Verdugo et al. (2003) researchers examined environmental beliefs and how those values relate to water conservation. The study populations (from two northern Mexican cities) were asked questions about general environmental beliefs using the New Ecological Paradigm (NEP) and the Human Exception Paradigm (HEP) (measuring both biocentric and anthropocentric beliefs) and observed participants to determine whether respondents were practicing conservation activities. Their findings suggest that attitudes toward water indeed influence behaviors (i.e. utilitarian beliefs = consumptive use, biocentric beliefs = conservation) (Corral-Verdugo, Bechtel, and Fraijo-Sing 2003). However, this study also identified motives and situations that help determine water use. Specifically, they found that affluence, large families and homes, and gardens correlate with more water use, while living in an area with water scarcity or “facing norms demanding a decreased consumption” (Corral-Verdugo, Bechtel, and Fraijo-Sing 2003, 248) results in greater conservation.

Other studies have found that environmental values directly lead to more participation in water conservation (Gilg and Barr 2006; Trumbo and O'Keefe 2001; Willis et al. 2011). A study by Gilg and Barr (2006) explored how commitment to environmentalism influenced water conservation activities, finding that the more committed the environmentalist, the more likely they will participate in water conservation. Willis et al. (2011) conducted a study of water use in Gold Coast city, Australia and found that “residents with very positive environmental and water

conservation attitudes consumed significantly less water in total...”(Willis et al. 2011, 1996). Australia is certainly more water scarce than Oregon however the concept remains the same - if people value water, then water conservation will become a priority (Willis et al. 2011).

Poortinga et al. (2004) found that looking only at attitudinal variables to explain behavior was perhaps too restrictive. While people may be motivated toward environmental behaviors, both opportunities and abilities play a role in actualizing the intent (Poortinga, Steg, and Vlek 2004). This was similar to Steel’s (1996) findings that when an environmental behavior is convenient, people are more likely to engage in it.

Further, in a study by Trumbo and O’Keefe (2001) of three distinct communities in the California-Nevada Truckee River Watershed, they found that “values essentially dropped out of a predictive model of water conservation behaviors”(897) and that this finding was “consistent” among the three demographically and ecologically different communities (897). While this study used an abbreviated environmental index with a three-question environmental assessment, other studies confirm that values play a stronger role in water conservation activities, which was particularly demonstrated across three different communities.

There are obvious challenges to making a direct correlation between purported values (as expressed in the NEP) and actual behaviors. Namely, several studies have noted that people are more likely to claim that they engage in environmental behaviors than actually perform environmental behaviors (Olli, Grendstad, and Wollebaek 2001). Therefore, environmental values may be an indicator of people's socially desirable responses rather than actual behavior.

Sociodemographic Factors

Other factors may play a role in environmental behaviors such as water conservation. A good deal of research has explored how sociodemographic factors influence environmental concern and behaviors. Studies have consistently demonstrated that younger (Arcury 1990; Dietz, Stern, and Guagnano 1998; Dunlap et al. 2000; Jones and Dunlap 1992), higher educated (Honnold 1981; Howell and Laska 1992; Jones and Dunlap 1992; Van Liere and Dunlap 1980), and liberal (Buttel and Flinn 1978a; Dunlap 1975; Samdahl and Robertson 1989) individuals express deeper concerns for the environment.

Other sociodemographic attributes such as place of residence (rural vs. urban), income, and gender are less definitive in their influence on environmental concern. Many researchers find that the distinction between rural and urban residence in their level of environmental concern has been overstated, and that other personal factors more strongly influence concern than the actual place of residence (Jones and Dunlap

1992; Salka 2001; Van Liere and Dunlap 1980). One factor coinciding with rural residency is employment in resource extracting industries or land intensive industries such as agriculture. The supposition is that lower levels of environmental concern among some rural residents has more to do with being economically dependent on land- or resource- use industries than place of residence, since environmental policies could negatively impact their financial livelihood (Freudenburg 1991; Salka 2001; Tremblay and Dunlap 1978). Other researchers find that this rural-urban divide is overstated, and that even when resource dependency is considered there are too many other factors and diversity in rural communities to simply use residency as a variable in level of environmental concern (Bennett and McBeth 1998; Brunson, Shindler, and Steel 1997b).

Isolating income from other socio-economic variables to measure environmental concern also has mixed research results. While some research indicates that income has a strong relationship to environmental concern (Arcury 1990), other studies find that it is an inconsistent predictor variable (Jones and Dunlap 1992; Van Liere and Dunlap 1980). Income, however, can be a factor in environmental behaviors (not concern) primarily because people with more expendable incomes often have more time or resources to commit to environmental work (Buttel 1975; Steel 1996).

Lastly, research on gender and environmental concern and behavior has shown some inconsistencies. Several studies have found that women are more likely to express

higher levels of concern and have stronger environmental attitudes (Bord and O'Connor 1997; Jones and Dunlap 1992; Steel 1996; Tindall, Davies, and Mauboules 2003; Zelezny, Chua, and Aldrich 2000). However, whether or not gender is a factor in environmental behaviors and actions is still disputed. Some research has found that indeed women are more likely to be more engaged in environmental activities (Blocker and Eckberg 1989; Mohai 1992; Stern and Dietz 1994), with other studies demonstrating that this concern does not translate into behavior or actions (Tindall, Davies, and Mauboules 2003).

The connection between sociodemographic attributes and actual conservation behaviors is more difficult to quantify. A study by de Oliver (1999), showed that while certain sociodemographics appeared to influence behavior “when these demographics converge in one manifest action by a given respondent or set of respondents, predictability can be substantially diminished” (390). In contrast, a study by Olli et al. (2001) finds that sociodemographics explained 10% of environmental actions. In addition, considering all of the sociodemographic variables, gender is the strongest predictor of behavior, followed by lower income, higher education, and age (older respondents) (Olli, Grendstad, and Wollebaek 2001). This is in contrast to earlier research suggesting that younger, higher income people are more likely to engage in environmental behaviors. Interestingly, Olli et al. (2001) found that “environmental and ecological concern and compost knowledge explain

almost as much of environmentally friendly behaviors as do the sociodemographic variables and political attitudes combined” (195).

With Oregon facing challenges to already-stretched surface water supply and increasing pressures on groundwater resources from climate change, population growth and use (primarily agricultural) (Oregon Water Resources Department 2010a) state water policy will likely require the input and cooperation of Oregon residents. As such, obtaining information about Oregon residents’ beliefs, concern and values related to water in addition to determining whether those variables lead to individual water conservation activities is a prudent first step in understanding how Oregonians are likely to adapt to future scarcity issues. This study will therefore examine concern and conservation behaviors as they pertain to values measured by the NEP and sociodemographic variables.

Methodology

In the spring of 2010, a mail survey was conducted of Oregon residents age 18 and older. Participants were selected using a random sample provided by a national sampling company. Survey implementation followed a revised version of Dillman’s “Total Design Method” (1978) with three waves of mailings, including an introductory postcard announcing the survey and two subsequent waves of the questionnaire and cover letter were sent. The survey was sent to 1,537 Oregon residents, of which 808 responded providing a 52.6 percent response rate.

The purpose of the survey was to determine whether environmental values (assessed through the NEP) influence beliefs and concern about water scarcity, and whether purported environmental values contribute to conservation behaviors. Therefore the survey included questions related to Oregon water quantity, specifically whether respondents felt there is a problem with water quantity in Oregon. The survey also included questions about personal water conservation behaviors and items from the NEP scale (Dunlap and Van Liere 1978) in order to assess participants' support of the NEP or Dominant Social Paradigm (DSP). Finally, demographic information was collected on age, gender, education, residency and income.

The independent variables in this study are sociodemographic (age, gender, education, political ideology and rural vs. urban residency) attributes as well as the NEP (see Table 2.2). Age was recoded from the initial range 19 to 93 years old to census distributions with 1= 18 to 19, 2= 20 to 24, 3= 25 to 34, 4= 35 to 44, 5= 45 to 54, 6= 55 to 59, 7= 60 to 64, 8= 65 to 74, 9= 75 to 84, and 10= 85 years and older. The NEP index measured the cultural variable by using a five-point scale ranging from "Strongly Disagree" as 1 to "Strongly Agree" as 5. A biocentric, or pro-NEP position, consists of agreement with the first three statements and disagreement with the last three statements. The three DSP variables were therefore recoded in order to compute the index so where they ranged from "Strongly Agree" = 1 to "Strongly Disagree" = 5. These six variables combined created the NEP scale that ranged

between 6 through 30, with 6 being “strongly anthropocentric” and 30 being “strongly biocentric”.

The dependent variable explored is water conservation behaviors. The dependent variable is the cumulative index of water conservation activities (see Table 3.1). The dependent variable was coded 0= performs no water conservation activities to 11= performs all conservation activities. An OLS regression was then run analyzing the relationship between the cumulative index of water conservation activities and the independent sociodemographic variables and the NEP. In addition, logistic regression was run to determine if the independent variables predicted individual water conservation behaviors. Frequencies were run to determine participation in water conservation activities as well as the reasons for non-participation (Table 3.1).

Results

In the survey, respondents were asked to indicate which (if any) water conservation activities they participated in at their homes. With one exception (collecting water in rain barrels) the majority of respondents indicated that they performed water conservation activities at home (Table 3.1). The activities ranged from household chores to daily routine use of water to yard maintenance. The finding that the majority of respondents perform almost all activities could indicate that these behaviors are normative. It could also mean that behaviors, such as washing a full load of laundry or dishes (which 98% of respondents said they do) are also

economically beneficial since these are large appliances that are usually a top energy and water uses in the house. For houses where residential water use is metered, economic incentives might encourage less water use overall, both inside and outside of the home. One issue that this study did not explore was the water source for the respondents, whether from private wells or from another source such as a public water district.

Of the respondents who answered “no” to participating in a specific behavior, they were then asked to select a reason for non-participation. The predominant response for non-participation was “no interest” (37%), followed by “don’t know” (27%), “one person makes little difference” (19%), “too costly” (9%), and “takes too much time” (8%). Both the “too costly” and the “takes too much time” response provides a relatively clear indication that these respondents felt the costs outweighed the benefits. The “no interest” and “don’t know” response requires more analysis to understand if participants had no interest in the activity because they see no benefit or relevance (i.e. they do not have a yard where watering is required), or because of lack of information or concern. However, the “one person makes little difference” provides more insight into the motivation behind behaviors (or lack of them). Hines et al. (1986-1987) discuss this as a “locus of control-behavior relationship”. The locus of control “represents an individual’s perception of whether or not he or she has the ability to bring about change through his or her own behavior” (Hines, Hungerford, and Tomera 1986-1987, 4). Essentially, people who feel that change is

brought about more by external factors are less likely to engage in environmental behaviors than people who feel they can directly impact an outcome (Hines, Hungerford, and Tomera 1986-1987).

