AN EXAMINATION OF THE UNITED STATES' SYSTEM OF WATER MANAGEMENT

598 Policy Report

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EXECUTIVE SUMMARY

Adequacy of water supply is a major concern in a variety of jurisdictions around the world, including the United States (US). A growing population, along with regions of arid climate, combine to place significant strain on the US water supply system. To complicate issues, certain portions of the country, especially in the northeast, have access to a significant water supply while others, notably the southwest, lack such access, creating an imbalance between regions. As the population of the arid southwest continues to grow at a rapid pace, finding a sufficient supply of water becomes an issue of increasing urgency. This report is an examination of the US system of water management that looks at how the system works and at efficiency issues, primarily in the south west. This research is being conducted on behalf of the Canada-US directorate at Environment Canada and is designed to provide information to Canadian policy makers engaging with their US counterparts on water policy issues.

Key Findings on Water Efficiency

Greater Water Efficiency Can Solve Supply Issues for the Next 25 years

Generally there is a consensus among the academic and scientific community that greater conservation and water efficiency measures can solve the water supply problem in California and the south western states for the next 25 years without the need to find new large sources of supply (Gleick, Cooley and Groves 2005; Anderson and Snyder 2002; Myerson 2002). To reach that point, water experts believe that there are three policy issues in particular that need to be tackled. First, water needs to be given a price that reflects its true cost. Second, a transfer is required of water from the agricultural community to municipal use. Third, water and land planning must be undertaken conjunctively.

Action on Efficiency has Started, but Much Work Remains

The south-western states, where water shortage is most critical (USGS 2008b), have already started to implement many water efficiency policies and are reaping the rewards of doing so. Where previously it was thought that water scarcity was the result of a lack of supply and new sources were required to solve shortages, it is now felt that scarcity is actually the result of a lack of efficiency. Many examples can be found where simple policy actions have significantly reduced consumption, which leaves a sense of optimism that the water efficiency agenda is gaining momentum, but there is still a long way to go before the water experts will be satisfied. Despite the fact that the US has been able to reduce its per capita water consumption since 1980 (Hutson et al. 2004), it still ranked last in an international study of water efficiency (O'Neil and Dobrowolski 2005). The population of the US has increased by 90 percent between 1950 and 2000, while public consumption of water increased by 209 percent during that same period (Subcommittee on Water Availability and Natural Resources 2007).

Key Points on the US System of Water Management

Shared Water Jurisdiction Creates a Complex System with Overlapping Responsibilities

The US system of water management is strongly influenced by the federal style of government that has a national government and various sub-national governments. With no specific constitutional authority over water, both the federal and state governments have a claim to water jurisdiction. The result is a complex system with many checks and balances and overlapping responsibility.

The federal government receives its authority over water issues primarily through the Commerce Clause of the Constitution, while the states receive their authority through the constitutional right that all issues not prescribed to the federal government fall under state jurisdiction. Historically, the federal government has deferred to the states in most decision-making areas of water policy. During the green wave of the 1970's, however, the federal government started to exercise its authority in the area of water quality with the implementation of a new Clean Water Act. In recent years, the Supreme Court has opened the door to greater federal authority on water supply issues as well (Benson 2006).

The CWA and ESA Have the Greatest Impact on Water Management

The two most influential pieces of legislation on water management are the Clean Water Act (CWA) and the Endangered Species Act (ESA). The CWA sets minimum standards of water quality that states must meet. Where the states fail to meet the federally set standards, the federal government will act instead. The ESA's purpose is to protect plant and animal species from extinction. The power the ESA has over water policy is that it prohibits all federal agencies and individuals from harming listed species. As water projects often alter the chemical, physical or biological integrity of a waterway, the impact of this legislation can be far-reaching if a listed species has the potential to be harmed.

Different Legal Approaches Across the Country Impact Water Scarcity

The complexity of the various legal approaches that different states have for water law results in there being fifty different water systems across the country. Each state's approach reflects the local reality of their water access. There appear to be two basic models, however. In the east, where water is plentiful, water rights are attached to land ownership. In the west, where water is scarce, water rights are generally associated with the date that the water was first used for beneficial purposes. The differences between the two approaches have significant impacts on the way each region deals with issues of scarcity. Furthermore, federal and Indian reserve rights supersede state law and have the potential to interrupt the manner in which others use their water. Understanding the complexity of these competing factors is important when considering how the country as a whole will approach water related challenges in the future, such as increased scarcity.

INTRODUCTION

Adequacy of water supply is an acute concern in a variety of jurisdictions around the world, the United States being one. A growing population along with regions of arid climate combine to place significant strain on the water supply. To complicate issues, certain portions of the country, especially in the northeast, have access to a significant water supply while others, notably the southwest, lack such access, creating an imbalance between regions. As the population of the arid southwest continues to grow at a rapid pace, finding a sufficient supply of water becomes an issue of increasing urgency. One solution often mentioned is importing fresh water from Canada.

Canada has long been considered to have an endless supply of its own fresh water. In reality, this assumption is misleading. While Canada does have 20 percent of the world's fresh water, only seven percent of that amount is renewable, roughly the same amount as the renewable supply of the United States, and behind both Brazil and Russia (Morris et al. 2007). Nevertheless, Canada does have significantly more water per capita than the United States, and so long as the US is facing water supply shortages, a moral, economic and environmental debate will ensue as to whether Canadian water should be exported to the United States. The focus of this paper, however, is on the US domestic system of water management, not Canada – US relations.

This research is being conducted on behalf of the Canada-US directorate at Environment Canada and is designed to provide information to Canadian policy makers engaging with their US counterparts on water policy issues. At the request of the client, this paper addresses three questions. First, how does the US system of water management work? Second, how seriously is the US treating its water supply and efficiency problems? And third, in which direction is the United States policy on water supply going?

In answering the three questions above, this report argues that the United States has the ability to find sufficient water to meet its needs over the next 25 years through greater water efficiency measures. The US is moving away from an era where scarcity was thought to be the result of a lack of supply to one where scarcity is believed to be the result of a lack of efficiency. Many steps are already being taken on this front, but not to the extent that water experts believe is required. If the US federal and state governments are able to make the necessary decisions to fully advance water efficiency programs, the US can stave off water supply issues for the foreseeable future.

Because the focus of this research is the US system of water management as a whole, with specific attention paid to the issue of water supply, two large components of water policy receive only limited attention in this paper: transboundary water issues and water quality. Furthermore, as issues concerning water supply are most pronounced in the southwest region of the US, that area will receive the most attention.

The first section of this report provides a review of the US literature on water management, followed by a section describing the methodological approach adopted in this report to address the research questions. Sections three to seven then provide an

overview of the US water management system as a whole. Since the intended audience is a federal Canadian agency, the focus will be slanted toward the US federal government's role, as that is the conventional level with which these Canadian officials most often interact. The importance of this element of the research is to provide those engaging in discussions on US water policy with a basic understanding of the US system and the tensions within it.

The eighth section attempts to gauge the level of priority the United States places on water supply and efficiency by looking at some examples of action being taken. This section helps to inform the debate as to whether the US is sufficiently concerned about their own supply issues as to even merit the potential option of importation of Canadian water.

Sections nine and ten then consider the current direction of US policy on water efficiency and tries to provide some explanation as to why US policy makers have not adopted the recommendations of water experts who believe that water supply issues can be solved through greater efficiency and conservation efforts. This section of the report will help to anticipate the direction that US water policy might take in the future.

I. LITERATURE REVIEW

Evolution of the Literature: A focus on Science and Engineering

The literature on water issues is considerable and can roughly be divided into two areas, the scientific and engineering side of water related issues on the one hand and water management on the other. The latter is comprised of the decision making and governance issues relating to water. A large portion of the literature and research today is focused on the scientific and engineering aspects of water issues, which is beyond the scope of this research, other than to establish the fact that efficiency gains in the US are feasible. Despite being a less popular topic in recent years, there remains sufficient literature examining the institutional, political and legal tensions of water policy in the US. These are the primary topics of consideration for water management and are the areas of the US literature on water, which is the focus of this research.

There were several books written on the subject of US water management in the 1970's and 1980's. The flurry of publications coincided with the Water Resources Research Act of 1964, legislation that established a water research centre within a college in every state across the country (Gerlak, 2005 p. 237). That same attention, however, does not seem to exist to the same degree today. The change in attention is likely a result of the fact that policy makers no longer need to be convinced, to the same degree, of impending problems with water quality and quantity. Instead, the focus is now much more on the scientific and engineering side, in order to improve and discover new water technologies for water both water supply and water quality. That is not to say that literature on management related issues does not exist, just that there is considerably more on the scientific side.

Heavy Focus on the Legal Issues

There is a heavy focus on the legal issues associated with water policy, which has dominated much of the conversation in the literature. This focus is not surprising since rights of access to water is a common feature of water management regimes. Much of the available US literature on water management is found in law journals, especially those from states that regularly deal with water related issues, such as the *Colorado Journal of Environmental Law*, the *Utah Law Review*, *Texas Tech Law Review* and the *Michigan State Law Review*, to name a few. The emphasis on the legal aspect of water policy might also help to explain why federal – state relations are often a dominant issue in water policymaking reform.

Interest Groups

While the legal field is well represented, there is a lack of literature on water policy interest groups. Interest groups are organized groups who take an active interest in a given policy issue and are also commonly known as pressure groups, advocacy groups, lobby groups, public interest groups, single-issue groups, and many others (Newman and Tanguay 2002). Those who regularly follow American politics are aware of any number of interest groups who might take an active role in water policy discussions, but the lack of literature dealing with these groups represents a significant gap in the study of US water management. It is also perhaps representative of a lack of contribution from these

stakeholders in terms of formal literature, which might illuminate their perspectives on water policy reform.

Elizabeth Graffy (2006) is one author who has looked at groups interested in water scarcity issues and found that there is a lack of unity between these groups. Through her research she determined that water interest groups have not been able to agree upon a shared problem definition, which leads to confusion among the public and policy makers. This confusion ultimately creates a system that is at best reactive to emergencies rather than forward thinking.

Beyond Graffy, lack of literature on water interests groups presents a gap in the full understanding of water management issues because of what is known about the influence that interest groups have on policy in general. Arthur Bentley, one of the first to study interest groups, argues that every group in society has a specific interest and that it is the role of government to strike a balance between these groups and the pressures they bring on government (Bentley 1967). In the balance between interest groups, Newman and Tanguay (2002) note that government outputs, such as laws, regulations and policies can be seen as a crude measure as to the influence of any particular group at a given time. Furthermore, group influence comes in waves with no interest group being able to dominate for any length of time (Newman and Tanguay 2002).

It is often through advocacy groups that Ellison (1998) argues that changes in policy occur. An outside pressure can force several groups into what he calls an advocacy coalition. When that coalition is sufficient in size, it brings the "conditions necessary to produce new governing coalitions or new policy approaches," (Ellison 1998, p. 38). Beyond the coalitions that bring complete policy change, Lowi (1964, p. 680) notes that the nature of the role interest groups play within the US political system brings with it a "pattern of access that [leads] to supportive relations between pressure groups and officials." The relationship that develops between interest groups and government has been called an iron triangle. In this theory, a small group of people from Congress, the bureaucracy and interest groups maintain a significant level of influence over policy decisions on a particular topic (Gais, Peterson and Walker 1984). In the absence of academic study on water interest groups, these general theories on group coalitions provides some, but not definitive insight, into the role that interest groups play in water policy and the direction that policy is being pushed.

Federal-State Relations and the need for a Coherent National Approach

From the perspective of the governance of the US water management system, the literature is divided as to whether the federal government or the states should play the stronger role. This division is not terribly surprising, as one would expect tension to exist in a healthy democratic nation based on the principles of federalism.

As water law and water needs vary greatly across the country, a logical argument can be made as to why states should bear the primary responsibility for decision making on water management issues. The argument is founded on the notion that, compared with the federal government, each state possesses a better understanding of its own needs.

From a program delivery perspective, this line of reasoning usually involves the federal government in the role of providing funding to states for state programs and priorities. The funding provision model also usually involves the federal government setting national minimum standards that states are required to meet as a condition of receiving funding (Babbit 2007; Mandarano; Featherstone and Paulsen 2008). The argument that states should bear the primary responsibility for water management decision making does not generally take the line that the federal government should stay out of the decision making all together. Rather the view is that the federal role is to determine whether states meet the minimum standards required to receive federal funding. This model is very much in line with the principles of the Clean Water Act. On a similar philosophical standing, Jeremy Jungreis argues that from a legal perspective, deference should be granted to state water law when federal water rights conflict with state water law (Jungreis 2005). The sheer complexity and size of the federal government also raises concerns for its ability to properly address the specific needs on water issues of individual states (Gerlak 2005; Hoornbeek 2004).

In the literature there are equally compelling arguments in favour of the federal government driving water policy. Reed Benson (2006) argues that the incredible number of federal laws and regulations that currently exist necessitate the federal government to take the lead on all water policy issues, including quantity related issues. His argument centres on the notion that states are unable to function within the parameters set by the federal government, and therefore the federal government has put itself in a position where it has to lead. There is also the concern that political entities entering into bargaining agreements are not equal (Tarlock and Wouters 2007), and a real concern exists that larger and more powerful states will be able to gain a greater advantage in water negotiations without strong federal involvement and oversight. Interstate conflict has also been identified as an issue that can seriously threaten efforts to protect water sources (Gerlak 2005; Hoornbeek 2004). Similarly, without a national vision being driven by the national government, state agreements on water use have a tendency to be formed around protectionism against outside use, while providing little or no concern for the internal use (Klein 2006).

