

**WATER RIGHTS  
AND  
DYNAMIC WATER POLICIES**

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## **Introduction**

Humans are intimately connected with all plant and animal life. All life is interconnected and the survival of humanity is dependent on a healthy ecosystem. Even so, we tend to treat our natural resources – our water, air, land, and forests – as commodities to be bought and sold.

Within the context of our busy lives, it becomes easy to dismiss the world around us. Instead of being respected as the habitat for all living things, our planet becomes scenery, simply the backdrop to the drama of our daily life. We go about our business “doing our own thing,” never stopping to realize that our earth simply cannot continue to accept the environmental insults that we inflict upon it.

As we consider the enormity of our environmental challenges, it is easy to throw up our hands in despair or in apathy, and turn our own responsibilities for the health of our planet over to the scientists, politicians and bureaucrats. As people of faith, however, we know that it is up to all of us to preserve and protect the physical, chemical and biological health of our home. This can be accomplished if “We the People” demand the development of a global survival strategy based on science, technology, personal ethics and spiritual awareness.

I believe that we have the responsibility to manage our water resources for the good of mankind. It is our job to manage our water resources as best we can, with the tools that we have and those that we can develop.

## **Water Use**

Water has many uses. Its management is multi-objective, and program success is difficult to quantify. For nearly 35 years, we have been implementing programs, gathering data and reporting on our progress.

Still, more than 50% of our nation’s waterways are polluted. The health of our water is critical to assure its primary uses, which include:

- Municipal Water Supply
- Recreation
- Transportation
- Economic development
- Flood control
- Hydropower
- Health and safety
- Agricultural Purposes
- Livestock watering
- Protection of endangered species
- Spiritual and cultural rites and rituals

Societal equity and ownership of environmental resources are pivotal to any discussion of water policy. Currently, individual states have authority over water use, which in many instances results in misuse and exhaustion of water supplies. This distribution scheme often causes inequity, especially in the west. Many suggest that it is time to rethink this policy to bring “We the People” back into the water policy discourse.

## **Water and History**

In early civilizations, when people did not live near a river or lake, the public water supply was a groundwater well. The first wells were dug by the Chinese and Egyptians as early as 2000 BC. Kanats, long underground infiltration galleries, were constructed to deliver groundwater to support flourishing empires in China, Egypt, Persia (Iran) and Afghanistan.

The rise of the Roman Empire shifted the emphasis from well drilling to construction of a vast system of aqueducts and cisterns for transport and storage of surface water from the mountains to the cities. The Romans did not trust well water because it was easily contaminated by sewage and refuse. About 260 miles of aqueducts brought 200 million gallons of water to Rome each day.

Since very early times, people have tried to remove debris from drinking water, mostly to make it look cleaner and taste better. Ancient Egyptian inscriptions describe methods of water purification that include boiling water in copper vessels, exposure to sunlight, filtration through charcoal, and then cooling and settling in earthen jars.

The Chinese were the first to discover the purifying effect of boiling water. In 400 B.C., Hippocrates, the Father of Medicine, suggested that water be boiled and additionally strained through a piece of cloth to remove particles. This ancient method has been advanced through collaboration between the Carter Center in Atlanta and the DuPont Company, which has all but eradicated the guinea worm, a waterborne parasite that has killed millions of people in developing countries.

Scientists did not begin to suspect until the 1850s that disease could be transmitted by drinking water. The microscope and growing knowledge of bacteria helped identify disease causing micro-organisms in the water. It was also about this time, following a typhoid epidemic, that the first attempts were made to disinfect London’s water supply using chlorine. Fifty years later, Middlekerke, Belgium became the first city to install a permanent chlorine disinfection system. Chlorination was first used in the United States in 1908 to destroy harmful bacteria in drinking water supplies.

### **Factoids:**

**The oldest known archeological example of water filtration was in Venice where rainwater was collected in catch basins and then filtered through sand into cisterns. Rainwater was the main freshwater supply for the city for over 1300 years.**

**As early as 1626, Sir Francis Bacon wrote of purifying water by filtration, boiling, distillation and clarification by coagulation.**

**The first complete domestic water distribution center in America was completed in Winston-Salem, North Carolina in 1776. Pipes were made of bored and fire-charred logs.**

## **US Water Policy in Development**

Water Management and Policy development began early in the United States. Federal efforts to control water pollution via legislation date back to the **Rivers and Harbors Appropriations Act of 1890**, which focused on preventing and removing obstructions to navigation by prohibiting the place of fill or other alterations in navigable channels without the permission of the Secretary of War.