It is interesting that the majority of Oregonians reported practicing all water conservation behaviors with the exception of collecting rainwater in barrels or buckets. While most other activities require purchasing decisions, are easy to perform, or have a economic incentive, collecting rain water is more time and energy intensive (initially), and is conceptually new to many people, which could explain the anomaly.

Table 3.1. Personal participation in water conservation activities

We are interested in your personal participation in the following water activities during this last year. Please indicate if you have participated in any of these activities or not by circling the responses “yes” or “no”. If you did not participate in the activity, please indicate the possible reason(s) you did not.

Water Consumption Behaviors:	%Yes	Reasons for non-participation (%)				
		A	B	C	D	E
Wash full loads of laundry or dishes	98	35	2	2	44	16
Repair leaky faucets	93	24	14	6	40	16
Turn off water while brushing teeth	84	35	1	15	23	27
Water plants deeply, less frequently	83	27	5	12	20	36
Water lawns early in the morning or late in the evening	81	52	9	5	18	16
Turn off water while hand washing dishes	77	23	1	28	20	29
Take shorter showers	73	70	1	1	18	16
Purchase water saving appliances	72	24	43	2	10	22
Use faucet aerators	65	22	9	1	9	59
Plant native plants or drought tolerant plants, trees, etc.	56	51	6	4	7	33
Collect rain water in barrels or buckets	9	46	8	15	3	29
Cumulative activities mean=	7.48					
Cumulative activities median=	8.00					
s.d.=	2.10					
N=	808					

Non-participation categories: A = no interest; B = too costly; C = takes too much time; D = one person makes little difference; E = don't know

Based on previous studies, both environmental attitudes (Gilg and Barr 2006; Trumbo and O'Keefe 2001; Willis et al. 2011) and sociodemographic factors (Dunlap et al. 2000; Jones and Dunlap 1992; Steel 1996) have shown a relationship with environmental behaviors. To ascertain the potential independent variables influencing survey responses, respondents were asked a series of sociodemographic and environmental value questions (assessed by the NEP) (Table 3.2). The respondents' average age was 56. More females participated than males responded, however and this is consistent with slightly more female residents in the state. Survey participants indicated that on average they had some college experience. Respondents were primarily urban residents. And, the average income of participants was between \$35,000 and \$49,999. Overall, the sociodemographic variables were consistent with state sociodemographic information provided by the U.S. Census in 2011. Lastly, consistent with previous research (Clucas, Henkels, and Steel 2011; Steel, List, and Shindler 1994), the survey found that overall, Oregonians express a more biocentric proclivity toward the environment as expressed through the NEP scale. The mean NEP score was 21.96 with 6=low support for the NEP and 30=high support for the NEP.

Table 3.2. Independent Variables

Variable Name	Variable Description	Mean (s.d.)
Age	Respondent Age in Years* (Range: 18 to 91 years)	56.82 (15.49) n=666
Gender	Dummy Variable for Respondent Gender 1=female, 0=male	.53 n=800
Education	Formal Education Attainment 1=Grade School to 7=Graduate School	5.03 (1.25) n=796
Income	Household Income Before Taxes 1=Less than \$10,000 to 10=\$200,000 or more	5.45 (2.22) n=729
Metro	Metro or Non-metro Residence? 1=Metro, 0=Non-metro	.75 n=808
Problem	Water quantity a problem in Oregon? ** 1=Yes, 0=Else	.56 n=808
NEP	New Environmental Paradigm Index 6=Low support for environmental protection to 30=High support for environmental protection	21.96 (5.32) n=780

*Recoded to census categories 1=18 to 19 years of age to 10=85 and older. **Water quantity question recoded from “Yes”=1, “No”=0 to “Yes”=1 and “No” or “Don’t know” combined as “Else”=0.

Research suggests that the higher the certainty of an ecological problem, the more likely people will conserve that resource (Kortenkamp and Moore 2006). Therefore, respondents were asked, “Do you feel water quantity (having enough water) is a problem in Oregon?” Respondents could choose “Yes”=1, “No”=2, or “Don’t know”=3 (Table 3.2). The variable was recoded to “Yes” and “Else” (combination of the “No” and “Don’t know” responses), with 1= “Yes” and 0 = “Else”, providing a mean response of .56, indicating that the majority of Oregonians surveyed feel that water quantity is a problem for the state. This finding, along with the majority of

respondents self-reporting that they perform almost all of the water conservation activities is consistent with previous studies that demonstrate belief in a problem relates to water conservation behaviors (Corral-Verdugo et al. 2002; Syme, Nancarrow, and Seligman 2000).

Given that many Oregonians feel there is a water quantity problem and a majority of respondents participate in all but one of the water conservation activities, regression estimates were then run to determine if environmental values or sociodemographic factors help predict water conservation behaviors (see Table 3.3). F-test results indicate that the model is statistically significant however, the model explains only 9 percent of the variation in conservation behaviors, which is consistent with the findings of Olli et al. (2001) and Wall (1995) who found that sociodemographic variables explain roughly 10 percent of variance in environmental behaviors.

Regarding the sociodemographic variables, age, gender, and income produced statistically significant impacts on water conservation behaviors, while education and place of residence did not. While age has frequently been found to have an inverse relationship to concern (Arcury 1990; Dunlap et al. 2000; Jones and Dunlap 1992), this research found that as people age they are more likely to engage in water conservation behaviors. Several studies have asserted a relationship between gender and environmental behaviors, most notably Steel (1996), reinforcing the findings in this study. The finding that income correlates with behavior is interesting when we

consider prior research. Specifically, studies by Cordell and Tarrant (1997) and Olli et al. (2001) found no relationship between income and environmental behavior or a negative relationship. The findings in this paper suggest that as income increases, so does water conservation behaviors which is similar to the findings by Trumbo and O'Keefe (2001) who found that of all the sociodemographic variables they tested regarding water conservation behaviors, only income proved to be predictive.

Place of residence (metro vs. non-metro) did not appear to influence environmental behavior. However, in light of research specific to Oregon on differences between metro and non-metro areas (Clucas, Henkels, and Steel 2011), this finding was somewhat surprising, especially since much of the water use occurs in non-metro areas (also coincidentally the drier areas of the state) for irrigation or agricultural purposes. Further, education was interestingly not a significant predictor of behavior. While several studies have found education to be a strong indicator of concern (Honnold 1981; Jones and Dunlap 1992; Van Liere and Dunlap 1980) and even a predictor of behavior (Scott and Willits 1994), this study did not find a connection between education and behavior.

As aforementioned, since previous studies suggests that people who perceive a problem will be more likely to take action to try and ameliorate that problem (Corral-Verdugo et al. 2002; Syme, Nancarrow, and Seligman 2000), it was expected that Oregonians who perceive that water quantity is a problem in Oregon will be more

likely to engage in water conservation activities. From this survey, a majority of respondents indicated both concern that water quantity is a problem and that concern proved to be a significant predictor of water conservation behaviors.

Lastly, this study found that belief in the NEP was positively related to individuals performing water conservation activities. This finding was similar to Steel (1996), who found that “attitude intensity in support of the NEP predicts self-reported environmental behavior and participation in environmental issues” (34). And also to Stern et al. (1995) who found that “biospheric-altruistic values, have explanatory power for individuals’ beliefs about environmental conditions and their willingness to take action in response to them” (1630).

Table 3.3. Ordinary Least Squares Estimates of Water Consumption Behaviors

	Coefficient (SE)
Age	.018*** (.005)
Gender	.537*** (.164)
Education	-.074 (.067)
Income	.232*** (.039)
Metro	.305 (.181)
Problem	.571*** (.159)
NEP	.042** (.015)
N=	700
Adj. R ² =	.095
F test=	10.418***

^a The dependent variable is the cumulative index of water conservation activities in Table 1.

*** p ≤ .001; ** p ≤ .01; * p ≤ .05

With the findings that age, gender, income and support of the NEP were statistically significant predictors of behavior, further regressions were run to determine whether these same variables would predict individual behaviors. Based on individual logistic regression for individuals' behavior Table 3.4 reports on the groups statistically significantly ($p < .05$) more likely to engage in individual water conservation behaviors.

Table 3.4 Groups More Likely to Engage in Individual Water Conservation Behaviors

Behavior	Groups Statistically Significantly More Likely to Engage in Individual Behavior
Use faucet aerators	Men Older cohorts Urban residents Higher income
Water plants deeply, less frequently	Older cohorts NEP Higher income Women
Water lawns early in the morning or late in the evening	Older cohorts Higher income
Take shorter showers	Older cohorts NEP
Repair leaky faucets	Older cohorts Higher income Women
Turn off water while hand washing dishes	NEP
Collect rain water in barrels or buckets	None Women
Plant native plants or drought tolerant plants, trees, etc.	NEP Higher income
Turn off water while brushing teeth	Women Younger cohorts Urban NEP
Wash full load of laundry	Women Higher income
Purchase water saving appliances	Older cohorts Higher income

Logistic regression with statistical significance of $p < .05$.

The individual logistic regression analysis reiterates the overall findings in Table 3.3. Age, gender, income and NEP are all statically significant predictors of individual water conservation behaviors, as well as cumulative water conservation behaviors.¹⁰ Specifically, older cohorts were statistically more likely to perform 6 of the individual behaviors, and women and those who believe in the NEP were statistically more likely to perform 5 of the individual behaviors. The most frequent predictor of individual water conservation behaviors was higher income with statistical significance in 7 out of the 11 individual behaviors. The findings here that higher income is the independent variable most frequently found to predict individual water conservation behaviors further reinforces the findings previously mentioned by Trumbo and O’Keefe (2001) who found that income was the only predictive sociodemographic variable related to conservation behaviors.

Discussion

This study explored whether Oregonians participated in water conservation activities based on several factors: 1) concern that water scarcity is a problem in Oregon; 2) sociodemographic characteristics; and 3) belief in the NEP. The findings suggest that of all factors explored, concern about water scarcity, age, gender, income and support of the NEP all proved reliable predictors of participation in water conservation activities, both cumulative behaviors and individual behaviors. However, education

¹⁰ Model is available upon request.

and place of residence (metro vs. non-metro) were not predictors of water conservation behaviors.

