

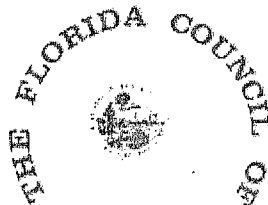
Water Resources Management

A Preliminary White Paper

September 2009

Version 2

(Note: This is an amalgamation of publicly released data and recommendations – Council has not endorsed or opined yet.)



Florida Council of 100, Inc.
400 North Ashley Drive, Suite 1775
Tampa, Florida 33602
fc100.org

Introduction¹

Water can be viewed as a basic right, but water also is a commodity, subject to the usual economic pulls of supply and demand, as constrained by public policy and environmental considerations.

Dr. Lynne Holt, University of Florida, 2005

The good news is, at its heart, water resources management is a quantitative issue of supply and demand. The bad news is the subjective forces of politics and value judgment often interject themselves into the discussion. One thing is certain, however – Florida's effective balancing of these forces will depend on its ability to implement comprehensive "water resources management" rather than address its difficulties piecemeal.

Why? Water resources management integrates the management and operations of sustainable water and wastewater infrastructure in a comprehensive fashion, recognizing and addressing the unique characteristics of water resources in Florida. These water resources are defined by a climate with abundant, but highly variable rainfall conditions. Annual dry season and wet season cycles, periods of drought, and flood events, all contribute to sustain diverse and rich natural resources (lakes, wetlands, springs, rivers, and estuaries).

However, this inherent variability presents significant challenges for reliable and cost-effective water supply infrastructure. Florida's wet seasons, flat terrain, and high water table have resulted in extensive drainage networks to facilitate the development of Florida. These drainage and storm water control features have proven to be counterproductive with regard to protecting natural resources and conserving freshwater resources for water supply. Flat terrain in most of the state makes the use of in-stream reservoir storage largely infeasible, creating challenges for reliable and sufficient water storage.

Water resources management must address the total water cycle, including: rainfall; water sources; water supply capture, treatment and distribution; water conservation; and wastewater treatment and reuse of reclaimed water. Within the water cycle, there are many water resource management objectives in addition to sustainable water supplies, including flood control, storm water management, and environmental protection and restoration. Integration of these multiple constraints and objectives within water resource management provides opportunities to leverage funding and seek optimal solutions.

Moreover, with many objectives, come many stakeholders. Within the public water supply community, stakeholders include elected officials, water utilities, regulators, planners, etc. In a broader sense, stakeholders include business and industry, environmental advocacy groups, agriculture, local governments, landowners, etc. Water resources management must integrate these present realities and forecast the future in order to develop effective management solutions.

Several significant developments have brought the issue of water resources management to the forefront in recent years:

- Population growth – Florida has been subject to significant population growth (though now slowing) for at least the last five decades, with a continued level of growth projected to occur for the near future. Related business development has also soared, further straining the water table. Public supply water system demand is projected to increase by two billion gallons per day between 2005 and 2025. These growing demands for water supplies intensify the need for water conservation, reuse of reclaimed water, and new sources.

¹ Note: This preliminary draft white paper draws extensively and directly from numerous sources.

- Environmental Restoration and Protection - Major environmental restoration projects, such as the Comprehensive Everglades Restoration Plan, have heightened the awareness of both potential conflicts and opportunities between environmental restoration and protection, and water supply.
- Public Fiscal Concerns - The increase in water rates needed for new water supplies, some of which are more expensive than in the past, has led to challenges by vocal consumers.
- Climate Variability - Future changes in climate may affect the water resources upon which the state depends, including potential changes in the frequency of droughts and tropical storms, as well as saltwater intrusion from rising sea level, and other impacts to surface water and groundwater. The uncertainty caused by climate change relative to its impacts on water resources poses a daunting challenge for water management districts and drinking water, wastewater, and storm water utilities responsible for managing water resources throughout the state and within local communities. These agencies and utilities rely upon historical hydrological precipitation patterns to regulate or manage source water supplies, storm water runoff, and wastewater conveyance and treatment. From the water, wastewater and storm water utilities' perspective there are three critical issues regarding climate change: (1) how increasing hydrologic variability may affect water supply and demand and wastewater collection and treatment; (2) in coastal areas, how sea level rise may impact water supplies, utility infrastructure, and relocation of coastal population centers; and (3) how energy usage, to treat and deliver potable water and to treat and dispose of wastewater, may contribute to climate change or variability.
- Source Water Protection - With population growth and industrial development there is a greater potential for contamination of water sources. In addition, the demand for more water leads to development of lower quality sources. As such, protection of these water sources is of even greater importance.

Thus, water resources management is important because it addresses all of the water-related topic areas in an integrated framework. This integration allows evaluation of trade-offs with the goal of finding optimal solutions that minimize cost and maximize reliability and sustainability of both the environment and water supply. This topic (water resources management) is critical to addressing questions of political, environmental, and economic concern including the cost and values of economic growth, water supply, natural assets, conservation, and intergovernmental coordination. If these questions are not addressed in an integrated framework, the result may be short-sighted actions that limit the future availability of resources for optimal growth across the state. Growth, tourism, agriculture, and the attraction of industry to the state are dependent on maintaining the natural assets that attract and sustain these activities.

Traditionally, water supplies for most water uses in Florida have come predominantly from fresh groundwater and some surface water systems. However, since the sustainable limits of these water resources are now being reached, future water needs in most areas of Florida must be met through a combination of improved water conservation, along with increased development of alternative water supply (AWS) sources where needed.

The vision for water resources management is to effectively develop and use these multiple water supply sources in an integrated and optimal fashion to meet future water supply needs that are projected to increase by two billion gallons per day over the next 15 years. The future is fast approaching, and it will take a significant shift in the mix of water supply sources and alternatives to meet the growing demands.

Water resources management must address the multi-objective goals of water conservation, water supply development, wastewater management, storm water control, and protection and restoration of natural systems. To implement sustainable water supplies, water resources management must also include adaptive management strategies to deal with uncertainty. The best example of uncertainty concerns the impact of climate variability (both short-term drought and longer-term global warming impacts). Water resources management must assess the impact of such uncertainties on both supply and demand to

develop adaptive management strategies for various water supply scenarios and hydrologic conditions. Sustainability and drought-proofing future water supplies will be the major objective in development of integrated water resources management master plans. Regionalization and collaboration among water utilities, the water management districts, and the Florida Department of Environmental Protection (DEP) on multi-jurisdictional projects to meet the collective needs of water users within a region will be an important strategy in water resources management. This collaborative environment and shared investment in water resource projects will be critical to addressing the effects of uncertainty and providing the most cost-effective water supply scenarios taking advantage of economies of scale.

Table of Contents	
	Page
Florida Water Policy and Governance Structure	5
Policy	5
Governance	5
Water Supply and Demand Issues	10
Conservation	13
Reuse of Reclaimed Wastewater	15
Alternative Water Sources	16
Water Allocation and Transfer	20
Other Water Issues	23
Governance	23
Data	26
Water Quality	28
Options and Recommendations	29
Appendix A – Improving Florida’s Water Supply Management Structure	A-1
Appendix B – Florida 2030: A Vision for Sustainable Water Infrastructure	B-1
Appendix C -- 2008 Water Congress, Consensus Recommendations	C-1

Florida Water Policy and Governance Structure

Policy

Because water constitutes a public resource benefiting the entire state, it is the policy of the Legislature that the waters in the state be managed on a state and regional basis. Consistent with this directive, the Legislature recognizes the need to allocate water throughout the state so as to meet all reasonable-beneficial uses and that the adverse effects of competition for water supplies be avoided. However, the Legislature acknowledges that such allocations have in the past adversely affected the water resources of certain areas in this state. To protect such water resources and to meet the current and future needs of those areas with abundant water, the Legislature directs DEP and the water management districts to encourage the use of water from sources nearest the area of use or application whenever practicable. Such sources shall include all naturally occurring water sources and all alternative water sources, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and storm water, and aquifer storage and recovery. However, in establishing this policy, the Legislature realizes that under certain circumstances the need to transport water from distant sources may be necessary for environmental, technical, or economic reasons.

Furthermore, the Legislature emphasizes that water resource development and water supply development must receive priority attention, where needed, to increase the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems. And regarding water conservation, the Legislature recognizes that the proper conservation of water is an important means of achieving the economical and efficient utilization of water necessary, in part, to constitute a reasonable-beneficial use. The overall water conservation goal of the state is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable use of water resources. The Legislature finds that the social, economic, and cultural conditions of the state relating to the use of public water supply vary by service area and that public water supply utilities must have the flexibility to tailor water conservation measures to best suit their individual circumstances. The Legislature encourages the use of efficient, effective, and affordable water conservation measures. Where water is provided by a public water supply utility, the Legislature intends that a variety of conservation measures be made available and used to encourage efficient water use. To achieve these conservation objectives, the state should emphasize goal-based, accountable, tailored, and measurable water conservation programs for public water supply.