The **Rivers and Harbors Appropriation Act of 1899** further ensured safe navigation in navigable waters by prohibiting the construction of any bridge, dam, dike, causeway, wharf, pier, jetty, etc. without Congressional approval.

The **Rivers and Harbors Act of 1938** broadened the scope of the Secretary of the Army and Chief of Engineers' responsibility in conducting Federal investigations and improvements by specifying that wildlife conservation be given "due regard."

The first broad statement of Federal interest in the promotion of clean water programs was the **Water Pollution Control Act of 1948**. It emphasized assistance for municipal wastewater treatment facilities, research on industrial water pollution and last resort federal enforcement of pollution discharge problems. A five-year grant program was authorized at \$1 million annually to defray the costs to local governments for planning and design of sewer plants and another \$22.5 million annually for construction.

The **1956 Federal Water Pollution Control Act** extended the Federal role in providing financial support for the construction of wastewater treatment works, tied the receipt of that support to States efforts to address water pollution and elaborated on the process by which the Surgeon General could pursue enforcement.

In the **Federal Water Pollution Control Act of 1961**, Congress raised the cap on construction grants to the less of \$600,000 or 30% of the cost of construction, and allowed an exception to grant up to \$2.4 million for plants providing service to multiple municipalities. The 1961 amendments signed by President Kennedy, after the 1960 veto by President Eisenhower, expanded federal grants to local communities for sewage treatment plant construction.

The **Water Quality Act of 1965** created the Federal Water Pollution Control Administration within the Department of Health, Education and Welfare. This statute brought about the mandate for water quality standards (with water quality criteria) for

interstate waters. In May of 1966, reorganization transferred the FWPCA to the Department of Interior.

The **Clean Water Restoration Act of 1966** increased the federal contribution for wastewater treatment. This act also required that each State planning agency receiving a grant develop a comprehensive pollution control plan for each watershed basin.

## **Public Outcry**

Disturbed by the profligate use of synthetic chemical pesticides after World War II, Rachel Carson penned her revolutionary treatise to warn the public about the long term effects of misusing pesticides. In ***Silent Spring (1962)***, Ms. Carson challenged the practices of agricultural scientists and the government, and called for a change in the way humankind viewed the natural world.

Eight years later, the nation united to publicly protest US environmental Policy. San Francisco, the city of the patron saint of ecology Saint Francis, issued the first Proclamation of Earth Day to be on April 22<sup>nd</sup>. A Proclamation signed by Secretary General U Thant at the United Nations in 1970, designating the first day of spring, **March 21** to be the equinoctial Earth Day. On whatever day it is celebrated, **Earth Day** clearly demonstrated, and continues to demonstrate, that the public cares about the environment.

## **A National Framework**

In response to the mounting public pressure, President Richard Nixon issued an Executive Order to establish the Environmental Protection Agency (EPA) in July of 1970.

The Congress, under the leadership of Senators Edmund Muskie (D-ME) and Howard Baker (R-TN) and Representatives John Blatnik (D-MN) and Williams Harsha (R-OH), enacted the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) on October 18, over a Presidential Veto.

In his statement before the United States Senate, as a part of the Year of Clean Water, the 20<sup>th</sup> Anniversary of the Clean Water Act, Senator Edmund Muskie said on September 22, 1992: “The House and Senate disagreed fundamentally on the thrust of the Act. The Senate viewed the Clean Water Act as an environmental statute; the House viewed it as a public works bill. The final product was a comprehensive environmental public works will... Because there was little organized data or scientific information, we acted in the Senate based on our extensive eight-year hearing record.”