One issue over which there appears to be a great deal of consensus involves the requirement for greater coherency at the national level to water management. Jungeris (2005) and Benson (2006) both cite the fragmentation of water management at the national level (and lack of a complete national water policy) as their respective reasons as to why either states or the federal government should take the lead on water policy. There is also a greater cost to delivering similar services through multiple government agencies (Levin et al. 2002). Coinciding with greater coherency in national vision, many argue that a more holistic approach to the water policy framework is needed (Johnson, Contor and Cosgrove 2008; McCray and Boving 2007; Hanak 2007). While each agency that forms a part of the water management system, such as the Bureau of Land Management or the USEPA, perform their own tasks within the scope of their particular mandates, there lacks a unifying body to ensure that each piece of the whole is working toward the same goal (Gleick 2003). Furthermore, a greater emphasis on gathering and sharing of information among all parties involved in decision-making has been identified

as an area requiring work (Hardy and Koontz 2008; Commission for Environmental Co-operation 2001).

Despite the concerns being raised over the fragmentation of the US system outlined above, Carey Hill (2006) argues that certain inefficiencies because of overlap can be a positive element. Overlapping responsibilities on water management issues, both between individual agencies and between levels of government, has an overall benefit on the country because with overlap comes increased accountability. She also found that a greater amount of information is available to decision makers and the public because of the inherent tensions within the system.

Consensus Regarding the Need for a Greater Value of Water

The literature is generally consistent in agreement that water use should be linked to its price (Morris 2006; Glennon 2005; Kenney et al. 2008; Levin et al. 2002). Market based solutions, and placing an economic value on water, seem to be especially popular in the west where scarcity is of great concern. Others look to the value placed on water by traditional Native Americans as a means of changing the way users consider water (Nakai 2006), and others express concerns about what happens when a price is put on something that is essential to human life (Eckstein 2006; Barlow 2008b). The opponents to applying a market-based value on water do not question the correlation between price and use, rather focus on the moral concerns of accessibility and profit seeking (Nakai 2006, Eckstein 2006, Barlow 2008b).

Summary

There is a vast amount of literature on water issues. However, the literature focused on governance is limited compared to that which is focused on scientific details. While the expected jurisdictional conflicts between states and the federal government exist, there is a consensus in the literature that water use should be linked to price and a higher value on water is needed in order to reduce consumption. Furthermore, because a fragmented system often results in inefficiencies, confusion and inconsistent policies, there is also a consensus over the necessity of federal coherency on water policy. With respect to water interest groups, there is a lack of literature, which represents a gap in the study of US water management.

II. METHODOLOGY

The research is undertaken through a lens that considers what Canadian decision makers need to know about the United States water supply policy during discussions with US counterparts: the foundation of the US water system, what action is currently being taken, and the direction that US water policy is being pushed. The focus however is on US domestic water supply policy with specific attention being paid to the south western states, as that is the region of the country that has been facing the greatest water supply challenges. Even though water quality and transboundary issues feature prominently in any discussion on water sales between Canada and the United States, they are deliberately avoided as there is already sufficient attention being paid to these topics from a Canadian point of view.

Drought preparedness and flood control plans are also important aspects of water management, and are often considered concurrently with plans for water supply and water efficiency. However, while there is a very important connection between these issues, drought and flood planning are significant enough issues in their own right, as such, they will not be considered within the scope of this research other than to acknowledge their importance in the overall discussion of water management.

Secondary literature will be relied on heavily throughout the paper to generate questions, test conclusions and to back up the appropriateness of outcomes. The particular interpretation of an article and personal judgement as to whether evidence supports findings will determine how literature is chosen. As much of the events of water governance plays out in the courts, legal journals will serve as a major source. Other major sources include publications by academics, think tanks, newspaper articles, legal texts and government documents. Careful consideration will be paid to the authors and the potential bias they bring.

Research of policy in the United States usually requires examining both federal and state actions. From the state perspective, the focus of the research is on the south western states of Colorado, Utah, California, Nevada, Arizona and New Mexico, sometimes with a more specific focus on California. These states are being singled out because they form the region with the most critical supply issues. The urgency is the result of the combination that these states form the region with the fastest growing population in the country (US Census Bureau 2005) and that it is the region with the lowest availability of water (USGS 2008b). California receives further attention in some circumstances because it has long been held as a leader on water policy issues (Getches 2001).

Using a simple case study has the advantage of providing an illustrative example that can be extrapolated to draw conclusions to a broader context, when similar circumstances exist. The weakness of a case study is that it can be shaped by the researcher and there is no way of definitively knowing if the findings from the case can be applied to the broader context (Hakim 2000). Keeping these shortcomings in mind, water efficiency techniques are, for the most part, universally applicable, and the regions of the US share a common federal government and political institutions. It therefore stands to reason that if the

region with the most critical water shortage is able to deal with their supply and efficiency issues, other regions of the country can do the same when their supply issues reach a critical stage.

The first research question, dealing with how the US system of water management works is primarily a review of the US system of water management and the actions being taken on water supply. The answer to this question is largely descriptive in nature and a synthesis of the US literature.

The second question asks how seriously the US is treating its supply and efficiency issues. In a federal system like the United States, the two elements to this answer are: what is happening at the federal level and what is happening at the state level? To answer these two elements of the question, actions by the federal government, examples of state initiatives and the water plan for the state of California are reviewed. The purpose in this case is not to evaluate the effectiveness of programs in place, rather it is to get a sense of the emphasis being placed on water efficiency issues through the level of commitment being made to improving water efficiency by the federal and state governments.

The third question looks at the direction that US policy on water supply is heading. To answer this question, the pressures being applied to government by special interest groups would normally provide the evidence that would allow a prediction to be made. Unfortunately, as was outlined in the literature review section, there is a lack of available information about these pressures. In the absence of this information, to explain the direction that policy is heading, political theories about interest groups and coalitions will be used. Similar to the shortcomings of the case study, political theory cannot explicitly provide the explanations being sought, but it does provide explanatory rationales of certain events. From these explanations inferences can be made to predict future action.

III. POLITICAL STRUCTURE

A country's political structure provides the foundation for its policy and regulatory system. The tensions that exist between different levels of government and across the various government institutions shape the way a country approaches a policy issue. In the case of the United States, its federal structure, as well as its congressional system, places a heavy emphasis on checks and balances and results in a great amount of fragmentation, both between levels of government and between government institutions. These tensions within the US system influence how its policy, laws and regulations are made and enforced. As law shapes much of US water policy, understanding the tensions between the institutions that drive the creation of new laws is important to understanding how the system works as a whole.

Federal Government

Governance

The United States of America is a federal constitutional government comprised of a national government and fifty sub-national states. The national government has three branches, the Executive, the Legislative and the Judicial, each serving as a check and balance over the other in a separation of powers. The Executive branch is headed by the President and includes the Vice-President as well as the Cabinet. The Cabinet includes Secretaries who are the heads of their respective federal departments. The President and Vice-President are elected directly in a national election and the President selects the remaining members of the Cabinet. The Legislature includes the Senate and the House of Representatives. Each state elects two Senators for six-year terms. The elections are staggered with one-third of Senate seats standing for election every two years. Members of the House of Representatives are elected for two-year terms on a representation by population formula. The Supreme Court is made up of nine Supreme Court Justices who serve life terms on the bench and are appointed by the President.

Each branch of government serves to keep the other in check in most areas. For instance, the President has the power to veto congressional legislation, the Senate approves presidential appointments, and the Supreme Court can exercise judicial review of congressional laws. The two houses of Congress even serve as a check upon the other through their form of representation. The Senate represents state equality and consistency. Equality is achieved by allowing each state to elect two senators, regardless of population, while consistency and stability is maintained through staggered elections so that only one-third of Senators are up for election at the same time. The House on the other hand, is a more politically responsive body through representation by population and short terms of election where all Congressmen face an election every two years.

The separation of powers between the three branches of government has a significant impact on the way in which policy issues are created and implemented, including water policy. The American statutory policy making power is split between the Executive and Congress. The strength of Congress results in a heavy reliance on Congressional Committees and Subcommittees to do much of the policy work (Hoornbeek 2004). It is not surprising, given the incredible volume of policy issues that Congress will review in a

given year, that much of the details are sorted out in committees. Once a committee has completed its work the House and the Senate will sometimes make changes of their own, but "changes made at these points in the process are often of less importance than the work that has already been completed in committees and subcommittees," (Hoornbeek 2004, p. 464). As committees are designed to allow committee members an opportunity for more intense scrutiny of the legislation before them, each committee member has significant influence to ensure that the interests of the district that he or she represents are being considered.

Concurrently, the Executive is not without its share of influence in the policy process. Not only do department officials make policy suggestions and assist in the policy development process, but it is often left to the bureaucracy to interpret the decisions taken by Congress and to implement the policies in conjunction with the states. This is particularly the case with environmental legislation, including water (Hoornbeek 2004). Finally, the interpretation and implementation of Congressional law by federal and state agencies is subject to judicial review.

Fragmentation

A key feature of the US water management system is its fragmentation. There are several factors that contribute to the fragmentation. First of all, water is not the exclusive jurisdiction of either the federal government or the states, resulting in both levels of government having significant engagement on the issue. Secondly, at the federal level, there are approximately 42 Congressional committees and sub-committees that deal with water issues at some level (including budget and appropriations committees) (US Senate 2008; US House of Representatives 2008), 25 federal agencies making water decisions (Subcommittee on Water Availability and Quality 2007), 13 major pieces of federal legislation that deal with water (Sax et al. 2006), and over 200 separate federal rules, regulations and laws (Gerlak 2006). Third, each state has its own set of laws, committee structure and bureaucracy. The result is that in the United States, as Jungreis (2005) noted, there are 50 separate water systems. Gerlak (2006) describes the form of water management in the US that results from the fragmentation as being a struggle between national supremacy and local authority, that it lacks a national water policy, and is crisis-driven.

Federal Authority

There is no specific constitutional authority regarding water policy in the United States. Water is managed and allocated according to state or local law in the absence of the exercising of Congressional power (Getches 1997). The federal government primarily obtains its authority through its exclusive constitutional powers over international treaties and commerce. International treaties give the federal government the authority to enter into water agreements with foreign governments, such as the Boundary Waters Treaty that governs the use of watersheds that mutually border Canada and the US, or the Mexico Treaty, which does the same between the United States and Mexico.

It is through the Commerce Clause of the Constitution that the federal government primarily derives its domestic jurisdiction over water policy. As waterways have

historically been a significant means of navigation, trade and commerce, Congress used its jurisdiction over commerce to extend its regulatory authority over water policy as early as the 1820's (Getches 1997). The Supreme Court has upheld that the federal authority over water through the Commerce Clause extends well beyond what would otherwise be considered navigable waters. The Court has allowed for federal regulation of tributaries, waters that could be made navigable, water quality, flood control, environmental protection and the protection of species, just to name a few (Sax et al. 2006, Tarlock et al. 2002).

Federal authority over water is also derived through the spending power, the war power, the property power and the Supremacy Clause, whereby federal law trumps state law when legitimate authority is exercised (Brougher 2008), such as with the Boundary Waters Treaty of 1909.

State Government

Governance

The United States is comprised of 50 states whose governments take the same form as the federal government, with a Governor, a bi-cameral legislature (except for Nebraska), and a state court. The separation of powers between each branch of government is also largely the same as at the federal level, although states elect all of their legislators based on some form of representation by population.

State Authority

State power comes from the Tenth Amendment of the Constitution that confers all rights not prescribed to the federal government to be reserved to the states or the people (US Constitution, Amendment Ten). With respect to water policy, states maintain jurisdictional authority unless Congress explicitly exercises a power.

Federal Deference to State Water Law

Despite the federal government's ability to extend its jurisdiction through its constitutional authority over commerce, from a practical perspective, laws governing use and allocation are primarily state law (Benson 2006; Commission for Environmental Co-operation 2001; Hoornbeek 2004; Jungreis 2005; Sax et al. 2006) and where Congressional law conflicts with state law, deference is *usually* given to state law (Getches 1997; Sax et al. 2006). While federal deference to state water law is generally accepted as conventional wisdom (Benson 2006), this might not always be the case. Benson (2006) and Getches (2001) both cite court cases which demonstrate that the history of water law is not as simple as arguing that deference has become a precedent. One example is a Supreme Court decision that water quantity affects water quality. As the federal government has existing authority over water quality through the Clean Water Act, the court is now providing an avenue for the federal government to extend its authority to the area of water supply, an area where deference to state law has traditionally been given (Benson 2006). As a result of this court decision, and others, there is a growing sentiment that the federal government can exert itself further into water law in the future should it choose to do so.

American Indian Tribes

For the purpose of water allocation, American Indian Tribes are treated as equals, having the same political standing as states. The Clean Water Act explicitly states: "Indian tribes shall be treated as States for the purposes of such section 101(g)," (CWA, s. 518). Section 101 (g) is the section that deals with State authority to allocate water within its own jurisdiction.

Tribes manage their own water resources with the assistance of the federal government but negotiate their right to access and use of water as independent political bodies. Tribes have been accorded standing as independent political entities for the purposes of water policy because many of the treaties signed with the United States are grants of lands, and as such, tribes are seen as having reserved the right to all water not specifically granted away within a treaty (Getches 1997). Furthermore, the legal history over American Indian water rights has been long and difficult for all parties and has not fully run its course through the Supreme Court. Rather than the long and expensive legal battles required for court settlement, a culture has emerged to negotiate with Tribes in order to avoid court settlements (Sax et al. 2006).

