Water Resource Distribution in the Deschutes River Basin

A Critical Analysis of its History, Evolution, and Current Application

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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> The internationally recognized human right to water and sanitation is not currently enforceable through domestic law within the United States.
>
> – Susan L. Smith, (Willamette Law Review, 2011)

I. There is No Natural Resource As Important as Water

Climate change, increased frequency and intensity of natural disasters, and ecosystem damage have raised the issue of an uncertain future for water resources in the Deschutes River Basin of Oregon (Turner and Perry, 1997; Central Oregon Intergovernmental Council, n.d.). Water rights have historically been used to manage the competing interests of nature, agriculture, municipalities, and others for the water resources of this basin (Haner, 1927; O'Connor et al., 2013; Deschutes River Conservancy, n.d.). The early establishment of prior appropriation has resulted in prioritization of the water needs of the oldest properties, while water for newer properties is cut off during drought years. Prior appropriation is a common law system that establishes a hierarchy of who receives water first. The first to take water in the past will be the first to receive water each year, the second receives water second, and so on. Many newer properties are used for agriculture, primarily for the growth of seed crops (Oregon State University, n.d.). Older properties with older water rights are mostly hobby farms that do not economically rely on their farms. Losing access to water risks the livelihoods of farmers who rely on their crops for their income, yet have junior water rights.

Without water life does not exist; ecosystems within this basin rely on there being some water left over in the river. This is particularly important for the conservation of endangered species such as the spotted frog (Deschutes River Conservancy 2020). Lack of reliable water in an arid region has far reaching consequences for local ecosystems, as well as for local communities – decreased economic output of farms, increased competition, and, in extreme

cases, potential for conflict. It is critical, then, that we evaluate existing resource allocation systems preemptively – as Ben Franklin said in 1735, "an ounce of prevention is worth a pound of cure." Lack of planning in this system, followed by decision making that promotes the goals of select individuals has resulted in a fragmented and inefficient water resource distribution system. Implementing improvements is easier now as problems begin to arise, prior to irreparable damage.

I use Mesthene's large political and economic system analysis perspective (1970) to develop a holistic perspective of the unique challenges faced within the prior appropriation based water rights system in the Deschutes River Basin (DRB). I focus on the evolution of public and private ownership, individual decision making at multiple levels, and surprising controversies with outsized effects. Mesthene employs case studies of U.S. education and medical practices in his analyses to discover insights about large, public, unplanned or uncontrolled systems. These insights increase understanding of key problem points that also exist in water rights of the DRB. This research paper explores the interactions between individual decision making, slow legislative change, and economic influences on the development of water resource distribution in the DRB by exploring parallels between this case and these two case studies. With this novel understanding, interested stakeholders will be able to make informed decisions about the future of water usage in this basin.

II. Problem Definition: Users Are Reliant on the River Continuing to Supply Water

Many Changes have Occurred in the Past Hundred Years of Oregon Water Legislation

By 1909 prior appropriation was officially established in the state of Oregon (Deschutes River Conservancy, n.d). In 1927 an early mention of prior appropriation appeared in the court opinion of the Circuit Court of the State of Oregon for the County of Deschutes, which details

the attempt of the "relative rights to the use of the waters of the Deschutes River…" by the State Engineer, and the resulting complaints to the court regarding the fairness of his decisions (Haner, 1927). In 1970 the Congress of the United States passed the Clean Water Act (CWA), following which Oregon enforced federal surface water quality standards detailed in the CWA as its primary water quality regulations. Further legislation was passed in 1987 to allow rivers to hold water rights; however, they were junior to the ones previously owned (Deschutes River Conservancy, n.d.). In 2002 Oregon listed 13,300 stream miles as in violation of standards and in 2003 passed a Senate bill that encourages urban waste water reuse (Callens, 2004). In fact, the city of Redmond uses its treated wastewater to water hay fields, decreasing how much it draws from the Deschutes River (City Council, 2020).

As Callens outlines in the overview of the CWA in Oregon, there are mandatory water quality and management standards that water in the state must meet as a direct result of the adoption of the CWA (Callens, 2004). These standards have led to further tiers of government involvement at the local and county levels. This paper focuses on Central Oregon Irrigation District (COID) and North Unit Irrigation District (NUID), two of the primary irrigation districts in the DRB. These entities work closely with others in the region, as well as with organizations like the non-profit Deschutes River Conservancy and local governments.