These were some of the findings:

- Many of the Nation's navigable waters were severely polluted, and major waterways near the industrial and urban areas were unfit for most purposes;
- Rivers were the primary sources of pollution of coastal waters, the oceans, and many lakes; confined waterways were aging rapidly under the impact of increased pollution;
- Rivers, lakes and streams were being used to dispose of man's wastes rather than to support man's life and health; and
- The use of any river, lake, stream or ocean as a waste treatment system was unacceptable.

Based on these findings, the 1972 Act set three broad goals: the biological integrity of receiving waters; the maximum use of available technology; and the ultimate goal of zero discharge."

According to Senator Howard Baker, "it was our thinking that a concise roadmap for discharges and for the environmental bureaucracy would be necessary for short and long term decision-making. This was also designed to ensure progress toward improving water quality and to provide certainty to corporate leaders who would need to secure funding and support from their boards in order to comply. Other Senators highlighted the need to establish a citizen suite provision to enable the public to serve as a watchdog for compliance. This allows citizens to engage in litigation to keep polluters and regulators on target and on track. This far-reaching statute was written by a group of lawmakers who were diverse in philosophy, geography, and political affiliation. Even so, we were able to pass the Clean Water Act through our Committee with a unanimous vote. And, impressively, despite a Presidential veto, both the House and Senate voted overwhelmingly to override the veto and establish the Clean Water Act as the law of the land on October 18, 1972."

The Act stated that there shall be no unlawful discharge of pollution to US waters. The goals called for water to be "fishable" and "swimmable" by 1983 and that all discharges of pollution to navigable waterways should be eliminated by 1985. Congress also called for clean water goals to preserve natural habitat and other wildlife.

Congress revised and expanded the Clean Water Act in 1977, 1981 and 1987. The statute now includes provisions to address:

- Point source pollution (direct pollution from pipes or other discreet conveyances)
- Nonpoint source pollution (diffuse pollution from sources such as urban, rural and agricultural runoff)
- Marine ecology, including oceans, estuaries and wetlands
- Toxic pollutant controls
- Groundwater protection

The tools utilized by the statute to implement the requirements of the Clean Water Act include:

- Water Quality Criteria and Standards
- Waste Load Allocations (WLA)
- Load Allocation (LA)
- Permitting through the National Pollutant Discharge Elimination System (NPDES)
- Effluent Limitations and Guidelines (ELGs)
- Total Maximum Daily Loads (TMDLs)
- Best Available Technologies (BATs)
- Best Management Practices (BMPs)

The obvious void in the statutory framework is regulatory parity between point and nonpoint sources in terms of management and regulation. Experts suggest that as much as 50 % of the remaining pollution is attributable to nonpoint sources, yet US policy addresses nonpoint primarily through voluntary and incentive based programs and policies.

### **Factoids:**

**Backyard mechanics that change their own oil generate over 324 million gallons of used oil and dispose of more than 90 % of it improperly.**

**Nearly 1.3 billion gallons of used oil are produced each year, but only about 770 million gallons are reprocessed by recyclers.**

**Since 1950, fertilizer use has increased from approximately 20 million tons annually to more than 50 million tons. More than 1.1 billion pounds of pesticides are applied each year in the United States**

**The average household generates more than 20 pounds of hazardous waste each year from household cleaners and chemicals.**

## **The Water Environment**

The amount of water circulating the earth remains essentially the same. The hydrologic cycle continually recycles water on a period of nine to twelve days. The sun acts as a pump, powering movement of water among the clouds, land, and ocean. This makes water our most recycled resource.

Water can take many different routes. Most of the water that goes into the air as a gas rises from the oceans, which cover  $\frac{3}{4}$  of the earth. Though most of the water falls back into the ocean, some falls to the land. There, it is used by living things, seeps into the ground, fills the lakes, runs into rivers and streams and then evaporates.

Weather, climate, and geographic features continuously affect the rate and amounts of water circulating between land, ocean and sky. Rain falls more frequently in areas closer to the equator or near large bodies of water. Mountain slopes help produce rain clouds by blocking wind currents and causing warm air to be lifted and cooled.

The hydrologic cycle does not distribute water evenly around the earth and when precipitation is low and groundwater levels drop, the result is drought. When large amounts of water fall in a short time, the land cannot absorb it all and rivers cannot hold the flows within their banks, the result is flood.