Governance

The Legislature officially recognizes that the water resource problems of the state vary from region to region, both in magnitude and complexity. Thus, it has given DEP general responsibility to implement the state's water policy. However, from a practical standpoint, it was envisioned that the vast majority of that responsibility would be delegated to the water management districts (WMDs). Nevertheless, DEP is still charged with exercising "general supervisory authority over the WMDs" and has been given the authority to "exercise any power herein authorized to be exercised by a water management district."

In terms of water conservation, the Legislature had directed DEP, in cooperation with the WMDs and other stakeholders, to develop a comprehensive statewide water conservation program for public water supply. Now codified in a Conserve Florida Master Guide and other documents, the program:²

- Encourages utilities to implement water conservation programs that are economically efficient, effective, affordable, and appropriate;

² See conservefloridawater.org.

- Is goal-based, accountable, measurable, and implemented collaboratively with water suppliers, water users, and water management agencies;
- Includes cost and benefit data on individual water conservation practices to assist in tailoring practices to be effective for the unique characteristics of particular utility service areas, focusing upon cost-effective measures;
- Uses standardized public water supply conservation definitions and standardized quantitative and qualitative performance measures for an overall system of assessing and benchmarking the effectiveness of water conservation programs and practices;
- Includes a clearinghouse for water conservation programs and practices available to public water supply utilities which provides an integrated statewide database for the collection, evaluation, and dissemination of quantitative and qualitative information on public water supply conservation programs and practices and their effectiveness. The clearinghouse has technical assistance capabilities to aid in the design, refinement, and implementation of water conservation programs and practices. The clearinghouse also provides for continual assessment of the effectiveness of water conservation programs and practices;
- Has a standardized water conservation planning process for utilities; and
- Maintains a Florida-specific water conservation guidance document containing a menu of affordable and effective water conservation practices to assist public water supply utilities in the design and implementation of goal-based, utility-specific water conservation plans tailored for their individual service areas.

In addition to its other powers and duties, DEP is supposed to perform the following data-related functions:

- Conduct, independently or in cooperation with other agencies, topographic surveys, research, and investigations into all aspects of water use and water quality.
- Be the central repository for all scientific and factual information generated by local governments, water management districts, and state agencies relating to water resources and, to that end, collect, maintain, and make available such information to public and private users within the state and assist in the acquisition of scientific and factual data from water management districts, local governments, and the United States Geological Survey. All local governments, water management districts, and state agencies are directed to cooperate with the department or its agents in making available to it for this purpose such scientific and factual data as they may have, generate, or possess, as the department deems necessary. The department is authorized to prescribe the format and ensure quality control for all data collected or submitted.
- Establish priorities for the development of a computerized groundwater database.
- Cooperate with other state agencies, WMDs, and regional, county, or other local governmental organizations or agencies created for the purpose of utilizing and conserving the waters in this state; assist such organizations and agencies in coordinating the use of their facilities; and participate in an exchange of ideas, knowledge, and data with such organizations and agencies. For this purpose, the department may maintain an advisory staff of experts.

DEP is also charged with developing the "Florida Water Plan." Developed in 2001 and currently being considered for update, the Florida Water Plan is intended to include the programs and activities of the department related to water supply, water quality, flood protection and floodplain management, and natural systems. The Florida Water Plan is also to include the district water management plans. The governing board of each WMD is to develop a district water management plan that is to address water supply, water quality, flood protection and floodplain management, and natural systems. Each WMD is to identify one or more water supply planning regions within the district. Each district is required to conduct water supply planning for any region in the district "where it determines that existing sources of water are not adequate to supply water for all existing and future reasonable-beneficial uses and to sustain the water resources and related natural systems." Each regional water supply plan is to include a water

supply development component that quantifies the water supply needs of the region within a 20 year planning horizon and that provides a list of water supply development project options that will meet those needs. The regional water supply plan is also required to list those water resource development projects that support water supply development. DEP is to provide an annual report to the Governor and the Legislature on the status of all regional water supply planning efforts in each district.

The five WMDs in Florida (Northwest Florida, Suwannee River, St. Johns River, Southwest Florida and South Florida) are responsible for managing the water resources within their respective jurisdiction. District responsibilities include water supply planning, water resource development, water use and environmental resource permitting, and, in some cases, various funding initiatives that encourage the use of alternative water supplies.

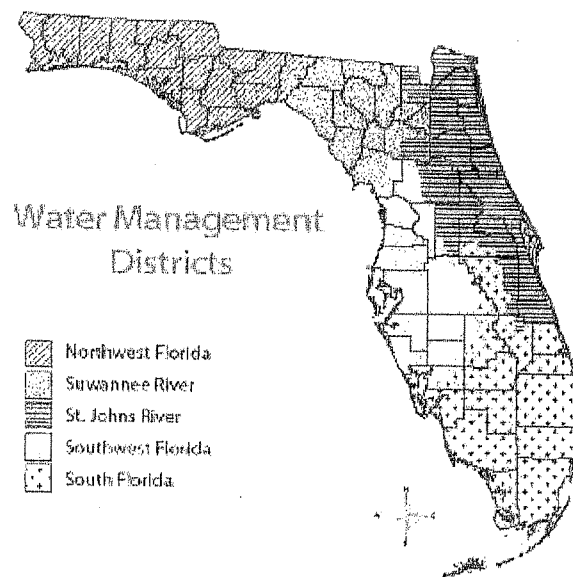


Figure 1 – WMDs within the State of Florida

The Legislature has determined that:

- The proper role of the water management districts in water supply is primarily planning and water resource development, but this does not preclude them from providing assistance with water supply development.
- The proper role of local government, regional water supply authorities, and government-owned and privately owned water utilities in water supply is primarily water supply development, but this does not preclude them from providing assistance with water resource development.

Additionally, it is the intent of the Legislature that:

- WMDs take the lead in identifying and implementing water resource development projects and be responsible for securing necessary funding for regionally significant water resource development projects.
- Local governments, regional water supply authorities, and government-owned and privately owned water utilities take the lead in securing funds for and implementing water supply development projects. Generally, direct beneficiaries of water supply development projects

should pay the costs of the projects from which they benefit, and water supply development projects should continue to be paid for through local funding sources.

- Water supply development be conducted in coordination with water management district regional water supply planning and water resource development.
- The WMDs fund and implement water resource development, especially and expeditiously as possible in areas subject to regional water supply plans.

To meet the anticipated needs of 2025, the Florida Water Resources Act (Chapter 373, F.S.) requires WMDs to develop regional water supply plans where existing and anticipated water sources are deemed inadequate. Regional water supply plans must be updated every five years and must include a list of water supply sources and water resource development projects that will meet anticipated demands while sustaining water resources and related natural systems.

Reported benefits of regional water supply planning, include:

- Addressing the collective water supply needs of a region, thus greatly reducing the potential for conflicts over water sources.
- Providing more holistic solutions to address a wider range of related water management objectives, including water supply, storm water management, flood control, and water quality, and environmental restoration.
- Providing economies of scale in developing water supply projects of a larger scale that serves multiple water utilities.
- Providing economically feasible options for developing alternative water supplies such as surface water, brackish water, reclaimed water or seawater, that are remote from utility service areas, by pooling resources for plant construction and transmission lines.

In 2001, the Northwest Florida, St. Johns River, Southwest Florida, and South Florida WMDs completed the first set of regional water supply plans. The original plans identified sufficient sources of water to meet 2020 demands. They included many projects that would help the districts better manage regional water resources. By February 2007, these four districts completed the five-year plan updates. These updated plans have identified long-term strategies that, if implemented in a timely manner, will be more than sufficient to meet the reasonable beneficial uses of 2025, while protecting the water resources. Although the Suwannee River Water Management District determined that water supplies in the district were sufficient to meet the 2025 demand and that no regional water supply plan was needed, it continues to closely monitor its status.

In addition to its other powers and duties, WMDs:

- Must engage in planning to assist counties, municipalities, special districts, publicly owned and privately owned water utilities, multijurisdictional water supply entities, or regional water supply authorities in meeting water supply needs in such manner as will give priority to encouraging conservation and reducing adverse environmental effects of improper or excessive withdrawals of water from concentrated areas.
- May establish, design, construct, operate, and maintain water production and transmission facilities for the purpose of supplying water to counties, municipalities, special districts, publicly owned and privately owned water utilities, multijurisdictional water supply entities, or regional water supply authorities.
- May not engage in local water supply distribution.
- May not deprive, directly or indirectly, any county wherein water is withdrawn of the prior right to the reasonable and beneficial use of water which is required to supply adequately the reasonable and beneficial needs of the county or any of the inhabitants or property owners.