COID and NUID manage the water rights of property owners within their respective boundaries, distributing water through networks of pipes, canals, and reservoirs. These open channel systems risk heavy losses of water from evaporation and infiltration; however, closed systems prevent ecosystem access to water. Properties in COID tend to have older water rights than those in NUID, thus in drought years irrigation flows are lowered first in NUID (Deschutes River Conservancy, n.d). Both of these organizations provide vital bureaucratic organization that

allows users to determine who gets water. Without these districts managing water use, many of the problems that are beginning to become prevalent would likely have occurred much earlier. In analyzing this system, it is important to remember that individuals and organizations in the past were making the best decisions they could with the information available to them; however there are further improvements that can be made.

Increasing Water Scarcity Cannot be Ignored

Water supply in the Deschutes River Basin is dependent on the snowpack in the Cascade Mountains (O'Connor et al., 2003). Historically, the snowmelt fed into the Deschutes River, which then flowed along the populated areas in the basin. Some water was removed and put to use, primarily for growing crops. Water rights specify how much water an individual can take from the river to be put to beneficial use (Deschutes River Conservancy, n.d.). Though the river flows year round, it is highly dependent on snowpack in the Cascade Mountains, which is itself highly dependent on meteorological patterns like El Niño and La Niña cycles that are becoming more extreme as the global climate changes. As of January 2024, the region was still in a moderate drought, caused in large part by El Niño (Mayfield, 2024). On January 4th, 2024, Jeremy Griffin, the Deschutes Basin Watermaster said to the Bend Bulletin:

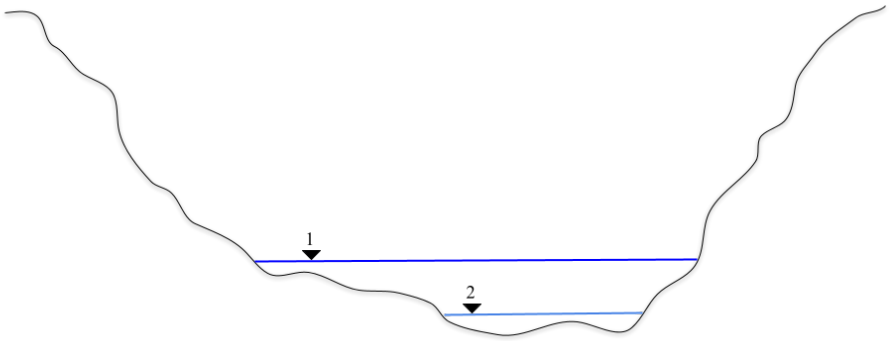
> "Currently, Oregon is sitting at 18% of either moderate or severe drought," Jeremy Giffin said Thursday. "The upper Deschutes Basin is mainly under 'moderate drought' right now." According to Giffin, the Cascades are only at 36% of their average snowpack for early January. (Mayfield, 2024)

Additionally, the volcanic geology of the region results in low drainage, so the bulk of melt from the Cascades is flowing in the river (O'Connor et al., 2003). The DRB does not receive high precipitation as it is a semi-arid landscape in the rain shadow of the Cascades. All of

this means major reduction in water available to the Deschutes river and those that rely on it – human and non-human alike.

Small scale efforts to address water loss are occurring [SOURCE]. A collaboration between the Deschutes River Conservancy and COID promotes conservation on individual farms and there are canal piping projects being designed to prevent 32.5 cubic feet per second (cfs) of water from being lost to infiltration and evaporation (Kohn, 2024). The Deschutes River Conservancy says that Oregon law prohibits the river having less than 30 cfs at any time; however, 250 cfs is considered the lowest level the river should be allowed to reach to maintain it as a scenic waterway and healthy ecosystem (n.d.). See Figure 1 below for an approximation of the difference these levels make in the river's surface level. While these efforts are needed, they do not fully address the complex interactions that occur between the values of individuals and values of stakeholders.

Figure 1
Sample River Cross-Section



Note. Surface 1 indicates water level at approximately 250 cfs flows, while surface 2 indicates 30 cfs flows, emphasizing the vast difference between the minimum allowed and the minimum that is healthy for local ecosystems. Both are still considered low flows for the river. Created by the author.

Continued conservation efforts combined with efficient legislation and operation, as well as increased user compliance is critical for addressing the long term water needs of human stakeholders without sacrificing the health of the river's ecosystems. Clear understanding of

user's traditional values, especially right to privacy versus the government's right to ensure equitable access to resources, provides much needed insights about this system.