Ultimately the amount of water available for our use is determined by the water cycle and the condition of the available water. Global climate change will undoubtedly affect the ratio of water available to sustain life.

Because all of the water we have now is all that has ever been, its quality is extremely important. And when we use water we change its quality.

### **Factoids:**

**Approximately 70% of the earth's surface is covered with water. Most of this is ocean water which is saline.**

**Three percent of the earth's water is fresh water, but two percent of this is locked in glaciers and polar ice caps. That leaves only one percent available for our use.**

**The world water supply is approximately 326 million cubic miles. For perspective, if poured on the United States, it would submerge the country to a depth of about 90 miles.**

**The estimated supply of groundwater in the 48 contiguous states is 65 quadrillion gallons or about 4 times the amount of water in the Great Lakes.**

**An estimated 90 billion gallons of liquid from landfills and 100 billion gallons from liquid impoundments annually leak into groundwater in the United States.**

## **Water Rights**

Water scarcity in the western part of the United States has necessitated the creation of a water allocation scheme vastly different from those that exists in parts of our country blessed with abundant rainfall. Water rights are established by actual use of the water, and maintained by continued use and need. Water rights are treated similarly to rights to real property (e.g. can be conveyed, mortgaged, and legally encumbered). The use of water is independent of the land on which it is used or originates. Key components of western water rights include:

Doctrine of Prior Appropriation: This doctrine dictates the use of water in most western states and provides that while no one may own the water in a stream, all persons, corporations, and municipalities have the right to use the water for beneficial purposes.

The allocation of water is based on "first in time, first in right," meaning that the first person to use water acquires the water right.

Types of Water Rights: Water rights are of two general types, direct flow and storage. A direct flow right is generally measured in terms of a rate of flow, not a total volume of water. A storage water right is measured in terms of volume.

Acquisition of Water Rights: To create a water right, an appropriation is made. Appropriations are the diversion of water and its application to a beneficial use. A diversion is made by removing water from its natural course or location, or by controlling water that remains in its natural course.

Replacement Plans: The laws of several of the western states provide for replacement plans which are schemes to balance new uses of water with the dedication of other existing water rights to the stream, so that the stream, as a whole, suffers no net decrease.

## **Wetlands as Purification**

There are three major types of wetlands: marshes, swamps and bogs.

- Marshes have standing water and soft-stemmed plants, such as cattails, rushes and grasses. Lily pads and submerged plants are found in the deeper water.
- Swamps are often described as "flooded woodlands" or "shrub lands," because woody plants and trees such as willows, ash, maple, and cypress dominate them.
- Bogs are wetlands that contain rich organic matter made up of decaying vegetation. The acid rich material forms mats as thick as 40 feet that fills in old ponds and lakes.

Wetlands are being destroyed at an estimated rate of 300,000 acres per year. This is devastating because they reduce flooding, filter pollutants, recharge groundwater, trap silt and sediment, serve as a home for endangered species and wildlife, and provide educational, commercial and recreational opportunities.

### **Factoids:**

**Wetlands are the home to 1/3 of the nation's endangered species and serve as a critical habitat for thousands of fish and wildlife populations.**

**About 66 % of the commercial fish catch taken along the US Atlanta and Gulf coasts depend on wetlands for survival.**

## **Water and Global Climate Change**

***“Water is the essence of life. Yet despite the seemingly limitless supply – it covers over two thirds of the planet – there is never enough of it to safely quench the world’s thirst or to reliably irrigate all its crops. The stuff of countless conflicts throughout history, nature’s elixir will become more precious still.”<sup>1</sup>***

About one third of the world’s population lives in countries suffering from moderate-to-high water stress – where water consumption is more than 10 percent of renewable freshwater resources. Some 80 countries comprising about 40 percent of the world’s population were suffering from serious water shortages by the mid-1990s. It is estimated that in less than 25 years, two-thirds of the world’s people will be living in water stressed countries.<sup>2</sup> “[I]n many places, the biggest threat...will be a shortage of water. Already, more than a half-billion people live in regions prone to chronic drought. By 2025, that number is likely to have increased at least fivefold, to 2.4-3.4 billion.”<sup>3</sup>

The three major factors causing increasing water demand over the past century are:

- 1) Population growth
- 2) Industrial development
- 3) Expansion of irrigated agriculture

Water scarcity is exacerbated by global climate change. Often referred to as global warming, it is the increase of the earth’s average surface temperature over time. The term global warming brings to mind coal-fired power plants and gas-guzzling SUVs. In truth, the earth’s climate has always fluctuated, with periods of sustained warming and cooling. Over thousands of years, changes in atmospheric conditions, including gas concentrations and natural events such as volcanic eruptions, have caused climate change.