- May provide water and financial assistance to regional water supply authorities, but may not provide water to counties and municipalities which are located within the area of such authority without the specific approval of the authority or, in the event of the authority's disapproval, the approval of the Governor and Cabinet sitting as the Land and Water Adjudicatory Commission.
- May acquire title to such interest as is necessary in real property, by purchase, gift, devise, lease, eminent domain, or otherwise, for water production and transmission.
- May issue revenue bonds for paying the costs and expenses incurred in carrying out its duties.
- May join with one or more other water management districts, counties, municipalities, special districts, publicly owned or privately owned water utilities, multijurisdictional water supply entities, or regional water supply authorities for the purpose of carrying out any of its powers, and may contract with such other entities to finance acquisitions, construction, operation, and maintenance.
- For each utility that receives financial assistance from the state or a water management district for an alternative water supply project, require the appropriate rate-setting authority to develop rate structures for water customers in the service area of the funded utility that will promote the conservation of water and promote the use of water from alternative water supplies.

Furthermore, the primary roles of the WMDs in water resource development as it relates to supporting alternative water supply development are:

- The formulation and implementation of regional water resource management strategies that support alternative water supply development;
- The collection and evaluation of surface water and groundwater data to be used for a planning level assessment of the feasibility of alternative water supply development projects;
- The construction, operation, and maintenance of major public works facilities for flood control, surface and underground water storage, and groundwater recharge augmentation to support alternative water supply development;
- Planning for alternative water supply development as provided in regional water supply plans in coordination with local governments, regional water supply authorities, multijurisdictional water supply entities, special districts, and publicly owned and privately owned water utilities and self-suppliers;
- The formulation and implementation of structural and nonstructural programs to protect and manage water resources in support of alternative water supply projects; and
- The provision of technical and financial assistance to local governments and publicly owned and privately owned water utilities for alternative water supply projects.

The primary roles of local government, regional water supply authorities, multijurisdictional water supply entities, special districts, and publicly owned and privately owned water utilities in alternative water supply development are:

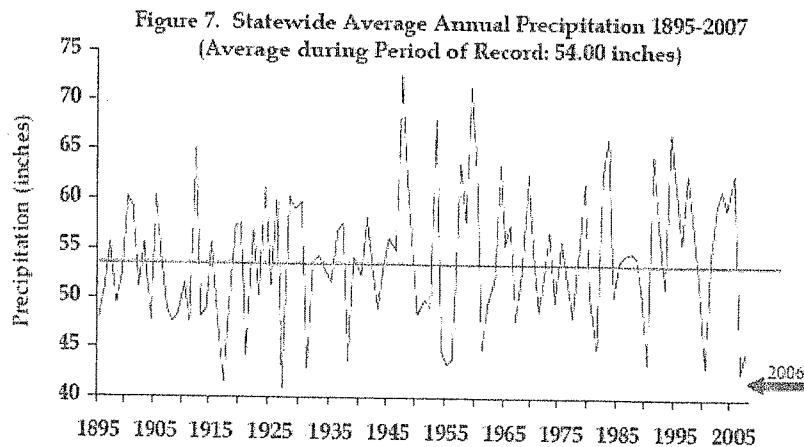
- The planning, design, construction, operation, and maintenance of alternative water supply development projects;
- The formulation and implementation of alternative water supply development strategies and programs;
- The planning, design, construction, operation, and maintenance of facilities to collect, divert, produce, treat, transmit, and distribute water for sale, resale, or end use; and
- The coordination of alternative water supply development activities with the appropriate water management district having jurisdiction over the activity.

Furthermore, due to the high costs of developing alternative water supplies, there is increasing need for local governments and others (cities, counties, special districts, etc.) to work together on a regional basis to develop alternative water supplies. In fact, counties, municipalities, and special districts are actually encouraged by the Legislature to create "regional water supply authorities" and other types of "multi-jurisdictional water supply entities" in order to develop alternative water supply projects. Florida law provides for the creation of "regional water supply authorities" by interlocal agreement between counties, municipalities, or special districts "for the purpose of developing, recovering, storing, and supplying water for county or municipal purposes in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas." Cooperation between counties and municipalities is seen as necessary for the "development of county-wide and multi-county alternative water supply projects that allow for necessary economies of scale and efficiencies to be achieved in order to accelerate the development of new, dependable, sustainable alternative water supplies."

Finally, drinking water supply utilities can be either private or public owned in the form of various governance structures. Private companies are involved in water supply development through consulting companies that provide engineering expertise during various stages of project development - design, construction and operation. In addition, private contractors have traditionally constructed facilities for utilities. In some cases private companies also provide operating services. Public utilities, in most instances, operate under the governance of counties or municipalities under the responsibility of local elected officials. Florida law has also created opportunity for public regional water supply authorities to act as wholesale water providers within a designated region.

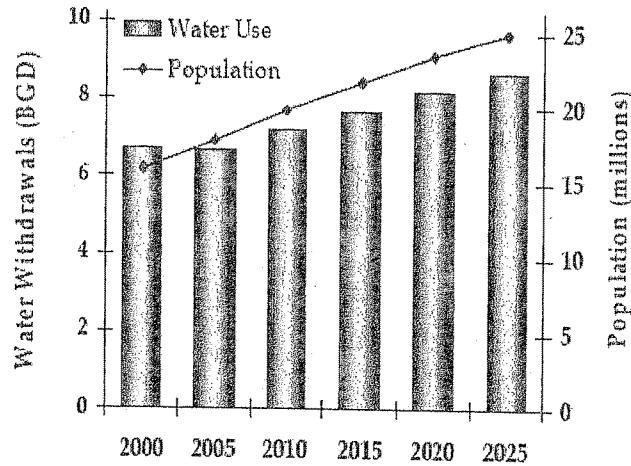
Water Supply and Demand Issues

Florida's average annual rainfall is 54 inches (greater than any other state except Louisiana), but it is not evenly distributed and has some unusual characteristics that tend to produce periods of severe water shortages. For example, over 70 percent of annual rainfall is lost to evaporation and only 30 percent finds its way to bodies of water or aquifers. Moreover, rainfall is highly variable from year to year, ranging from 40-75 inches annually. The recurrence of extreme drought events also presents some unique challenges when developing and implementing regional water supply plans.



Floridians used an estimated 6.7 billion gallons per day (bgd) of fresh water in 2000. This is estimated to increase by about 30 percent to 8.7 bgd a day in 2025 (Figure 2). During this same period, Florida's population is expected to increase by 57 percent, from 15.9 million to approximately 23 million.

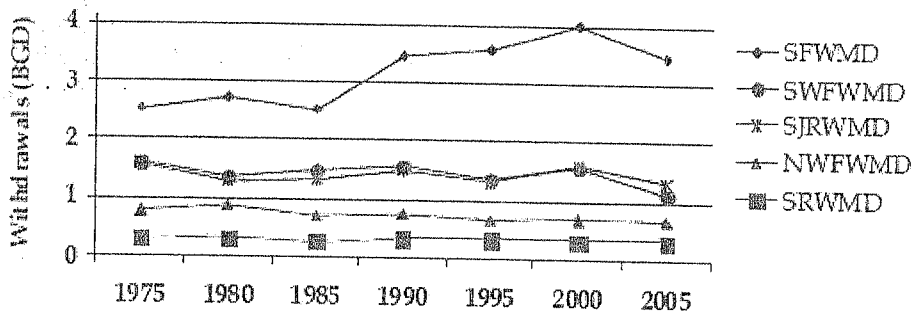
Figure 2. Statewide Freshwater Withdrawals and Population Growth



However, water use data and trends must be interpreted carefully. For example, total water use in 2005 was slightly less than use in 2000, which might lead one to conclude that Floridians were using water more efficiently in 2005 than in 2000. While improved water use efficiency might be a factor, the more accurate explanation for the reduction in demand over that five-year period is that Floridians used more water during the drought in 2000 than they did during the more normal rainfall year of 2005.

