

PERSPECTIVES ON ETHICS AND WATER POLICY IN DELAWARE

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ABSTRACT: Water is a finite resource held in common by the community yet coveted by individuals and special interests. The water management field is filled with disputes about water allocation, rights, and pollution. Environmental ethics is a basis for equitable water policy making in Delaware. The resource allocation dilemma is examined in relation to conflicting objectives imposed by a market economy between individual self-interests and community environmental well being. Two forms of water law are practiced in the USA—eastern riparian rights and western prior appropriation. Both forms seek an ethical balance to resolve conflicts and protect individual water rights while protecting downstream users (the common good). Delaware Valley case studies discuss how environmental ethics can help the water policy specialist make difficult decisions during conflicts. Surveys polls indicate that 81 percent have values supportive of a balance between the economy and environment, or pro-environment, indicating that an environmental ethic is central to decisions concerning water policy.

INTRODUCTION



Water resources managers in Delaware often recommend water policy based on Federal, State, and local laws and regulations. Water resources decision—making becomes a dilemma because of politics, special interests, and limitations in

water law or regulations that do not apply to a particular case. The central theme of this article is that the fundamentals of environmental ethics can provide a basis to make difficult yet equitable water policy decisions in the face of often-conflicting special interests. Environmental ethics is an overall philosophy or set of principles concerned with protecting the earth's natural resources.

PROBLEM STATEMENT

What are the bases for sound decisions regarding water policy in Delaware and other areas? What tools are available where water law or economic principles do not extend far enough to assist a water policy maker in making equitable decisions? The literature and several case studies suggest that the code of environmental ethics is available to the water resources manager to make tough yet fair decisions.

Water is a finite natural resource held in common good by the community yet coveted by the individual and special interest groups. Hence, the field of water resources management is a discipline filled with conflicts and disputes about water allocation, water rights, and water pollution. This article explores the field of environmental ethics as a basis for fair and equitable water policy making in Delaware. The dilemma of resource allocation is examined, given the seemingly conflicting objectives imposed by a market economy between individual self-interest and the environmental well being of the larger community, and seeks concepts and methods to facilitate ethical decision-making. We examine the ethical dimension of water law as practiced in different forms in the eastern and western USA. We explore the dilemma: the economic interests of the individual or the environmental needs of the community. Can one have both?

This article reviews a brief history of the evolution of environmental ethics over the last fifty years. A series of case studies in Delaware and other states discusses how a sense of ethics can help the water policy specialist make difficult decisions in the face of various conflicts.

Lastly, we surveyed several committees of water resources practitioners who work in the watersheds in and near Delaware to gauge their beliefs in an environmental ethic as a basis for decision-making. In an effort to employ a sort of environmental ethics index, the survey responses are grouped according to three categories: (1) responses with a pro-economic viewpoint, (2) responses with a more balanced viewpoint between the environment and the economy, and (3) responses with a pro-environmental viewpoint.

CONCEPTUAL FRAMEWORK

The economic interests of the individual or the environmental needs of the community—can we have both? On the front pages, this ethical dilemma is debated in columns about construction of new reservoirs to address drought, oil drilling in national wildlife refuges, and the effects of sprawl development on the landscape. With a dwindling land base, rising population, and the quest for economic prosperity,

water policy makers should reconsider the discipline of environmental ethics when evaluating policies to protect our land, water, and natural resources.

The public manager confronts many difficult decisions in enacting policies to protect natural resources. Should a builder be permitted to cover an aquifer with acres of shopping mall pavement at the expense of the drinking water supply? Should an oil refinery be allowed to operate without adequate air or water pollution control equipment?

Usually ordinances and regulations are designed to protect the environment by limiting the maximum levels of water and air pollution generated by these economically productive activities. Presumably the natural resources laws or regulations were written in an ethical spirit to guide development or progress without appreciably harming the environment. But what do we make of the developments that meet the letter of a regulation but not the ethical intent? In many cases a regulation or ordinance or law is not available or complete enough to guide public manager's decisions in protecting natural resources. For instance, in some states there is no law setting a minimum stream flow to protect fisheries. The ethical public manager would advise a water supplier to leave some portion of the water flow in the stream to support the fishery even if there is no legal requirement to do so.

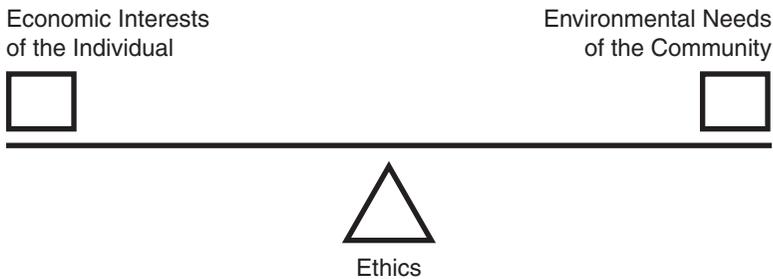


Figure 1. The ethical dilemma: balancing the economic interests of the individual with the environmental needs of the community.

Ethical decisions in water resources management are not black or white but rather shades of gray. Water policy-making is often influenced by the perspectives of various stakeholders in the watershed: the developers, environmentalists, government officials, farmers, and industrialists. Mahatma Gandhi's ethical philosophy emphasized protection of individual rights while preserving the welfare of collective society. Gandhi would advocate that the rights of all the stakeholders should be protected in the watershed not just the rights of a few. But often this is not the case. The viewpoints of special interests in the watershed are often acceded to at the expense of greater society (Cech, 2003). At the March, 2003 Third World Water Forum in Kyoto, the president of the World Water Council announced four key priorities to meet "the greatest challenge of the 21st Century—fresh water." He went on to say that first there needed to be a focus on the ethics of water use namely in the areas of water rights and regulation (Third World Water Forum, 2003). In

the ethical spirit, water is described as a basic human right, a common good, not a commodity to be sold by special interests (Brunner et al. 2002).

Perhaps conflicts between upstream and downstream owners are inherent in water management as both the words “river” and “rival” are derived from the Latin *rivalis* meaning “one taking from the same stream as another” (Webster’s Dictionary, 1980).

Ethics is a discipline that implies a moral duty or obligation. The ethical public manager evaluates the strengths and weaknesses of a proposal regarding impacts on the environment and makes a decision based on the strength of water law and a set of ecological values. When confronted with difficult water resources management decisions that are clouded with political overtones, we recommend “doing what’s right for the water” as the ethically preferable thing to do.

The ethical dilemma inherent in water management is compounded because streams and watersheds know no political boundaries. Most state, county and municipal boundaries do not coincide with watershed boundaries and the polyglot of individual governments is what makes water management so complex. The many governments in a watershed may have different stream standards or different economic goals such as pro-development or pro-preservation. Because the many governments have different agendas, it puts them in dispute with their upstream and downstream neighbors leading to conflicts that must be resolved by public managers usually through the principles of watershed management.

Speaking at *Drinking Water 2001*, a public policy forum organized at the University of Delaware in October 2001, McKay Jenkins described this dilemma when he said:

What I would like to do today is try and expand our notion of the importance of watersheds to talk about borders and flow in a larger context. Ecologists and drinking water experts have long acknowledged the silliness—not to say utterly counterproductive, and potentially destabilizing—notion of political boundaries when it comes to the flow and distribution of water. What does a county line mean to an aquifer? What does a state line mean to a raincloud? What does a national border mean to a river? . . . The point I want to make here is that any effort to reject the permeability and flow of boundaries, be they natural or psychological, runs against the natural way of things. Water wants to flow—it’s in the nature of water. People want to flow—it’s in the nature of people. . . . Finally, at least in some places in the country, we are beginning to think in terms not of boundaries, but in terms of watersheds, and flow. (Jenkins, 2001)

Water policy makers strive to make decisions to provide the greatest public good. But how? Water laws and regulations and economic principles have evolved to address this question. Where laws fall short, we turn to ethics as the basis for water resources decision-making to protect the rights of the individual as well as the common good in the watershed.

ETHICAL PRINCIPLES IN WATER LAW

Water laws are based on a set of ethical principles that seek to protect the water resource while trying to balance the needs of various environmental, economic, and social interests. Water law codifies a set of ethical principles designed to protect the water resource and its users.

In the United States, we practice two disparate forms of water law—riparian rights (eastern water law) and prior appropriation doctrine (western water law). Riparian rights law is practiced in the humid, water rich eastern USA in states such as Delaware (Dzurik and Theriaque, 1996). Prior appropriation doctrine is practiced in arid western states such as Arizona. Both forms of law seek to protect the individual water user while trying to protect other users on the stream (the common good). However, there are important differences.