In this study, values, concern and sociodemographics predicted 9 percent of the variation in conservation behaviors. Other factors most likely inform Oregonians and contribute to their concern about water in the state and their motivation to take steps to mitigate water scarcity. One major factor may be place of residence. Although this study did not find place of residence to be a significant predictor, it is possible that an oversampling of rural (non-metro) communities would produce different and potentially significant results. Oregon is divided politically, as well as geographically and ecologically. Areas where drought is more prevalent (eastern side of the state) may present more opportunities for residents to gain insight into water quantity issues. In addition, the coastal areas have concerns about water storage that may influence their concerns about water quantity. Further, since rurality is often characterized by resource-dependent industries (like agriculture, fisheries and logging) this could heighten an individual's water knowledge and concern.

As previously indicated, there are other reasons (aside from ecological orientation and sociodemographics) that explain why people engage in water conservation. One could be social desirability (Steel 1996), or other factors such as cost-effectiveness, home maintenance, rebate incentives (by purchasing a water-saving appliance for example), or what is known as "reasoned influences" that include attitudes, intentions

and norms (Gregory and Di Leo 2003). In addition, environmental behaviors can also result from “unreasoned influences” or rather habits associated with water conservation such as washing clothes and dishes, watering the garden, etc. (Gregory and Di Leo 2003). These “unreasoned influences” are distinguished from attitude-behavior relationships because “unreasoned influences” are not necessarily thought out, but rather acted out due to habit. As Gregory and Di Leo (2003) find, “these habits are repetitive, frequent, and can result in a reduction in the amount of cognition needed to make everyday decisions” (1265-1266). Therefore, one potential area for future research is whether habitual behaviors are a factor in performing water conservation activities.

Lastly, the finding that higher income was predictive of both cumulative water conservation behaviors and the majority of individual water conservation behaviors reveals that much more needs to be explored regarding income and water conservation. If economic disparity is the underlying factor in not performing these behaviors, then any discussion about encouraging household water conservation should involve discussion of rebates, incentives, or other programs devised to encourage those with lower incomes to engage in water conservation.

Conclusion

Oregon is an environmentally complex state exhibiting both progressive environmental policies and deep-seated battles over resource use. This study found that when dealing with water issues in Oregon, the NEP, concern about water scarcity, and sociodemographics partially predict environmental behaviors among Oregonians. Future research should examine other factors such as perception of risk, occupation, normative habits, and also an oversampling the eastern, drier part of the state that may provide more insight into predictors of water conservation and concern. Lastly, further research should seek to identify where Oregon respondents get their residential water (i.e. well-water or public water source), and if they have to pay for their water use (flat fee versus metered).

As Oregon moves forward in planning the management of water for current and future use, it is a good sign that concern about water scarcity and water conservation activities are broad-based. Although Oregon will most likely face greater water scarcity challenges in the future, the majority of Oregonians surveyed live up to their environmentally progressive reputation by exhibiting both concern about water quantity and by taking steps through conservation activities at home. The challenge ahead is identifying other factors that might enhance personal concern over water scarcity and potentially encourage more support for adaptations to water use in the future.

Applying the Institutional Analysis and Development (IAD) Framework to Oregon Water Policy

Abstract

Oregon water management is a complex process involving many interests, requirements and restrictions. This paper utilizes the Institutional Analysis and Development (IAD) framework to help construct a clearer picture of the variables involved in water policy in Oregon. Using a purposive survey conducted in the spring of 2011 of water stakeholders, as well as supplemental interviews of key actors, this paper discusses the salience of the development of a statewide, integrated water resource strategy and the potential outcomes of this strategy for Oregon water supply.

Keywords

Institutional Analysis and Development (IAD) framework, Oregon water, collaborative governance, integrated water resource strategy (IWRS)

Introduction

Garret Hardin (1968) in the seminal piece “The Tragedy of the Commons” described humankind’s inability to deal with problems of common pool resources. In a classic game theory arrangement, people would opt to depend on beneficial actions of others instead of taking on the burdens of protecting the resource themselves. The likely result of this strategy would be a free rider problem¹¹, or more seriously the demise of the resource. While Hardin’s (1968) theory serves as a cautionary tale for resource management, it does not encapsulate the increased focus on the management of natural resources as an institutional arrangement (i.e. collaborative governance). There are many scholars who challenge Hardin’s theory as an oversimplified model

¹¹ A free rider is someone who benefits from a resource without paying or contributing to the conservation of it.

of complex human interactions (Dietz, Ostrom, and Stern 2003; Dietz et al. 2002; McCay 1996). The “tragedy of the commons” suggests that stakeholders themselves cannot be vested with management or governance tasks.¹² This view “leads to arguments for strong, centralized governance or privatization, letting the market do the job” (McCay 1996, 117). Alternatively, scholars like McCay (1996) suggest that a more apt description would be a “comedy of the commons” where “people recognize that something is wrong and try, for better or worse (often “comically”), to do something about it” (McCay 1996, 117).

Oregon water policy has reflected both a “tragedy” and a “comedy” of the commons. Oregon’s history of managing water conflict is illustrated both by a battle over water so fiercely political, it became Oregon’s “water war” and by cooperation where all parties were able to find an agreeable management policy. The Klamath “water war” of 2001 most notoriously epitomized Oregon water conflict, and most clearly presents a tragedy of the commons.

In 2001, the federal government cut off irrigation water to farmers in the Klamath Basin inciting what has popularly been called the “Klamath Water War.” A confluence of disparate water uses combined with an unusually intense drought season forced policy makers (specifically those within the United States Bureau of

¹² Governance would provide leadership and a framework like the IWRS, management would entail more of the work itself (contributing to the development or the application of the IWRS).

Reclamation) to decide who (or what) had priority water use. The U.S. Bureau of Reclamation was forced to decide between irrigation and protection of endangered species (Doremus and Tarlock 2008). Ultimately, the Bureau of Reclamation relied on the biological opinion (BiOps) prepared by the National Marine Fisheries (NMFS) and the U.S. Fish and Wildlife Service (FWS), the agencies charged with enforcing the Endangered Species Act, who concluded that “summer irrigation releases from the...Upper Klamath Lake, would threaten the survival of protected Lost River and Shortnose suckers and coho salmon” (Doremus and Tarlock 2008, 1). Based on this biological opinion, the Bureau of Reclamation denied irrigation water from the Upper Klamath Lake.

The consequences of this decision serve as a harbinger to water conflicts throughout the West. Irrigators were furious over the decision to provide water to “fish over farms” and formed a bucket brigade symbolically transporting water bucket to bucket to an irrigation canal in protest against the government’s decision (Doremus and Tarlock 2008). The situation escalated until irrigators illegally forced open the headgates to irrigation canals to allow water to the farmers resulting in the federal government sending in FBI agents and federal marshals to guard the headgates (Doremus and Tarlock 2008). Ultimately, neither the fish nor farmers benefitted from the government decision in 2001. The Klamath Basin now has the dubious distinction of being the site of the largest fish die-off in the history of the West

(Doussard 2007) and the region took a hard economic hit with roughly fourteen hundred farms impacted by the water cut-off (Muedeking 2003).

The Klamath water crisis illustrated traditional top-down water management, and therefore the inherent problem with government agencies managing common pool resources in isolation from citizen involvement (especially managing water with the Endangered Species Act guiding the process). Managing water in a top-down manner suggests that water is merely a resource to be distributed based on rules and laws. But the distribution of water is not only about who gets the water, but a proxy for values that epitomize the west's history of rugged individualism, spiritual connections to the land, and fierce independents from government's heavy-hand. As such, another approach (and arguably a more favorable approach for many) to water management in Oregon is collaboration, exemplified by the collaborative water management efforts in the Umatilla Basin.

In the 1970's the water policy came to a head in the Umatilla Basin when conflict arose between irrigators and the Umatilla's tribes. Essentially, the federal government allocated water to irrigators that it had a responsibility to protect for the Tribes under a Treaty agreement. Thus, the federal government set the stage for conflict and animosity between the Tribes and irrigators. The Confederated Tribes of the Umatilla Indian Reservation wanted to restore salmon runs in the Umatilla Basin, but faced great opposition from irrigators. Using litigation to enforce Tribal water

rights was one option, but not a desirable one since litigation could take years and a great deal of money. Further, litigation could push back salmon restoration to the point of no return and potentially threaten the water rights held by the Tribes. For the irrigators, litigation could result in less water, or in some cases, a loss of water to farmers and thus potentially impact both individual irrigators and the local and regional economy.

Instead of reaching a tipping point, like in the Klamath Basin, stakeholders in the Umatilla Basin recognized the no-win situation that would result from protracted legal battles and instead relied on reaching a compromise that would help restore salmon runs and protect irrigators from water losses. Specifically, the Tribes, irrigators, the Bureau of Reclamation, the Bonneville Power Administration (BPA), the Oregon Water Resources Department (OWRD), and the Oregon Department of Fish and Wildlife (ODFW) helped enact the Umatilla Basin Project that has helped watershed restoration, salmon recovery, and continue to provide water to irrigators.

In both the Klamath Basin and the Umatilla Basin, the federal government laid the groundwork for conflict by allocating water to irrigators and supplementing farmers with Bureau of Reclamation irrigation projects intended to provide a steady and reliable flow of water to irrigators. The irrigation economies grew, but at the expense of fish (particularly salmon runs) and Tribal water rights. While both of these cases represent the extreme (in conflict and cooperation), they are by no means exclusive

events in Oregon. In a study by Fesler (2007) of water conflict and cooperation in Oregon's 18 water basins between 1990 and 2004, Fesler found a total 393 events. Interestingly, of these events, the majority (54%) were cooperative (Fesler 2007). Further, "water resource conflict was shown to intensify over time, and major conflictive events lead to major cooperative events" (Fesler 2007, 90). So while the move toward a more collaborative approach to water management in Oregon is important in preventing conflict, it is important to recognize that conflict can *result* in cooperation as well. Further, Fesler (2007) found that hydrologic and demographic variables are both components of stakeholder's level of conflict or cooperation "institutional changes may act as either an instigator or resolution of resource conflict" (101). Thus, an understanding of the environment in which water policy is formulated is essential to mitigating conflict or facilitating cooperation over water resources in the future.

The purpose of this paper is to explore Oregon water policy by employing the Institutional Analysis and Development (IAD) framework. Because much of Oregon's water management involves numerous stakeholders, the application of the IAD framework is "an attempt to examine a problem that a group of individuals (or organizations) face and how the rules they adopt address a problem(s)" (Imperial 1999). Specifically, this paper will examine the current efforts, spearheaded by the Oregon Water Resources Department (OWRD) to develop a statewide, integrated water management strategy.