Interest Groups

Interest groups, also known as advocacy groups, lobby groups and pressure groups, are an integral part of the American political system and water management decisions. Their role within the political system is one of such influence, that during his farewell address, President Carter blamed special interest groups' ability to exploit the policy process as one of the sources of his troubled presidential term (Gais, Peterson and Walker 1984).

Salisbury (1975, p. 175) defines interest groups as an "organized association which engages in activity relative to government decisions." That is to say, individuals freely join groups who share their interests and values as a means of influencing a particular policy area within government. The nature of interest groups can range from organizations promoting a cause, such as Mothers Against Drunk Driving (MADD), to those that are trying to protect economic interests, such as CropLife International, a Washington based interest group representing the agricultural biotechnology industry. In attempting to influence policy, interest groups engage with a combination of elected politicians, senior bureaucrats, members of the executive, the media and the public (Jackson and Jackson 2002).

Despite President Carter's comments, interest groups play an important role within the governmental process. By providing an avenue for greater citizen participation, Newman and Tanguay (2002, p. 387) refer to the place of interest groups as an "essential element of a healthy and vibrant democracy." As there are an overwhelming number of interests in society as a whole, interest groups help governments gain an understanding of which issues are of greater or lesser importance to society, as well as provide a direct avenue of information to decision makers from interested parties (Newman and Tanguay 2002).

The darker side of interest groups to which President Carter alludes, also exists. The goal of an interest group is to influence the direction of government and the political activity of peddling that influence is known as lobbying (Jackson and Jackson 2002). With a huge number of interest groups vying for the attention of decision makers, lobbying has become a big business in the US. In 2004 more than 34,750 people were registered to lobby the federal government and interest groups spent a total of $2.9 trillion dollars lobbying the US federal government (Birnbaum 2005).

The result of the lobbying effort is a web of personal relationships between decision makers and interest groups. These relationships form a system that some have labelled as a "subgovernment" or an "iron triangle" between interest groups, Congress and the bureaucracy (Gais, Peterson and Walker 1984). The suggestion under the iron triangle or subgovernment concepts is that a "stable set of participants coalesce to control fairly narrow public programs which are in the direct economic interest of each party to the alliance," (Hamm 1986, p. 321). When it works to their mutual advantage, the interest group achieves the policy decision of their desire, the bureaucrat extends his or her responsibilities by managing a larger budget, and the member of Congress is able to keep the interest group happy, which in turn should reap electoral rewards. The negative implication is that each player is looking out for their own best interest and not the greater public good.

For better or for worse, interest groups are an essential element of the American political system. Those who see interest groups in a positive light point to the role interest groups play in increasing democratic participation and providing decision makers with a direct a voice to the views of specific groups (Newman and Tanguay 2002; Dahl 1967; Lindblom 1965). Those who are concerned with the negative implications point to an unhealthy level of influence by certain interest groups forged through personal relationships and big lobbying budgets (Gais, Peterson and Walker 1984, Hamm 1986, Lowi 1964). In either case, the role of the interest group is entrenched within the American political system and the views of interest groups need to be considered by government on virtually every policy decision.

Summary

The structure of the US government results in a significant amount of fragmentation with multiple levels of checks and balances that result in an overlap of responsibility. With no specific constitutional authority assigned to water, both the national government and states share in the responsibility of its management, along with recognition that Indian Tribes have equal decision-making powers to states. States have traditionally driven water policy, with the federal government occasionally providing a national standard that states must meet. When laws conflict, the federal government has also traditionally deferred to state law. However, federal government's constitutional authority over commerce, which extends to its authority to protect navigable waterways, does give Congress the power to act in all aspects of water policy should it choose to do so.

IV. MAJOR FEDERAL LAWS AND TREATIES

Federal water legislation provides the federal government with strong tools over the management of water resources should the government choose to exercise them. Traditionally, the federal government has left issues of water supply in the jurisdiction of the states. Increasingly, however, the Courts have been extending federal power into areas of water supply.

At the federal level, water law is administered by various different agencies, including the Environmental Protection Agency (EPA), the Department of the Interior (DOI), Department of Fish and Wildlife Services (DFWS), Department of Agriculture (DOA) and the Department of Energy (DOE). A few of the key pieces of legislation are outlined below.

Federal Water Pollution Control Act (Clean Water Act)

Overview

The Clean Water Act (CWA) is the primary federal law governing surface water protection in the United States. It was first enacted in 1948, was completely revised in 1972, which provided its current form, and received significant amendments in 1977, 1981 and 1987. The original purpose of the 1972 legislation was to "replace ineffective state regulation of pollution with a comprehensive national system involving federal-state sharing of responsibilities," (Getches 1997, p. 379). The primary objectives of the Act include taking action to "restore and maintain the chemical, physical, and biological integrity of the nation's waters," and to provide "protection and propagation of fish, shellfish, and wildlife," (CWA, s. 101). Benson (2006) argues that the authority that comes from the CWA, as a result of section 101, has helped make the CWA one of the two most influential pieces of legislation on water management, the Endangered Species Act being the other. It is the broad language of the section that courts have often used to extend federal powers, such as the Supreme Court decision that connects water supply with water quantity. Because of the impact that water supply has on the "chemical, physical, and biological integrity" of a river, the two components of water supply and quantity have been linked, thus providing the opportunity for the federal government to extend its authority into a section of water policy traditionally managed at the state level.

Two ambitious goals of the CWA at its inception sought to establish zero discharge of pollutants by 1985, and to have all water "fishable and swimmable" by mid-1983 (Copeland 2006). While the dates have long passed, the goals of the Act remain the same. The United States Environmental Protection Agency (EPA) is the principle agency responsible for the implementation and enforcement of the CWA, however, much of the day-to-day program implementation and enforcement is carried out by the states. To that end, the federal government sets the requirements, while the states fulfil them. Where states fail to do so, the EPA will act instead. While the CWA generally deals with water quality issues, the courts have clearly stated that water quantity and supply issues are not beyond the reach of the CWA (Benson 2006).

State Revolving Fund

There are two major components to the CWA. The first is to provide funding assistance for municipal sewage plant construction and repair. The second applies regulatory requirements for all municipal and industrial dischargers of waste into waterways. With respect to funding assistance, approximately $75 billion in funds have been allocated to states through the CWA for the construction of municipal wastewater treatment facilities. According to a study in 2003, an additional $181 billion will be required for facilities across the country meeting eligibility for funding (Copeland 2006). Funding is provided to states through a State Revolving Fund, where the federal government provides matching loans. States then repay the loan into a fund, which is available for other communities to use.

CWA Permits

The Act's philosophical approach is that all discharges into waterways are unlawful unless specifically authorized by a permit. The permit system is known as the National Pollution Discharge Elimination System (NPDES), and to obtain a NPDES permit, the discharger must comply with federal effluent standards. States that qualify can issue NPDES permits directly, while the EPA issues permits for the states that fail to meet CWA requirements.

A second form of permit is required for the disposal of fill or dredged material into any waterway, including wetlands. The US Army Corps of Engineers, using environmental guidelines set by the EPA, administers these permits. Normal farming, silviculture and ranching activities are exempted from requiring permits.

Total Maximum Daily Loads (TMDL) Requirements

In some circumstances, even after the most rigorous technology-based effluent limitations have been applied, discharges into water may compromise water quality standards. States are then required to determine the total maximum daily load (TMDL) of pollution that a body of water can received without harming the water quality standards. TMDLs are then to be used as part of the water quality standards application that is applied when issuing discharge permits (Sherk 2005).

Non-Point Source Pollution

Since 1987, the focus of CWA activities has shifted from point source pollution to non-point source pollution. Point source pollution is water that comes from an identifiable source, such as a pipe, and non-point source pollution includes anything that does not have an identifiable source, such as storm water or agricultural runoff. While it is believed that non-point source pollution accounts for a majority of water pollution, it is not subject to CWA permits or regulations. Instead, state programs regulate non-point source pollution with federal assistance and funding. The CWA directs states to put in place a non-point source pollution management program that is to be approved by the EPA. If a state fails to put a program in place, or the EPA rejects a state's proposal, the EPA will prepare one on their behalf (Copeland 2006).

Safe Drinking Water Act

Overview

The Safe Drinking Water Act (SDWA) is the primary federal law for protecting public water from harmful contaminants. It requires that all public water systems meet national standards for drinking water. The Act was first enacted in 1974 with broad amendments in 1986 and 1996. The EPA is the federal agency responsible for administering the SDWA. In 2002, the law was extended to require the EPA to put plans in place to prevent and respond to terrorist attacks against the nation's water supply (Tiemann 2007b). To date, the EPA has regulated approximately 91 water contaminants and in 2003, 94% of water systems reported no violations of water quality standards (Tiemann 2007c).

Administration

A key component of the SDWA is the ability for the EPA to delegate authority over enforcement and implementation to states and Indian tribes. To date, all but two states, Wyoming and the District of Colombia, have taken the responsibility to deliver the Public Water Supply Supervision (PWSS) program, which is the primary program through which public water is regulated.

Funding

The federal government provides funds to states in order to meet the requirements of the SDWA regulations through the drinking water state revolving loan fund (DWSRF). States must match 20% of the grant and may use the funds to provide loans to public water systems. Each state must receive at least 1% of the grants, and 1.5% is reserved for Indian Tribes. As of June 2006, $11.03 billion has been spent on 4,985 projects (Tiemann 2007a).

The National Environmental Policy Act (NEPA)

Overview

The National Environmental Policy Act (NEPA) was first enacted into law in 1970. It is a broad umbrella statute that mandates all federal agencies to review the environmental impacts of all agency actions. NEPA sets a framework for environmental procedure within which federal agencies must work. The framework can include the need to comply with other environmental legislation, like the Clean Water Act, but does not in itself set any environmental standards. While the Act requires that an environmental assessment be applied to all federal actions, it does not require that environmental standards be met, nor does it require that the option with the lowest environmental impact be chosen (Alexander 2007).

Public Participation

A key component of NEPA is the requirement for all environmental assessments to be made public, thus providing a mechanism for public participation in the decision making process. To this end, supporters of the legislation view it as an essential component of

environmental protection because it forces agencies to publicly consider environmental impacts of all actions (Alexander 2007).

Administration

The Act also establishes the Council on Environmental Quality (CEQ) within the Executive Office of the President. The CEQ has the mandate to oversee the implementation of NEPA regulations, but it has no authority to enforce them (Alexander 2007). The courts have been reluctant to enforce any NEPA regulations other than the requirement to perform environmental assessments (Getches 1997).

The Endangered Species Act (ESA)

Overview

The Endangered Species Act (ESA) was enacted in 1973 to protect plant or animal species from extinction due to economic growth and development. The Secretary of the Interior, through the Fish and Wildlife Service (FWS), administers the Act along with the Secretary of Commerce who, through the Marine Fisheries Service, administers the ESA for marine species (Meltz 2008).

Impact on Water

The ESA has been described as one of the farthest-reaching environmental laws in the United States (Getches 1997). There are two pertinent portions of the Act applicable to water. The first, section 7, prohibits federal actions that jeopardize the existence of species listed as endangered. It requires that federal agencies consult with the Fish and Wildlife Service, prior to the issuance of any permits, in order to determine the impact of a given action. The second, section 9, applies to all persons, not just federal agencies. Section 9 prohibits taking or harming any member of an endangered species. The FWS has included "significant modification" or "degradation" of habitat within the definition of harming, thus bringing private lands within the jurisdiction of the ESA (Benson 2006).

The ESA's further impact can be seen through its ability to prohibit new water projects or limiting existing operations. The ESA can also restrict the use of water in an upstream state to preserve an endangered species in a downstream state (Sherk 2005).

Exemptions

An exemption can be obtained, despite the possibility of extinction if a high level committee "of high ranking federal officials" (Metz 2008) determines that there are no reasonable alternatives available to the agency, and that the benefits of the action outweigh the benefits of an alternative that would protect the species in question. The process of achieving the exemption is generally considered quite burdensome and rarely used (Benson 2006).

Wild and Scenic Rivers Act (WSRA)

Overview

The Wild and Scenic Rivers Act (WSRA) was enacted in 1968 maintain the free-flowing condition of certain rivers determined to have recreational, scenic, historic, cultural and other values. The purpose was to create a balance between development and the protection of undeveloped qualities. Congress can designate rivers, and states can recommend to the Secretary of the Interior that rivers receive the designation. Once a river has received the designation, projects on or directly affecting the river are prohibited. The intent is not to change the amount of water that a river receives, rather to protect it from future changes. There are currently 167 rivers given this designation (Brougher 2008).

Federal Power Act (FPA)

Overview

The Federal Power Act (FPA) establishes a comprehensive national policy for the creation of hydroelectric developments. Enacted in 1920, the FPA is administered by the Federal Energy Regulation Commission (FERC), an independent agency that has the authority to license private hydroelectric facilities, as well as the regulation of the interstate transmission and sale of electricity (Getches 1997). Since the Act requires that FERC provide a permit for the building of any hydroelectric power facility, it is subject to the environmental protections of federal legislations such as the ESA or the WSRA. An additional requirement of receiving a license is also the demonstration that the project is in compliance with all state laws regulating hydroelectric power facilities (Getches 1997).

Fish and Wildlife Coordination Act (FWCA)

Overview

The Fish and Wildlife Coordination Act (FWCA) requires that all federal agencies that issue permits for water related projects consult with the Fish and Wildlife Service to determine potential mitigation steps that can be implemented to minimize negative impacts (Commission for Environmental Co-operation 2001). The purpose of the Act is to ensure that the protection and conservation of wildlife receives the same level of consideration as water development programs (Sherk 2005).