Eastern Water Law

Ethics form a tenet of water law or what are commonly called riparian rights. Riparian rights law is practiced in the humid, water—rich eastern United States and is derived from English common law. Riparianism provides the right to use water as a property right. Owners of land or property in contact with lakes or rivers are granted the right to use the water from that waterway. It's use originally evolved to protect water-powered mill owners and later in pollution prevention to provide downstream users a clean supply. The ethical dimension of eastern water law is that upstream riparian owners may not obstruct the water flow, impair the water quality or otherwise injure the lower or downstream owner. Lower riparian owners may not back-flood an upstream owner. Injured riparian owners may recover damages.

Riparianism dictates that an upstream builder may develop land provided that the construction of new pavement and hard surfaces do not increase downstream flooding or cause more stormwater pollution. Riparian water law provides the basis for most floodplain and stormwater ordinances that have been adopted in many watersheds. The riparian philosophy is the precept of whole basin principles whereby streams are managed on a “watershed” basis with lesser regard for often-conflicting viewpoints expressed by governments separated by political boundaries.

In Delaware, riparian water law is modified by reasonable use doctrine. That is, the upstream owner can take an amount of water as long as the use does not interfere with the “reasonable use” of the downstream owner. The term “reasonable use” is a gray area that is usually defined by an ethical water policy maker and, if not, is decided by a judge and jury.

Western Water Law

Prior appropriation doctrine is practiced in the arid western USA in states such as Arizona. Western water law evolved as a way to protect miners and settlers. Since the federal government owned most of the land in the west, settlers could not claim riparian water rights since they did not own the land. So water rights law

in the west grew to resemble the claims system set up by gold and silver miners. Just as the miners who arrived first claimed a grubstake, western water law grew where the first person to divert water is granted the vested right to that water. Prior appropriation doctrine grew to a “first in time first in right” doctrine.

In western water law there evolved two types of users: senior appropriators and junior appropriators. A senior appropriator is the first user on the stream who, since he was there before all the others, has rights to as much water as needed and the full flow in the stream. The junior appropriators settled later and have secondary rights to the water. They receive their allotted supply except during drought when they may have the right to no water at all.

This system normally provides sufficient water to the senior and junior users on the stream. However during drought, the senior appropriator has the right to all the water they need. The junior user has rights to whatever water is left, which could be none at all. Senior rights can be lost if water is not withdrawn over a certain period of time. If the senior owners do not use the available water in the stream, they could forfeit their right to that water.

Comparison of Water Law Doctrines

Table 1 compares and contrasts the two forms of water law practiced in the United States. The ethical forms of eastern and western water law are quite different. Where eastern water law provides an ethical dimension where the upstream user must provide sufficient water to the downstream user, in western water law the senior user may use all of the water in the stream leaving none for the downstream user. In the west the owner can actually forfeit water rights if water is not withdrawn over a certain period. Travelers in the west may observe irrigation running continuously even during periods where watering is not needed. This quirk in western water law actually promotes water waste, which is counter to a water conservation ethic. For this reason many western states such as Colorado have adopted a hybrid form of water law combining riparian and prior appropriation doctrines (Cech, 2003).

Table 1. Forms of Water Law in the United States

Parameter	Riparian Rights	Prior Appropriation
Geography	Eastern USA	Western USA
Climate	Humid, water rich	Arid, dry
States	Delaware	Arizona
Right to Water	Property right provided by adjacency to stream.	First in time, first in right.
Withdrawal	Must return unused water.	Can take all water in stream.
Superior Rights	Upstream owner must allow sufficient flow to downstream owner.	Senior user has rights to all water. Junior user takes leftover water.
Transferability	Can transfer water rights with property.	Can forfeit seniority/water rights if water not used for a certain period.

LITERATURE REVIEW

Philosophers throughout history have considered the triad of ethics, the environment, and the economy and whether mankind can achieve balance with nature. Some philosophers believed in an ethic that supports mankind's dominion over nature. The Book of Genesis in the Old Testament of the *Bible* recorded a biblical belief in a human right to master the earth and its creatures (Attfield, 1983). Rene Descartes in the seventeenth century wrote that mankind's goal was to become nothing less than the master and possessor of nature (White, 1967). American frontiersmen believed in a nineteenth-century manifest destiny in a right to settle the west, string up barbed wire, and tame nature. More recently the anti-environmentalism views of James Watt, Rush Limbaugh and the rising tide of the "Wise Use" groups contribute accusations that ecological protection hurts the economy (Brick, 1995). These principles of conquering nature and harnessing the environment are still practiced today in the twenty-first century even in the face of a growing environmental movement.

Over the last fifty years, the environmental ethic has evolved to a tradition concerned with balancing the wise use of the earth and its creatures. In 1949, Aldo Leopold in *Sand County Almanac* proclaimed that conservation is a "state of harmony between man and the land" (Leopold, 1966). In 1962 Rachel Carson wrote in *Silent Spring* that we have a moral obligation toward nature thus giving rise to the federal water and air pollution laws that followed (Carson, 1962). In April 1970, millions assembled to celebrate the first Earth Day, a watershed moment in the progression of an environmental ethic. The philosophy of the "deep ecology" movement blossomed in 1973 which reflected the inter-relatedness of all mankind as a biotic community (Stark, 1995).

The environmental movement evolved from revolution to regulation when Richard Nixon signed the Federal Clean Water Act in 1972 which set fishable and swimmable standards for waterways in the United States. Later Congress passed the Safe Drinking Water Act Amendments of 1986 and 1996 which set enforceable drinking water standards including requirements for wellhead protection. In 1990, New Castle County, Delaware adopted one of the first water resource protection area ordinances in the country that set thresholds on the amount of new development over an aquifer to protect drinking water supplies (Kauffman and Brant, 2000).

In 1992, the Congress on Renewable Natural Resources "called for our nation and its resources community to develop and adopt a stewardship/sustainability ethic incorporating a long-term perspective to guide both public and private resources decisions" (Renewable Natural Resources Foundation, 1992).

Research over the last few decades supports the feeling of a growing pro-environmental ethic in the USA. A 1989 Harris poll reported that 97 percent of the respondents felt that the country should be doing more to protect the environment and curb pollution (Kempton, Boster, and Hartley, 1999). A 1990 Roper Organization survey of the public indicated that 50 percent of those polled believe that

environmental laws and regulations don't go far enough, up from 30 percent with the same belief in 1980. Membership in environmental lobbying organizations such as the Sierra Club and Natural Resources Defense Council exceeded 3,100,000 in 1990, a 30-fold increase from 120,000 members in 1960 (Mitchell, Mertig, and Dunlap, 1991). The survey results indicate that more people care for the environment than they used to.

So the environmental ethic evolved from a state of dominion to a more modern ecological concept of balance with nature. The theme of stewardship was resurrected meaning that people are entrusted with a duty to preserve the earth's beauty and fruitfulness. The modern ethical public manager assumes a stewardship role and maintains an obligation to secure a clean environment for future generations and posterity.

Table 2. Abbreviated Chronology of Watershed Moments in Environmental Ethics

Period	Watershed Moments in Environmental Ethics
1949	Aldo Leopold wrote <i>Sand County Almanac</i> and defines conservation as state of harmony between man and land.
1962	Rachel Carson wrote <i>Silent Spring</i> emphasizing a moral obligation toward nature.
1970	First Earth Day celebration in April.
1972	Passage of Federal Clean Water Act setting swimmable and fishable standards.
1973	Philosophy of "deep" ecology" blossomed.
1989	Harris poll reports 97% feel country should do more to protect environment.
1990	Roper organization reports 50% believe environmental laws do not go far enough.
1990	Membership of environmental groups exceeds 3,000,000 up from 120,000 in 1960.
1992	Congress on Renewable Resources calls for nation to adopt a stewardship/sustainability ethic.
1996	Congress passes amendments to Federal Safe Drinking Water Act.
1997	New Castle County, Delaware modifies one of first water resource protection area ordinances in USA to protect ground and surface water drinking water supplies.

With knowledge of the evolution of the modern environmental ethic, the public manager has a sturdy foundation upon which to make difficult, but balanced decisions concerning natural resource protection.

CASE STUDIES

The following case studies explore the ethical dilemmas that face the water policy manager.

Water Law versus the Constitutional Takings Issue

The principles of water law can be used by the ethical public manager to address constitutional takings challenges. The Fifth Amendment of the United States Constitution reads that private property shall not be taken for public use without just compensation (Farmer, 2001). According to interpretations of the Fifth Amendment, landowners have the right to develop land and realize reasonable fair market value provided what is done on the land does not unduly harm others or the environment. If the landowner is impeded from realizing an economic return on the land by government ordinance, then the landowner has the right to fair compensation by the government.