The Institutional Analysis and Development (IAD) Framework

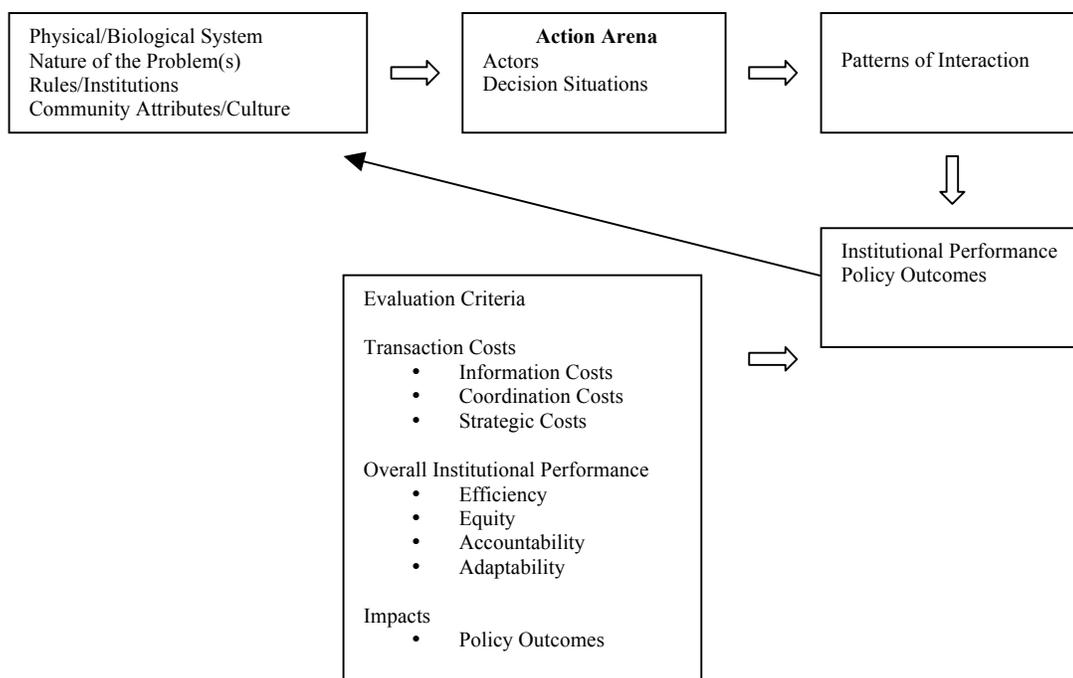
Public policy, and certainly natural resource policy, is often fraught with complex and challenging issues. In order to make sense out of the chaos, policy theories have evolved to help understand the policy process that requires policy makers to determine the key actors involved, legal and scientific restrictions, and an understanding of the motivation of the actors trying to obtain policy outcomes favorable to their interests (Sabatier 2007). In the realm of water policy, it is crucial to understand the context in which water policy decisions are made, and what rules and institutions guide those decisions. As such, the institutional analysis and development (IAD) framework originated by Elinor Ostrom and colleagues at Indiana University (Ostrom, Gardner, and Walker 1994), provides a lens in which to capture a more detailed picture of water policy in Oregon and implications for future policy decisions.

The Institutional Analysis and Development (IAD) Framework is essentially, “a general language about how rules, physical and material conditions, and attributes of community affect the structure of action arenas, the incentives that individuals face, and the resulting outcomes” (Ostrom 2007, 46). The foundation of the IAD, and the main unit of analysis, is the “action arena.” The action arena incorporates individuals and organizations that make resource management decisions based on the information about how actions are connected to possible results (outcomes), and to the costs and benefits attached to actions and outcomes (Imperial 1999, 454). In the action arena

three variables influence the pattern of interactions of individuals and organizations:

1) interactions are influenced by implicit and explicit assumptions about the rules used to order relationships between individuals; 2) to be effective rules must be compatible with the underlying physical and biological setting; and 3) interorganizational relationships will be influenced by the attributes of the community where actors are located (Imperial 1999, 454) (Figure 1).

Figure 4.1. The Institutional Analysis and Development Framework



Modified from Imperial (1999)

The IAD provides a framework in which to examine common-pool resource decision-making processes. Use of the IAD is especially helpful in analyzing whether the

potential for stable agreements over common pool resources might be reached

because (Imperial 1999, 453):

1. The IAD recognizes the full range of transaction costs associated with implementing policies;
2. The IAD draws attention to contextual conditions that influences institutional design and performance (e.g., physical, biological, social, economic, cultural, etc.).
3. The IAD does not contain a normative bias with respect to institutional arrangements; it does not presume that a centralized hierarchical arrangement is more effective than a decentralized or polycentric arrangement;
4. The IAD posits using a variety of criteria to identify the strengths and weaknesses in different institutional arrangements; and
5. The IAD focuses on rules rather than the policies themselves, which broadens the analysis to address a wider range of organizational relationships.

However, unless the policy is a fixed end-result type policy, then the iterative nature of IAD means that post policy analysis could leave questions unanswered. Polski and Ostrom (1999) state that, “all policy situations are governed, for better or for ill, by institutional arrangements that are specific to the demands of a particular time, place, and people (5). Therefore, application of the IAD to water policy in Oregon can only reflect the current attempts to manage Oregon’s water resources in light of current surface water demands, and the unknowns of climate change and population growth.

The IAD framework has been used in numerous countries for variations of institutional arrangements. One major reason to utilize IAD is the application of the IAD for meta-analysis to help identify patterns that could lead to improved theory of common-pool resources like water (Smajgl, Leitch, and Lynam 2009). The move

toward more collaborative governance over common-pool resources in Oregon makes IAD an ideal framework to apply as an analysis tool. An understanding of how individuals (or organizations) address the problem of water usage and conservation is crucial to understanding the means to begin resolving some of the problems in water management in Oregon. Essentially, the IAD framework “emphasizes individual actions as affected by rules, community, and the physical world” (Koontz 2005).

For this research, I apply the IAD framework to the development of the integrated water resource strategy (IWRS) in Oregon. A comprehensive analysis of the IAD framework ideally includes a detailed account of cost-benefits, perceptions of actors involved, and generally an assessment of all components in the development of this strategy. However, I focus instead on the rules that guide Oregon water quantity management, the actors (stakeholders) involved, and the physical environment in which this strategy would apply because it is these factors that primarily influence water policy in Oregon.

Application of the IAD

Physical Environment

Water is a finite resource, and under current conditions, the State of Oregon is already struggling to meet the growing demand for water, particularly in the summer months (Oregon Water Resources Department 2011b). Oregon’s water availability depends

on supply. Most of the state's water is held in snowpack and thus the timing and abundance of water runoff impacts when the water is available for use. Surface waters provide 85% of water use for the state (Bastasch 2006), which is important because "during many months of the year – including those months when water is most demanded – no further water is available for new water rights" (Oregon Water Resources Department 2001, 7). However, due to the reliance on surface waters that can no longer meet all demands, groundwater is being tapped to fill the void. But groundwater provides roughly 70% of drinking water for Oregonians, with 90% of rural residents dependent on groundwater for drinking water (Oregon Water Resources Department 2011a). The increased pressure on groundwater resources to supplement deficiencies in surface water "has resulted in a number of challenges, including declining aquifers, administratively restricted areas and difficulty with 'conjunctive management'" (Oregon Water Resources Department 2011a, 20).

Like other states in the western part of the United States, Oregon struggles with meeting current water demands while trying to mitigate for the effects of climate change. Most precipitation occurs from October to March (Oregon Climate Change Research Institute 2010) during which time the water is stored as snowpack until spring when the snowpack melts and provides water for the drier months. Climate change will redefine the timing and abundance of water runoff of Oregon's snowpack. Specifically, "in the future, as winter temperatures warm, mountain snowpacks will diminish and summer water supply will likely decline" (Oregon

Climate Change Research Institute 2010, 9). This is in addition to projections that climate change will decrease existing levels of summer precipitation making the drier months in Oregon even more water scarce (Oregon Climate Change Research Institute 2010).

Adding further stress to Oregon's water supply is current population growth projections. While Oregon must continue to meet the needs of fish and wildlife, industry, and irrigation (Oregon's major economic force that uses over 80% of surface water), the state must also meet residential water needs. With increased population, especially to metropolitan areas, and projected warmer, drier summers, the demand for water is also expected to increase (Oregon Climate Change Research Institute 2010). Thus the management of water in the state becomes not just one of moving water around, but requires a deeper look into the rules that guide water allocation and use.

Community

Prior to the legislature passing HB 3369 that initiated the development of an IWRS, Oregon State University's Institute for Water and Watersheds (IWW), the Institute for Natural Resources (INR) and Oregon Sea Grant Extensions in collaboration with the Oregon House Committee on Energy and the Environment conducted the Statewide Water Roundtables. The Roundtables, conducted in 2009, were a series of public meetings to discuss current and future water issues in Oregon. In all 301 people

participated in five distinct hydrological regions in Oregon (Central, Coastal, Eastern, Southern, and Western/Willamette Valley).¹³

The Roundtables found that overall, water quantity (33%) was the issue residents were most concerned about, followed by water quality (25%), and ecological water concerns (25%) (Oregon State University Institute for Water and Watersheds et al. 2008). Concern over water quantity was for both current use and future use of both residents of Oregon and Oregon wildlife needs. In response to the statement, “In 2008 Oregonians have enough water to cover their needs, including wildlife” and “In 2028, I believe Oregonians will have enough water to cover all of their basic needs, including the needs of wildlife”; most participants disagreed or disagreed strongly (Oregon State University Institute for Water and Watersheds et al. 2008, 10).

Although regionally the emphasis on water varied the efforts of the Statewide Water Roundtables illustrate the need for Oregon to address water issues¹⁴.

In the spring of 2010, a survey conducted by the author and colleagues, was sent to 1,537 homes within the state of Oregon, with 808 responses to the survey for a 52.6 percent response rate. The purpose of the survey was to assess citizen attitudes and opinions toward water use in Oregon, thereby furthering our knowledge about Oregon

¹³ Participants were self-identified and therefore not a representative sample of Oregonians.

¹⁴ For example, in the coastal regions water quality was a high concern, whereas in the eastern area of Ontario, water quantity was the primary focus.

residents water concerns to add to the Roundtables findings. Results of this survey provided valuable information on whether Oregonians are concerned about water scarcity and how they would prioritize water use.¹⁵

Overall, 56% of the surveyed Oregonians felt that water quantity is a problem in Oregon, although only 35% were concerned that they would personally be affected by water scarcity. In terms of factors contributing to water scarcity, it is interesting that the Oregon public respondents identified the two main stressors on water: climate change and population growth, as well as the largest water user in the state, agriculture, were the factors contributing the least to water scarcity according to public opinion (see Table 4.1).