This gap in knowledge concerning the evolution of water resource distribution within the DRB must be filled. It is imperative that relevant stakeholders – including the public, farmers, government, environmentalists, etc – take an interest in understanding the past so that it is possible to critically evaluate the present and decide how to move into a future that maximizes needs met, ensures conservation, and increases efficiency.

III. Research Approach: Case Studies Allow Us to Learn from the Past

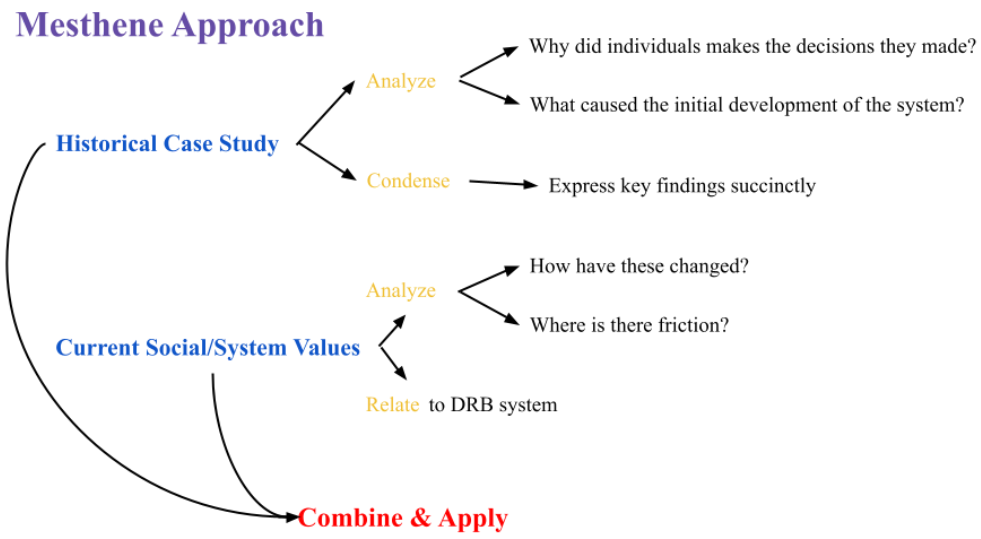
Case studies demonstrate the complexity of issues involving the government, corporations, the public, and others. They also show how systems have been changed by technological advancement in ways that are neither inherently good nor explicitly bad. Emmanuel G. Mesthene, a faculty member at Harvard University, developed an effective research approach for examining such systems in chapter 3 of his book *Technological Change: Its Impacts on Man and Society* (1970). In his book he closely examines systems that have successfully transitioned from small, private, and decentralized to large public entities. He looks at key components of technological development as it relates to governance, going as far as to say that society "face[s] the problem of deliberately restructuring our political institutions… [for] the enhanced social role of the public sphere" (Mesthene, 1970, p. 69).

Mesthene explicitly speaks of a "renewed effort to save society before it explodes under planlessness and inadequate administration," suggesting that consequences for lack of action could be severe (1970, p. 78). Even with new technology there was awareness of devastating societal implosion rooted in unplanned ventures. Mesthene shows that it is possible to organize a large public entity as technology and its role in society develops. It has been done with education

and medicine. It follows that it is feasible to reorganize the complex legislation, competing economic interests, and traditional values of finite public resources like water. Education and medicine are still evolving systems; however there is a distinct organizational component to them that distinguishes them. Understanding of these organizational structures can be applied to water resource distribution in the DRB, see figure 2 below.

Mesthene communicates that people will have conflicts of interests between their commonly agreed upon responsibilities to society (the basis for laws) and their rights (privacy, for example). He asserts that "that individual privacy declines in a complex technological society…" with "many people voluntarily trading some of their privacy for benefits…" and highlights the potential for friction as transitions occur between the public and private sectors (Mesthene, 1970, p. 82). One cannot exist without the other, but coexistence is a constant struggle for the upper hand. In the case of education, governments previously were "to provide for the national defense and to act as agents of social justice," whereas now, governments must provide free public education for years. This results in bigger bureaucracy, leading to shifts in public versus private control of goods important to the public. The key finding of his research is that while technology and unruly systems are difficult to control, it can be done through carefully examining the roles they play in our society. A final touch to the research approach used for this paper was to organize evidence clearly and impactfully to impart on the reader the gravity of this matter and provide a logical framework for addressing the problems found.