Pro-development and/or anti-environmental interests commonly cite the takings issue as the mechanism to overturn environmental regulations such as floodplain or wetlands protection ordinances. The common economic argument provided is that floodplain ordinances monetarily injure the landowners by limiting the number of homes or acres of pavement built in the floodway thus reducing the value of the land. This, in turn, triggers an accusation of a “taking” of land from the owner by the government.

Incidentally, those concerned about losing the value of floodplain and wetland land due to ordinances often oversell the value of the land as it was usually acquired for many thousands of dollars per acre less than adjacent high land. Floodplain land has little economic value in the first place. Why? The function of the floodplain is to flood.

In response to a takings challenge, an ethical public manager might point out from an environmental perspective that the floodplain ordinance does not outright prohibit the development of the land. It just sets a protective threshold limiting the number of structures to protect the ecological value of the floodplain, prevent flood damage to the owner, and minimize downstream flooding. The basis of the floodplain ordinance then is in line with the ethical dimension of riparian water law whereby the upstream owner (developer proposing to put homes in the floodplain) may not injure the downstream owner.

The ethical dimensions of water law may be used to address other economic arguments for the development of land particularly when builders raise the specter of a constitutional taking challenge. Should 100 acres of forest be cut down to accommodate 100 homes to maximize economic return to the builder? This proposal may not meet the ethical principles of water law because the loss of trees and addition of pavement will increase downstream flooding and stormwater pollution thus injuring the riparian rights of the downstream or subservient landowner. A compromise might be to cluster the 100 homes on twenty-five acres of the parcel leaving much of the forest intact thus limiting the possible increase in downstream flooding.

An upstream owner has the right under the constitution to develop land and maximize economic return but not if these actions injure the downstream owner which would violate the ethical dimension of riparian water law. The public manager

strives to balance the rights of landowners under the constitution so that they do not suffer economic injuries while at the same time ensuring the rights of downstream owners under the protection of water law so that they are not injured by upstream development interests.

Imperviousness and the Drinking Water Aquifer

Consider the case of the ethical public manager and a proposal for a new shopping center over a drinking water aquifer in New Castle County, Delaware (Kauffman, 2001). During the early 1990s, a prominent land development firm filed plans to build a new shopping center with approximately 60 percent impervious roof and pavement area over a limestone aquifer that provides drinking water to 20,000 people. This proposal did not comply with the county water resource protection area (WRPA) ordinance that set a maximum 50 percent limit on new pavement and roof area to protect the sensitive drinking water aquifer.

The shopping center developer circumvented the WRPA ordinance and secured an agreement from the county to build the project at 60 percent impervious cover. This project not only violated the letter of the WRPA ordinance but the intent of the ordinance, which was to protect the quality and quantity of drinking water supply. The developer pursued his financial self—interest which threatened the value of the aquifer hence the choice may not have been in concert with the modern conservation ethic.

During deliberations concerning this matter before the county's Resource Protection Area Technical Advisory Committee, the public manager employed the ethical argument of "doing what's right for the water." The public manager advised against approving this proposal because at 60 percent impervious cover the development was out of harmony with the water resource. The project was not only technically out balance with the ordinance but ethically challenged since the developer cut a deal to circumvent the ordinance.

The public manager lost the ethical battle with this particular project. But the war was won as the WRPA ordinance was toughened in 1997 to prevent further projects of this kind that could harm the drinking water resource (New Castle County Unified Development Code, 1997).

Ethics of Watershed Management

The Christina River Basin in Delaware, Pennsylvania, and a small sliver of Maryland contributes drinking water to over a half million people in these states situated near Wilmington halfway between Philadelphia and Baltimore (Greig, Bowers, and Kauffman, 1998). Streams in the basin such as the Brandywine Creek flow from the headwaters in Pennsylvania and Maryland downstream into Delaware before flowing out to the Delaware River. Pennsylvania has designated the creek as a warm water stream, a less protective designation because the commonwealth is a large state with hundreds of hilly Piedmont streams. In tiny Delaware with

three counties and only six Piedmont streams of this type, the state considers the Christina Basin to be of statewide significance. Delaware regulates the same creek just a few yards away over the state line as exceptional resource water with more protective stream water quality standards.

A factory in the Pennsylvania portion of the watershed files a wastewater discharge permit that meets the state's stream water quality standards. However, a few miles downstream over the state line in Delaware, the discharge effluent from the industry violates the Delaware's more protective stream standards. The industry discharge meets the upstream state's water quality standard but does not comply with the downstream state standards. The two states are in dispute.

What course should an ethical watershed manager pursue in this instance? One opportunity is to employ the ethic of riparianism as the principle of watershed management. Since watersheds know no political boundaries, an ethical manager would advocate the regulation of the industrial discharge without regard for political boundaries. Using the principle of the watershed, the public manager advocates unifying the differing water quality standards across state boundaries so that a single water quality standard is employed for the watershed regardless of state status.

Fortunately, the Total Maximum Daily Load provisions of the Federal Clean Water Act provide the opportunity for common regulation of stream water quality standards across state boundaries. In 2001, the two states banded together as part of a joint Christina Basin Watershed Committee Strategy and developed a maximum load that the industry can discharge into the stream to meet both states water quality standards. The ethical water managers from both states averted a lawsuit. Using the principles of watershed management, water managers in both states employed a common environmental ethic to reach across state lines to solve this water pollution problem.

Table 3. Ethical Considerations in Case Studies

Case Study	Ethical Considerations
Case Study 1 Water Law versus the Constitutional Takings Issue	The ethical dimension of riparian water law is that the upstream owner (developer proposing to put homes in the floodplain) may not injure the downstream owner. The public manager should employ an ethical spirit to balance the rights of landowners under the constitution so that they do not suffer economic injuries while at the same time ensuring the rights of downstream owners under the protection of water law so that that they are not injured by upstream development interests.
Case Study 2 Imperviousness and the Drinking Water Aquifer	The public manager employs the ethical argument of "doing what's right for the water." The public manager advised against approving this proposal because at 60 percent impervious cover the development exceeded the 50% impervious cover requirement of the ordinance and was out of harmony with the water resource. The project was not only technically out balance with the ordinance but ethically challenged since the developer cut a deal to circumvent the ordinance.

Case Study	Ethical Considerations
Case Study 3 Ethics of Watershed Management	The ethical water managers from both states in the Christina Basin averted a lawsuit when an industry in upstream Pennsylvania proposed a wastewater discharge that did not meet downstream Delaware's water quality standards. Ultimately a strategy was crafted under the Federal Clean Water Act whereby the wastewater discharge could meet both states' standards. Using the principles of watershed management, water managers in both states employed a common environmental ethic to reach across state lines to solve this water pollution problem.

SURVEY METHODS

Thus far this article discusses the evolution of environmental ethics and through case studies it's availability as a tool for equitable decision making in water resources policy. But what are the current environmental attitudes and values of those who participate in water resources policy making in Delaware? To assess the environmental ethic of the water resources community, we surveyed members of the Delaware Water Supply Coordinating Council and Christina Basin Clean Water Partnership using a survey instrument adapted from the peer-reviewed literature. Research of the published literature indicates that the following survey methods are available as a possible environmental ethic "measuring instrument":

The New Environmental Paradigm summarized responses to twelve questions designed to measure a new Environmental Paradigm Index (EPI) as the state of the worldview and desire to protect the environment (Dunlap and Van Liere, 1978). The survey directed a series of statements to 806 respondents from the general population and 407 respondents from environmental organizations and asked them to strongly agree, mildly agree, mildly disagree, or strongly disagree on their views toward the environment. The survey included the following statements:

1. We are approaching the limit of the number of people the earth can support.
2. The balance of nature is very delicate and easily upset.
3. Humans have the right to modify the natural environment to suit their needs.
4. Mankind was created to rule over the rest of nature.
5. When humans interfere with nature it often produces disastrous consequences.
6. Plants and animals exist primarily to be used by humans.
7. To maintain a healthy economy we will have to develop a steady state economy where industrial growth is controlled.
8. Humans must live in harmony in nature in order to survive.
9. The earth is like a spaceship with only limited room and resources.
10. Humans need not adapt to the natural environment because they can remake it to suit their needs.

11. There are limits to growth beyond which our industrialized society cannot expand.
12. Mankind is severely abusing the environment.

The article concludes that in 1978 the “general public tends to accept the content of the emerging environmental paradigm much more than we had expected.” The survey concluded that concepts such as balance with nature were beginning to permeate the consciousness of the public and that the new Environmental Paradigm Index is useful in assessing the attitudes and values of the public and environmental organizations toward the environment.