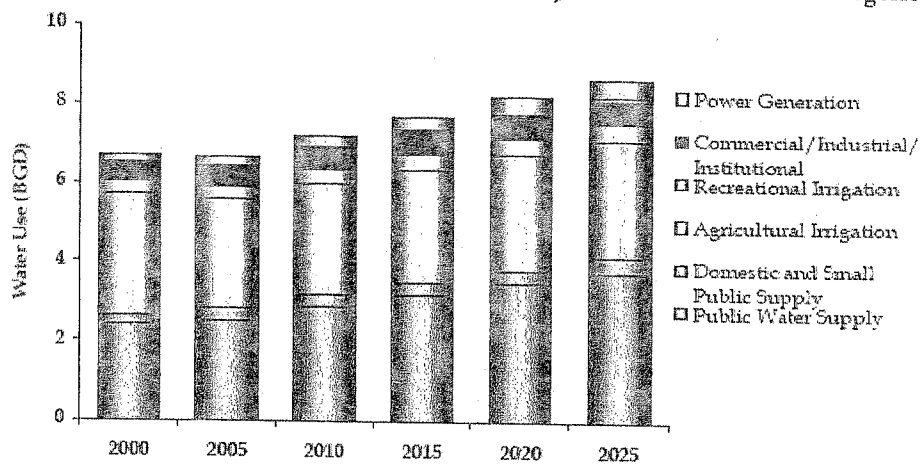
Furthermore, figures on total water withdrawals do not necessarily show important trends within different sectors of water use, or within regions. By examining water use trends in regions and user categories, we can gain greater insight about where and how we can best meet the future needs. Figure 3 shows the distribution of fresh water withdrawn in each water management district since 1975. In the northern part of the state, total fresh water withdrawn since 1975 has remained relatively stable. Water withdrawals in the South Florida Water Management District alone are about 50 percent of all withdrawals in the entire state. In this district, water withdrawals increased substantially after 1985 until 2000. After 2000, a record dry year, withdrawals declined to about 1995 levels.

Figure 3. Total Fresh Water Use by Water Management District
(Source: U.S. Geological Survey)



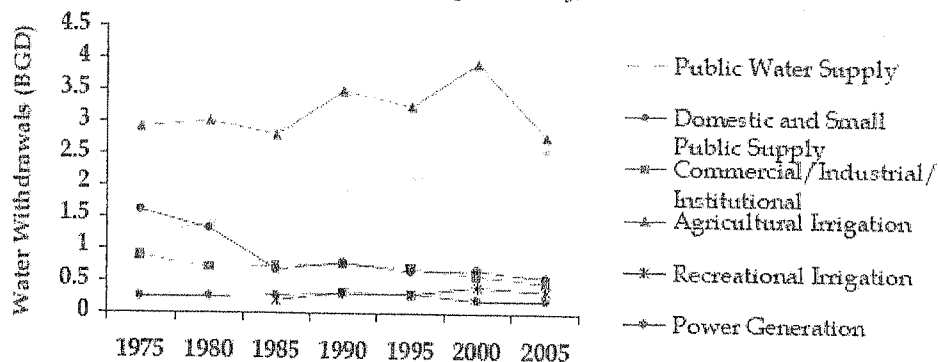
Use also varies between water use categories. Agriculture currently is the largest user of fresh water in the state; however, public water supply is projected to become the largest user by 2010 (Figure 4). Based upon water management district projections, public water supply will account for the majority of overall growth in statewide demand between 2000 and 2025. The regional water supply plans estimate that, by 2025, demands in public water supply will increase by about 49 percent and account for about 43 percent of the total estimated use of 8.7 bgd. Agriculture will be the second largest use, but will only increase by about 6 percent. It should also be noted that about 50 percent of potable water supplies are used to irrigate landscapes that often are not well suited to Florida's climate and soils.

Figure 4. Statewide Freshwater Demand Projections and Water Use Categories



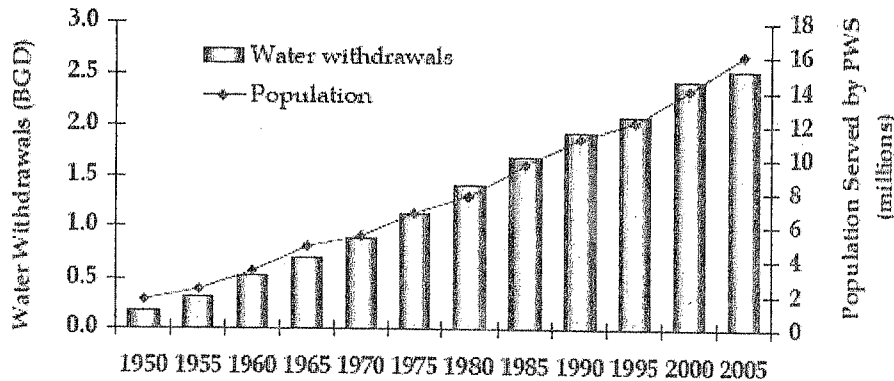
Except for public water supply, the historical use of fresh water for most of the sectors has remained relatively uniform or declined since 1975 (Figure 5).

Figure 5. Historic Uses of Freshwater
(Source: US Geological Survey)



Agricultural use has peaked during exceptional drought years, but has declined to same levels as in 1975. On the other hand, public water supply has shown a steady increase. Looking more closely at historical public water supply use, Figure 6 shows the amount of water used and the population served by public water supply. It shows a large overall increase in water withdrawn since 1950, and also that water use has been increasing in direct proportion to population growth.

Figure 6. Historic Public Water Supply Withdrawals and Population Served
(Source: US Geological Survey)



While there are adequate supplies of potable groundwater in northwest Florida, the WMDs have declared that groundwater cannot be relied on to meet the growing demand for water in the central and southeast parts of the State (and even in some areas of the northeast part of the State). This is in addition to existing limitations on groundwater withdrawals in southwest Florida. Such deficiencies impact not only individuals, but businesses (present and future) as well.³

In general, the literature suggests that Florida's water supply needs in these areas will be met primarily by: (1) decreasing demand through increased conservation, (2) increasing the reuse of reclaimed wastewater, and (3) increasing the supply of water from alternative water sources. (Transfers of water and other possible solutions will be discussed later.)

Conservation

As endorsed by the Legislature, conservation, by reducing wasteful use, can help ensure a more reliable supply of water for all existing uses and could meet a significant portion of the increased demands of Florida's growing population.⁴ While the issues necessitating the need for water conservation/ water use

³ California's current water plight may be illustrative. As the state faces one of its worst droughts in two decades, building projects are being curtailed for the first time under state law by the inability of developers to find long-term water supplies. Water authorities and other government agencies scattered throughout the state have begun denying, delaying, or challenging authorization for dozens of housing tracts and other developments under a state law that requires a 20-year water supply as a condition for building. While previous droughts and supply problems have led to severe water cutbacks and rationing, water officials said the outright refusal to sign off on projects over water scarcity had until now been virtually unheard of on a statewide scale. "Businesses are telling us that they can't get things done because of water," Gov. Arnold Schwarzenegger said.

⁴ The Legislature recognizes that the proper conservation of water is an important means of achieving the economical and efficient utilization of water necessary, in part, to constitute a reasonable-beneficial use. The overall water conservation goal of the state is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable use of water resources. The Legislature further finds that the social, economic, and cultural conditions of the state relating to the use of public water supply vary by service area and that public water supply utilities must have the flexibility to tailor water conservation measures to best suit their individual circumstances. Additionally, the Legislature encourages the use of efficient, effective, and affordable water conservation measures. Where water is provided by a public water supply utility, the Legislature intends that a variety of conservation measures be made available and used to encourage efficient water use.

efficiency may differ from utility to utility, many conservation methods and technologies are universally applicable. While the advantages of water use efficiency are apparent, the challenge comes in having comprehensive conservation programming accepted by utilities as a water supply alternative. The least expensive water that a utility can develop is water that has already been developed. When considering the comparative marginal costs of the next increment of water supply, conservation should be included.

Unfortunately, a common perception is that water conservation involves "doing without." Actually, a significant level of water conservation can be achieved with minimal inconvenience or cost for water users. Efficiently watering landscapes and using efficient plumbing fixtures and appliances in the home can reduce daily water use by 25 percent or more. Some new devices use as much as 50 percent less water than older technologies. Replacing older, water wasting fixtures and equipment for outdoor and indoor uses in all water use sectors (i.e. residential, industrial, commercial and institutional) could save large amounts of water and wastewater costs, but would involve some costs to water users. Incentive programs such as rebates or credits could help offset these costs.