Boundary Waters Treaty of 1909

Overview

The Boundary Waters Treaty came into being as a result of a dispute between Canada and the United States that started in the early 1890's and ran until settlement negotiations began in 1905. The dispute was over a proposed diversion from the St. Mary River into the Milk River in Montana, at a point where both rivers are completely within the US. Canada complained that the diversion would impact Canadian appropriations. When the project continued to proceed, Canada made plans for a diversion from the Milk River into the St. Mary River at a point when both rivers were completely within Canadian territory.

The diversion would have completely negated the diversion on the US side of the border. Since both countries were in upstream and downstream positions from the other, both saw it in their best interest to negotiate a solution for shared water basin disputes (Sax et al. 2006). As an international treaty, the Boundary Waters Treaty is supreme to all federal and state laws – a status achieved through the Supremacy Clause of the US Constitution (Hall 2006).

The Treaty establishes the International Joint Committee (IJC) to administer the treaty and resolve disputes. The IJC is comprised of six members, three appointed by each country, and are obligated to pursue the best interests of both countries (Commission for Environmental Co-operation 2001).

Water Allocations and Quality

Under the terms of the Treaty, diversion of water that may affect the flow of natural levels of water on the other side of the border is prohibited without approval from the International Joint Commission. Diversions that already existed at the time of signing were exempted (Hall 2006). The Treaty also contains a provision to protect against any pollution that would result in injury or damage to property (Commission for Environmental Co-operation 2001).

International Boundary Waters Treaty of 1944

Overview

Two major rivers are shared between Mexico and the United States, the Colorado River and the Rio Grande. The International Boundary Waters Treaty (1944 Water Treaty) updates the Rio Grande Treaty of 1906, which apportioned the Rio Grande River (Szydlowski 2007).

The 1944 Water Treaty guarantees that Mexico will receive 1.5 million acre-feet of water from the Colorado River, which can be reduced during a serious drought in the US. It also maintains the existing requirement from the 1906 Treaty that Mexico send 350,000 acre-feet from the Rio Grande to the US. The 1944 Water Treaty is a response to disagreements over waters of the Lower Colorado River. Prior to the agreement, and despite the treaty regarding the Rio Grande, the US had been functioning on the theory of absolute territorial sovereignty over the water for which the US is the upstream nation. Pressure from Mexico however, resulted in the negotiation that brought about the 1944 treaty. The treaty makes no mention however, of the quality of the guaranteed water, which has proven to be an area of great dispute (Getches 1997).

The International Boundary and Water Commission is responsible for administering the treaty. Other watercourses that flow between Mexico and the United States are not subject to a treaty and neither of the existing treaties makes any mention of groundwater, despite the fact that numerous aquifers are shared between the two countries (Sax et al. 2006).

North American Free Trade Agreement (NAFTA)

Overview

The North American Free Trade Agreement (NAFTA) is an international trade agreement between Canada, the United States and Mexico that came into effect in 1994. NAFTA has wide-ranging impacts on trade issues, labour and the environment, including water.

North American water in its natural state, i.e. in lake or river, is not subject to NAFTA provisions. However, if water in any form enters into commerce, it becomes a good or product, and thus falls under NAFTA (Szydlowski 2007). Because of the potential commoditization of water, and subsequent NAFTA provisions that become applicable, many Canadians have expressed their unease with the situation (Barlow 2008b). The primary concern surrounds chapter 11 of NAFTA, which requires that all parties, from each member country, receive fair and equal investment opportunity throughout the entire trading block. While no trade body has ruled on water export restrictions, the concern remains that should water become a tradable commodity, a nation could lose of control over its own water policy and be unable to "turn off the tap" should it desire to do so (Szydlowski 2007). As certain parts of North America search for new sources of water, NAFTA considerations will weight heavily on any nation that may consider allowing its excess water to fill the void.

Summary

Political decisions not to exercise authority to the full extent are quite common in government, especially when those decisions may limit economic development. Nevertheless, the power and authority of the federal government to protect US waterways clearly exists, should the federal government choose to exercise it. In this section, only a few of the major pieces of legislation that regulate water have been described in order to give a sense as to the role the federal government plays and can play in water management. Whether or not powers are fully exercised, the ability of the federal government, through such agencies as the EPA and the FWS, to prohibit the development of waterways in order to protect the environment, is quite strong. The provisions of the CWA and ESA in particular provide an avenue for the federal government to govern US water.

V. WATER RIGHTS

To understand the complexity of US water management, it is important to have a basic understanding of the different approaches to water law that apply across the country. American surface water jurisdiction can roughly be divided into three systems of water law: riparian, prior appropriation, and hybrid. Table 1 provides an overview of the basic points of each system and the states that use them. Geographically, those to the east of Kansas City generally use the riparian system, and those to the west use either the prior appropriation or hybrid system. These three systems, as well as groundwater rights and federal and Indian reserve rights are explained below.

Riparian Rights

Overview

Riparian law is an ancient doctrine that defines the right to water use in association with the ownership of land adjacent to waterways. Those who own land bordering on a natural waterway are entitled to use water so long as it does not cause material harm to those who also own land along the same waterway (Sax et al. 2006). As demand from urban centres and industry increased, most riparian states adopted a permit system for large users such as hydroelectricity, industry, municipal water supplies, etc. At the same time most riparian states also adopted a modern tendency to allow non-riparians a subordinate right to water use. Most riparian states do not require small domestic users to obtain a permit (Getches 1997).

There are two critical points to the notion of riparianism. The first is that water rights cannot be lost from non-use, although a few exceptions exist under special circumstances. The second is that in the event of insufficient water for all riparian needs, water is rationed proportionally (Sax et al. 2006). These points stand in stark contrast to the prior appropriation system that grants water rights based on the seniority of the water claim and maintains the right based on whether the claim is used.

Riparian states are generally those that either border on, or are to the east of the Mississippi river. The exceptions are Mississippi, which uses a hybrid system, and Louisiana, which adapted its water law from the French Civil Code.

Prior Appropriation

Overview

Riparianism is appropriate for an area where water is plentiful. However, as the arid west started to populate, it became clear that water rights based only on proximity to a very limited supply would not work everywhere. The prior appropriation doctrine uses a first-come, first-serve basis to anyone who can put the water to beneficial use, whether that person is riparian or not (Sax et al. 2006). The date of the appropriation determines the priority of use. The earlier the date, the greater the priority, this is also known as the "first in time, first in right" approach (Sax et al. 2006). During times of scarcity, water is allocated based on the seniority of the appropriation, with the senior appropriators being able to claim all of their water before the junior appropriators can take any. This means

that junior appropriators may only get some, or even none, of the water to which they have a right.

There are four main tenets of the prior appropriation doctrine. The first is the "first in time, first in right" seniority of water allocation. The second is that appropriators only have the right to water that can be used for beneficial purposes; waste is not a beneficial use as it is depriving someone else. Third, water rights are considered personal property and can be mortgaged, transferred, sold and even taxed in some states. Finally, the appropriative right can be lost if the water is wasted or not used (Sax et al. 2006).

These concepts place the prior appropriation doctrine in stark contrast to the riparian system. In particular, the "first in time, first in right" concept of allocating water rights during times of scarcity differs greatly from the riparian approach that requires all users to reduce their use proportionally. The ability to lose one's right to water when it is not being used is another significant contrast to the riparian system and has an impact on the incentive to conserve. Some states are making moves to change this barrier to conservation by altering legislation, but as a long-standing component of the prior appropriation doctrine, it is not easy to make the change (Getches 2001). One such example within the framework of prior appropriation is to encourage water right holders to capitalize on their water rights by selling them to other users, such as municipalities.

It is the eight inland states of the west, and Alaska, who use the prior-appropriation doctrine: Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona and New Mexico. Permits are required to appropriate water in all but Colorado, which uses a special court process (Getches 1997).

Hybrid Systems

Overview

Some states that originally used the riparian system, and later switched to a system of appropriation, nonetheless retained portions of the riparian system, most often because their respective courts ruled that they could not completely extinguish riparian rights. These are hybrid systems. There is no general doctrine that fits all hybrid systems other than that there is a mix of riparianism and prior appropriation (Sax et al. 2006). Over the years, some states have sought to rid themselves of the riparian aspects of their water law with greater success than others.

Hybrid systems are best thought of as primarily following the doctrine of prior appropriation with elements of riparianism that still remain. That is to say, they are by and large systems of prior appropriation, with allowances for certain riparian rights under specific circumstances, but those circumstances vary depending on the state. For instance, in California, Nebraska and Oklahoma, riparians can still originate new uses for water. While in the remaining hybrid states, permits are required in the same manner as non-riparians for new water uses. Most hybrid states still recognize the original riparian rights that existed at the time the state transitioned, but often have a fixed quantity of water allowed and do not permit water claimed under riparian rights to be used off the riparian land (Getches 1997).

The three states that border the Pacific Ocean, along with the six states that straddle the hundredth meridian and Mississippi, are the 10 states that use some form of mixed hybrid system: Washington, Oregon, California, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas and Mississippi.

Table 1: Legal Systems for Water Allocation

Legal Systems for Water Allocation	States		Key Features
Prior Appropriation	Alaska Arizona Colorado Idaho Montana	Nevada New Mexico Utah Wyoming	▪ A water right belongs to the first person who puts it to a beneficial use, with superiority over anyone who begins use later; "First in time, First in right" ▪ Water right depends on being used for a beneficial purpose, not land ownership ▪ A water right is similar to a property right and can be bought and sold, mortgaged and taxed ▪ A water right can be lost if it is not used
Riparian Rights	Alabama Arkansas Connecticut Delaware Florida Georgia Illinois Indiana Iowa Kentucky Maine Maryland Massachusetts Michigan Minnesota	Missouri New Hampshire New Jersey New York North Carolina Ohio Pennsylvania Rhode Island South Carolina Tennessee Vermont Virginia West Virginia Wisconsin	▪ Landowners bordering a waterway are considered riparians ▪ All riparians have equal right to water that flows past their land, proportional to the amount of land owned ▪ Usage must be "reasonable" relative to other users ▪ During times of shortage, all users must equally reduce use, proportionally to land owned ▪ Riparians may initiate a new use at any time ▪ Water rights are connected to property ownership and need not be exercised to be maintained
Hybrid System	California Kansas Mississippi Nebraska North Dakota	Oklahoma Oregon South Dakota Texas Washington	▪ No pervasive doctrine that encompasses all hybrid states ▪ Use a mixture of riparian and prior appropriation rights ▪ In many cases, riparian rights are left over when a move was made to prior appropriation, and riparians maintain their riparian rights, while new rights are allocated based on prior appropriation ▪ In some states riparians can still originate new uses superior to prior appropriators

Groundwater Rights

The management of groundwater differs to the management of surface water mentioned above. To manage groundwater, states have adopted an even greater and more confusing number of doctrines, although they largely follow the same basic legal principles as for surface water (Sax et al. 2006). For the purpose of this research, suffice it to say that all states have their own unique system, but can be grouped into similar approaches. Most of those states that border on, or are to the east of the Mississippi River, use a system whereby only those who own the land have a right to the underlying aquifer. Most of those in the west use some form of appropriation system to allocate groundwater, with California using a mix of the two. It is only recently, however, that states have started to take action to prevent overdraft of groundwater. Prior to regulations being put in place, groundwater could be removed without concern for other users or the impact on neighbouring watersheds (Sax et al. 2006).

Federal and Indian Reserve Rights

Overview

Federal water right is the legally protected right for federal installations (federal parks, military bases, nature reserves, etc) to use water independent of state law (Jungreis 2005). Federal water rights apply in two scenarios, Indian reserves, and any other parcel of land that the federal government has set aside. The Indian reserve right stems from land agreements being reached by Indian tribes with the United States. The courts ruled that no reservation would be established without sufficient water with which to use the land. Therefore, all Indian reserves have a right to water, regardless of state law, that coincides with the date the Indian reservation was created, even if no water has ever been drawn. This means that in states who use a prior appropriation system, Tribes often have the most senior appropriation right, sometimes dating back to the date a given treaty was signed (Getches 1997).

Since Indian reserves are under the protection of the federal government, the same principal extends to all lands that are put aside by the federal government (these can be parks, nature reserves, military bases, etc). The courts have ruled that if Congress thought it important enough to reserve land, it implicitly reserved sufficient water for that land's use. Therefore, all federal public lands have a right to water, regardless of state law, which coincides with the date land was reserved (Getches 1997).

The implication of the federal and Indian reserve rights has the potential to have a major impact on water allocation decisions. First, it provides another avenue for Congress to supersede state law. Secondly, as the degree to which the protection of the environment constitutes a "use" of water plays out in the courts, the impact of Congressional decisions to reserve land and water can increase significantly and force other users to alter their habits. It should be noted that for land reserved today, all prior appropriations maintain their right ahead of the new federal reserve.

Summary

The complexity of the various legal approaches that different states have for water law results in there being fifty different water systems across the country. Each state's approach reflects the local reality of their water access. Nonetheless, some broad patterns are evident. In the east, where water is plentiful, water rights are attached to land ownership. In the west, where water is scarce, water rights are generally associated with the date that the water was first used for beneficial purposes. The differences between the two approaches have incredible impacts on the way each region deals with issues of scarcity. Furthermore, federal and Indian reserve rights supersede state law and have the potential to interrupt the manner in which others use their water. Understanding the complexity of these competing factors is important when considering how the country as a whole will approach water related challenges in the future, such as increased scarcity.