Public Opinion in the 1980s Clear Consensus, Ambiguous Commitment surveys trends in public opinion and support of the environment (Dunlap, 1991). The thesis of the article is that public support of the environment continues on the upswing. Members of the public were asked eight questions drawn from original surveys by the National Opinion Research Center, Cambridge Reports, the Roper Organization, and New York Times/CBS Polls. For instance, one of the questions asked:

1. Are we (the Government) spending too much, too little, or about the right amount on improving and protecting the environment?
 - Don't know 5%
 - Too much 4%
 - About Right 21%
 - Too Little 70%

The results of the survey indicate that in 1990 there was a measurable “pro-environmental sentiment.” For instance, 75 percent of those surveyed said the government is spending too little on improving the environment. Overall, more than half of the respondents said that the environment was so important that more should be done to protect it. One could interpret from the survey that a majority of the public surveyed had a relatively strong environmental ethic.

Environmental Values in American Culture included a fixed-form survey to measure the environmental values of selected sectors of the American public (Kempton et al., 1995). One hundred forty-nine questions were answered by members of Earth First, Sierra Club, lay public, dry cleaner, and sawmill worker samples. The respondents were asked to strongly agree, agree, slightly agree, slightly disagree, or disagree with the questions. Several of the 149 survey questions are listed below:

7. People have a right to clean air and clean water.
24. We have to protect the environment for our children, and our grand-children, even if it means reducing our standard of living today.
39. A healthy environment is necessary for a healthy economy.
74. The environment doesn't need as much protection as we imagine.

The results of the survey indicate, “our data demonstrate that environmental values are now closely tied to many other deep valued systems in American culture.” At least 93 percent of the respondents agreed that people have a right to clean air

and clean water. The authors concluded, “today’s environmentalism is unlikely to be a passing fad.”

We proposed to utilize one of the above survey instruments to poll members of the Delaware water resources community and determine their level of environmental ethics as a basis for decision-making. Dunlap and Van Liere employed a lengthy twelve-question survey as a measure of the new environmental paradigm that concluded, “concepts such as the environment are beginning to permeate the consciousness of the public.” Dunlap utilized a precise eight question survey that indicated there is a measurable pro-environmental sentiment among the American public. Kempton et al. surveyed sectors of the American public in a 149-question survey that concluded that environmentalism is not a passing fad. The surveys concluded that the environment is favored by a majority of the American public thus indicating a rise in environmental values. Table 4 summarizes the surveys examined in the literature:

Table 4. Comparison of Environmental Survey Instruments

Author (s)	No. of Survey Questions	Sentiment
Dunlap and Van Liere (1978)	12	“Concepts such as balance with nature are beginning to permeate the consciousness of the public.”
Dunlap (1990)	8	“There is a measurable pro -environmental sentiment among the American public.”
Kempton, Boster, Hartley (1995)	149	“Environmentalism is not a passing fad.”

Of the three survey methods, we chose the Dunlap (1990) survey instrument to poll the Delaware water resources community about their environmental ethic because:

- The survey is not as lengthy as the other methods (it is eight questions) and can be taken by the respondents in a brief amount of time, which hopefully leads to a higher response rate.
- It is measurable and the results can be analyzed by standard statistical methods.
- It contains general questions about environmental values that should be familiar to the Delaware water resources community.

SURVEY DESIGN

This section describes the design of the survey instrument to assess the environmental ethic level of the Delaware water resources community using questions from Dunlap’s 1990 method. Members of two committees, the Delaware Water Supply Coordinating Council and Christina Basin Clean Water Partnership, were

asked a series of questions to gauge their level of environmental understanding as a basis for decision-making. Each of the committees are composed of public and private stakeholders in water management and are often challenged to make ethically equitable decisions regarding water resources matters

The Governor and General Assembly appointed the Delaware Water Supply Coordinating Council in July 2000 to develop and recommend water supply policy in Delaware.

The Christina Basin Clean Water Partnership is an interstate initiative between Delaware and Pennsylvania to protect and improve water quality in the streams used for over 50 percent of the drinking water supply in Chester County, Pennsylvania and New Castle County, Delaware.

We employed the following survey methods:

I. Identify Respondents—Survey members of the Delaware Water Supply Coordinating Council and Christina Basin Clean Water Partnership (n = 65) with a series of fixed format questions. The composition of these two water policy bodies are listed below:

Membership of the Delaware Water Supply Coordinating Council

Water Purveyors:	Artesian Water Company City of Newark City of Wilmington New Castle Municipal Services Commission Tidewater Utilities, Inc. United Water Delaware
Business Owners:	New Castle County Chamber of Commerce Delaware State Chamber of Commerce Delaware Nursery and Landscape Association Grounds Management Society Delaware State Golf Association
Government:	Office of the Governor Delaware Department of Natural Resources & Environmental Control Delaware Department of Public Safety Delaware Department of Agriculture Public Service Commission Delaware Emergency Management Agency Delaware Division of Public Health Public Advocate Delaware River Basin Commission New Castle County Executive
Academia:	Delaware Geological Survey University of Delaware Water Resources Agency

Non-Profits:	Delaware Nature Society Coalition for Natural Stream Valleys New Castle County Civic League
Membership of the Christina Basin Clean Water Partnership	
Water Purveyors:	City of Newark City of Wilmington United Water Delaware
Business Owners:	URS Corporation
Government:	Cecil County Office of Planning and Zoning Chester County Conservation District Chester County Health Department Chester County Parks & Recreation Chester County Planning Commission Chester County Water Resources Authority Delaware County Planning Department Delaware Department of Natural Resources Delaware River Basin Commission Delaware Department of Transportation U.S. Environmental Protection Agency—Region III Lancaster County Planning Commission New Castle Conservation District New Castle County Department of Land Use Pennsylvania Department of Environmental Protection U.S. Army Corps of Engineers U.S.D.A.—Natural Resources Conservation Service U.S. National Park Service
Academia:	Delaware Geological Survey University of Delaware, Water Resources Agency
Non-Profits:	Brandywine Valley Association Red Clay Valley Association Delaware Nature Society

II. Survey Questions—The survey includes a series of global questions adapted from Dunlap (1990) to identify the respondent's overall global environmental ethic (questions 1–5 in the survey) and a second series of questions that pertain locally to the Delaware water policy area (questions 6–10 in the survey). We posed the following survey questions to the members of the Delaware Water Supply Coordinating Council and Christina Basin Clean Water Partnership:

Global Orientation (from Dunlap, 1990)

1. Are we (the Government) spending too much, too little, or about the right amount on improving and protecting the environment?
 - a. Don't know

- b. Too much
 - c. About Right
 - d. Too Little
2. Do you think environmental laws and regulations have gone too far, or not far enough, or struck about the right balance?
 - a. Don't know
 - b. Too far
 - c. Right balance
 - d. Not far enough
 3. Do you agree or disagree with the following statement: Protecting the environment is so important that the requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost.
 - a. No opinion
 - b. Disagree
 - c. Agree
 4. Which of these two statements is closer to your opinion: We must be prepared to sacrifice environmental quality for economic growth. We must sacrifice economic growth in order to preserve and protect the environment.
 - a. Don't know
 - b. Sacrifice environmental quality
 - c. Sacrifice economic growth
 5. Do you think that the overall quality of the environment around here is very much better than it was five years ago, slightly better than it was five years ago, slightly worse, somewhat worse, or very much worse than it was five years ago?
 - a. Slightly, somewhat, very much worse
 - b. About the same/don't know
 - c. Very much, somewhat, or slightly better

Local Perspective (from Kauffman, 2003)

6. A developer proposes to construct a shopping center over an aquifer recharge area. The shopping center will provide property tax income. The aquifer is the only source of drinking water. Which of the following options would you recommend?
 - a. Build on 100% of the site, \$1 million in annual tax income
 - b. Build on 50% of site, \$500,000 in annual tax income
 - c. Build on 20% of site, \$200,000 in annual tax income
 - d. Deny project, no tax income.
7. A bottling plant is proposed which would require a wastewater discharge upstream from your city. The stream is the sole source of drinking water

- for the city. The industry will generate jobs. Which of the following options would you choose:
- a. 100,000 bottles per day, 500 jobs provided, stream water quality reduced by 100%.
 - b. 50,000 bottles per day, 250 jobs provided, stream water quality reduced by 50%
 - c. 10,000 bottles per day, 50 jobs provided, stream water quality reduced by 10%
 - d. Deny projects, no jobs created, water quality remains at existing level.
8. For every dollar of water supply revenue, what percentage would you apply to the following programs?
- a. Improved distribution
 - b. Better water treatment
 - c. Stream restoration
 - d. Profit
9. A reservoir is proposed in a wild and scenic river valley, which of the options would you recommend?
- a. One billion gallon reservoir, sufficient water through 2040, disturbs 20 acres of wetlands
 - b. 500 million-gallon reservoir, provides half the needed water through 2040, disturbs 10 acres of wetlands.
 - c. 250 million gallon reservoir, provides one quarter the needed water through 2040, disturbs 5 acres of wetlands
 - d. No reservoir, water conservation provides 10% of water needed through 2040.
10. During drought, a water purveyor needs to provide 20 mgd of drinking water from a stream which is flowing at 20 mgd. Which of the following options would you prefer?
- a. Draw 20 mgd for drinking water leaving 0 mgd instream to sustain fishery at 0%.
 - b. Draw 15 mgd for drinking water and release 5 mgd from new reservoir which disturbed 5 acres of wetlands leaving 5 mgd instream to sustain fishery at 50%.
 - c. Draw 10 mgd for drinking water and release 5 mgd from new reservoir which disturbed 10 acres of wetlands leaving 10 mgd instream to sustain fishery at 100%.
 - d. Draw 10 mgd for drinking water and conserve 10 mgd by not watering lawns leaving 10 mgd instream to sustain fishery at 100%.