Table 4.1. Water scarcity factors

What factors do you feel contribute to water scarcity in Oregon? (Circle all that apply.)	Percent response (n = 808)
Climate change	36%
Commercial use	47%
Agriculture/irrigation	35%
Increasing population	13%
Residential use	46%

What is important about this information is that Oregonians, while generally perceiving a water scarcity issue in Oregon, are not personally concerned it will impact them, and are incorrect as to the factors contributing to water scarcity. The fact that Oregonians are generally concerned about water scarcity in the state at least

¹⁵ The term water scarcity is defined in this paper as “a situation where there is insufficient water to satisfy normal requirements” (Abrams 2000, 1) with primary causes being climate change, population growth, demand, etc.

makes the issue more salient for policy discussions. However, there is evidence that overall many Oregonians are not aware of the stressors to water availability and the potential impact scarcity can have on them personally.¹⁶ In a time when the state of Oregon is gearing up to develop an IWRS due to water scarcity concerns, the public at large is not as particularly well informed on this issue.

Rules and Management of Oregon Water

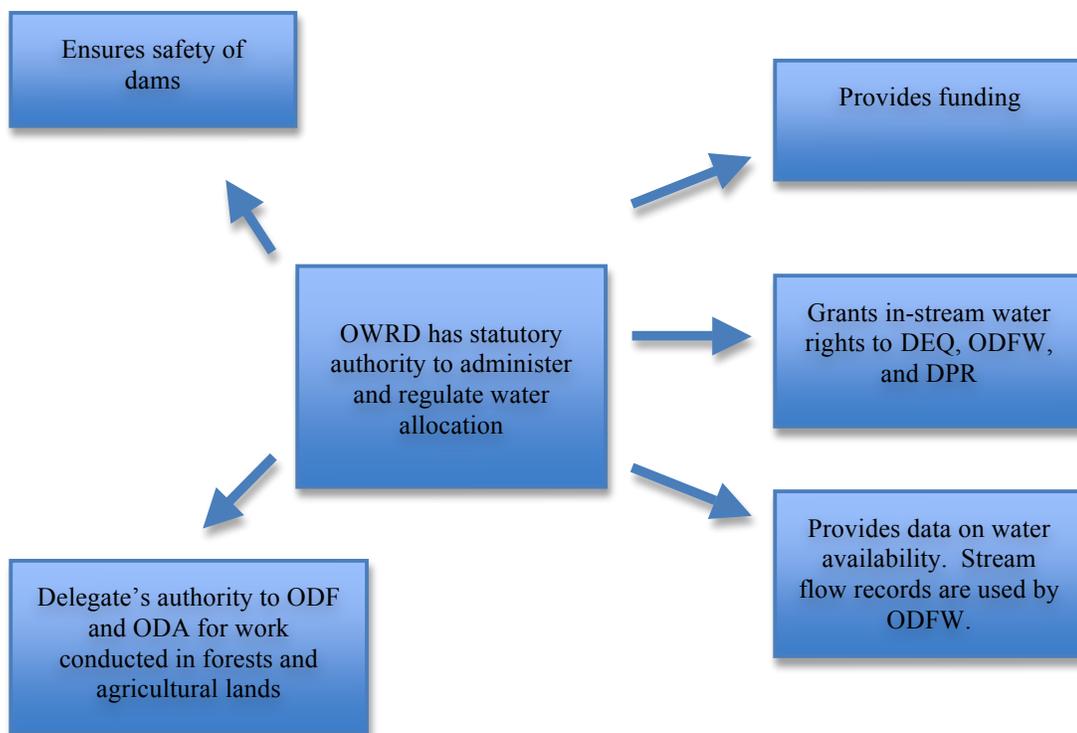
Oregon is one of the last Western states (the other being Alaska) to develop a statewide, integrated water resource strategy (IWRS). Lack of funding, in addition to low political salience effectively postponed any effort for an IWRS until recently. With the Statewide Water Roundtables providing evidence of public interest and concerns about water issues in the state, the Oregon State Legislature eventually passed HB 3369 in 2009. This measure authorized the Oregon Water Resources Department (OWRD), the Department of Environmental Quality (DEQ), and Oregon Department of Fish and Wildlife (ODFW) to develop an integrated water resource strategy (IWRS) with the goal of the integrated water resource strategy to meet Oregon's present water needs and projected demand for water over the next 50 years. The strategy has the stated objective:

¹⁶ In a survey of Oregonians conducted by the author and colleagues the question “what factors do you feel contribute to water scarcity in Oregon?” resulted in the top two responses being 47% responding “commercial use” and 46% responding “residential use”, when in fact agriculture, climate change, and population growth are the greatest stressors.

The strategy, when finished, will be an action agenda for the state to follow as it prepares to better understand and meet Oregon's water needs (in stream & out of stream) now and in the future. The approach will be integrated, taking into consideration water quantity, water quality, and ecological needs. The intent is to develop a framework consisting of a set of tools, data, and resources with statewide relevance to communities across Oregon ((Oregon Water Resources Department 2010b).

There are numerous state agencies responsible for the quality and quantity of Oregon's water. At the most fundamental level, the main state agencies responsible for water management are Oregon Water Resources Department (OWRD), the Department of Environmental Quality (DEQ), and the Oregon Department of Fish and Wildlife (ODFW). Specific to water quantity, the Oregon Department of Agriculture (ODA), the Department of Parks and Recreation (DPR), the Oregon Department of Forestry (ODF), and the Department of Land Conservation and Development (DLCD) are also agencies playing a specific role in water quantity management (see Figure 2). Both OWRD and the DLCD are jointly responsible for water supply planning.

Figure 4.2. Water Quantity Management



Flow Chart by Winters, K. (2010)

While there has been great efforts put into the development of a IWRS by the OWRD, specifically public meetings in 11 regions in the state (in addition to one on-line open house meeting), the creation of a policy advisory committee meeting roughly every three months to discuss the progress of the strategy, and the research and development of issue papers contributing to the current draft recommended actions, the end result of this process is not to fundamentally change Oregon water laws, but rather to provide a strategy of recommended actions for the state. Although the OWRD has the ability to file a pre-session bill to propose a change to the Oregon

Water Code, there are no efforts by the OWRD or any legislators to change current water law. However, the creation of an IWRS by OWRD can help influence policy and the management of water quantity in Oregon since OWRD essentially serves as the main agency for water permits, allocation, supply planning, and water use monitoring and enforcement (Bastasch 2006).

Oregon Water Law

In the State of Oregon, water is publicly owned. The management of water is guided by the Oregon Water Code which follows four principles: water is a public good, rights to water is by permit system, permits are only granted for beneficial use, and permits are allocated according to the “prior appropriation doctrine” (Bastasch 2006). However, public ownership does not preclude rights to water by various stakeholders. Since 1909, the State of Oregon has abided by the “Prior Appropriation Doctrine” which essentially ensures that the date of issuance of a water right establishes use of water, or “first in time, first in right.” In order to establish a water right, a permit must be obtained from the state that requires permits to be used for “beneficial use without waste” (Bastasch 2006, 55) and establishes the timeline for prior appropriation. The exception to this is rights allocated to Native American Tribes, those held by the federal government, and Exempt Groundwater Use.¹⁷

¹⁷ Exempt Groundwater Use is essentially water that is for “beneficial purpose without waste” or too small of use to necessitate a permit.

In 1908, the U.S. Supreme Court established Tribal reserved water rights in the case *Winters v. United States* (known as the Winters Doctrine). These “reserved” water rights “represent full-blown right to use water” (Bastasch, 2006: 140) for Native American Tribes and for the federal government land holdings due to court decisions following Winters, like the 1963 *Arizona v. California* decision that applied the Winters Decision to federal lands (Bureau of Land Management 2011). Thus, with the Winters Doctrine in 1908, permits obtained from the State of Oregon after 1909 are inherently at minimum second in line after water use on federal lands and by Native American Tribes.¹⁸

However, while the Winters Doctrine established more centralized federal control over water in the states, subsequent court cases have sought to restrict reserved water rights and bring some more control to the states. Specifically, both 1976 *Cappaert v. United States of America* and 1978 *United States of America v. New Mexico*, the courts determined that reserved water rights applied only to “primary purposes” of the reservation or the federal lands respectively (Bureau of Land Management 2011). Therefore, according to the rulings of *United States of America v. New Mexico*, any other federal water needs “were to be considered secondary purposes and the federal government would have to obtain rights like any other appropriator under state law” (Bureau of Land Management 2011, 1-2). Lastly, the McCarren Amendment of 1952

¹⁸ There can be some exceptions however since the State of Oregon can opt to “negotiate” water disputes.

helped bring water management back into state control by requiring the federal government to participate in the state's water adjudication processes (Bureau of Land Management 2011).

Although legal restrictions provide preferences to federal lands and Tribes, other uses have established long-term priority use, primarily agriculture. In Oregon, irrigators have old water rights that have helped establish agriculture as an important sector of the economy, which now constitutes 15 percent of the state's economy (ODA, 2011). However, irrigation for agriculture also accounts for roughly 80 percent of all fresh water withdrawals (Kenny et al, 2009)¹⁹ making irrigation the top water user in the state, and one of the most vulnerable users in times of drought. It is during these times of water scarcity that water policy is challenged.

The aforementioned Klamath Basin "water war" and the Umatilla Basin story of cooperation illustrates the complexity of water policy in Oregon and highlights the value conflicts policymakers must reconcile to ascribe water "rights" to various water users (including fish and wildlife via proxy by environmental organizations and tribes). While there is definitely a more noticeable shift in greater inter-agency cooperation, as well as involvement by the public and stakeholders in Oregon's water policy issues, it seems to be increasingly complex to work through the myriad of water issues. There are the "unknowns" that must be dealt with, like the extent of

¹⁹ Based on 2005 data.

climate change impacts on water in Oregon, and there are trade-offs that will have ripple effects, leaving “traces” that cannot be undone (Rittel and Webber 1973). But most significantly, there is no one definable (or formulated) problem(s) that have potential solutions because each group would define the problem distinctly according to their worldview, dependence on water, or agency perspective. For example, water quantity is affected by the impacts of climate change (yet unknown), exempt wells (unaccounted), irrigation use, urbanization, population growth, water loss, mining of nonrenewable groundwater, consumptive use, and municipal use. Therefore, in order to understand water policy in Oregon, it is necessary to understand the factors that impact and influence water policy.