VI. FEDERAL AGENCIES INVOLVED IN WATER POLICY

There are approximately 18 federal agencies making water decisions in the United States (Gerlak 2006). There are agencies with only minor involvement in water-related issues such as the Department of Energy, which is responsible for the marketing of hydroelectric power produced by the federal government, or the Department of Agriculture, which has some authority over water issues and the conservation of natural resources through the US Forestry Service and the Natural Resources Conservation Service. On the other side there is the Environmental Protection Agency, which is responsible for maintaining national water standards and the Department of the Interior, and which oversees the Endangered Species Act and all reclamation projects. A few of the key federal agencies are outlined below.

Environmental Protection Agency

Overview

The Environmental Protection Agency (EPA) was established in 1970 as an independent agency within the executive branch with a mission to reduce risks to human health and to safeguard the environment. The EPA serves both a regulatory and research function on environmental issues to do with air, water and land. With respect to water, the EPA is the primary federal agency responsible for water quality issues and receives its jurisdiction through the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). While the EPA is not an agency within the Cabinet, the Administrator of the EPA is generally accorded Cabinet-level rank. Water issues are handled through the Office of Water which is managed by an Assistant Administrator.

EPA Role in Water Quality

Water quality is the main focus of the EPA on water related issues. Through the CWA and the SDWA the EPA receives a mandate to work with states to ensure a national standard of water quality is maintained across the country through the issuance of permits (see section on CWA and SDWA for an explanation of standards and permits).

EPA Role in Water Use and Quantity

The EPA's role in water use and quantity issues is somewhat murky. Through the CWA, Congress explicitly stated: "nothing within this chapter shall be construed to supersede or abrogate rights to quantities of water which have been established by any State," (CWA s. 102(g)). Despite Congress' attempts to defer to state laws on quantity issues, the courts have ruled that quantity and quality issues are not completely separate. Given the CWA's mandate is to protect water from pollution, which may result from "changes in the movement, flow or circulation of any navigable waters," (CWA s. 304 (f)), the courts have established that water quantity and use issues are not beyond the scope of the CWA, and thus the EPA, even if the Act itself does not directly address water use or quantity (Benson 2006).

Dams are another example where the EPA has a role in water use and quantity issues. Even though Congress gave the power to issue permits regarding dams to the Army

Corps of Engineers, ultimately Congress recognized the EPA's expertise and concentrated concern over environmental issues. The EPA has the final decision over permits through the ability to veto a project that it determines to have an unacceptable impact on municipal water supply, wildlife or recreational areas (Sax et al. 2006).

The EPA has historically stayed out of water quantity issues, letting states make their own use and quantity decisions. This, however, may not always be the case in the future, should it be determined that the federal government needs to take a more active role in water supply policy. A legitimate role for the EPA exists, even if it has not often been exercised.

Council on Environmental Quality (CEQ)

Overview

The Council on Environmental Quality (CEQ) is an advisory body to the President within the Executive Office of the President and was established in 1969 by the National Environmental Policy Act (NEPA). Its purpose is to advise the President on domestic and international environmental policy, oversee the implementation of NEPA, advise federal agencies on environmental legislation, and coordinate federal environmental policy across all federal agencies. Despite the CEQ's close proximity to the President, its enabling legislation does not provide it with any powers of enforcement (Alexander 2007), and courts have been reluctant to enforce any of its regulations (Getches 1997). As such, the CEQ's level of influence will vary significantly depending on the prominence placed upon it by a given administration.

Department of the Interior (DOI)

Overview

The Department of the Interior (DOI) is the federal agency with the primary responsibility for the management of natural resources, which include public lands, national parks, recreation areas, wildlife refuges, fish and wildlife and minerals. The Secretary of the Interior is a full member of Cabinet. Within the DOI there are various bureaus with specific responsibilities to fulfil the department's mandate. Those who have responsibility for water issues are the Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), US Geological Survey (USGS), National Park Service (NPS), and the Bureau of Reclamation (BOR).

The BLM and NPS have relatively minor roles in water management, largely limited to ensure water protection within the mandates that they have otherwise been given. The BLM does however issue permits for mineral exploration, and is thus required to follow the environmental procedures that are associated with issuing permits that is identified above. The USGS maintains an office in each state and performs nationwide assessments of water supply and quality. It is a research body that provides information to decision makers, but has no regulatory or decision making capacity.

Fish and Wildlife Service (FWS)

The Fish and Wildlife Service (FWS) plays a fairly prominent role in water management as the administrator of the Endangered Species Act (ESA) and the Fish and Wildlife Coordination Act (FWCA). As outlined above, both of these acts require that federal agencies consult with FWS before engaging in activities that may harm the natural environment of fish or wildlife. The FWS also plays a role in regulating and protecting wetlands as well as performing environmental impact assessments of hydroelectric projects, monitoring pesticides and other contaminants within the environment, and studying the ecology of fish and wildlife populations (Commission for Environmental Co-operation 2001).

Bureau of Reclamation (BOR)

The Bureau of Reclamation (BOR) is responsible for water and power development in the 17 contiguous western states. The Reclamation Act of 1902 conceived of the BOR for the purpose of building large-scale dams and irrigation projects in order to supply water to the growing population of the west. The purpose of the BOR was to promote settlement of public lands in the west by independent farmers. Through the sale of public property, the BOR financed irrigation projects and farmers were required to repay the costs of the investment in interest-free repayments, which were then used to finance other projects.

The federal funding of water projects was not intended to supersede individual state control over water distribution. When the Bureau of Reclamation was created, President Theodore Roosevelt stated: "irrigation works should be built by the National Government…the distribution of the water, the diversion of the streams among the irrigators, should be left to the settlers themselves, in conformity with State law," (Tarlock et al. 2002). Despite this statement, the Supreme Court has ruled that where state laws are inconsistent with Congressional directives on reclamation projects, Congressional authority supersedes (Getches 1997, Benson 2006).

The Reclamation Act also contains a provision that limits the amount of land that is eligible to receive subsidized water. As BOR covers the cost of water projects, with interest free repayment plans, farmers receive their water at a subsidized rate. The Act puts a limit on ownership and leasing land at 2080 acres, after which excess lands are subject to the full cost of water delivery to those lands, including the amortization of construction costs and any unpaid operational or maintenance costs, for which other users are not liable (Tarlock et al. 2002).

Today the BOR focuses more on promoting efficient use and management of water than developing new supplies. It also works closely with other governments to create new and improve existing water management plans, prepare environmental assessments for proposed federal water projects, design and construct water projects, provide engineering expertise to Indian tribes, and work with other federal and state agencies to protect against water contamination (Commission for Environmental Co-operation 2001).

US Army Corps of Engineers (the Corps)

The US Army Corps of Engineers (the Corps) is a federal agency with military and civilian responsibilities within the Department of Defence. With respect to water, the Corps' primary responsibility is the issuance of permits for the discharge of dredge and fill material into US waters and wetlands as per the CWA. The Corps also regulates all construction projects in navigable waterways (Commission for Environmental Co-operation 2001). As explained above, the Corps must comply with the environmental requirements from such federal legislation as the CWA, ESA, NEPA, etc. when issuing permits.

In addition to the permitting responsibilities, the Corps, at the discretion of Congress, plans, builds and operates a wide variety of water resource facilities across the country. It also has responsibilities for maintaining navigable channels, controlling floods, as well as shared responsibilities in ecosystem restoration, disaster relieve and infrastructure for municipal water and wastewater (Carter et al. 2007).

Summary

The number of federal agencies that make water decisions has resulted in some analysts referring to the overall system as fragmented (Jungeris 2005; Sherk 2005). The division of powers among agencies is such that no single agency, be it the EPA or the DOI, have the authority to completely write a comprehensive national water policy. This fragmentation has lead to great frustration among decision-making bodies at the state and local level as no single representative can speak on behalf of federal government's water policy. As a result, many involved in water decision-making would prefer the federal government to adopt a comprehensive national water strategy in order to decrease the burden of frustration that fragmentation can place on states and local water management boards (Mandarano et al. 2008).

VII. INTERSTATE WATER MANAGEMENT

Interstate water management can range from agreements that include memorandums of understanding to legally binding compacts with the weight of federal law attached. As several states with conflicting interests are often dependent on the same river or watershed, interstate water management is an important tool for preserving the resource and resolving conflicts. In the absence of federally mandated water allocations, states have three options for managing conflicts: litigation in the Supreme Court, informal associations and interstate compacts. As informal associations can take various forms, and do not have any force of law, and the Supreme Court does not require further explanation in this report, this section will focus on the interstate compact.

Interstate Compacts

Overview

A compact is a legally binding agreement of interstate cooperation between states. In circumstances where an agreement increases the political power of the states at the expense of the federal government, Congressional approval is required (Sax et al. 2006). For an interstate compact to come into force, the legislatures of each member state must approve identical compact language, and when required, Congress must provide its consent. Once authorized, a compact is a legal contract between states with force and effect of statutory law (Viña and Sheikh 2006). As a compact agreed to by Congress becomes a federal law, all federal agencies are then bound to its terms. At the same time, as federal law, Congress also has the ability to pass legislation that would override the provisions of the compact, for instance altering the agreed upon allocation of water among the compact states (Mandarano et al. 2008).

The primary purpose for the creation of water compacts in the west is to apportion the water within a shared watershed. In the east compacts are primarily for the purposes of pollution control and flood control. At present, there are approximately 38 interstate compacts in force, 22 of which are to apportion waters in the west (Mandarano et al. 2008).

Advantages

The advantage of a creating a compact is that it has strength beyond what could be enacted through state law. First, compacts take precedence over state laws that might be inconsistent with the provisions of the compact, and member state cannot unilaterally withdraw or alter the terms. Second, interstate compacts often establish a commission, or other administrative body, with the authority to manage the shared water resource within the terms of the compact (Sax et al. 2006). Furthermore, when disputes arise, the Supreme Court is the usual forum for resolution (Viña and Sheikh 2006). These three elements provide a manner of managing water interests between states that, once terms have been agreed upon, is consistent and avoids the day-to-day political pressures that have the potential to derail an agreement that is beneficial to all.

Shortcomings

Interstate compacts also display some prominent flaws. As Mandarano et al. (2008) noted there are at least three specific factors that weaken compacts. First, the majority of compacts are narrowly focused on allocation of water and ignore the more comprehensive watershed issues such as habitat protection or water quality. Secondly, since compacts require the unanimous consent of all parties, they often become watered-down. The result is that the commissions administering the compacts end up serving as research bodies and advocates on behalf of the member-states when dealing with the federal government, but the commissions lack the teeth to properly protect the watershed. Third, as many of the compacts were established over 40 years ago, they lack the capacity to deal with present-day water issues.

Compacts have also been noted for their tendency to be protectionist of a region's resource against outside use, rather than protecting the watershed as a whole (Klein 2006). An example is the Great Lakes-St. Lawrence River Basin Water Resources Compact, which has as a key provision: "all new or increased diversions are prohibited," but does not provide the same strength in language preventing withdrawals of water (Klein 2006). The implication of the wording is that outsiders cannot have access, but those who are part of the watershed are not forced to deal with conservation issues.

Summary

Interstate water management is a critical part of the overall US water management system. As states with competing priorities often share a watershed or river, how disputes are settled is of great importance, as is the allocation of water as it passes from state to state. While the Supreme Court provides the venue to settle disputes, the interstate compact provides the enforceable rules under which states must act. As was mentioned above, there are strengths and weaknesses in the compact approach. It provides protection against day-to-day political whims, but some academic critics have questioned the strength of compacts that require unanimous consent. Furthermore, some have argued that compacts serve more a protectionist purpose against outside use than protection of the watershed as a whole. Whether compacts are indeed an effective water management tool or not, they are an integral part of the overall US water management system and understanding their role within that system is essential.

VIII. WATER EFFICIENCY

Having examined the US system of water management, this section will now focus on what action is being taken on water conservation and efficiency at the federal and state level. Examples of programs to increase water efficiency can be found across the US, although the greatest number, and those that are most widely promoted are in the west. California's Water Plan is singled out in this report because of the state's record as being on the forefront of water efficiency efforts over the last 50 years (Getches 2001, Dickinson 2001).

To remain consistent with the language being used by the US government, the terms water efficiency and water conservation are used in their broadest context and include water reuse, waste-water reclamation, water rates, efficient equipment, and behavioural changes. As the goal of both water conservation and improved efficiency is to secure new sources of water supply by changing consumption habits, the terms are often used interchangeably (Environmental Protection Agency 2002)

History of US Water Supply Policy

Initially, with sufficient water in the east and a system of riparian rights to determine its allocation, concerns over access to water in the west dominated the US policy on water supply, and still does. David Getches (2001) argues that the history of US water supply policy has three distinct phases and that early policy still has a negative impact on attempts to conserve water.

The first phase involved the development of water sources in order to encourage the relocation of people to the west. The water policies until the start of the 20th century allowed users to do as they pleased and develop any source of water without consideration for the potential impacts the development might have on anything or anyone else. This is where the "first in time, first in right" system of water rights originated.

A second phase took hold once the easily accessible sources of water were allocated at the end of the nineteenth century. This phase focused on finding and developing new sources of supply that required big infrastructure projects to store and transport water. In this phase, the federal government moved from a position where it turned a blind eye toward all water development that was taking place, to taking an active involvement as the primary financial investor. Engineering feasibility was the principal factor for project approval and little attention was paid to economic, social or environmental impacts (Getches 2001). This was the era of the big dam and large supplies of water were committed to certain sectors and regions.