III. Survey delivery and analysis—Questions were delivered to the respondents via email and the respondents were asked to transmit their answers back via email, fax, or US mail. The survey results are compiled in a tabular and graphical manner using statistical methods.

SURVEY RESULTS

Of sixty-five surveys distributed, we received thirty-three responses, a 51 percent response rate. The respondents are classified into five categories. Table 5 summarizes the responses to the survey.

<u>Category</u>	<u>Responses</u>
Water Purveyors	7
Business Owners	4
Government Water Agencies	13
Academia	5
Non-Profit Environmental Organizations	<u>4</u>
Total responses	33

Table 5. Responses to Survey

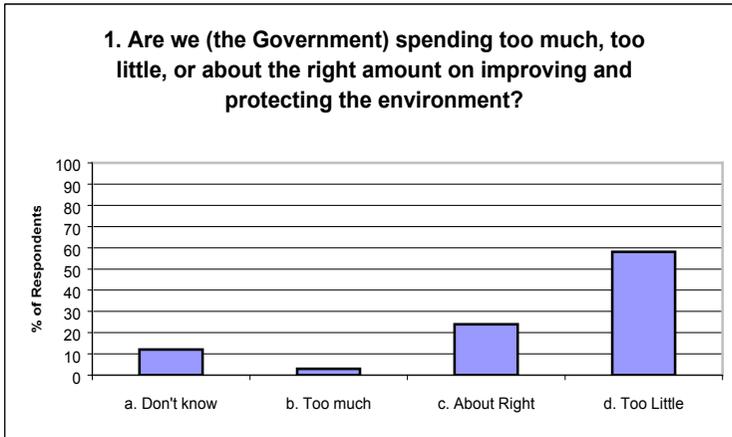
Question	a.	b.	c.	d.
1. Is the government spending too much, too little, or about the right amount on protecting the environment?	Don't know (12%)	Too much (3%)	About Right (24%)	Too Little (58%)
2. Do you think environmental laws have gone too far, or not far enough, or struck the right balance?	Don't know (12%)	Too far (9%)	Right balance (30%)	Not enough (48%)
3. Protecting the environment is so important that requirements cannot be too high, environmental improvements must be made regardless of cost.	No opinion (6%)	Disagree (58%)	Agree (33%)	
4. We must sacrifice environmental quality for economic growth. Or, we must sacrifice economic growth to protect the environment.	Don't know (27%)	Sacrifice environment (9%)	Sacrifice economic growth (64%)	
5. Do you think overall quality of the environment 5 years ago is: much better, better, slightly worse, somewhat worse, or much worse?	Slightly, somewhat, very much worse (27%)	About the same/don't know (33%)	Very much, somewhat, or slightly better (39%)	
6. A developer proposes to construct a shopping center over an aquifer recharge area. Which of the following options would you recommend?	Build 100% of site, \$1 million in annual tax income (0%)	Build 50% of site, \$500,000 in tax income (18%)	Build on 20% of site, \$200,000 in tax income (55%)	Deny project, no tax income. (27%)

Question	a.	b.	c.	d.
7. A bottling plant is proposed which would require a wastewater discharge upstream from your city along a drinking water stream	100,000 bottles/day, 500 jobs, water quality reduced 100%. (0%)	50,000 bottles/day, 250 jobs, water quality reduced 50%. (6%)	10,000 bottles/day, 50 jobs, water quality reduced 10%. (64%)	Deny project, no jobs, water quality no change. (30%)
8. For every dollar of water supply revenue, what % would you apply to the following?	Improved distribution. (23%)	Better water treatment (31%)	Stream restoration (29%)	Profit (17%)
9. A reservoir is proposed in a wild and scenic river valley. Which of the options would you recommend?	1 BG reservoir, sufficient water for 2040, disturbs 20 acres wetlands. (39%)	500 MG reservoir, provides half water for 2040, disturbs 10 ac. wetlands. (24%)	250 MG reservoir, provides ¼ water for 2040, disturbs 5 ac. wetlands (6%)	No reservoir,
10. During drought, a purveyor proposes to provide 20 mgd of drinking water from a stream flowing at 20 mgd. Which of the following options would you prefer?	Draw 20 mgd for drinking water, leave 0 mgd instream fishery at 0%. (6%)	Draw 15 mgd for drinking water, release 5 mgd from new reservoir, sustain fishery at 50%. (18%)	Draw 10 mgd for drinking water and release 5 mgd from new reservoir, sustain fishery at 100%. (6%)	Draw 10 mgd for drinking water, conserve 10 mgd, sustain fishery at 100%. (70%)

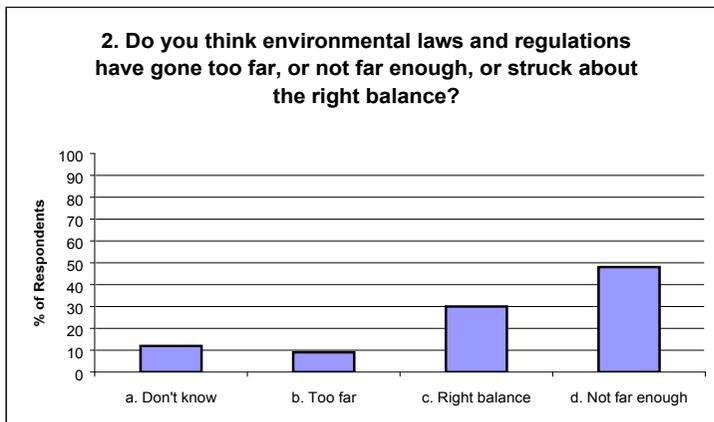
(%) = percent of respondents in favor

Question 1. Fifty-eight percent of the respondents felt that the government spends too little on the environment. By comparison, the survey conducted by Dunlap in 1990 indicated that 70% believed that too little was spent on the environment. While a majority felt that more could be spent on the environment, several of the respondents believed that too much has been spent. One of the water purveyors answered the question stating: “Too much of what? Time or money? I think government means well but is extremely inefficient. Government should do a lot more with what they have available and work to streamline processes.” Since overall 84% said that government spending was about right or too little, this indicates a tilt toward an environmental ethic.

Question 2. Seventy-eight percent of the respondents think environmental laws and regulations have gone not far enough or have achieved the right balance. By

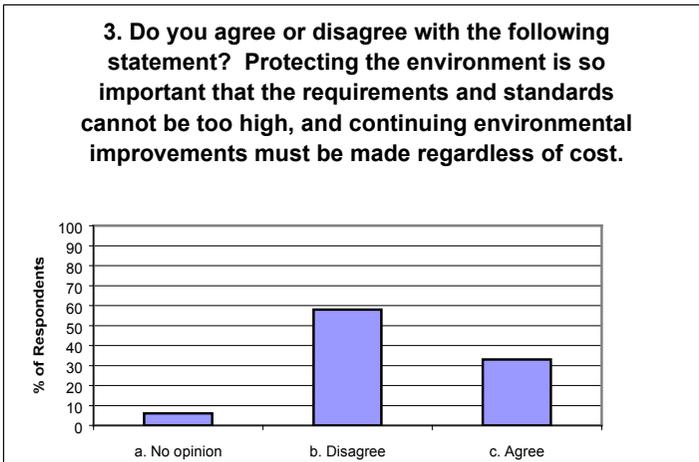


comparison, the survey conducted by Dunlap in 1990 indicated that 77% had the same feeling. While 75% of the respondents have what can be interpreted as a pro-environmental belief, several of the respondents sought to clarify their answers. A water purveyor answered the question stating “if government is truly the will of the people, we must conclude the balance is ‘right’ for today’s people.” A member of a government water conservation district did not know how to answer the question stating: “Several laws and regulations are in place but are not enforced. Since laws and regulations have not been enforced, it is difficult to determine whether the right balance has been struck.” And a nonprofit environmental group member said that: “Environmental laws and regulations now existing have nearly enough substance if they were fully implemented and enforced.”