Figure 2
Mesthene's General Approach



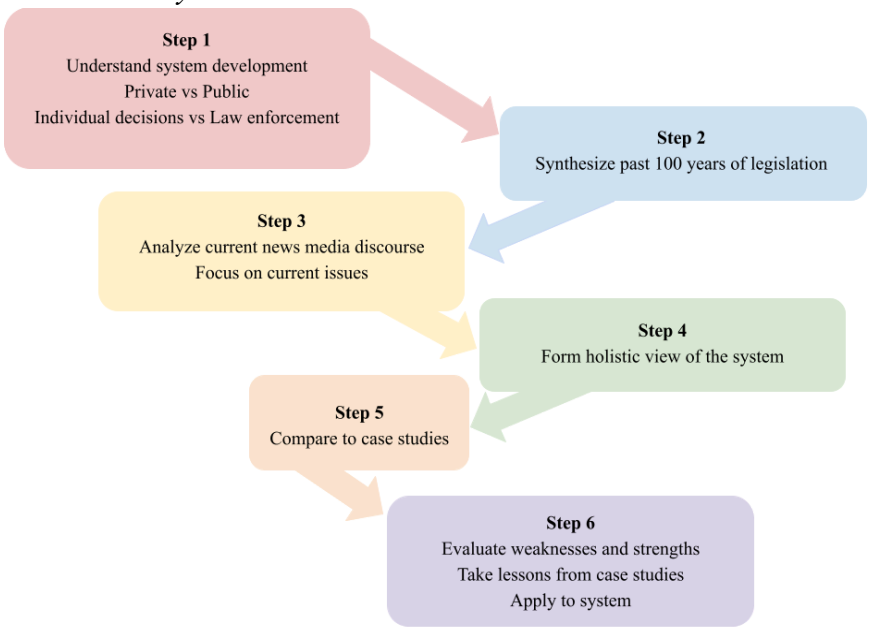
Note: Mesthene utilizes critical analysis of systems from a public versus private view that capitalizes on understanding how individual decisions interact with the common good. Created by the author.

Legislation at various governmental levels, a court case, local news articles, scientific journals, and conservancy websites were used to gather evidence and create a case study of the DRB water system structurally similar to Mesthene's education and medicine case studies. Scientific journals provided expert opinions in contrast to public opinions furnished by news articles. Varying attitudes towards the system highlight friction points that can be used to promote beneficial change to the system. Legislative history provided a framework for the development of the water distribution system as it is today. Understanding how the system arrived at its current structure illuminates strategies that were or were not successful, which can increase effective future solution implementation. Conservancy and irrigation district websites gave information on small scale improvements to water efficiency in the system, while also providing information on technical factors.

The steps shown in Figure 3 below were followed to generate insights about the DRB system, especially concerning its development and inefficient operation. The history of water law in the region provided a timeline for the system's development and a basis for relations between public and private entities. Discourse analysis of recent news articles highlighted challenges within the modern system. Together the historical and modern system overview result in a holistic perspective on water resource distribution in the DRB. Most importantly, this synthesis demonstrates why the system developed as it did and why individuals make the decisions they do concerning water. Strengths and weaknesses in the DRB system became evident when the case study created was compared to Mesthene's case studies. These can be used to inform future decisions by stakeholders within the system.

Figure 3

Six Steps to Understand a System



Note: Each of the steps outlined in the figure further increases deep understanding of the system. Created by the author.

My research method exposes the hidden dimensions of the DRB water distribution system. Case studies of systems that have undergone restructuring to improve function at a large scale show how to implement effective change (e.g. U.S. Education and U.S. Medical Practice).

Increased understanding of seemingly unrelated systems that are linked by their size and importance to the public can be applied to other similar systems. Similarities of the DRB to U.S. education and medical practice suggest that it is possible to shift the focus of water resource distribution to prioritize the needs of all stakeholders at a system level.