The third phase, which is the current phase, is one of conservation. In the middle of the 20th century federal dollars for big water projects started to dry up at the same time as most rivers capable of easy dam construction were tapped. At the same time, environmental consequences such as damage to natural water systems that are the result

of dam construction were starting to be noticed and political pressure to change the practice of dam construction grew. Water supply policy then shifted to focus on stretching the existing water supplies (Getches 2001).

While the financial and environmental factors were combining to change the policy on water supply, the consequences and legal implications of having committed water to specific uses several decades prior, predominately inefficient agricultural uses, were starting to be noticed. Legal battles between the holders of water rights and those advocating for change became more regular (Getches 2001). Today, attempts at conserving water for economic and environmental reasons are hindered by the inflexible water policies and water laws that have developed through the history of US policy on water supply. Nevertheless, the large water infrastructure budgets of the past are gone, and opposition to building new dams and storage facilities is strong. In the face of a growing population, policy makers must balance these constraints against the pressures from the holders of existing water rights as well as the need to find greater water efficiency during the new era of water conservation.

Current Trends

Water policy is an evolving process as improved management strategies are continually being sought. Beyond the current era of conservation, the following trends are still in their relative development stage and not yet entrenched within the culture of water management.

Convergence of East and West Policies

Both the east and the west are moving away from the strict doctrines of riparianism and prior appropriation as both doctrines have been subject to substantial criticisms for their inherent flaws. Among those flaws is the difficulty to protect water uses that are not quantifiable, such as environmental concerns, in the prior appropriation system, and the assumption of a perpetual abundance of water in the riparian doctrine. In both cases, most states are adopting elements of the opposing system and are slowly converging their water resource policies (Sax et al. 2006; Deason et al. 2001; Getches 1997). For instance, as the interest in water marketing grows, the eastern states are determining that a "quantification process is essential in determining the amount of water that a permit holder can transfer," (Deason et al. 2001, p. 179), something that has been ingrained within the prior appropriation system since its conception. Within the west, there is a growing trend to consider the "reasonableness of use" concept during disputes (Deason et al. 2001), a central tenet of the riparian doctrine.

This convergence is not the same as what occurs under a hybrid system where legal rights to water exist based on a combination of riparianism and prior appropriation. The convergence is merely seeing states adopt similar polices in an evolution of their water management structure, where the hybrid system contains entrenched legal rights that have historical significance. This evolution of policy indicates that states are recognizing that the rigidity of the entrenched legal rights that accompany both riparianism and prior appropriation are not ideal for dealing with contemporary water efficiency issues.

Instream flow and Public Interest

Traditionally little consideration has been given to water issues that cannot be quantified. Recently however, there has been a growing acceptance that environmental concerns, such as water levels, public uses and recreational value are considered a "beneficial use" (Deason et al. 2001; Getches 2001). Previously, "beneficial use" had been limited to uses that can be quantified, such as agricultural, municipal or industrial use. Growing public concern over water use and water quality, along with the courts' continued rulings that water quantity is linked with water quality (Benson 2006) have made way for this shift in policy.

Collaboration

Collaboration and cooperation between the federal government, states and stakeholders is the central tenet of the current federal approach to water policy. Since the late 1990's, the federal government has placed an "emphasis on partnering with state, tribal and local governments," (Gerlak 2006, p. 240). Amendments to legislation, such as the CWA in 1998 and the SDWA in 1996, allowed greater flexibility for states to exercise authority over standards and enforcement (Gerlak 2006). More recently, former Secretary of the Interior, Gale Norton, identified cooperation as one of the four cornerstones of US water policy (Department of the Interior 2005). An example of a collaborative approach can be seen in the California-Federal Bay-Delta Program (CALFED). In response to complaints from stakeholders that water agencies at the state and federal level were making decisions without consulting each other and hindering the management of the watershed, CALFED began as a forum where federal and state agencies could create a "single, comprehensive plan for the entire region," (Gerlak 2006, p. 244). There are now 23 state and federal agencies with responsibilities for protecting natural resources and managing water supplies that participate in this policy making process. In addition to CALFED, Chesapeake Bay Commission and the Great Lakes Water Quality Initiative are just a few of the countless examples of the collaborative approach that is being taken in US water policy.

A major driver of collaboration is the avoidance of litigation. As Gerlak (2006) argues, states, tribes, water users and the federal government have come together on numerous occasions to build consensus in advance of conflict in order to avoid litigation. That theme can equally be seen within the Department of the Interior, which states that the avoidance of lengthy and expensive litigation is one of the reasons that collaboration has become a cornerstone of the Department's approach to policy making (Department of the Interior 2005).

Whether the purpose of collaboration is to avoid litigation or ensure that stakeholders are content with the process, all agree that it is much better than a scenario where decision-makers work independently of each other (Gerlak 2006, Department of the Interior 2005).

Federal Actions on Water Efficiency

The United States' policy on water supply has entered an era where more water needs to be found within the existing sources of supply. The population of the United States has

increased by nearly 90 percent between 1950 and 2000 while public consumption of water has increased by 209 percent during that same period (Subcommittee on Water Availability and Natural Resources 2007). With this increased demand placing additional stress on water availability, and few new traditional sources of supply available, the focus is now on water conservation and efficiency. Table 2 provides the total use of water by sector across the US.

Table 2: Total Water Use in the United States by Sector

Total Water Use in the United States in 2000: 48 billion gallons per day			
Sector	Percentage of total US water use	Amount in million gallons per day	Explanation
Public Supply	11 %	43,300	Public parks, pubic buildings, public pools, etc
Domestic Use	1 %	3,590	Domestic indoor and outdoor purposes
Agriculture	35%	138,760	Irrigation and livestock uses
Industry	5%	19,700	Uses for the production and transportation of a product
Thermoelectric Power	45%	195,000	Generation of energy through steam-driven turbine generators – most of which is returned to source
Aquaculture and Mining	2%	7,170	Uses for the purposes of mining and raising water organisms
Source: Hutson et al. 2004			

In a 2004 study by the World Water Council, of the 147 countries surveyed on water efficiency, the United States finished last (O'Neil and Dobrowolski 2005). Furthermore, the EPA (2008) reports that 36 states expect to face water supply shortages in the next 5 to 10 years. Yet despite the international ranking and the numerous states facing shortages domestically, the United States does not have a national policy on water supply, nor is water supply presently a top priority of the federal government outlined in either the 2007 or 2008 State of the Union addresses, or the FY 2009 federal budget documents.

Despite the seemingly low priority on water efficiency at the highest level of the government the picture is not entirely bleak. The US has made significant strides in increasing its water use efficiency over the past few decades. Since the peak in 1980, per-capita water use has declined each year until 2000, the year from which the most recent data is available (Hutson et al. 2004).[1] While actions on water efficiency vary between regions, when looking at the country as a whole "water efficiency has become the first choice for many water utilities in lieu of expanding facilities or purchasing more expensive sources of water," because its cost-efficient results (Dickinson 2001, p.11). Furthermore, the issue receives attention within some government reports and programs, indicating that water efficiency is not completely removed from the federal radar.

Government Reports on Water Efficiency

A prominent trend within government reports that deal with water efficiency and conservation is to acknowledge the importance of the issue and make a recommendation for further study. In the 2007 Report of the Subcommittee on Water Availability and Quality (SWAQ), water supply is identified as a top challenge for water policy. Despite the listing as an important challenge, the report by SWAQ falls short of placing much urgency on water efficiency, by simply recommending further research with no indication of necessary timelines or the level of financial commitment required. In its own report, the United States Geological Survey (2008) makes the same recommendation about the need for research dollars directed towards water efficiency, but again, does not indicate a target for research completion or the amount of financial support required. Finally, the US Department of Agriculture produced a white paper on agricultural water security, where again, further studies on water efficiency is identified as an important priority, but no timeframe is mentioned (O'Neil and Dobrowolski 2005). While none of the three reports mentioned indicate that the issue is one of great urgency at the federal level, they do indicate that the federal government is cognisant of the fact that water efficiency needs to be addressed.

Taking a different approach to the research reports mentioned above, the EPA (2002) produced a report promoting some of the success stories of water efficiency measures being taken across the country in order to encourage greater water conservation. Some of the savings found through efficiency measures such as rate adjustments and efficient plumbing are quite impressive and worth highlighting:

- through the use of high efficiency plumbing retrofits alone, Tampa, Florida has been able to reduce total water use by 15 percent between 1989 and 2002;
- Seattle, Washington dropped per-capita water consumption by 20 percent during the 1990's by adopting a seasonal rate structure, public education and providing incentives for water-saving products; and
- with increased rates and retrofitting toilets and showerheads, Goleta, California found a 30 percent reduction in water consumption between 1983 and 1991 (EPA 2002).

[1] The most recent United States Geological Survey data is until the year 2000; 2000-2005 data should be available shortly according to the USGS website, last checked July 28, 2008.

The EPA report is not a policy document intended to provide federal direction on water efficiency, nor are any of these water efficiency programs federally run. However, even if the action in this case is limited to the promotion of water efficiency, it serves as an example of how the federal government is acknowledging that water efficiency is an issue of concern.

Water 2025 – Department of the Interior

The most comprehensive federal program dealing with water supply is the Department of the Interior's Water 2025 that is aimed at improving water efficiency in the west. The program began in 2003 by conducting extensive consultations with stakeholders across the west; in total just over 3000 people took part (Department of the Interior 2005). Through the use of market mechanisms, conjunctive management and further research on efficient technologies, the purpose is to enhance water efficiencies and conservation. The program is not however, generating any new laws, or suggesting any changes to existing law. It provides a framework for developing solutions to identified problems with water supply and granting money for pilot projects that address water efficiency issues.

There are two key aspects of Water 2025. First, the program opens a consultative dialogue with states, tribes and all water stakeholders to find solutions to water shortages. Second, the Challenge Grant Program, contained within the framework, provides matching grants to small projects designed to create water markets and improve efficiencies of existing uses. For successive years starting in 2004 the federal portion of the Challenge Grant Program has invested $8.4 million in FY 2004; $19.5 million in FY 2005; $30 million in FY 2006; $15 million in FY 2007; and $25 million in FY 2008 (Office of Budget and Management). Examples of the type of programs that are receiving grants are programs that promote water markets, retrofit existing facilities, line unlined water canals, or install water-measuring devices. Unfortunately there are no publicly available evaluations on the success of the programs. However, regardless of its ultimate success, by conducting very extensive consultations and providing a significant amount of funding through grants, Water 2025 and the Challenge Grant Program does signal that water efficiency is being taken seriously by the federal government.

WaterSense – Environmental Protection Agency

The second primary contribution to water efficiency at the federal level is the EPA's WaterSense program. WaterSense is a public-private-partnership to promote water efficiency through education and a labelling program of water efficient appliances. Partnering with private sector manufacturers and suppliers of water appliances, as well as water NGO's, the WaterSense program identifies efficiency standards for products, evaluates them for purposes of receiving the WaterSense label, and identifies products or sectors that are in need of water efficiency research. The purpose is to increase public knowledge of water efficiency and how individuals can improve their personal water efficiency through appliance upgrades (Environmental Protection Agency 2008a). The program was launched in FY 2008, but is not a line item in either the FY 2009 EPA Budget in Brief (Environmental Protection Agency 2008b), or the FY 2009 Congressional Justification (Environmental Protection Agency 2008c) so the size of the federal financial commitment is unknown.

Congress

Water efficiency is not at the top of Congress' concerns. Between January 2007 and July 2008, 1000 bills referencing water have been read in one or both houses of Congress. Of that list, only nine contain substantial measures on water efficiency, and none of them have passed both Houses (Library of Congress 2008). Furthermore, of the nine, only one is specifically about water efficiency, the *Water Use Efficiency and Conservation Research Act*, which authorizes the EPA to conduct research on water efficiency under the WaterSense program (Matheson 2007). The remaining eight contain mentions of water efficiency, or direct research dollars to water efficiency within the context of other issues, such as agricultural funding or energy efficiency. Water quality on the other hand features in 319 bills while the remaining reference water in passing without substantively addressing any water issues.

State Level Actions on Water Efficiency

Most of the actions being taken on water efficiency are being initiated at the state level. Despite the Supreme Court recently establishing a connection between water quality and water quantity, which has opened the door for more federal intervention on water supply, as has been previously outlined, the federal government has taken very little action, leaving it in the hands of the states. To that end, many states and municipalities are taking significant strides at reducing their water use through finding greater efficiencies.

In addition to the examples already outlined that are being promoted by the EPA (2002), there are many more highly advanced initiatives, especially in the west, which are highlighted by the Western Resource Advocates (2003). These initiatives deal with several facets of the whole water supply and efficiency problem including:

- water loss management programs to detect and repair leaks and proper metering of use;
- cooperative water management, which includes regional water banking and regional integration of collection and distribution systems;
- water reuse and recycling programs to collect some of the near 50 percent of municipal water delivered to consumers that is not completely consumed;
- market mechanisms which include various water rate structures and incentives to retrofit homes with efficient appliances and faucets; and
- conjunctive land and water planning.

The savings reported from these efficiency initiatives are significant. The city of Denver, Colorado estimates that it can directly attribute the implementation of proper water metering to achieving close to a 5 percent reduction in water demand between 1980 and 2002. The city of Phoenix, Arizona reuses 163 million gallons per day of wastewater for irrigation. And in the city of El Paso, Texas over 160,000 citizens took advantage of incentives to buy low-flow showerheads and an additional 34,000 citizens did the same for high efficiency toilets in 2002 (Western Resource Advocates 2003).