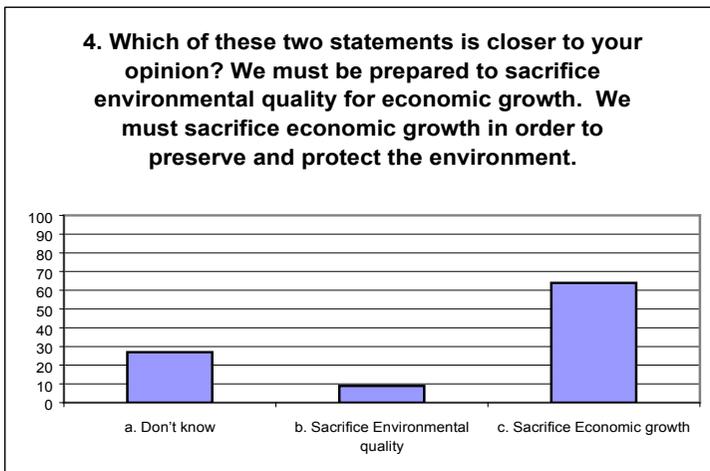


Question 3. In contrast to the pro-environmental theme of the proceeding two questions, close to 60% felt that that there must be some cost limits set on spending for environmental improvements. By contrast, the survey conducted by Dunlap in

1990 indicated that only 21% disagreed that environmental improvements must be made regardless of cost. The first two questions indicated that the respondents believed that the environment is important, however, spending limits should be set. Interpretation of the pro-environmental sentiments of the first two questions with the need for spending limits in the third question indicates that the respondents are trying to achieve some sort of balance between the environment and economics. One of the nonprofit environmental group members corroborated this belief stating: “Obviously some balance must come into play. Cost-benefit ratios should not be ridiculous.”

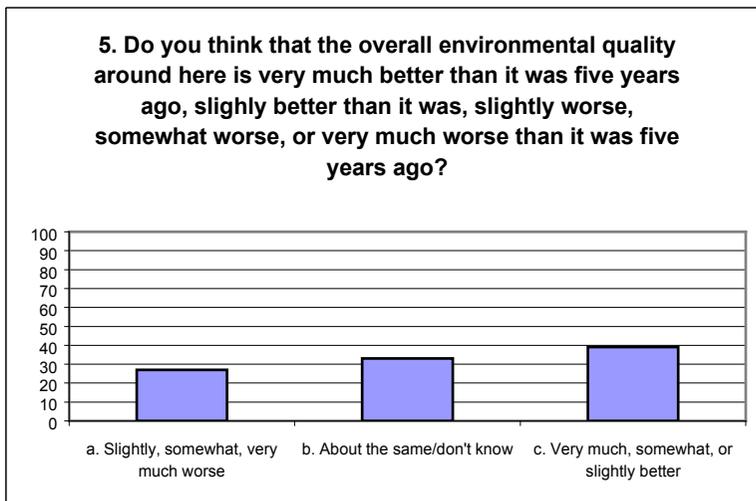


Question 4. While in question 3 the majority of those surveyed believe that spending limits should be set, in this question 65% believed that we must sacrifice economic growth to protect the environment. By comparison, the survey



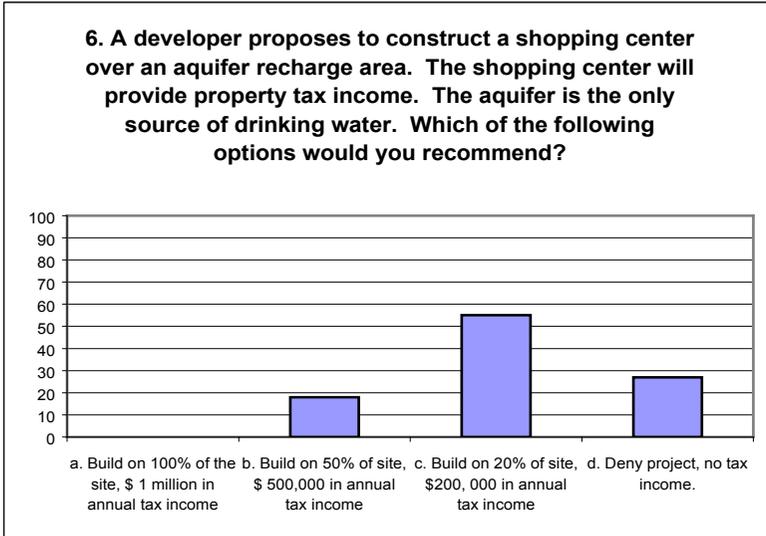
conducted by Dunlap in 1990 indicated that 64% believed the same. The results of this question indicate that almost 2/3 of those surveyed have a pro-environmental belief when compared to sacrificing economic growth. Several of the respondents clarified their answers as follows. Government water conservation district official: "Both need to be sacrificed in order to reach a balance. The issue is not as black and white as this question implies." Nonprofit environmental group member: "I don't really agree with either. I believe that the economy and the environment are interdependent."

Question 5. No real consensus was achieved here as 39% believed the environment is better than it was, 33% believe it is about the same, and 27% believe it is worse. By comparison, the survey conducted by Dunlap in 1990 indicated that 32% said the environment is better, 13% said it was the same, and 55% said it was worse. One member of a nonprofit environmental group probably summarized the sentiments of those surveyed saying: "On balance environmental quality is worse, but some facets are better, others slightly to considerably worse." It is difficult to determine from this question whether there is a pro-environmental sentiment from the surveyed groups.

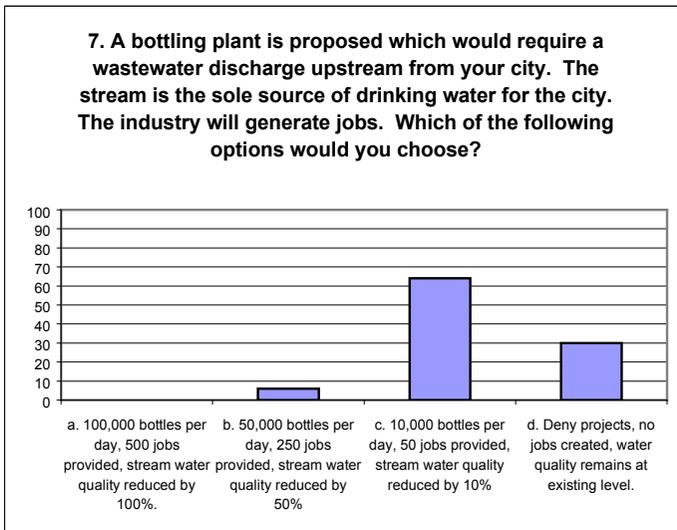


Question 6. Almost 3/4 of the respondents chose a moderate approach in trying to balance the environment with the economy. Seventy-three percent of those surveyed chose options B or C which would allow the developer to build on 20% or 50% of the site over the aquifer, while still allowing for \$200,000 or \$500,000 in annual tax income. None of the respondents chose option A which represents the greatest economic return (\$1 million in annual tax income) but has the greatest environmental impact (100% of the site would be developed). On the other extreme, 27% chose option D which has the least economic return (they voted to deny the project) and would have the least environmental impact to the aquifer.

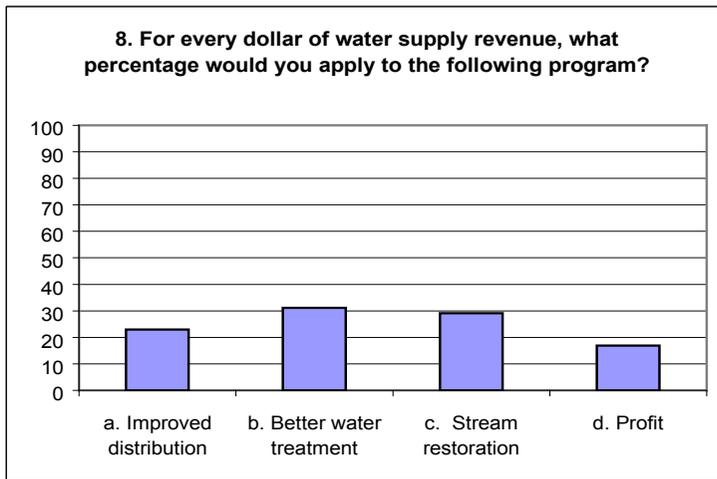
All the respondents selected an option which would provide at least some form of environmental protection to the aquifer.