IV. Results: Complex Systems Require Complex Solutions

The Shift from Primarily Private to Primarily Public Has Not Occurred

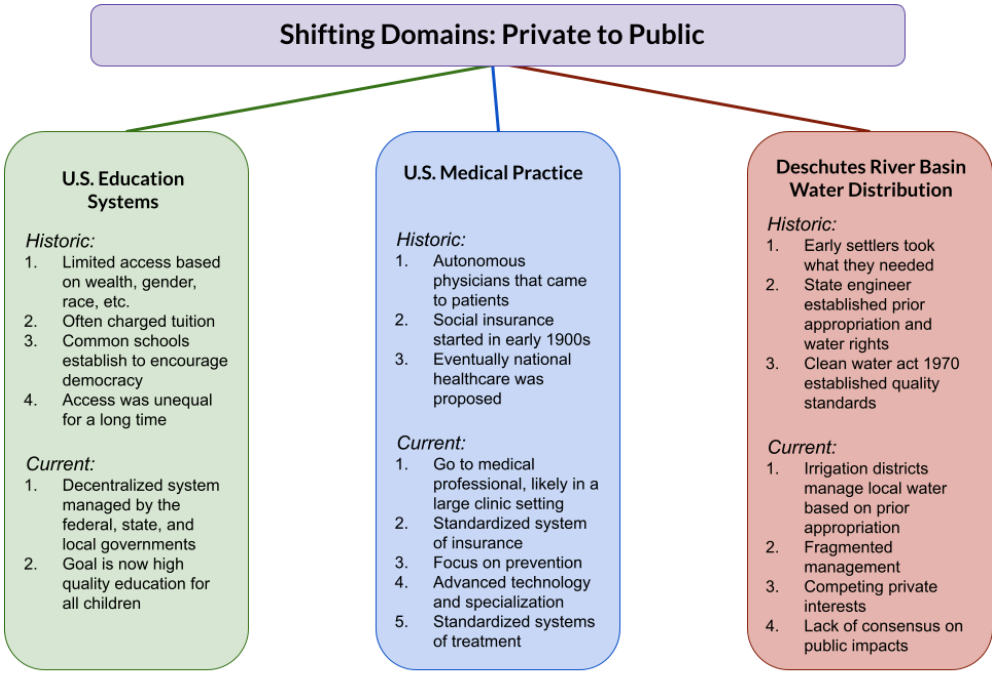
Organization of a system does not need to be the same; however, it must exist and be intentional. As mentioned in the previous section, Mesthene brings up two case studies that are comparable to water resource distribution due to baseline similarities – private and public domain interactions, affecting a large number of people, and the general view that issues are the responsibility of the government to fix. These case studies are public education and medical practice in the U.S., which both began with limited accessibility and did not meet the needs of the broader population, then managed to make the shift to the public domain, where they could meet the needs of greater numbers of individuals. There is still work to be done in these systems; however, education is now publicly available to every child in the country and medical practice is highly specialized, with the ability to treat large numbers of people with a vast array of issues. Education is managed at the federal, state, and local levels in a very decentralized, but highly structured way (Kober and Rentner, 2020). Medicine also has many elements of government involved on issues such as standard and allowable practice, as well as private groups such as insurance companies (Konklin, 2002).

In contrast, there does not appear to be large-scale standardization of management in the Deschutes River Basin. NUID is reliant on COID being willing to cooperate with it to ensure adequate water reaches farmers, while conservancy groups have to fight for water in the river

and to protect endangered species habitats (Deschutes River Conservancy, 2020). There is significant disagreement in the best way to handle water shortages. Even groups making an effort to implement solutions that meet the needs of at least two interest groups have not yet had success beyond small localized settings. Legislation has not undergone any significant change to account for modern challenges, such as climate change and decreased water supply reliability. Figure 4 below shows a quick summary of all three systems, historically and at present.

Figure 4

The Shift from Private to Public is Inevitable



Note. U.S. education and medical practice both began as private systems with limited accessibility, but have since shifted to largely public and standardized systems. The Deschutes River Basin Water Distribution system has not yet completed a similar shift. It is somewhat publicly managed, but there is not a consensus on the overall goal of the system. Created by author.

Despite being a public resource, debates of who should get water and who legally can access water remains largely fueled by private interests, including individual economic gain and differing views of environmental goals (Deschutes River Conservancy, 2020; Kohn, 2021). Consequently, there is little agreement on how to manage water going into the future, but lots of agreement that water must be managed. The question then becomes "how?"