Water conservation efforts in Florida date back more than 30 years. Traditionally, conservation has been promoted through public education, water conservation grant/funding programs sponsored by some of Florida's water management districts, the implementation of best management practices, and regulatory requirements. The success of Florida's cooperative funding programs, for instance, hints at the potential for water conservation as an integral part of water supply planning. Since 1991, about \$20.5 million in conservation grant funding from the Southwest Florida WMD and South Florida WMD alone has resulted in an estimated water savings of more than 16 million gallons per day – enough to fill 1,100 residential swimming pools each day or meet the daily water demands of 100,000 Florida residents. At less than \$3.00 per gallon saved, including cooperators' costs, conservation is easier to implement, more energy efficient, and significantly less expensive than other alternatives for augmenting local water supplies, such as reuse or desalination, which may cost more than \$10.00 per new gallon produced.

Conservation-oriented water rates, or demand-management pricing, are also being employed throughout the country in an attempt to encourage all consumers to use water more efficiently.⁵ Under one model, communities attempt to encourage water conservation by implementing what is known as an "inverted block rate structure." Under such a scenario, customers would pay a fixed rate per unit of water until they had consumed a certain amount of water. Then, if a household or business wanted to consume more, it would have to pay a higher price for the next "block" or specific number of units. The higher the usage, the higher the rate is set. The logic behind increasing prices at each tier is that people might decide some water use is frivolous and cut back. As the price of these block usages rise, people would see their water bill go up.⁶ Another benefit of block-rate pricing is that municipalities can assign a lower price to the lower tiers of water use. Consequently, consumers pay less for necessary water use like washing and cooking, but pay more for discretionary use like watering lawns.

However, while properly designed conservation rates do not adversely affect utility revenues, inefficient pricing plans do. For example, residents of Palm Beach County have seen their water bills increase, even as they conserve more. Why? The water utilities have high fixed costs that must be covered. Utilities' infrastructure needs to be replaced over time and pricing water supply too low (below marginal cost charges to customers) typically results in inadequate long-term capital investments. The water supply industry is very capital intensive because almost every component of the water delivery system –

⁵ Regarding the use of water conservation or drought rate structures as a conservation practice, Florida law provide that a water management district must afford a public water supply utility wide latitude in selecting a rate structure and must limit its review to whether the utility has provided reasonable assurance that the rate structure contains a schedule of rates designed to promote efficient use of water by providing economic incentives. A WMD may not fix or revise rates.

⁶ The city of Greensboro, N.C., adopted an increasing block-rate system for its water customers in 2001. Under its pricing structure, usage is measured in units of 748 gallons. The first nine units cost \$1.47 each, then units 10 to 30 cost \$2.05 each, and units 31 to 60 cost \$2.65 each. All units over 61 cost \$3.40. Block-rate pricing has helped conservation in Greensboro. Before the switch average household water consumption was roughly eight units per month, afterwards, consumption dropped to six units or less. Peaks in water usage during summer months also fell.

capturing and storage of water, transport of water, water treatment, water delivery, and disposal of dirty water require fixed capital investments in long-term infrastructure assets. The high ratio of fixed costs relative to variable (usage-based) costs involved in water supply suggests that water utilities typically operate for many years without fully recovering their costs. Without adequate cash flows and financial returns, water utilities cannot invest in much-needed infrastructure replacements.

Finally, other conservation issues include:

- Financial incentives, other than pricing, can be an effective means of increasing conservation. They can include such things as rebates, bulk purchase/product giveaways, and tax credits to encourage installation of water saving devices.
- Agricultural water conservation -- As a long-time primary driver of Florida's economy, the agriculture industry has been at the heart of any discussion of Florida resources, land use, and population distribution. And, as a traditional primary consumer of water, the industry often finds itself in the center of the heated debate over proper distribution of Florida's water supply. The Facilitating Agricultural Resource Management Systems (FARMS) program is an example of a conservation program that encourages farmers and nursery owners to use best management practices to conserve water use. Overuse of the aquifer means saltwater can seep into the underground freshwater since water from the Gulf of Mexico is pulled inland as the aquifers recede. Too much salt on many crops can spell disaster, so it's in farmers' best interest to cut back on underground pumping. FARMS allows farmers to submit a water conservation project design and budget to be eligible for consideration to receive grant money from a program jointly funded by the state and WMDs.
- Some local governments treat their water utilities like "cash cows," unwilling to share conservation savings with users. The localities supplant their taxes with revenues from the local water utility.

Reuse of Reclaimed Wastewater

Florida law provides that encouragement and promotion of water conservation and reuse of reclaimed water are state objectives and considered to be in the public interest. Thus charged by the Legislature, DEP defines reclaimed water as water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility to become available for reuse for a beneficial purpose. Extensive treatment and disinfection ensures that public health and environmental quality are protected. In regions facing rapid population growth, the task of mobilizing new water supplies to meet new demands, while also protecting the sustainability of Florida's resources is complex. Reclaimed water is a very important water source that can play a major role. It saves water that would otherwise be withdrawn from freshwater ground or surface water sources to meet non-potable water supply needs such as for irrigation or other uses. Reuse of reclaimed water also reduces the reliance on traditional disposal methods such as ocean outfalls or deep disposal wells that otherwise waste the resource.

While the number and capacity of reclaimed water facilities is increasing, much of the potential as a resource remains underutilized. As a result of significant increases in reuse capacity over the last 10-years, the current wastewater reuse utilization is 41 percent of wastewater treatment plant flows and the capacity represents 56 percent of the total permitted domestic wastewater treatment statewide. Furthermore, most reuse is seasonal. In those areas that have been reusing wastewater for irrigation purposes for an extended period of time, annual utilization records substantiate the expected seasonality of reuse, resulting in a large surplus of reuse water in the wet season when wastewater flows tend to be at their peak.

Currently, most reclaimed water use occurs on the west coast of Florida and central Florida. A major reason is that many wastewater treatment plants originated as small developer-owned systems designed to serve their development, and later were deeded to local governments. Conventional disposal methods

(e.g., stream discharges or ocean outfalls) are not easily permitted or have proven to not be sustainable in this part of the state. The costs of injection wells for small systems cannot be justified either, so the reuse (usually by percolation ponds) of small quantities of wastewater was the chosen alternative for disposal. With the advent of federal funding in the 1970s, larger systems like St. Petersburg pursued larger scale reuse efforts.

The cost of implementing reclaimed water use systems is \$3-5/gallon in capital costs. However, locally the costs, particularly in developed urban environments are much higher than the cost of traditional groundwater supplies. For example, Southeast Florida has historically had a much older and denser development pattern than the west coast or central Florida. The same programs that created funding for St. Petersburg to implement a reclaimed water use system within an urban setting encouraged Southeast Florida utilities to pursue injection wells and outfalls to move treated wastewater away from developed land. Many injection wells are currently under development. As a result, reuse on top of water supplies has not been favored by local officials. There is a limited amount of large acreage upon which to use reclaimed water, so the alternatives generally migrate to residential reuse. The cost to install a dual distribution system similar to the City of St. Petersburg's system has been estimated at nearly \$10,000 per lot and a total in excess of \$30 billion, and thus not cost effective.⁷

That being said, South Florida shouldn't get a pass -- ocean outfalls in the region send some 300 million gallons a day of treated domestic wastewater into the sea -- water that could be put to beneficial use on land.⁸ Artificial recharge of groundwater using reclaimed water has been proposed as a solution to protect coastal fresh groundwater sources from sea level rise and create additional sources of water to meet the growing water needs in some regions of the state. Canal recharge is one suggested reuse option, especially in Southeast Florida. The current suggestions for canal recharge are likely to be too expensive to receive serious traction, but, based on the costs for new technologies used in California, construction costs for similar facilities in Southeast Florida would approach \$12 per gallon treated, yielding a total cost above current treatment, with piping costs, exceeding \$6 billion, plus over \$10/1,000 gallons for water treated. With this concept in mind, and assuming the need to meet the indirect potable reuse requirements, Miami-Dade County has embarked on a similar canal recharge project. The cost estimate for Miami-Dade's current 22 MGD canal recharge project is \$700 million (\$35/gallon); for 500 MGD, the costs may exceed \$15 billion.

Alternative Water Sources

The Legislature has found that demands on natural supplies of fresh water to meet the needs of a rapidly growing population and the needs of the environment, agriculture, industry, and mining will continue to increase and that there is a need for the development of alternative water supplies for Florida to sustain its economic growth, economic viability, and natural resources. Furthermore, Florida law provides that alternative water supply development must receive priority funding attention to increase the available supplies of water to meet all existing and future reasonable-beneficial uses and to benefit the natural systems.