Several provided comments along with their choices. A government water conservation district official recommended “Using BMPs such as porous pavement and filtration systems to collect and treat water from the site, and allowing treated water to recharge the aquifer. A member of a nonprofit environmental group mentioned that the choice between option B and C depended on “How much impervious surface already exists over the aquifer recharge area?”



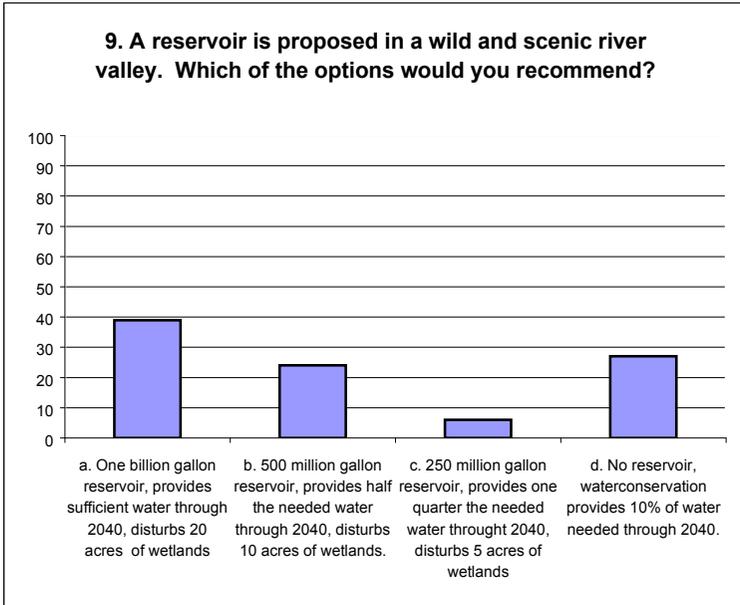
Question 7. Seventy percent of the respondents chose options B and C which provide a moderate balance between the environment and the economy. Almost 3/4 of those surveyed would allow a bottling plant wastewater discharge with an economic return of 50 to 250 jobs created but reduces the stream water quality by 10% to 50%. None surveyed chose the most favorable economic option A which would provide 500 jobs but reduce the stream water quality by a factor of 100%. Thirty percent chose the most favorable environmental option D, which would deny the project, no jobs created, at no cost to the environment. Most of those surveyed seemed to employ an ethic which sought to balance the economy (create jobs) and minimize reduction in stream water quality.



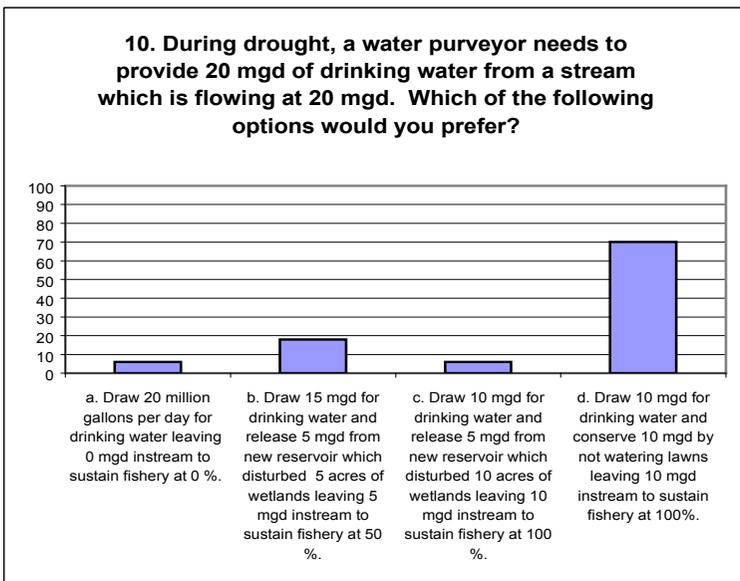
Question 8. When it comes to spending water supply revenue, the members of the Water Supply Coordinating Council and Christina Basin Clean Water Partnership felt that 60% of the money should be spent on environmental projects such as option B (better water treatment) or option C (stream restoration). The respondents felt that 23% of the funds should be reinvested to improve the distribution system (option A) and 17% should be reserved for profit (option D). Those surveyed generally came out in favor of spending the majority of the revenues on the environment while favoring lesser expenditures on reinvestment to the system and profit.

Question 9. Almost 70% of those surveyed felt that some sort of reservoir could be constructed but at differing environmental costs. Forty percent chose option A which would construct the largest reservoir but have the largest environmental cost at 20 acres of wetlands disturbed. Thirty percent chose options B or C which would be smaller reservoirs, which would provide one quarter to half the water needed with less environment impact to wetlands. A little over one quarter chose the least environmentally damaging option D (Water Conservation) which would provide 10% of the water needed meaning other costly projects would need to be implemented. Options B and C represent reservoir alternatives where the members

of the Delaware water resources committee chose to balance the economy (the need for water) with the environment (need to minimize wetland impacts).



Question 10—A majority (70%) of those surveyed preferred the most environmentally favored water withdrawal option D where half the needed water would



be withdrawn from the stream and half would be conserved by not watering lawns thus leaving enough water in the stream to sustain the fishery at 100%. This option indicates that over 3/4 of the respondents would prefer the environmental benefit of sustaining the fishery over the negative economic impacts of sustaining lawns and landscaping during drought. Only 6% prefer option A at the other end of the environment vs. economy spectrum—withdrawing all of the water out of the stream leaving none to sustain the fishery. About one quarter chose more balanced environmental-economic options B and C which sought to withdraw a portion of the needed drinking water from the stream and the balance from a reservoir. These options have forms of environmental impact as the reservoir from which the water was released originally had damaged wetlands. One of the water purveyors preferred a combination of options A and D writing: “I would ask for conservation to save the water in my reservoir—NOT to sustain the fishery at 100%. Damn the fish!”

Table 6 tabulates the responses to the survey by total sample and then disaggregated by each of the following sectors: water purveyors, business, government, academia, and non-profit environment groups. There were discernible differences in the responses depending on the perspective of each sector.

1. Are we (the Government) spending too much, too little, or about the right amount on improving and protecting the environment? Over 50% of the total sample, business, government, academia, environmental groups responded that too little is spent on the environment. In contrast, only 14% of the water purveyors felt the same way. The largest segment of the water purveyors (43%) thought that spending was just right,
2. Do you think environmental laws and regulations have gone too far, or not far enough, or struck about the right balance? Over 47% of the total sample, business, government, academia, environmental groups responded that environmental laws have not gone far enough. In contrast, only 14% of the water purveyors felt the same way. The largest segment of the water purveyors (43%) thought that environmental laws went too far or struck the right balance.
3. Do you agree or disagree with the following statement? Protecting the environment is so important that the requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost. The majority (over 50%) of the total sample, water purveyors, business, and government responded that they disagreed that continuing environmental improvements must be made regardless of cost. The majority of the academic sector (60%) and environmental groups (75%) agreed with this statement.
4. Which of these two statements is closer to your opinion? We must be prepared to sacrifice environmental quality for economic growth. We must sacrifice economic growth in order to preserve and protect the environment. Interestingly, at least half of the total sample and the five sector groups

- shared a similar environmental perspective responding that we must sacrifice economic growth in order to preserve and protect the environment.
5. Do you think that the overall quality of the environment around here is very much better than it was five years ago, slightly better than it was five years ago, slightly worse, somewhat worse, or very much worse than it was five years ago? The responses to this question varied widely by sector group. The majority of the total sample (39%), water purveyors (72%), and environmental groups (75%) responded that the environment was better. The majority of the business (50%), government (46%), and academia (40%) groups thought the environment was about the same.
 6. A developer proposes to construct a shopping center over an aquifer recharge area. The shopping center will provide property tax income. The aquifer is the only source of drinking water. Which of the following options would you recommend? The majority of the business sector (50%) recommended building on 50% of the site. The majority of the total sample (55%) recommended building on 20% of the site. The majority of the water purveyors (72%), government (61%), academia, and environmental groups (75%) recommended denying the project.
 7. A bottling plant is proposed which would require a wastewater discharge upstream from your city. The stream is the sole source of drinking water for the city. The industry will generate jobs. Which of the following options would you choose? The majority of the environmental groups (75%) chose the option of a 50,000 bottle per day plant with water quality reduced by 50%. Over 60% of the total sample (64%), water purveyors (86%), business groups (100%), and academia (60%) chose the option of a 10,000 bottle per day plant reducing water quality by 10%. The majority of the government groups preferred to deny the project.
 8. For every dollar of water supply revenue, what percentage would you apply to the following program? This question was not disaggregated by sector.
 9. A reservoir is proposed in a wild and scenic river valley. Which of the options would you recommend? The majority of the total sample (39%), water purveyors (43%), government (46%) and academia (40%) preferred the largest reservoir (1 billion gallons) at the largest environmental cost. The majority of the business groups (50%) preferred a reservoir at half the size (500 million gallons) and half the environmental cost. The majority of the environmental groups (75%) preferred no reservoir instead preferring water conservation.
 10. During drought, a water purveyor needs to provide 20 mgd of drinking water from a stream which is flowing at 20 mgd. Which of the following options would you prefer? There was consensus here. The majority of all the groups preferred the least environmental costly alternative: Draw 10 mgd for drinking water and conserve 10 mgd by not watering lawns leaving 10 mgd instream to sustain fishery at 100%.