These examples of savings indicate that states recognize the importance and the immediacy of the need for water efficiency policies, especially in the west where the urgency is greatest.

The following table presents a representation of regulation and programs that encourage water efficiency at the state or local level in the south western states. Only when there is no state action taking place are municipal activities considered.

Table 3: Laws and Programs Promoting Water Efficiency and Conservation in the South Western United States

	Laws and Programs Promoting Water Efficiency and Conservation at the State or Local Level in the South Western United States						
State	Incentives to use Water Efficient Appliances	Conjunctive Land and Water Planning	Water Rate Structures	Cooperative Management	Water Reuse and Recycling	Water Loss Management Programs	Public Education Programs to Encourage Conservation
California	√	√	Δ	√	√	√	√
Arizona	√	√	Δ	√	Δ	√	√
New Mexico	√		Δ	Δ	√	√	√
Colorado	√	√	Δ	√	Δ	√	√
Utah	Δ	√	Δ	√	√	√	√
√ = State Level Δ = Municipal Level							

California Water Plan 2005

California in particular has always been a leader on water supply and efficiency policy (Getches 2001), and as such, specific attention to the California Water Plan is merited as an example of actions already being taken at the state level.

Every five years California's Department of Water Resources publishes a detailed Water Plan, the most recent being in 2005. The first observation that one notices when examining the Plan is the comprehensiveness with which California deals with all aspects of water management. Including approaches to find non-traditional sources of supply, such as recycling, underground storage, and desalination, along with finding greater water efficiency through conjunctive water and land management, economic incentives, and greater use of high efficiency appliances, California's water plan presents a holistic view of water management.

A heavy emphasis is placed on water efficiency. Of the 14 recommendations made in the 2005 plan, the top priority is focused on efficient water use. The estimated amount of water that can be added through implementation of the water plan is 8.6 million acre-feet per year, of which 3.1 million is found through urban water efficiencies. These savings are expected to have a minimal impact on the way Californians live (Department of Water Resources 2005).

From the perspective of water use, according to the detailed analysis (Department of Water Resources 2005), while the population is expected to increase by 29.1 percent by

the year 2030, under current trends, total water use will reduce by 23,000 acre feet during the same time period. The reduction is being found from the agricultural sector, where there is expected to be a 3.5 million acre foot reduction, equal to 10 percent of 2000 agricultural water use. Urban water use, however, is expected to increase by 2.9 million acre-feet, which represents an increase of 32.5 percent from urban water use in 2000.

The overall savings are all found through the water efficiency strategies mentioned above. According to the Pacific Institute, using the same strategies identified in the Plan, but more aggressively, can result in a 20 percent reduction in overall consumption by 2030. Regardless of the debate as to whether the efficiency initiatives by California's Water Plan are sufficient, in the face of a significant population increase, the Plan reduces actual water consumption through a comprehensive approach that clearly demonstrates that the State of California is taking water efficiency measures seriously. As noted above, the components of California's plan are being adopted by other states, however the calculations are all California specific.

Summary

The US history of water supply policy has left the federal government in a position where its previous policy actions have created a system that often hinders conservation efforts. That being said, water efficiency is an issue of concern in the United States. The two primary federal programs, Water 2025 and WaterSense provide avenues for federal dollars to be invested in researching new water efficiency projects and provide consumers with a reliable efficiency standard for appliances. Water efficiency may not be a top priority for the federal government at the present time, but it is an issue about which the government is well aware.

At the state level, and especially in the west, the actions being taken, and results being seen, demonstrate that water efficiency is being taken seriously and is a top priority for state governments. The combined factors of expanding populations and a lack of new sources of water supply, has forced arid western states to look at policies of conservation and efficiency in order to meet their water demand.

Overall, the United States has met some success with water efficiency. There is obviously much room for improvement, as is evidenced by the World Water Council's evaluation, and the EPA's report that 36 states expect to face water shortage in the next 5 to 10 years. Nevertheless, the US has managed to reduce per capita water consumption since 1980 (Hutson et al. 2004). The achievements that have already been made on this front, most of which have come from state level action, leave a sense of optimism that as water efficiency becomes a greater issue of concern, a blueprint can be created, from which national and state water efficiency plans can work. California's Water Plan is an example of how a strategy that considers all aspects of water management can improve efficiency with little impact on the current way of life.

IX. DIRECTION OF US POLICY ON WATER SUPPLY

The focus of this section is on the pressure that stakeholders are placing on the federal government as a way of suggesting the direction that policy on water supply in the United States is being pushed. As has been previously mentioned, water supply issues in the western states decide US water supply policy (Getches 2001). As a result, the issues being raised in the west, and more specifically in the south west, provide evidence from which strong inferences can be made regarding the direction of national water supply policy.

The scientific and academic community have identified the primary issues they feel, if adopted to the fullest, will provide sufficient efficiency and water conservation to meet water supply needs over the next 25 years. This section will now outline those issues, and then, using a consideration of pressures presented by the main stakeholders outside the federal government, provide some explanation as to why governments have not followed the recommendations.

Policies to Achieve Greater Water Efficiency and Conservation

There is a general consensus within the academic and scientific community that if certain policies to promote water efficiency and conservation are adopted, supply issues over the next 25 years can be met without the need to import water in the south western United States (Gleick, Cooley and Groves 2005; Anderson and Snyder 2002; Myerson 2002). Where previously it was thought that water scarcity was the result of a lack of supply and new sources were required to solve shortages, it is now felt that scarcity is actually the result of a lack of efficiency or at least can be overcome by the application of suitable efficiency measures (Gleick, Cooley and Grooves 2005). There are three efficiency measures in particular that are promoted. First, reduce urban consumption through market mechanisms by applying a true cost to water use and providing incentives to purchase high efficiency appliances. Second, promote a redistribution of water from agriculture to urban use by applying water rates that encourage farmers to improve their efficiencies and sell their excess. Third, implement policies of conjunctive land and water planning. Should these policy recommendations be adopted, their implementation will provide significant returns.

Market Mechanisms

There is no longer any debate among water experts in the United States about the need to conserve, or that many water inefficiencies exist within the current system. Nor is there much debate that market mechanisms will result in more efficient use of water and in greater conservation. Since the Supreme Court ruled in 1982 that water is an article of commerce various approaches to the use of market mechanisms have been tested (Deason et al. 2001), from pure open markets, to government incentives. Despite the evidence that these approaches will result in greater water efficiency, Webb (2006) notes that these policies are still in their infancy. Like many policies in the development stage of their implementation, governments are still determining which mechanisms to use and to what extent they should be applied. While there are many views on how to properly make use

of market mechanisms, a consensus is growing that price is an important part of meeting water needs (Smith and Wang 2008; Klein et al. 2007; Gosnell, Haggerty and Byorth 2007; Anderson and Snyder 2002; Levin et al. 2002). Conservation and redistribution are the contexts under which market mechanisms are most often mentioned.

The opposition to market mechanisms, which can often be quite vocal, does not oppose applying a true cost to water. Rather, the opposition largely surrounds the ethics of the privatization of water, and the affordability of water for the poor (Barlow 2008b; Morris 2006; Nakai 2006; Eckstein 2006). As such, market mechanisms, including applying a true price to water that includes the cost of the infrastructure and a cost to use a public good, as is the case when other public resources are extracted for consumption, is widely supported within the academic community that studies water policy across the US. Inherent within the calls for market mechanisms is the removal of the subsidies received by many bulk water users, especially in the agricultural sector of the west.

Reducing Urban Consumption

As a means of conservation, various market mechanisms have been studied including excess surcharges, drought demand rates, inclining block rates, seasonal rates, and time of use rates, each of which has demonstrated a reduction in use when a price is applied (Smith and Wang 2008). As Klein et al. (2007, p. 36) conclude, "overall the literature is clear, water demand is largely a function of water price." Anderson and Snyder (2002), report that a 10 percent increase in the price of water results in a decrease of consumption between 3.75 percent and 12.63 percent, indicating that consumption is responsive to price. Further studies by Levin et al. (2002) confirmed that consumption is responsive to price across OECD countries, while Smith and Wang (2008) found that a 10 percent increase in price would result in an 8.2 percent reduction in consumption during the summer months. At a higher price, urban consumers respond by using less or finding more efficient ways of meeting their water needs. Presently, water prices are kept artificially low through direct and indirect subsidies. The result is often a water shortage due to a lack of incentives to change behaviour and upgrade inefficient appliances (Anderson and Snyder 2002). Inefficient water use is a user's rational response to water supply that does not reflect its true cost.

The savings that can be found by changing urban consumption habits are quite significant. It is estimated that by the year 2030, California can find a 40 percent savings below 2000 water levels in urban centres simply through the use of efficient toilets, showers, washing machines, dishwaters, faucets and fixing leaks (Gleick, Cooley and Groves 2005). Incentives to encourage consumers to purchase these efficient appliances will go a long way to reducing urban water consumption. A second major area of urban water savings is from the household lawn. The average percentage of total household water use on lawns and gardens is approximately 50 percent, moving closer to 60 percent in urban centres (Dickinson 2007; Hanak and Davis 2006). In California, the average is 60 percent and savings are estimated to be in the range of 32.5 percent through the selection of indigenous plants and efficient garden designs (Gleick et a. 2003). Combining both efficient appliances and savings from household lawns and gardens, the

California Water Plan estimates that total urban water consumption, can be reduced by 3.1 million acre-feet per year (Department of Water Resources 2005).

Redistribution from Agricultural to Municipal Use

Beyond the conservation of water, market mechanisms are touted as a means of redistributing water in order to find new sources needed to meet increasing demand. The most recent survey by the US Geological Society estimates that approximately 35 percent of the 408 billion gallons of water used per day in the United States is by the agricultural sector (Hutson et al. 2004). In the west, the amount of water used by agriculture dramatically climbs to 80 percent (Greenstone 2008; Glennon 2005). Anderson and Snyder (2002) estimate that if five percent of agricultural water was transferred to municipal uses, the needs of urban areas in the Western United States could be met for the next 25 years without damaging food production.

The reason that agricultural use, especially in the west, has become so inefficient is twofold. First, the system of prior appropriation encourages waste, and secondly, irrigation systems are old and outdated. The challenges stemming from prior appropriation centre around the "beneficial use" requirement, whereby if a farmer does not put all his or her allocation to use, it will be lost. On the irrigation side, the canals that divert water for irrigation often lose 40 to 50 percent through seepage into the ground, and many irrigation systems used by farmers lose a significant amount to evaporation (Glennon 2005). Because farmers receive their water at a subsidised rate, there are no incentives to improve upon these measures. While subsidy rates vary across the country, one estimate by the Public Policy Institute of California is that Californian farmers pay around a quarter the price per acre-foot that urban citizens pay (Kaleita 2008). Removing the subsidies and establishing an open water market would create an incentive for farmers to fix the inefficiencies in order to trade any excess.

Conjunctive Planning

One of the greatest concerns among water experts is the disconnect between water and land management. There are many examples of water development remaining "segregated from land use planning," (Getches 2001, p. 38). The segregation between land management and water planning is considered by some to be at the root of water problems (Getches 2002; Babbitt 2007). In order to avoid scenarios where land developments are approved without a sufficient supply of water to sustain growth, conjunctive planning that includes land and water considerations is a top priority for many water experts (Klein 2006; Levin et al. 2002; Johnson, Contor and Cosgrove 2008). Despite the clear voice of support for conjunctive planning, an all-encompassing national water resource policy has not been adopted (Webb 2006).

Summary

The use of market mechanisms to find greater efficiencies in urban centres and redistribute water from agricultural to municipal use, applied concurrently with conjunctive land and water planning, are identified as key policies to achieving sufficient

water conservation and efficiency. These recommendations break down more specifically to three points:

- apply a price structure to reduce urban consumption and provide incentives for consumers to use more efficient appliances and fixtures;
- redistribute water from agricultural to urban centres by applying a water rate that encourages efficient agricultural use and allow for the creation of water markets to redistribute savings;
- ensure that water and land management are not segregated.

Generally, there is a consensus that conservation and greater efficiency can solve water scarcity for the next 25 years in the western United States without the need to import water.

X. ADVOCACY COALITIONS TO EXPLAIN POLICY DIRECTION

If the recommendations being made by the water experts from the academic and scientific communities are as good as they claim to be, and in light of the fact that a number of states expect to face water shortages in the next 5 to 10 years, why is the federal government not implementing a comprehensive national water supply policy with these policy recommendations as its foundation? One possible answer is that the recommendations cannot achieve what they claim. However, this paper is not attempting to evaluate potential policies, but to get a sense of the direction in which the US water system is heading. An assumption will therefore be made that the academic and scientific community have a good understanding of the policies that will bring the greatest water efficiency. For the purposes of this report, these policies will be referred to as the "optimal efficiency" policies.

With the optimal efficiency policy recommendations having been made, one then observes that they have all been adopted, in one form or another, by various state and local governments as was outlined in the previous sections of this report. The issue then must not be that there is great opposition to policies that seek to improve water efficiency and conservation, and specifically not to the optimal efficiency policy recommendations mentioned above. The issue must be the extent to which they are applied.

There is some merit to the observation that the issue is the degree to which the optimal efficiency policies are applied, and not necessarily the policies themselves. An example can be seen with the 2005 California Water Plan. The Pacific Institute argues that using the exact same policies as found in the California Water Plan, but in a more sustained manner, consumption can be reduced by an additional 20 percent by the year 2030 (Gleick, Cooley and Groves 2005). Therefore, the issue according the Pacific Institute, is not with the policies being used to achieve greater efficiency, it is that the state is not pushing them far enough.