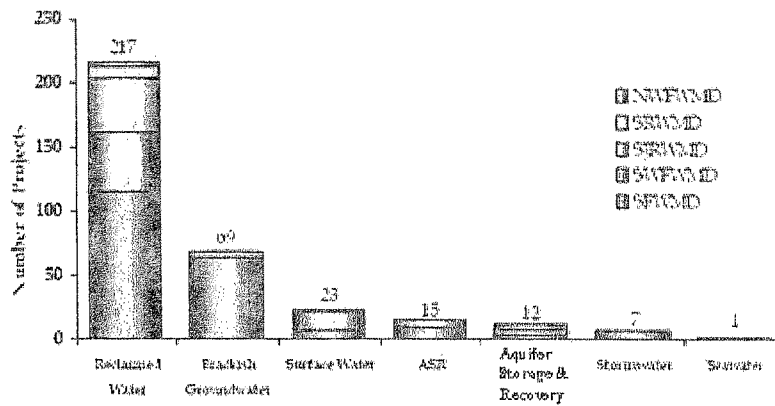
⁷ And the statistics bear this out. Lee and Collier counties, for example, operate at 80 to 90 percent reuse for irrigation. However, Miami-Dade County, the greatest consumer of water, only reuses 5 percent; with Palm Beach County up to 30 percent reuse.

⁸ In fact, the Legislature has directed the South Florida Water Management District to require the use of reclaimed water made available by the elimination of wastewater ocean outfall discharges in lieu of surface water or groundwater when the use of uncommitted reclaimed water is environmentally, economically, and technically feasible and of such quality and reliability as is necessary to the user. Such reclaimed water may also be required in lieu of other alternative sources. In determining whether or not to require such reclaimed water in lieu of other alternative sources, the water management district must consider existing infrastructure investments in place or obligated to be constructed by an executed contract or similar binding agreement as of July 1, 2011, for the development of other alternative sources.

Thus, in 2005, the Legislature, recognizing the need for the development of additional alternative water supplies, created the Water Protection and Sustainability Program and Trust Fund. The Trust Fund is to be funded with revenues from documentary stamps and is to provide money "for the purpose of providing funding assistance for the development of alternative water supplies under the Water Protection and Sustainability Program." These funds are to be used to supplement other funding sources in the development of alternative water supplies.

During the first three years of the Water Protection and Sustainability Program, the WMDs provided funding assistance to local water suppliers for the construction of 344 projects. Figure 9 shows that approximately 63 percent of the projects funded were reclaimed water projects. The next most common group of projects funded were brackish groundwater projects, which comprised approximately 20 percent of the total.

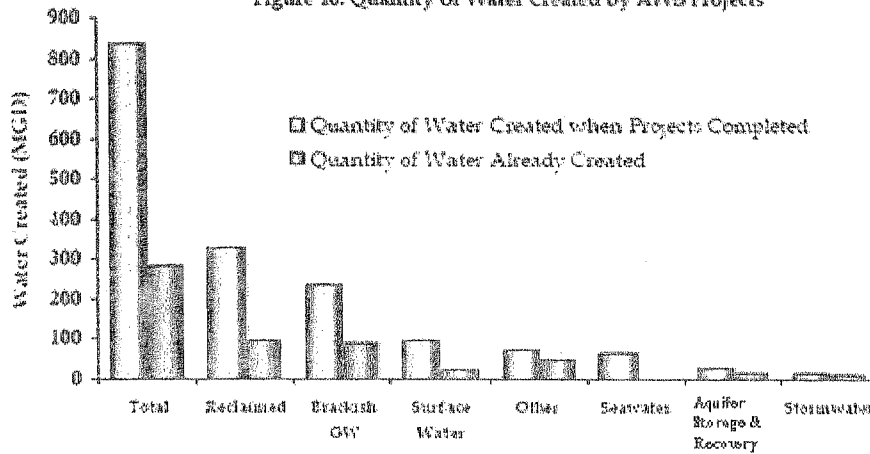
Figure 9. Statewide Summary of Types of Alternative Water Supply Projects Funded



The WMDs estimate that when construction of these projects is complete they will help create approximately 842 mgd of "new water," which is about 42 percent of the additional 2 bgd of water needed by 2025. Figure 10 shows that reclaimed water projects are expected to produce the largest amount of water, approximately 330 mgd. That is about 16.5 percent of the additional water needed by 2025 (though not all of the reclaimed water will completely offset groundwater use). Brackish groundwater projects are expected to produce the next largest amount of water, approximately 234 mgd.⁹ That is about 12 percent of the additional water needed by 2025.

⁹ Brackish water desalination in Florida has been successfully demonstrated for two decades; seawater desalination will become an increasing part of Florida's future water supply treatment portfolio. In the period between 1990 - 2005 seawater desalination became more economical as a result of increased energy efficiencies of the membrane system and reduced capital costs. A good rule of thumb for Florida cost of water is the 1-2-3 rule: groundwater \$1/1000 gals; surface water \$2/1000 gal; and seawater desalination \$3/1000 gal. However, the cost of desalination for 6 million people in coastal areas may exceed \$10 billion plus the cost for intakes and disposal of concentrate, plus another \$10 billion for power supplies.

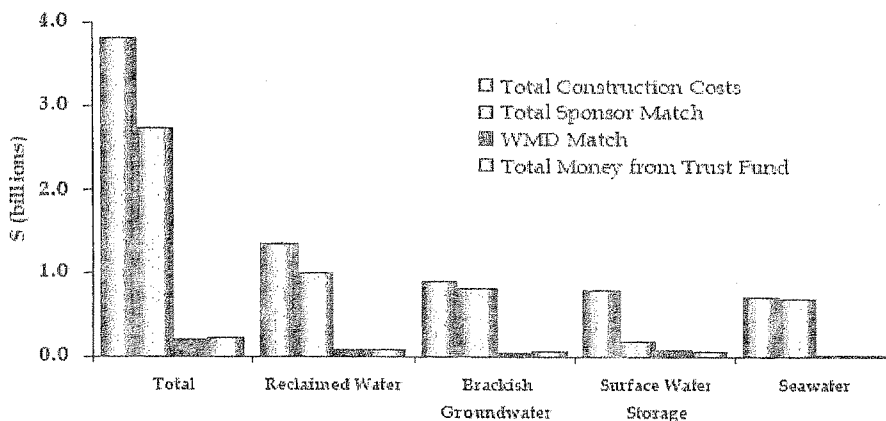
Figure 10. Quantity of Water Created by AWS Projects



Since program inception, a total of \$220 million has been appropriated for the development of alternative water supplies (\$100 million in 2005; \$60 million in 2006; \$52 million in 2007; and \$8 million in 2008). While this amount of money is not insignificant, it compares to an estimated \$3.8 billion as the amount of money needed to develop the alternative water supply projects identified during that period. Florida law states that funding for this development of alternative water supplies is to be a shared responsibility of water suppliers and users. In fact, in the first three years, the Water Protection and Sustainability Program, including the match provided by the water management districts, will provide about \$422.6 million, representing about 11 percent of the total construction costs. The water suppliers have committed to providing about \$2.7 billion toward construction of these projects, which represents about 72 percent of the total. Although larger, multi-year projects may receive additional state and district funds in future years, much of the remaining cost is expected to be borne by end-users.

In addition to total costs, Figure 11 shows the cost breakdown for the four types of projects with the highest construction costs. The estimated costs for reclaimed water projects are \$1.3 billion and account for approximately 35 percent of the construction costs for all the alternative water supply projects. There is only one seawater desalination project proposed for funding assistance (by SJRWMD), yet the cost of that project is expected to be \$717 million and accounts for approximately 19 percent of the construction costs for all the alternative water supply projects.

Figure 11. Statewide Costs of Alternative Water Supply Projects



As emphasized by the Legislature, due to the high costs of developing alternative water supplies, there is increasing need for local governments and others to work together on a regional basis to address this common problem.¹⁰ While there are currently a limited number of regional water supply authorities in the state, there will need to be many more regional water supply authorities or other similar regional entities to ensure the future construction of the alternative water supply projects necessary to meet the state's future water supply needs.