Stakeholders

There are numerous individuals, organizations, industries, and agencies that could arguably be considered a stakeholder in Oregon water issues. The following table (see Table 4.2) provides an overview of the stakeholders most directly associated with water policy, law and use that were surveyed or interviewed for this research.

Table 4.2. Oregon water stakeholders and guiding rules/mission

Stakeholder	Guiding Rules/Mission
State Agencies OWRD, ODFW, DEQ, DLCDD, ODA, and DPR	Management and protection of water resources
Elected Officials	Implementation of new laws, modification of existing laws
County Commissioners	Responsible for providing services, including water and water treatment, to counties
Irrigation Districts	Provide construction and maintenance of irrigation systems; can “acquire domestic or municipal water works” (Bastasch 2006)
Industry	Use of water for manufacturing of goods and services
Energy	Large water use and water quality impacts due to energy generation
Water Utility	Provides water for residential and commercial use
Agriculture	State’s largest water user and major economic sector for Oregon accounting for over 12% of state economy (Oregon Department of Agriculture 2010)
Watershed Councils	Improve watershed quality
Native American Tribes	Legally entitled to “reserved” water rights
Environmental Organizations	Represent the public interest in protecting natural resources including fish and wildlife
Recreation	Provide water-oriented recreation activities for the public

State Agencies

It is pertinent to specify the role of state agencies in water policy formation, since they are independent entities also should interact with each other in water issues. As aforementioned, OWRD, ODFW, DEQ, DLCDD, ODA, and DPR are all directly charged with the management and protection of water quantity for purposes specific

to the agency's directive (see Table 4.3). The current efforts by OWRD to create an IWRS consult with each of these agencies according to the varying degrees of involvement by each agency in the planning process.

Table 4.3. Agency water mission/purpose

Agency	Mission/Purpose
Oregon Water Resources Department (OWRD)	To serve the public by practicing and promoting responsible water management through two key goals: to directly address Oregon's water supply needs, and to restore and protect stream flows and watersheds in order to ensure the long-term sustainability of Oregon's ecosystems, economy, and quality of life.
Oregon Department of Fish and Wildlife (ODFW)	To protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.
Department of Environmental Quality (DEQ)	To protect and improve Oregon's water quality.
Department of Land Conservation and Development (DLCD)	Protection of natural resources generally. Jointly responsible for water supply planning with OWRD.
Oregon Department of Agriculture (ODA)	To protect the natural resource base for present and future generations of farmers and ranchers, to promote economic development and expand market opportunities for Oregon agricultural products.
Department of Parks and Recreation (DPR)	Provide and protect outstanding natural, scenic, cultural, historic and recreational sites for the enjoyment and education of present and future generations.

Adapted from Winters, K. (2010)

The Oregon Water Resources Department is the foremost state agency responsible for water resource administration including (but not limited to): appropriation of water (ORS 537), withdraw of water from appropriation (ORS 538), determination of water rights for Federal recognized Native American Tribes (OR 539), distribution of water (ORS 540), authorizing and decommissioning hydroelectric projects (ORS 543A)

(Bastasch 2006). OWRD therefore is the epicenter of water management policy in Oregon due to its vast duties and scope of water management.

Water management in Oregon, and any changes to the status quo of management, involves several factors. These variables help to construct a better picture of the components to explore when examining policies concerning Oregon water quantity (see Table 4.4). However, due to the interconnected nature of these variables, it is difficult to determine which, if any, variable unilaterally impacts water management.

Table 4.4. IAD Variables

IAD Variables	Attributes
Physical Environment	Climate Change Population Growth Current and Future Water Demands
Community	Oregonians' understanding and assessed values of water from 2010 survey Statewide Water Roundtables 2008
Rules and Management	1909 Prior Appropriation, OR Water Code Tribal reserved water rights Federal reserved water rights Exempt groundwater use
Stakeholders/Actors	State Agencies Elected Officials Irrigation Districts Industry Energy Watershed Councils Native American Tribes Environmental Organizations Recreational Organizations
Policy Outcomes	Water policy change

Modified from Koontz, T.M. (2005)

Methodology

Water stakeholders in the State of Oregon were the primary focus of this research. In the spring of 2011, a mail survey was conducted of Oregon water stakeholders.

Specifically, stakeholders from twelve sectors were surveyed: state agencies, elected officials, county commissioners, irrigation districts, industry, energy, water utilities, agriculture, watershed councils, Native American tribes, environmental organizations, and recreation. The survey was sent to a purposive sample of 390 individuals within the state of Oregon during the months of April and May 2011. The purpose of the survey was to assess stakeholder attitudes and opinions toward water use and policy in Oregon. For the survey distribution an abbreviated “Total Design Method” constructed by Dillman (1978) was employed with one wave of mailings, including an introductory postcard announcing the survey. The survey was sent to 390 stakeholders, of those 147 responded, resulting in a response rate of 40.4%.

In addition, beginning in the winter of 2010, a series of interviews (12 total) with identified stakeholders and elected officials were conducted. The interviewees were asked a series of open-ended semi-structured questions, allowing them to respond in full to the question, and elaborate on any points they felt necessary. The purpose of the interviews was to enhance our understanding of water management goals for different sectors of stakeholders. Interviews lasted from 20 to 60 minutes, with one researcher asking questions, and a second researcher taking detailed notes of the conversation. While most interviewees did not ask for confidentiality, those who

requested that their responses remain confidential agreed to be identified based on the water sector they represented (i.e. agricultural community, environmental organization, irrigation district, etc.).

Analysis

At the core of the IAD framework is the action arena (that includes the action situation and the actors themselves). In this paper, the action situation is Oregon water policy as it relates to quantity (scarcity). In this action arena, the stakeholders previously identified must make decisions based off of the physical environment, community, and current rules and norms pertaining to water quantity management. Further, any policy implemented has “costs” associated with it. Actors must weigh the costs of their decisions whether it is economic, implementation costs, or political costs. Therefore, the perception of stakeholders about Oregon water quantity, including management rules and norms, affects decision-making.

While tasked with shaping or influencing water policy development, actor’s beliefs about water quantity, as well as personal beliefs and values, will inevitably impact policy outcomes. The survey therefore asked stakeholder’s their concerns and opinions about issues related to water quantity. Using SPSS (a statistical analysis program), frequencies were run to see 1) if stakeholder’s perceive of a water quantity

problem; 2) understand the main stressors to water quantity; and 3) how they prioritize water use.

Stakeholder's clearly felt that there is a water quantity problem in Oregon. Over three-quarters of respondents (77%) felt that having enough water is a problem in Oregon (see Table 4.5). Similarly, the Statewide Water Roundtables found that water quantity was the water issue they cared most about (33%) (Oregon State University Institute for Water and Watersheds et al. 2008). When asked if they were concerned about being personally affected by water scarcity, over half (53%) of respondents said they were "concerned" or "very concerned". Compared to the survey of Oregon residents, stakeholders were much more concerned about water scarcity in Oregon overall (56% vs. 77%).

Table 4.5. Concern About Water Scarcity

Do you feel water quantity (having enough water) is a problem in Oregon?	Percent circled (n = 390)
Yes, it is a problem	77%
No, not a problem	21%
Don't know	2%
How concerned are you that water scarcity (having enough water) will affect you personally?	
Not concerned	14%
Slightly concerned	31%
Don't know	3%
Concerned	34%
Very concerned	19%

In contrast to the general public survey, stakeholders were more informed about the factors (stressors) contributing to water quantity problems (see Table 4.6).

Table 4.6. Factors Contributing to Water Scarcity

What factors do you feel contribute to water scarcity in Oregon? (Circle all that apply.)	Percent response (n = 390)
Climate change	47%
Commercial use	37%
Agriculture/irrigation	57%
Increasing population	72%
Residential use	36%

Here, the stakeholders/actors identified the top two stressors (climate change and population growth) with the top water user (agriculture/irrigation) signifying recognition of the key factors that would most likely need to be addressed in any water policy outcome dealing with water scarcity in the state.

The one question that both the general public and stakeholders/actors answered similarly was their prioritization of water use. Both the general public and stakeholders/actors felt that the top three “most important water uses in Oregon” were (in order of ranking): drinking water (first), irrigation (second) and wildlife (third).

With a clear majority of stakeholder/actor respondents indicating a concern over water scarcity, the matter is politically salient for OWRD to make recommendations about current and future water management. This does not however, indicate a consensus among stakeholders/actors as to the best way to manage water. Rather, it is recognition that there is a problem that needs to be addressed.

The stakeholder/actor interviews therefore sought to find common threads or themes among interview responses. From the interviews of elected officials, irrigation districts, environmental organizations, agricultural interests, and city water planners several key themes emerged:

1. Need for collaboration among all stakeholders;
2. Water should be managed at a basin, or sub-basin level, not statewide;
3. Need to balance in-stream and out-of-stream uses;
4. Need to balance economic needs with water needs;
5. Push for incentive-based programs, not top-down regulation;
6. Water management should be holistic; and
7. Management strategies should be flexible and adaptive²⁰

Aside from the management themes described above, other concerns and questions arose during the interviews that illustrate the multi-dimensional nature of Oregon water quantity management. Several actors indicated concern about establishing trust in state agencies to manage water allocation, but recognize the importance of trust between the state and other stakeholders. One water planner observed this as a potential incentive stating:

²⁰ Many of these themes are similar if not identical to responses from the Statewide Water Roundtables conducted in 2008. A potential issue is bias, since these themes have already been explored and discussed. Or, it is possible that these themes reoccur because they are conceptually engrained as “good” water policy goals.

The creation of credibility is a two way street and the building of trust relations is in some ways as good as a loan or grant in terms of incentives (interview conducted July 13, 2010).

Other actors suggested that management should occur locally with the state less involved so as to avoid political whims. One interviewee stated it this way:

If you could develop basin-wide, stakeholder positions you could get to the point of being pretty smart, and insulate yourself from the constant swings of politics (interview conducted March 16, 2011).

However, in rural areas in the state, where they lack the same amount of “human capital” as the larger cities, like Portland, it could be challenging to find rural residents to navigate regional water quantity strategies. Some rural communities are burdened with lack of social, economic and human capital necessary to utilize watershed councils to help water management, therefore:

Communities are having to rely on one or two people for everything, and they are starting to get burned out (interview conducted January 20, 2010).

While this may be true in many rural regions, it is noteworthy that in places like the Umatilla Basin (see aforementioned description) it is the rural water users who are taking leadership roles.

Other individuals wondered how a statewide strategy could effectively manage water quantity without out changing water law. One respondent posed the question this way:

How do you shift an existing pot of water without tipping over prior appropriation laws? (Interview conducted November 16, 2010).