To conclude the analysis of the survey and employ an environmental ethics index, the responses were grouped according to three categories: (1) responses with a somewhat pro-economic viewpoint, (2) responses with a more balanced viewpoint between the environment and the economy, and (3) responses with a somewhat pro-environmental viewpoint. Table 6 summarizes the criteria for an environmental index derived from the survey results.

Table 6. Environmental Index Criteria

Question	Pro-economic viewpoint	Balanced viewpoint, environment and economy	Pro-environmental viewpoint
1. Are we (the Government) spending too much, too little, or about the right amount on improving and protecting the environment?	Option B (3%)	Option C (24%)	Option D (58%)
2. Do you think environmental laws and regulations have gone too far, or not far enough, or struck about the right balance?	B (9%)	A and C (42%)	D (48%)
3. Do you agree or disagree with the following statement? Protecting the environment is so important that the requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost.	B (58%)	A (6%)	C (33%)
4. Which of these two statements is closer to your opinion: we must be prepared to sacrifice environmental quality for economic growth. We must sacrifice economic growth in order to preserve and protect the environment.	B (9%)	A (27%)	C (64%)
5. Do you think that the overall quality of the environment around here is very much better than it was five years ago, slightly better than it was five years ago, slightly worse, somewhat worse, or very much worse than it was five years ago?	A (27%)	B (33%)	C (39%)

Question	Pro-economic viewpoint	Balanced viewpoint, environment and economy	Pro-environmental viewpoint
6. A developer proposes to construct a shopping center over an aquifer recharge area. The shopping center will provide property tax income. The aquifer is the only source of drinking water. Which of the following options would you recommend?	A (0%)	B and C (73%)	D (27%)
7. A bottling plant is proposed which would require a wastewater discharge upstream from your city. The stream is the sole source of drinking water for the city. The industry will generate jobs. Which of the following options would you choose?	A (0%)	B and C (70%)	D (30%)
8. For every dollar of water supply revenue, what percentage would you apply to the following program?	A and D (40%)		B and C (60%)
9. A reservoir is proposed in a wild and scenic river valley. Which of the options would you recommend?	A (39%)	B and C (30%)	D (27%)
10. During drought, a water purveyor needs to provide 20 mgd of drinking water from a stream which is flowing at 20 mgd. Which of the options would you prefer?	A (6%)	B and C (24%)	D (70%)
Composite Viewpoints	19% Pro-economic	36% Economic— environment balance	45% Pro- environment

The results of the survey indicate that the majority of those polled from the Delaware water resources community (81%) have values that may be interpreted as either (1) supportive of a balance between the economy and the environment or (2) pro-environment, thus indicating that (at least for the questions posed) this ethic is injected into decisions concerning water policy. Thirty-six answered the survey questions in a manner that attempts to strike a balance between economic and environmental needs. Forty five percent answered the questions from what could be construed as a pro-environmental viewpoint. The minority viewpoint was pro-economic as 19% of those surveyed preferred economic needs in answering the

questions. The survey of a cadre of water resources policy makers on the Delaware Water Supply Coordinating Council and the Christina Basin Clean Water Partnership concludes that (at least for the questions posed) they instill water resources decision-making with a reasonably strong environmental ethic.

CONCLUSIONS

This article explored the field of environmental ethics as a basis for fair and equitable water policy making in Delaware. We examined the dilemma of resource allocation, given the seemingly conflicting objectives imposed by a market economy between individual self-interest and the environmental well being of the larger community, and seek concepts and methods to facilitate ethical decision-making. We have the following conclusions:

Evolution of Environmental Ethic—A literature review indicates that mankind's overall environmental ethic has evolved over the 50 years from a state of dominion to a more modern ecological concept of balance with nature. For instance, membership in environmental lobbying organizations such as the Sierra Club and Natural Resources Defense Council exceeded 3,100,000 in 1990, a 30-fold increase from 120,000 members in 1960. More people care for the environment than they used to thus serving as an underpinning for water law and ethical water resources decision-making.

Water Law—Environmental ethics is a basis of current water law, which is designed to guide water resource allocation and help resolve conflicts. In the USA, two forms of water law are practiced—riparian rights (found in the eastern states) and prior appropriation doctrine (predominately in western states). Both forms of water law seek an ethical balance to protect the rights of the water user (the individual) while trying to protect other upstream and downstream users (the common good).

Case Studies in Water Resources Decision-making—A series of case studies from Delaware and other states discuss how an awareness of environmental ethics can help the water policy specialist make difficult decisions in the face of various conflicts. Witness:

- The ethical dimension of riparian water law is that the upstream owner (developer proposing to put homes in the floodplain) may not injure the downstream owner.
- The public manager advises against approving a shopping center proposal over an aquifer because at 60 percent impervious cover the development exceeds the 50 percent impervious cover requirement of the water resources ordinance and is out of harmony with the water resource.
- The ethical water managers from both states in the Christina Basin averted a lawsuit when an industry in upstream Pennsylvania proposed a wastewater discharge that did not meet downstream Delaware's water quality standards. Ultimately a strategy was crafted under the Federal Clean Water Act whereby the wastewater discharge could meet both states' standards.

Survey of Delaware Water Resources Policy Makers—A survey was conducted of sixty-five water resources policy makers in the water purveyor, business, government, academic, and nonprofit environmental sectors on the Delaware Water Supply Coordinating Council and the Christina Basin Clean Water Partnership. The purpose of the survey is to assess their beliefs in an environmental ethic as a basis for water resources decision-making. The results of the survey indicate that the majority of those polled from the Delaware water resources community (81 percent) have values that may be interpreted as either (1) supportive of a balance between the economy and the environment or (2) pro-environment, thus indicating that this ethic is injected into decisions concerning water policy. Thirty-six answered the survey questions in a manner that attempts to strike a balance between economic and environmental needs. Forty five percent answered the questions from what could be construed as a pro-environmental viewpoint. The minority pro-economy viewpoint was expressed as 19 percent of those surveyed preferred economic needs in answering the questions. The survey of the cadre of water resources policy makers on the Delaware Water Supply Coordinating Council and the Christina Basin Clean Water Partnership concludes that (at least for the questions posed) water resources decision-making in Delaware is instilled with a reasonably strong environmental ethic.

The general public was not part of the survey and therefore it is uncertain what the public's attitude would be toward an environmental ethic. Some perspective may be gleaned from a comparison of Dunlap's survey in 1990 which surveyed the general public and the current survey of policy makers. For instance, 58 percent of the water policy makers felt that the government spends too little on the environment. By comparison, the survey conducted of the public by Dunlap in 1990 indicated that 70 percent believed that too little was spent on the environment. Seventy eight percent of the policy makers think environmental laws and regulations have gone not far enough or have achieved the right balance. By comparison, the survey of the public conducted by Dunlap in 1990 indicated that 77 percent had the same feeling. In contrast to the pro-environmental theme of the proceeding two questions, close to 60 percent felt that that there must be some cost limits set on spending for environmental improvements. By contrast, the survey conducted by Dunlap in 1990 indicated that only 21 percent disagreed that environmental improvements must be made regardless of cost. Sixty-five percent of the policy makers believed that we must sacrifice economic growth to protect the environment. By comparison, the survey of the public conducted by Dunlap in 1990 indicated that 64 percent believed the same.

Summary—When confronted with difficult decisions concerning the protection of natural resources such as water and land, the public manager may find it useful to remember the concept of environmental ethics as a state of harmony between humans and the land. The economic interests of the individual and the environmental needs of the community can be balanced provided it is done on the scale of ethical decision-making.

Quod natura non sunt turpia. What is natural cannot be bad.

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