Beyond these basic project categories, there are also other potential "sources" of water, such as:

- Transferable Development Rights – Take, for example, Owens Valley in California, which has two counties — Inyo and Mono County. Los Angeles has most of the water rights from Inyo and Mono counties through the Owens River Project, but didn't get all the rights. There was one little community consisting of six farms in a little place called Benton, California, which is in Mono County. These farms were growing tomatoes to sell to the towns in Owens Valley: Mammoth and Bishop and Old Pine. The city of Los Angeles, during a drought period, approached the tomato farmers in Benton, all six of them, and proposed the following deal: We will buy 75 percent of your water, we will pay to plant orchards to replace the tomatoes, because the water use for orchards is much less than the water use for tomatoes, so your capital expense going into the orchard business will be totally paid for by the city of Los Angeles. From the 75 percent of water that we buy, we will give 25 percent of it to Mono County, to accommodate the growth in the city in Mammoth Lakes which is the largest ski resort in the United States. In addition, we will give 25 percent to Inyo County for the small towns along there for some of the farms, so we'll pay all of this money for the water shipped to Los Angeles. The farmers are better off, the people who live in Mono and Inyo Counties are better off and the people who live in Los Angeles are better off.
- Expanded Storage Capacity -- It is clear that that the development of significant quantities of new storage capacity is critical to maximizing use of alternative water supplies and to provide reliable water supplies under the dynamic cycles of drought and flood that characterize Florida's climate. Fortunately, there are multiple options, two of which (aquifer storage and recovery well systems and surface reservoirs) have already been implemented in Florida.
 - ASR is a system of wells that first injects water into a formation of the aquifer for storage, and then recovers this stored water later for use. ASR can be thought of as an underground storage system. ASR is typically more cost-effective compared to conventional reservoir storage. However, ASR is only feasible under certain aquifer conditions, based on aquifer parameters and groundwater quality.

¹⁰ Florida law strongly encourages cooperation in the development of water supplies and the provision of alternative water supply development. In fact, it states three times:

- Cooperative efforts between municipalities, counties, special districts, water management districts, and the Department of Environmental Protection are mandatory in order to meet the water needs of rapidly urbanizing areas in a manner that will supply adequate and dependable supplies of water where needed without resulting in adverse effects upon the areas from which such water is withdrawn. Such efforts should use all practical means of obtaining water, including, but not limited to, withdrawals of surface water and groundwater, reuse, and desalinization, and will necessitate not only cooperation but also well-coordinated activities. Municipalities, counties, and special districts are encouraged to create regional water supply authorities as authorized in s. 373.1962 or multijurisdictional water supply entities.
- Cooperation between counties, municipalities, regional water supply authorities, multijurisdictional water supply entities, special districts, and publicly owned and privately owned water utilities in the development of countywide and multi-countywide alternative water supply projects will allow for necessary economies of scale and efficiencies to be achieved in order to accelerate the development of new, dependable, and sustainable alternative water supplies.
- It is in the public interest that county, municipal, industrial, agricultural, and other public and private water users, the Department of Environmental Protection, and the water management districts cooperate and work together in the development of alternative water supplies to avoid the adverse effects of competition for limited supplies of water. Public monies or services provided to private entities for alternative water supply development may constitute public purposes that also are in the public interest.

- Conventional wisdom has been that surface water reservoirs are not feasible in Florida due to flat topography, high evapotranspiration rates, and high land costs. While direct impoundment of streams and rivers is not generally feasible, offline reservoirs with pumped storage has in fact been demonstrated to be feasible. The best example is the C. W. Bill Young reservoir, constructed by Tampa Bay Water. The C.W. Bill Young Regional Reservoir is an off-stream storage reservoir, which has a storage capacity of 15.5 billion gallons. The reservoir has been operational since June 2005 (although poor engineering will leave it inoperative for the next two years) and, when working, is used to maintain production at Tampa Bay Waters Regional Surface Water Treatment Plant at about 60 mgd even in dry periods. This provides approximately 30 percent of the region's current public water supply needs.
- Though now downsized, the proposed \$1.75 billion purchase of U.S. Sugar Corp. lands south of Lake Okeechobee might eventually provide storage for 325 billion gallons of water. The South Florida Water Management District, which negotiated the deal, could build reservoirs and marsh systems on the land.

Water Allocation and Transfer

There will be a state-wide water allocation mechanism based on economics. The reason is that there is no way to avoid it.

Dr. Roger Noll, Doyle Centennial Professor in Public Policy, Stanford University, 2005

Within an increasing number of regions in the state, the existing or future water demands can not be met by the existing water supplies as traditionally developed to serve historical demands. To meet future demands some water providers are looking to water resources outside their respective regions. In some regions the water supply may indeed be limited and resources from outside the region may be a consideration; however, in other regions part of the problem may be an inefficient geographic distribution and allocation of the water supplies in the area that could be resolved through voluntary redistribution/transfer of water supplies within the area. While such "transfers" are allowed by state law after the need for the transfer is proven, the political and social backlash caused by even the mention of a possible transfer has rendered the process nearly unworkable. However, if the state is to meet future water demands an environmentally sound, economically equitable and regionally collaborative transfer process is needed. To be successful, that process must address both the needs of the water user and those of the area of potential withdrawal to be successful.

Today, with the increasing demands of public supply in combination with the existing significant demands of agriculture and industry, the limits of traditional water resources have been reached in some areas. Despite this situation, Florida may not have a water supply problem but a water storage, distribution and cost of water production problem.

When the existing developed resource becomes scarce, competition for the resource among users increases, often resulting in legal and political confrontations. The list of regional "water wars" in the Tampa Bay area, in the Osceola/Brevard area, and most recently in central Florida is indicative of public supply users looking outside of their areas to other areas in which the local residents believe they are solely entitled to the local water resource and are concerned about potential resultant limitations on regional growth. These water wars have generally been costly in both economic and political capital. Interestingly, these conflicts are often resolved through some form of regulatory or politically brokered partnering involving transfers and allocations of the available water imposed at some level of acceptability by the parties. In many cases, Florida water law allows transfer and provides or outlines specific requirements to be considered for those transfers including the future needs of the source (donor) area and protection of the natural resources of the source however there is no specific statutory authority to reallocate water which could be transferred from one permit holder to another. In practice the existing

statutory provisions have not prevented conflicts when transfers are proposed. A refined approach would avoid the unnecessary conflict and subsequent waste of resources and time by providing incentives and a regulatory structure that facilitates mutually beneficial inter and intra regional cooperation; such cooperation could involve assessing and developing water resources on a regional basis.

For a transfer process to be acceptable it must function in concert with the existing minimum flows and levels program and satisfy the statutory three part test; reasonable beneficial use, be in the public interest, and protect existing legal users. However, there are two regulatory areas which require consideration for modification to assist in developing a successful transfer program. They are the establishment of an accepted and consistent common methodology for establishing water demands and consistent water use permitting criteria for transfers between WMDs.

The following scenarios are illustrative of the options/alternatives for water resource transfers either directly or through credits and/or some type of resource trading:

- Regional Utility Grid - Two or more utilities within a local region could, through interlocal agreement, establish multiple interconnections to create a regionally interconnected water distribution system. The system would have the capability to move or transfer water from one area of a region to another area of a region to match localized supply and demand requirements within the region, subject to meeting the environmental constraints of the water resource(s). Through a regional utility grid, water resources could move routinely back and forth across WMD boundaries and county jurisdictional boundaries to manage supply and demand regionally. Establishment of a Regional Utility Grid in some areas could provide a means to effectively manage multiple water resources including wellfields, surface water supplies, reclaimed water supplies, and other supplemental water supplies across a region to optimize performance and respond to variations in demand and climate patterns. In fact, Central Florida utility managers have begun circulating long-term proposals to lay hundreds of miles of interconnected pipelines that could cross nine counties to satisfy growing demand for drinkable water.¹¹
- Resource Trading - This option encompasses several possible scenarios that could be classified or labeled as source trading, regional wellfield management, permit transfers, and inter-regional transfers. For each of these scenarios there are some common characteristics: each involves agreement or partnership between two or more utilities or partners and within the agreement or partnership one or more partner receives some form of compensation, trade or share of cost savings in exchange for the other partner receiving some portion or form of a water resource.
 - Source Trading - Two or more utilities could be utilizing a common water supply source such as groundwater that is limited in some manner requiring the utilities to seek and develop an alternative water supply (AWS). Under this scenario the AWS would be located geographically in proximity to one utility but more distant from the other utility. Instead of the utilities developing and managing the AWS through some partnership, a more efficient alternative solution could involve the utility in proximity developing and using the AWS and subsequently reducing their use of the limited groundwater water supply thus allowing the other utility to increase their use of the groundwater supply source. By agreement between the participants the utilities developing and using the AWS would be paid by the other utilities that continued and increased their use of the existing groundwater supply and thus not incur significant infrastructure costs associated with transmitting the water from the AWS. Source trading in this scenario could occur across WMD boundaries as well as across county boundaries.