The validity of this question cannot be understated. Among the various actors that were interviewed, no one suggested that water law, specifically prior appropriation water rights, be revoked or revised. With agriculture contributing so much economically to the state, and with deep interests representing agriculture, the mere suggestion of modifying existing water rights is the equivalent of political suicide. Yet, the big question is how does Oregon meet water quantity demands, which are already stretched, to accommodate growing demand and changes in availability due to climate change? Relying on the Oregon Water Code has resulted in overuse and (in some cases) misuse: “its design is based largely on a nineteenth-century code of conduct: get cracking and use all that water otherwise wasting to the sea by taking charge, putting it where it is needed, and transforming wasteland into Eden” (Bastasch 2006, 63-64). Or, more succinctly the Oregon Water Code is “a system true to its time and successful in its day, but proving an odd fit for today’s needs” (Bastasch 2006, 64).

Discussion

Applying the IAD framework to Oregon water policy does not illicit an explicit outcome to Oregon’s water quantity concerns. Instead, it provides a method of organizing information to better comprehend a policy situation and reach a solution.

Oregon water law is deeply engrained legally and culturally, and there are no proposals in the near future to suggest that water law will substantively change. In light of current and future constraints on water availability and use, how can Oregon go about managing water quantity? The state of Oregon has initiated a process to develop a statewide, integrated water resource strategy that the OWRD is tasked with producing. That strategy will serve as a policy tool for elected officials to enhance their knowledge of Oregon water issues, and to provide them with greater information on the potential impacts and challenges to managing water quantity.

Based on the two surveys conducted in this study, one to the general public and one to stakeholders and actors in water management, both groups indicated concern for water quantity in Oregon. Between these two groups however, there is a significant knowledge gap of Oregon water stressors. The general public specified that commercial use and residential use were the primary factors contributing to water scarcity, when in fact climate change and population growth are the two main stressors and agriculture the largest water user in the state. While increased population to the state will add additional pressure to current over-allocation of water in the summer months, climate change will further limit water availability in summer months due to decreased precipitation and earlier peak streamflow (Governor's Advisory Group on Global Warming 2004). The stakeholder/actor survey respondents, in contrast, listed the top water scarcity factors as climate change, population growth and agricultural use. This distinction is important because while

the general public and stakeholder/actors both feel there is a water quantity problem, the general public is ill informed of the stressors of water quantity. This disconnect presents a problem for water policy management that may require public support or participation. However, the acknowledgement of a problem indicates that the issue is politically ripe for the OWRD to be working on an IWRS.

As aforementioned, the main focus of the IAD framework is the action arena, or more specifically the action situation. The primary action described in this paper is the statewide, integrated water resource strategy being developed by OWRD. There are both benefits and drawbacks to the state's effort to create an IWRS for Oregon. First, OWRD has done extensive research into the multitude of factors impacting Oregon's water quantity and quality. They have conducted open-house meetings across the state, and have utilized the expertise of different state agencies to conduct a thorough analysis of Oregon's current and future water needs. They acknowledge that Oregon is geographically, culturally, and economically diverse, and that each basin and sub-basin requires a special focus that "merits more discussion" in the development of a water strategy (Oregon Water Resources Department 2011b). Specifically, the OWRD's Draft Recommendations (Oregon Water Resources Department 2011b, 67) cites several areas that are high priority:

- Assist with climate change adaptation strategies;
- Integrate water information into land-use planning;
- Encourage and facilitate regional (sub-basin) approaches to water;

- Fund the development and protection of Oregon's water; and
- Increase water conservation and water efficiency.

However, such recommendations present several challenges, including lack of proposed water law changes, meaning any policy changes will have to be consent-based or incentive-based programs that can help conserve water quantity or mitigate for water losses.

Unlike the "Tragedy of the Commons" that Garret Hardin skeptically illustrated, Oregon's water quantity management may take a decidedly different approach. While actual water quantity is finite, collaborative efforts can help mitigate evapotranspiration in irrigation, negotiate water transfers or water banking options, improve water efficiency, and generally encourage water conservation. There are clearly shared goals (themes) among stakeholders/actors who participated in the survey underlying all of these goals is the need for information. One interviewee put it this way:

The real dream is when you get diverse entities together...working together generating solutions in real-time... We have had a limited toolbox in the past to make good decisions. Regions where there is a great deal of conflict are more work because stakeholders want information (interview conducted March 16, 2011).

Perhaps this will ultimately be the result of the IWRS, to provide information, support collaboration in water basins, and to supply needed funding and services to regional water management efforts.

The Future of Oregon Water

The Klamath “water war” demonstrated that without proactive multi-stakeholder efforts to mitigate impending water scarcity problems, all actors could potentially suffer the consequences. Establishing a water network of information, resources, and most importantly relationships, is the basis of the policy outcome for the IWRS. Laying the groundwork prior to a water conflict or problem is crucial, considering the projected water challenges ahead. Each basin (and sub-basin) should also be individually assessed to identify unique water issues and challenges and to devise basin-by-basin resolutions.

The findings in this study echo results from the Statewide Water Roundtables, and the goals of the draft IWRS. Specifically:

- Management should take place at basin or sub-basin level;
- Water and land use planning should be integrated;
- Need to plan for climate change; and
- Balance various needs of the state.

Clearly there is a common theme that resonates throughout each of these studies, and the core of the solutions then will require input and support from Oregonians. Further evidence for this comes from the Roundtables with identified proposed solutions including (but not limited to):

- “Promoting and funding water conservation by all users”;

- “Water conservation tax credits, like energy tax credits”; and
- “Local integrated water planning” (Oregon State University Institute for Water and Watersheds et al. 2008, 12).

The OWRD states “it is important to note that the development and implementation of this Strategy relies in the first order on collaboration and voluntary efforts” (Oregon Water Resources Department 2011a, 11). Therefore, any utilization of this strategy must somehow move from abstract policy to on-the-ground implementation. Unique to all environmental issues is the individuality of the people involved. The IWRS depends upon Oregonians to develop and effectively implement goals of the Strategy to avoid another Klamath “water war” and focus instead on encouraging more collaborative efforts like in the Umatilla Basin. To work the IWRS (which is in essence public policy) needs to be adaptive, integrative and on going. As Daniels and Walker (2001) explain:

Public Policy must move beyond simplistic attempts to balance competing interests, efforts that often yield compromise solutions that none of the participants desire. We must craft policy processes whose outcomes achieve a high level of both technical competence and social discourse (xiii).

Collaboration is often suggested as the means to reaching agreement on an issue. But getting people to collaborate is more complex than simply getting them in a room together. Daniels and Walker (2001) explain that “while environmental and natural policy conflicts are overtly about substantive matters, progress on them often hinges on the quality of relationships that exist among the conflict parties” (157). However, to be successful, the IWRS should identify not just collaboration (which may only

address management issues), but a move toward adaptive governance of Oregon's water. Adaptive governance is essentially,

...the specification of public policy objectives, the allocation of government revenue, the imposition of regulatory controls, and the allocation of gains and losses necessary to achieve political equilibrium regarding levels of water quantity and quality...whether these are ecologically sustainable or not” (Susskind 2005, 142).

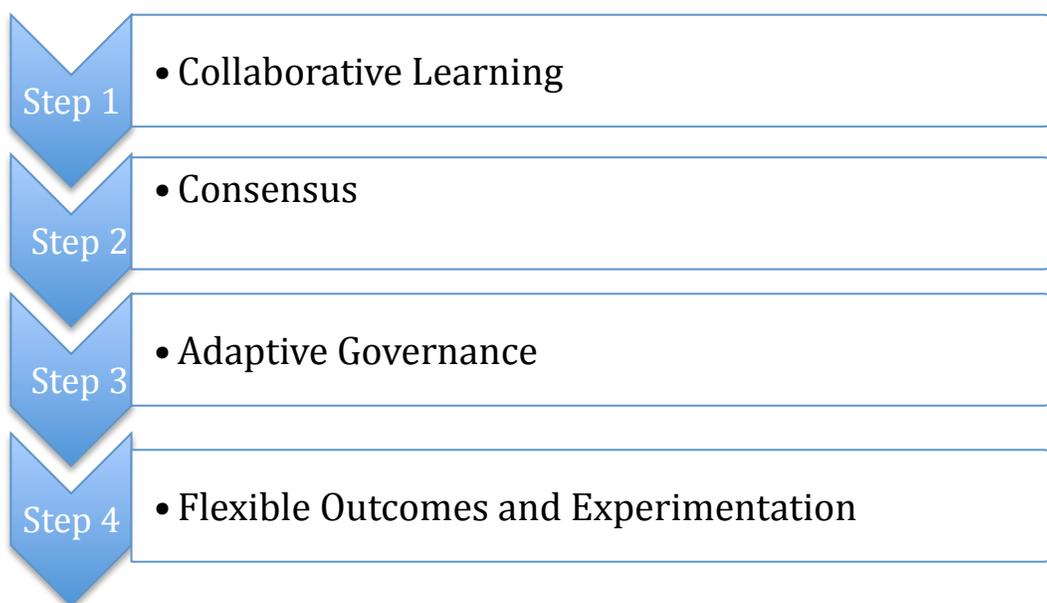
Adaptive governance requires several steps: 1) decisions must involve stakeholders and elected and appointed officials for both short and long term planning; 2) all parties should have “adequate technical support” to analyze and interact with “experts” to develop and maintain trust in the process; 3) neutral facilitators should help guide the process; and 4) “defining areas of disagreement, and experimentation and collaborative monitoring to resolve these disagreements, must be the primary response to scientific uncertainty” (Susskind 2005, 142-143).

While adaptive governance should be the goal, it requires the aforementioned steps to be successful. Using different collaborative techniques based on the actors and situation at hand is a good place to start.²¹ I would propose that an IWRS that truly seeks to fulfill the stated vision of “bringing various sectors and interests together to work toward the common purpose of maintaining healthy water resources to meet the needs of Oregonians and Oregon's environment for generations to come” (Oregon

²¹ There are different approaches to collaborative efforts like collaborative governance (Sirianni 2009) and collaborative learning (Daniels and Walker 2001). Since each situation is unique, the utilization of one of these (or another) collaborative approach should be based on applicability to the situation.