In a system where private interests dominate, even when public interests help more people, there is little incentive to conserve water where it is possible or even economical to do so. Increasing the public side of the system would allow incentives to be developed and implemented on a scale large enough to make a noticeable difference. According to Central Oregon Landwatch, an organization aimed at educating the public on water waste in Central Oregon, “there is no incentive to conserve water so property owners don't. COID only tells us when we haven't used enough to maintain our water rights, but not when we're using too much” (Central Oregon Landwatch, 2023). This is one example of a direct consequence of lack of planning in the development of a large public system. It is not that people are opposed to conserving water, rather they simply have no incentive to do so. On the flip side, they do have an incentive to use all of the water they are allocated, even if they do not need to.

Efforts to Address Problems Are Fragmented and Have Limited Public Acceptance

As mentioned above, there have been efforts made to increase conservation of water at the individual farm level and in municipalities within the DRB (Kohn, 2024; Deschutes River Conservancy, n.d.; Central Oregon Intergovernmental Council, n.d.). The collaboration between COID and NUID ensures that farmers in NUID have closer to adequate water to grow their crops, and the Oregon Department of Environmental Quality ensures that water quality meets standards set in the CWA, resulting in water bodies suitable for recreation and as habitat for local wildlife (Department of Environmental Quality, n.d.). Piping projects aim to decrease water loss due to evaporation and infiltration, and property owners can lease some of their water rights back to their irrigation districts if they do not want to use them (Kohn, 2024). Despite problems with each of these partial solutions, they demonstrate that people are concerned and are addressing the problems occurring in the DRB system before irreversible damage is caused.

That being said, there are issues that remain. Disagreement over who deserves water, especially controversy over spotted frog habitat conservation, remains prevalent. There is no financial incentive to lease water back to the districts for those who do not own enough acres of water. A property owner must lease at least ten acres of water back to their irrigation district to receive monetary compensation (COID, 2023). Heightened public awareness would encourage faster legislative change – historically slow – that could support solutions. Understanding and increasing utilization of enforcement within the system, as well as clear incentive to conserve water, could increase participatory buy-in to the system. Educational outreach could teach the public about the importance of water and the issues within the system from all perspectives. Such efforts are fragmented now, but their implementation could lead to solutions that satisfy all interested parties.

The System Remains Complex and Requires Further Research

This system is incredibly complex, with decades of history and many different groups who have competing interests and opinions. The final finding of this paper is that there is no one perfect solution. Continuing to use the strategies already in place, improving their efficiency and implementation is critical. Increasing cohesive management remains a challenge that must be addressed quickly in order to stave off consequences of over using water in a climate where water supply is increasingly variable. Additionally, increased efficiency and systematic participation would address a wider range of users within the system. I acknowledge that while case studies are a good way to gain some insights and make comparisons, they examine different systems with vastly different components, thus they are not completely analogous. They should serve rather as a guide or inspiration for what is possible, but not as an exact roadmap of how to reach the goal of an ideal system. Additionally, there are many complexities of the DRB system

that have not been fully explored in this paper and likely more that remain undiscovered as they were outside the scope of this project. As such, further research should be conducted in conjunction with solution design and implementation. More research would increase both the knowledge base from which future decisions within this system could be made and enable adoption of the most efficient model for management of this system.

V. Conclusion: There is Work to Be Done

At the beginning of this research journey it was not obvious how influential differing belief systems were on individual decision making about water usage. According to the Deschutes River Conservancy, droughts and pressure from farmers who were losing their livelihoods called for litigation protections for irrigation districts in case river flows dropped below critical levels, which could prevent the protection of endangered species such as the spotted frog (2020). This highlights that private interests still have heavy influence in a system that is shifting to having more public importance. Controversies shift focus away from the real issue – lack of a clear goal for the water resource distribution of the Deschutes River Basin.

Using Mesthene's research approach as described above showed that it is important to pay attention to what individual decisions add up to within a system. One alone will likely have little impact, but together they can add up to big changes. The question for the future is if these will be good changes or bad. More government is not necessarily the best solution, but it is critical to carefully examine the system from all angles and organize it before issues worsen. Practically, these results show that in order to move forward and organize this system, for it to make the shift from private to public, all people and groups must be brought to the table and their concerns addressed. Fragmented patch solutions, like those being conducted currently, will continue to alienate groups and prevent system organization that will allow the river to meet the

water needs of all its users – human and non-human alike. I acknowledge that there were many limitations of this research, duration being the most relevant. It was beyond the scope of this project to fully understand all perspectives; however, this paper starts the work that must be done in forming a holistic perception of water resource distribution in the Deschutes River Basin.

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