Further evidence to support the merit of this observation is found in the vast support for the optimal efficiency policies from a large number of groups. The state governments themselves, and cities, have demonstrated their support by enacting the recommendations in various different forms. The governors associations, which are the political bodies that advocate on behalf of state governors, also express support for the above-mentioned policies. The governors associations have even gone so far as to suggest that perhaps a national policy on water supply would be worth considering, so long as it does not infringe on state sovereignty (National Governors Association 2008; Council of Great Lakes Governors 2008; Western Governors Association 2008; Western States Water Council 2006). There is also no shortage of support for the optimal efficiency policies from the water advocacy community, including the Western Resource Advocates (2003; 2004), Urban Water Conservation Council (Dickinson 2001), the Public Policy Institute of California (2006; Hanek and Davis 2006; Kaleita 2008); the Pacific Institute (Gleick, Cooley and Groves 2005), and the California the Alliance for Water Efficiency (Dickinson 2007), just to name a few. Even some parts of industry have identified their support. Not surprisingly, the Plumbing Manufacturers Institute has released a policy

statement in full support of regulations for water efficiency standards and incentives for customers to purchase water efficient appliances and fixtures (Plumbing Manufacturers Institute 2000).

The optimal efficiency policies therefore have the support of the water advocacy community, and a certain level of support from cities and state governments. Through the fact that state governments and cities have enacted these policies to varying degrees, and given that governments rarely enact policies in the face of significant public opposition, there is an implication that there is not a significant level of opposition from the general public. The next question then, is from where does the opposition come? What or who prevents implementation of the optimal efficiency policies to the degree recommended?

Brian Ellison (1998) provides a theory on the advocacy coalition framework that helps to explain why the optimal efficiency policies have yet to be adopted to the fullest extent. Ellison (1998, p. 38) argues: "external events cause policy changes by creating the conditions necessary to produce new governing coalitions or new policy approaches." With respect to water policy in the west, an increase in population, combined with greater environmental awareness, has created the external pressure forcing change in water supply policy. As was seen by looking at the history of US water supply policy, it has gone through several stages, and Ellison would argue that at each stage, external pressures forced new coalitions to be formed, who then influenced the policy change. The important element of this theory is that a sufficient number of groups need to form a large enough coalition to bring about the policy change.

With respect to present day policy, Elizabeth Graffy (2006, p. 467) notes that water organizations that are concerned with water efficiency do not present a unified message and even found there is an "absence of a shared core problem definition for water scarcity." The organizations Graffy surveyed are grouped into scientific, development, ecological, governance or managerial backgrounds, and are all advocating for improve water efficiency standards and practices. Lacking a unified message, she argues, is a significant issue that creates confusion among policy makers and the public, which in turn creates scepticism about the severity of the issue. This in part helps to explain the scenario. Even though there are a large number of groups who support the optimal efficiency policies, they have not yet been able to form a large enough coalition to fully implement these policies.

Combining Ellison's theory regarding the necessity of coalitions in order to change policy, with Graffy's comments that water organizations advocating for improved water efficiency are not yet unified, the reason the optimal efficiency policies have not been adopted to their fullest starts to become apparent. These theories, however, have only explained the reaction to those who are looking to bring policy change, while there is bound to also be groups and coalitions who support the status quo. To assist with that aspect of the scenario, James Shaffer (1975) provides some insights through the political economy theory of concentrated and diffused interests.

Shaffer (1975) argues that those being regulated, or are under the consideration of regulation, have an inherent incentive to participate in debate about reform. Those who will be impacted or forced to change are pushed together by this potential outside force of change. This outside force fits with Ellison's theory regarding the reason that coalitions are formed. Among the rest of the population, however, interests are diffused. As Shaffer argues, the probability of one's attempts to influence are very small, thus there is little incentive to participate in the process unless one is being directly impacted.

The groups who are being impacted, and are forced into formal and informal coalitions, do not necessarily support or oppose the regulation in question for the same reasons. The importance is not why these groups have come together, but that in sharing a desired outcome, their interests are concentrated, and thus form a coalition and present a stronger unified group.

The status quo has a distinct advantage when certain conditions exist. These conditions involve concentrated efforts from those who favour the status quo, diffused interests coming from interested parties who have not experienced the external force required to form a large coalition, and a general public that is not engaged. As Shaffer argues: "when the effects of public decisions are uncertain, the concentrated interests have an advantage in persuading legislators and regulators to take their side," (Shaffer 1975, p. 22). That is to say, in order to overcome the inherent advantage of the concentration of interests from those who wish to maintain the status quo, other parties must bring together a coalition sufficient in size to overcome the intensity of the concentrated message. Until a sufficiently sized coalition is formed, it is difficult for other interested parties to get the attention of legislators or the general public.

How then does all of this explain the direction that water supply policy in the United States is going? Ellison's theory provides an understanding that coalitions are needed in order to bring upon policy change. Graffy points out that among water organizations advocating for improved water efficiency, a clear coalition and a unified message does not presently exist. Finally, Shaffer identifies the obstacle of concentrated interests among those protecting the status quo that must be overcome.

In the debate over water supply policy in the south western United States, the concentrated interest comes from a coalition of those who support the status quo. This coalition draws predominantly from among water agencies, the agricultural community and land developers, the strongest of these three groups being the agricultural community (Steinhauer 2008). Some of these groups include the California Water Coalition, Family Farm Alliance, American Farm Bureau Federation, National Endangered Species Act Reform Coalition (NESARC), California Water Crisis, the Association of California Water Agencies, and the Colorado River Water Users Association, to name a few. These groups may form formal coalitions, such as the National Endangered Species Act Reform Coalition (NESARC 2008), but more often their coalitions are informal, take place behind closed doors and are difficult to track. However, with the potential of being significantly impacted from the adoption of the optimal efficiency policies, these informal alliances combine to present a concentrated voice to legislators.

Within the coalition, each group has their own reason to oppose change. Water agencies are concerned about the potential "onerous restrictions on pumping" water to their clients that change might bring (Barringer 2008). Farmers are concerned that changes to the status quo will result in losing water supplies (Gold 1989; Family Farm Alliance 2005). While land developers are concerned that changes in water allocation regulations will trample property rights and place costly and time-consuming regulations on the development process (National Endangered Species Reform Coalition 2008; Myerson 2002). The concentrated efforts of these groups who have an interest in maintaining the status quo present the obstacle to change outlined in Shaffer's theory.

This coalition is by no means preventing all change from taking place, as many states and cities have adopted portions of the optimal efficiency policies. There is however, reason to believe that the coalition is sufficient in its concentrated effort to receive concessions from legislators and prevent the comprehensive implementation of the optimal efficiency policies. An example of this is seen in California. A recent plan in California aimed at achieving greater water conservation and quality is being criticized because "the state's agriculture industry, which uses far more water than urban areas, is being asked to contribute little to conservation," (Steinhauer 2008). Furthermore, land developers secured $3.5 billion from the same plan for new storage facilities in California to allow for new developments (Steinhauer 2008). This action is action is taking place despite the fact that new storage facilities are one of the primary objections of the environmental community (Department of Interior 2005) and is a return to the old approach to water policy of creating new supplies, as opposed to finding greater efficiencies. These concessions by the Californian government, despite the state's action on many of the optimal efficiency policies, suggest that the concentrated effort by those who are impacted by changes to the status quo are sufficient in clout to prevent the comprehensive application of the optimal efficiency policies.

With respect to the direction of US policy on water supply, at present, there appears to be positive advancement, but not to the extent the experts believe is needed. On the one hand states are taking action to improve water efficiency. At the same time however, interest groups who will be impacted by change maintain a sufficient amount of influence to slow progress, or at least receive concessions from governments attempting to advance water efficiency. As the external forces from Ellisons's theory that bring change get stronger, it is likely that the influence of the interest groups who oppose change will weaken, and the influence of those looking for change will become concentrated.

The shift in power away from the interests who oppose change seems apparent for two reasons. The first reason is because of necessity. As was previously mentioned, the population in the US is expanding while new sources of supply are becoming increasingly harder to find. It is only a matter of time before necessity creates a coalition sufficient in size to force change. The US has already entered into an era of water efficiency; because of future necessity, this will only continue to grow. Secondly, the states in the south west are already moving on many water efficiency measures and seeing the benefits of doing so. With increased necessity, and greater support from

interest groups who support change, there is reason to believe that these actions still in their developmental stage will become more numerous and comprehensive.

Summary

The scientific and academic community have identified the optimal efficiency policy recommendations that they believe will provide sufficient water for the next 25 years, yet these policies have not been fully adopted. The advocacy coalition theory and concentrated versus diffused interests provide an explanation as to why this might be the case. With respect to water policy, it appears that the critical mass required to bring about change has not yet been achieved to its fullest extent. Even though there are a large number of groups who support change, they have not yet been forced into a coalition sufficient in size to over come the concentrated efforts of those opposing change. There is however, reason to believe this will happen in the future as an increasing number of regions find that water scarcity is a critical concern,

While most of the advocacy takes place behind closed doors, and is thus difficult to document, the agricultural community, land developers and water agencies have expressed their support for maintaining the status quo. The framework outlined above provides an explanation as to why these interest groups that are few in numbers are nonetheless able to attain a high level of influence over the policy process.

CONCLUSION

The US system of water management is an incredibly complex multi-layered system, with many overlapping jurisdictions of decision-making. This paper has attempted to provide Canadian policy makers with a greater understanding of the complexities of that system, a perspective on the level of priority the US federal and state governments place on water supply efficiency, and provide insight into the direction that US policy on water efficiency may be headed.

The first research question examined how the US system of water management works. An overview of the political structure, major federal laws and treaties, federal agencies involved in water policy, water rights, and interstate water management provides the critical elements required to grasp the US water management system. Through this examination it was shown that many tensions exist within a very complex and fragmented system.

The political strength of the federal government in potential water policymaking power has become apparent. Despite a legacy of allowing state law to predominantly drive American water policy, the federal government has the authority, should it choose to exercise it, to play a much stronger role on all aspects of water policy. As a result, where it might have been unthinkable for the federal government to consider a national policy on water quantity issues a short time ago, this is no longer the case. With 36 states expecting to face water shortages in the next five to ten years (Barlow 2008a, EPA 2008), a national policy similar in scope to the Clean Water Act is no longer out of the question. This is important for Canadian officials to keep in mind during discussions with American counterparts, at both the federal and state level, as a movement in that direction by the federal government would signal a change in the traditional division of powers between states and the federal government on water issues.

The second question asked how seriously the United States is treating its water supply and efficiency problems. The findings in this section were mixed. The US is making progress on water efficiency, although remains near the bottom of the global water efficiency league tables. Even though water efficiency does not register as a top federal priority at the present time, federal agencies are cognizant that it is an area of concern. At the same time, the actions being taken at the state level, specifically in the south west, are showing significant and positive results, despite their relative infancy in development. There remains room for significant improvement, but it stands to reason that as these efficiency programs are refined, water efficiency will continue to improve. It also stands to reason that the advancements being made in the south west will serve as a blueprint for other regions of the country, and the federal government, as water shortages in other regions become a greater concern. While the federal government is not taking a very active role at the present time, the south western states take water supply and efficiency very seriously. As the water supply becomes more of a national issue, there is reason to believe that the country as a whole, through the foundation laid in the west, is in a position to tackle water supply and efficiency problems.

The third question looked at the future direction of water supply policy in the US. Generally there is a consensus among the academic and scientific community that greater conservation and water efficiency can solve the water supply problem in California and the south western states for the next 25 years without the need to find new large sources of supply (Gleick, Cooley and Groves 2005; Anderson and Snyder 2002; Myerson 2002). The biggest obstacle in the way of greater water efficiency is current consumption behaviour. So long as water runs for free when a tap is turned on, it is difficult to convince consumers that their habits should change, let alone create the political climate necessary for governments to make decisions that impact how water is used. To overcome the barrier of inefficient use, water experts propose that governments need to use incentives that will encourage change. Some of the proposals to do so include applying a full cost to the price of water, offering rebates for efficient appliances, and combining land and water planning.

Standing in the way of creating these policy changes are those who benefit from the status quo. Theories on advocacy groups have provided insight from which inferences regarding policy direction can be made. While those who oppose change have been able to form a coalition sufficient in strength to inhibit the comprehensive adoption of policies proposed by the academic and scientific community, this is not likely to be the case forever. It has been noted that the groups who support change are not presently united on the same issue. As supply issues become even more critical than they presently are, it is very likely that the coalitions necessary for change will form. This new coalition will then overpower the existing coalition that is preventing the full adoption of necessary policies on water efficiency. The US, especially in the south west is already moving in a direction of water efficiency. This movement is likely to continue and become greater as interested parties determine that supply issues have become even more critical.

What does all this mean for Canadians?

The scientific and academic community believe that through conservation and efficiency efforts the United States should be able to deal with their water supply challenges over the next 25 years without the need to import water. However, looking beyond the 25 year horizon, the population growth in the US, especially in the arid south west, shows no signs of slowing. That being the case, it is very likely that Canada will be in a position where it will have to make the moral, economic and environmental decision as to whether it wishes to export its water. When that time comes, based on the progress that has already been made, it is very likely that the United States will have its act together on water management by knowing exactly how much supply it has, how it is used, how much it needs, and potentially a national policy to oversee the whole system.

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