Water Resources Department 2011a, 15) needs to follow a conceptual map like the following (Figure 4):

Figure 4.3. Adaptive Governance Process



The first step is learning, in this case collaborative learning (Daniels and Walker 2001). Collaborative learning is intended for “multiparty decision situations” that can help lead toward consensus or at least active collaboration by: identifying the situation, sharing views and perceptions of the situation, generating dialog about interests and concerns, and devising improvements that work toward discussions about desired changes (Daniels and Walker 2001, 18). Collaborative learning can help build consensus, and establish a system of trust and mutual understanding between parties involved. Next comes adaptive governance, or the implementation of decisions generated from collaborative learning and consensus decisions. Adaptive governance begins to integrate other concerns like land use planning, mechanisms to

achieve compliance, and so forth to create a holistic, integrative approach to water governance. Finally, implementation of goals and objectives will need to be flexible and considered experimental, and must be reassessed and monitored to determine whether policies are effective or need to be revisited (Susskind 2005).

The goal of this process would be to eventually only focus on step 3 and 4, once parties have developed trust and a set of shared mutual goals and policy objectives. Then, the adaptive part of the process is the focus where policies that work are left to do their job, while policies that don't (or if a situation were to change) can be revisited and revised. Admittedly this will not be easy, nor will it be without conflict. However, our current system of water use and management no longer is sustainable. Water management has seemed "to put the highest possible priority on maintaining historical patterns of water use" that has established "property rights that are meant to trump any new interpretation of what might be in our collective best interest" (Susskind 2005, 141). Without simply stripping away those rights, there needs to be a way of managing and governing water that is fair, flexible and sustainable, something all parties would most likely agree to.

Finally, the IWRS should not be viewed as the definitive planning strategy, but rather the basis for communities to access information, resources, and ideas. Many stakeholders said that they did not want "top-down" management. Indeed, water management in Oregon most likely would not work well with that management

technique. The IAD framework described in this paper could be further used for each specific management area (whether that be basin or sub-basin) in order to understand the actors, policy situation, and physical and community attributes that weigh in on the decision making process. Then, working toward collaborative learning, consensus, and ultimately adaptive governance should be the goal of each basin (or sub-basin) in order to develop their own means of governing water.

Conclusion

Oregon is a region historically perceived as water rich. But a reminder of the 2001 Klamath water war illustrates how inaccurate this perception is. While Oregon's abundant rainfall has created an illusion of quantity, the state is in the midst of very real water scarcity issues. As more people become aware of this real and imminent concern, the state of Oregon is responding by developing a water management strategy to meet current and future water needs while simultaneously meeting the demands of various stakeholders and ecosystems, and under the constraints of current water law.

This paper used the IAD framework as a method of organizing and describing current water management in Oregon. Based on the stakeholder survey, actors involved in water policy in Oregon show concern for water scarcity issue and understand that climate change and population growth will only exacerbate the problems. The challenge for managing water scarcity is understanding the tools available for policy

makers. The interviews revealed that basin or sub-basin water management is preferred over a one-size-fits-all statewide plan, and that collaborative stakeholder participation is essential to meet the needs of each region.

Current water laws and norms shape water management in Oregon. The allocation of water to meet Oregon's ecological and societal needs and goals may require some creative incentives to water conservation. One thing is very clear: unless Oregon comes up with a viable water management strategy with clear policy objectives that are implementable, climate change and population growth to the region may take an excessive toll on Oregon's water, ultimately creating more problems with fewer viable solutions.

Conclusion

Oregon is a state with great social and ecological diversity. Unfortunately however, Oregon's water-rich reputation is more rumor than reality. As with many Western states, Oregon struggles with water scarcity, especially during dry summer months. And just like other Western states, the majority of Oregon's water use is for agricultural or irrigation purposes. Recent effort by the state to develop an integrated water resource strategy (IWRS) to manage present and future water demand in Oregon signifies the very real concern that water is no longer as abundant and available as it once was. With the predicted impacts of climate change and population growth, the already-strained water supply will unlikely sustain current water needs.

The statewide IWRS will serve as a policy tool for policy makers to shape the direction of Oregon's water management. It will not alter water code or prior appropriation, laws that are so ingrained in the history of water management in the west that the mere suggestion of altering them might spell political suicide. Instead, the challenge for Oregon is best stated as such:

How do you shift an existing pot of water without tipping over prior appropriation laws? (Interview conducted November 16, 2010).

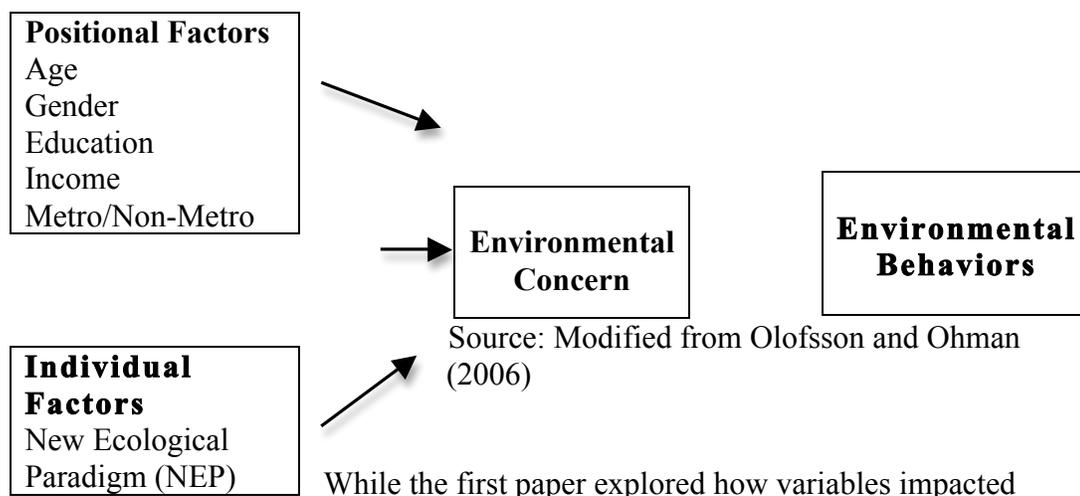
There is no clear answer to this question, but the effort behind the IWRS seems to rely on the scientific, public, stakeholder, agency, and other expert data in order to

generate a much-needed accounting of Oregon's water demands. Thus, the IWRS could provide an invaluable tool to plan for water needs.

The purpose of this dissertation was to present three stand-alone papers centered on the theme of Oregon water quantity. The first paper, "Determinants of Concern Over Water Scarcity in Oregon" focused on whether Oregonians are concerned about water scarcity both for the state and also on a personal level. Specifically, the paper explored whether sociodemographic variables, along with environmental values (measured by the NEP) predict people's concern about water scarcity. The results determined that older age, males, education, and the NEP were all influencing variables to some degree on concern about water scarcity both for the state and personally, yet overall these independent variables had a weak association (predicting only 6% to 10%). Interestingly, a majority of Oregonians felt that water quantity is a problem in the state (56%), while only about 36% felt that having enough water would affect them personally.

For the first two papers "Determinants of Concern Over Water Scarcity in Oregon" and "Attitude-Behavior Consistency in Household Water Consumption: An Oregon Case Study" the following theoretical model provided a framework to understand how independent variables influence concern that in turn affect behavior.

Figure 5.1. Theoretical Model



concern about water scarcity, the second paper, “Attitude-Behavior Consistency in Household Water Consumption: An Oregon Case Study” examined how these same variables (sociodemographic and NEP), in addition to concern, influenced environmental behaviors. The results determined that of all of the factors explored, concern about water scarcity, age, gender, income, and support of the NEP were all reliable predictors of participation in water conservation behaviors. However, while reliable, these variables predicted only 9% of the variation leaving much to be explained regarding what factors influence behaviors.

From the first two papers, three important points emerged. First, the majority of Oregonians are concerned about water scarcity. Second, Oregonians agree that the top three water priorities are drinking water, irrigation and wildlife. Third, the majority of Oregonians perform almost all of the water conservation activities. This

is good news for Oregon as it moves forward with the development of its statewide, integrated water resource strategy since public support for water conservation and allocation will be important.

The first two papers provide the background for the third paper “Applying the Institutional Analysis and Development (IAD) Framework to Oregon Water Policy”, by integrating the public survey results with the stakeholder/actor survey used for the IAD chapter. In the third paper the IAD was applied to current water management in Oregon as it pertains to the development of the IWRS. Therefore the IAD paper explored the physical environment, community factors, rules and management of Oregon water (including Oregon water law), stakeholders, and state agencies that are all components of water management in Oregon.

The use of the IAD Framework provided a clearer picture of the actors involved, the rules in place, and the environment (physical and social) that comprise the policy arena for Oregon water management. Through the stakeholder/actor survey, contextual interviews, and reviews of the OWRD’s database of surveys, interviews, and issues briefs, the IAD chapter illustrated that in order for the state to meet water management goals, it needs to consider various stakeholders needs, as well as the unique basin (even sub-basin) water needs and challenges. Most importantly the state must create a sense of community or collaborative management as opposed to a top-down, one-plan-fits all approach.

Both the public survey and the stakeholder survey revealed some positive similarities. First, a majority of the general public and stakeholders feel that water quantity is a problem in Oregon. Second, both groups surveyed agree on how to prioritize water use (drinking water, irrigation, and wildlife). This combined with the fact that a majority of Oregonians are currently engaged in water conservation activities illustrates that Oregon has a strong bases to build a water management strategy that is publicly acceptable and most importantly implementable.

However, the use of the IAD is both beneficial and problematic. The benefits to using this framework is the successful application of IAD in collaborative based management studies, irrigation policies, and other natural resource based policies where the use of the IAD illuminated the interconnectivity of common-pool resources with social, economic, and bio-physical concerns. An issue with the IAD is that it does not define a unit of analysis. This can potentially be both a strength and a weakness. The strength is that it is creative and flexible. A unit of analysis could be a neighborhood, an environmental organization, or a water management sub-basin. However, the compromise is that it is more difficult to make comparisons with other IAD analyses unless the unit of analysis was identical. In this study, the separation of stakeholders from community members is a questionable choice. With a policy implication that will require buy-in from the public (or community), does this inherently make the community stakeholders as well? Without clearly delineating the

differences and impacts of stakeholders and community members the separation of the two may be a poor choice. This may mean that in the application of the IAD to water policy in Oregon, it is a good choice for macro level policy, but not micro level or sub-basin analysis. Regardless, it is important to understand that when applying a framework there are inherent trade-offs and choices about how the issue is framed for analysis.

Oregon's water issues are a long way from being resolved. As one of the last two Western states to initiate an IWRS, Oregon had yet to take account of water needs, stressors, uses, and demands until the recent efforts by OWRD to develop a management strategy. The strategy itself will only be a starting point to help guide and direct water management. However, water management in Oregon will take more than a strategy. It will require the participation of stakeholders, the support of the public, and strong leadership willing to address Oregon's water problems with candor and with solutions in mind that will be respectful of social, environmental, economic, and cultural concerns.

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