For the most part, these changes have taken place over hundreds or thousands of years. With that said, most scientists agree that the world appears to be in a sustained and rapid period of warming. Some of the warmest years in recorded history (1861) occurred in the 1990’s. Disturbingly, 2004 was the fourth-warmest year on record. Many speculate that global warming will increase the number of extreme weather events like the El Nino and the European heat wave of 2003. The increase in temperature coincides with the industrial revolution, exacerbated by the increase of carbon dioxide from the over harvesting of forests and the burning of fossil fuels.

The personal toll of global climate change was beautifully articulated by Sheila Watt-Cloutier, chair of the Inuit Circumpolar Conference in 2004, “We have to give climate change a human face– it is not all about ‘sinks’ ‘emissions trading schemes’ and technology. Climate change is about people, children, families and our relationship

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<sup>1</sup> “The Future of Earth: A Planet Challenged from the Arctic to the Amazon,” *U.S. News & World Report Special Edition*. (2004), 38.

<sup>2</sup> United Nations Environment Programme, *Global Environment Outlook 3: Past, Present and Future Perspectives* (London: Earthscan Publications, 2002), 150.

<sup>3</sup> *State of the World 2003: A Worldwatch Institute Report on Progress Toward a Sustainable Society* (New York: W.W. Norton & Company, 2003), 5.

with the world around us. To Inuit it is a question of our very survival as a hunting people and a hunting culture. Our human rights – to live our traditional way – are being violated by human-induced climate change.”

In this example, the person and the environment are the same, inextricably intermixed. Despite the huge impact that climate change will ultimately have on the environment, for most of us these concepts are just too big for us to fully grasp. Change occurs over decades, ecosystems shift over generations. Most people understand that climate change is an issue, as recently recognized in President Bush’s State of the Union speech. However, for the majority of the population, global warming is not their most immediate or pressing problem.

## **Water and War**

People’s need for sustenance and sustainable water collide with global markets and corporate interests. This global “tug of war” for water is intimately connected to modernity, social justice, democratization, private ownership versus public resources, and the fight for self-determination.

Only recently have policy makers started to focus on managing demand.<sup>4</sup> As water becomes increasingly scarce, conflicts arise over who has control. Water pollution is another serious problem worldwide, with toxic contamination from industrial processes and polluted runoff threatening ecosystem integrity, aquatic life, and human health.

In 1995, Ismail Serageldin, vice president of the World Bank, made a prediction, much quoted since, about the future: “If the wars of this century were fought over oil, the wars of the next century will be fought over water.”<sup>5</sup> These conflicts are already taking place, often camouflaged as ethnic and religious battles.<sup>6</sup>

This conclusion was also emphasized by President Jimmy Carter during his keynote address before an international delegation of environmental leaders attending the 1991 World Water Summit in Atlanta. The former President Carter said that “the majority of wars fought on this planet find their origins in the ownership of water. Water; who has it, who needs it, who wants it and who can get it, is often at the root of the conflict. Indeed, there are other serious issues that we fight and die for, religion, jealousy, guilt, family honor and so on, but in all likelihood the initiation of the conflict included water.”

Creating a national and ultimately a global water budget and finding the balance between need, want, fairness and survival is a role tailor made for the community of believers.

## **Future Options**

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<sup>4</sup> *GEO-3*, 151.

<sup>5</sup> Quoted in Vandana Shiva, *Water Wars: Privatization, Pollution and Profit* (Toronto: Between the Lines, 2002), ix.

<sup>6</sup> *Ibid.*, xi.

**Asset Management** - Asset management is a business process and a decision-making framework that covers an extended time horizon, draws from economics as well as engineering, and considers a broad range of assets. The asset management approach incorporates the economic assessment of trade-offs among alternative investment options and uses this information to help make cost-effective investment decisions.

**Emissions Trading** - Environmental credits generated through land-use changes. Most successful water quality trades have been point sources to point sources. Point to nonpoint source trades are more challenging and have great potential, especially in terms of nutrient run-off reductions. The intent is to meet environmental goals by using market-based incentives to encourage changes in land management practices.

**Membrane Technology** - Water utility management is desirable because it has the potential for minimizing the physical footprint. Integration of membrane treatment systems presents a number of challenges, including technical, political, managerial, operational, and maintenance. Integrating membrane treatment into existing water treatment plants will consider regulatory compliance, desalination, protection against future threats including viruses and chlorine-resistant pathogens, reuse applications, or providing high-quality water treatment.

**Privatization** – Water is essential for all human life and is increasingly becoming a commodity and a great business opportunity. In that past decade large multinational corporations have assumed control of water supply systems throughout the world. Some estimate that more than 300 million people in every continent of the world are being served by such systems. The end results have been questionable and many municipal governments in the U.S. and other countries are rethinking their decisions to turn over their water management responsibilities over to high-powered corporate giants.

**Water Market** - Water is becoming big business with annual revenues estimated at more than \$300 billion worldwide. Not surprisingly the United States accounts for more than half of this number...and expected to grow as water scarcity becomes more apparent. Water rights and municipal water supply systems are two of the fastest growing market areas.

## **Global Water Budget**

In the United States we are using Total Maximum Daily Load (TMDL) to create our water pollution budget. TMDLs are comprised of;

- 1) Waste load allocations (the sum of point sources)
- 2) Load allocations (sum of nonpoint sources and background pollutant levels) and
- 3) Margin of safety (reflects uncertainty of the load).

Though a provision of the Clean Water Act since 1972, for all intents and purposes, TMDLs were ignored by Federal and State governments because program implementation demands of the point source provisions diverted bureaucratic attention from the watershed and basin wide provisions. These include, for example, the development of water quality standards, the issuing of NPDES permits and the

processing of billions of dollars of wastewater facilities construction grants. Nationally orchestrated litigation brought against the US Environmental Protection Agency, in the mid-1990s kick started the TMDL program, which has now become a nationwide priority.

To assure that TMDLs are an effective water management tool, and not just a costly paper exercise, TMDLs must be supported by technically defensible water quality standards. Credible water standards, buttressed by comprehensive water monitoring, are critical elements of a meaningful TMDLs. These calculations should then form the basis for performance measures for both point and nonpoint source clean-up activities.

It has become cliché to say about water programs that “much has been accomplished and much remains to be done.” Yet, in its *Draft Report on the Environment 2003*, USEPA concluded: “...at this time, there is not sufficient information to provide a national answer to this question with confidence and scientific credibility.” With the exception of coastal areas (and now Wadeable Streams) the report was punted on the question of the health of the waters of the U.S.

## **Getting to Done**

If water is truly the next global crisis, as I believe it is, then it is time to move beyond the chatter and “get to done.” Getting to done will necessitate the creation of compatible or as is the case within the European Union, identical water goals and standards.

Such standards need to be based on sound science, comprehensive bio-monitoring, trends analysis based on credible data, development and implementation of total maximum daily loads. The time is now to embrace an integrated watershed approach to include land and water, point and nonpoint sources, water quantity and quality for surface and ground waters.

All these programmatic aspects should be woven together as a patchwork of participation of public, private and non-governmental organizations, all of whom are essential to the restoration and protection of global water resources.

These watershed (catchments) concepts need to be imbedded in statute, regulation and global water policy that can be measured, documented and made available for public review. The Bonn Charter <http://www.who.int/wsportal/bonn/en/>, developed by a group of international water experts, including myself, is one option for water program integration, in this case specifically for drinking water. In this country, reexamination of our water rights and land use policies, our growth and development goals and our water use expectations will also be necessary to develop a comprehensive water strategy.

In the US alone, this will likely require the integration of the Clean Water Act, the Safe Drinking Water Act, as well as provisions of the Clean Air Act and the Water Resources Development Act. This is no small task, but the template is there and the Europeans are leading the way.