¹¹ About 3 million people now live in that area, which reaches from St. Johns and Putnam counties to Central Florida suburbs west of Orlando. That count is expected to top 5 million by 2030, a rough timeframe some supporters have set for having a large network in place. Scientists at the St. Johns River Water Management District have tentatively projected that water demand by then could exceed groundwater supplies in nearly every part of Northeast Florida and eastern Central Florida. The pipelines, perhaps close to 500 miles of them, would be designed to move water from any end of the system to another, tapping river and ocean sources that haven't been developed yet. The plan shows the St. Johns and Ocklawaha rivers as water sources, as are desalination plants in Flagler and Volusia counties. The network would also reach Lake, Marion, Orange, Seminole, and Sumter counties.

Source trading could have a number of variations using the same basic elements. Two or more utilities could engage in trading a variety of different quality water resources to meet a variety of demands or needs at different times. For example different demands such as potable, landscape irrigation, and environmental mitigation, industrial process and agricultural could be met, with the exception of potable demand, in some cases by a variety of water sources and quality. Additionally, these demands/needs could vary in time, duration, and location across or between the utilities engaged in this source trading scenario. A regional utility grid for each of the water demands would be incorporated with source trading in this scenario for it to function. What has been described is an extremely dynamic and flexible source trading cooperative on a local regional level. For source trading to evolve to this level of sophistication, the appropriate legal and regulatory environment would have to be established to encourage and permit water suppliers to engage in the exploration, evaluation, and subsequent negotiation of developing source trading alternatives.

- Regional Wellfield Management - Two or more utilities within a region utilizing groundwater as their source of water supply could have the alternative of being able to potentially increase their total overall groundwater production without harm to the environment by shifting or re-distributing their wells. Groundwater supplies have been historically developed in proximity to the development and customers. Some urbanized regions may have significant areas of rural undeveloped land surrounding or outside the urban developing core. Moving wells from areas of concentration and/or areas of environmental impact could provide the potential to increase or continue pumping without harm or by mitigating some existing harm. To implement or consider this as a water supply management alternative would require the agreement of two or more water supply entities including agreement relative to the costs of re-distributing groundwater withdrawals and the distribution of the resulting benefits. This scenario could involve the same considerations as outlined in Source Trading above involving multiple WMDs and counties with the same statutory and regulatory issues and potential solutions.
- Permit Transfers - This form of resource trading essentially involves one entity with a water use permit/allocation transferring all or a portion of that permitted allocation to another entity. From a water supply perspective the entity transferring the water use permit or allocation is not necessarily another utility though it may be. Some typical examples of permit transfers include the transfer of the water use permit or allocation associated with an agricultural property to a utility when the property is transitioned to residential or commercial use. Another example could involve the acquisition of all or a portion of a water use permit allocation by a water supplier from another permit holder typically an agricultural, commercial, or industrial user. These transfers could occur as a result of a change in use or from improvements in water use efficiency that sometimes could be financed by the acquiring water supplier.
- Inter-Regional Transfer - Within local geographic regions most potential water resource transfers can occur within the framework of the transfer scenarios outlined previously. However, once the concept of transfer moves from within a local region to between different local regions, resource trading becomes more complicated because of the controversial and often contentious local sentiments. Despite the fact that the natural water resources are a state resource managed by the state for the benefit of the public, most local regions ignore that fact and react with an ownership attitude towards their local water resources. For that reason any mention or proposal for considering an Inter-Regional Transfer will elicit emotional debate.

Inter-Regional Transfer involves the transfer of water resources from an area where water resources can be developed cost effectively and are substantially in excess of existing and projected future demands (including ecological and environmental needs), to an area that is deficient in water resources to meet its future demands that can be obtained affordably. The key element required for this type of water resource transfer to be workable and acceptable is that the donor area (water rich area) and the receiving

area (water deficient area) have achieved an agreement between themselves and the corresponding WMD(s) in a co-operative manner. Obviously, without the basis of agreement between the two regions to permit the transfer, there will be conflict and the expenditure of valuable resources in an unproductive litigation and other conflict. These types of disputes divert attention from developing cooperative solutions and leave scars within communities, inhibiting future regional cooperation in this and other areas.

To avoid conflict and facilitate consideration of "Inter-Regional Transfers", a framework for collaboration should be developed to guide the discussions/negotiations between communities in this area and provide criteria for an acceptable transfer agreement to guide the evaluation of the feasibility of a proposed resource transfer. A statewide water resources management coordinating entity might play a role both in the development of the framework and the discussions/negotiations. One element of an agreement between two communities or regions that would be critical to agreement would be the compensation based on savings to the receiving community to be received by the donor community or region. The savings achieved by the receiving area (relative to an extremely high cost water resource alternative) would be shared with the donor area – promoting win-win outcomes, since those savings could be devoted to variety of community enhancements including acquiring sensitive lands or protecting aquifer recharge areas. Payment, in whatever form, would be market driven, but with appropriate governmental oversight because water resources are a critical component to the health of both communities. Having a system/mechanism for Inter-Regional Transfers could provide an environment that would provide an incentive to communities and regulatory authorities to explore regional intra-state alternative solutions to water supply issues in a rational and logical method that could mitigate local community concerns.

Ultimately though, as Dr. Lance deHaven-Smith contends, Florida's water issues are not difficult from a technical perspective; we have large quantities of water although we may need to share it. The reason water supply problems cannot be resolved is mostly due to a lack of trust. People feel that those in power have a hidden agenda and therefore are less willing to come to the table. What Floridians need is leadership that will encourage public buy-in and support.

Other Water Issues

Governance

There is a growing consensus among those in Florida who are knowledgeable about issues relating to water supply that while the existing statutory governance structures have served the state well to date, they may not be adequate to fully implement the current state water policy of promoting the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems. The significant limitations on groundwater withdrawals in central, southeast, southwest, and parts of northeast Florida have served to highlight potential shortcomings of the existing governance structures.

The current governance structure has also resulted in local and regional parochialism as some areas of the State try to "protect their water resources" from other areas of the state. This parochialism arises out of a fear that one area will lose its water resources to another area. This type of fear led to the enactment of the so-called "Local Sources First" provision of law in 1998. This provision of law requires that, before a local government can go outside its county boundaries to secure a water supply, it must first exhaust all alternative water supplies within its own county. The fears result from the uncertainty that the citizens of an area may have as to the availability of adequate water supplies to meet their own needs. While the

stated water policy - "to promote the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems" - should allay these fears by providing certainty as to the availability of adequate water supplies, the absence of a state-level water supply entity to ensure adequate water supplies for all has allowed these fears to continue.

The recent developments with regard to limitations on future groundwater withdrawals, especially in the Central Florida Coordinating Area (CFCA), have served to raise the issue as to whether the current governance structure will be adequate to address Florida's future water supply needs. The CFCA involves the overlapping jurisdictions of three WMDs to address the potable water needs of all or portions of six counties, numerous municipalities and over 80 water utilities. Proposed solutions to prevent the impending water supply shortage include surface water withdrawals from the St. Johns, Ocklawaha, and Kissimmee Rivers. Such surface water withdrawals have the potential to impact downstream counties and cities outside the CFCA. There is a question as to whether the WMDs working from their own district's plans and regional water supply plans will be able to ensure the identification and implementation of workable solutions to the CFCA dilemma.

While the current governance structures have served the state well to date, it is unclear that those same structures will be sufficient in the future to assure continuing implementation of the state water policy. As a result of the recent developments in central and southeast Florida, in many different forums people are asking whether it is time to consider the creation of a state-level water supply entity. Such an entity could have responsibilities to ensure water supply planning that would transcend water management district boundaries, and to ensure the construction and operation of the infrastructure needed for the storage and distribution of water over broad geographic areas so as to provide water to and between regional water supply entities.

It is worth noting that "A Model Water Code" (by Dean Frank Maloney and others at the University of Florida), which provided much of the basis for the Florida Water Resources Act of 1972, envisioned a "top-down" approach to water supply beginning with a "State Water Resources Board." Under the Code, a "State Water Resources Board" (to have been appointed by the Governor) was to have been given the responsibility for the development of the "State Water Use Plan" by proceeding "as rapidly as possible to study the existing water resources in the state; means and methods of conserving and augmenting such waters; existing and contemplated needs and uses of water for" a variety of uses including protection of wildlife, irrigation, mining, power, and domestic and municipal uses. The study was also to examine related issues including "drainage, reclamation, flood-plain or flood-hazard area zoning and selection of reservoir sites." Though the Water Resources Act incorporated much of the Model Water Code, the State Water Resources Board was one of the few features of the Model Water Code that the Legislature did not incorporate into the Act. Nevertheless, the responsibilities that were to have been given to the Board were divided between what is now the FDEP and the five WMDs.

An important part of any discussion with regard to governance structures is a clear understanding of the current statutory law with regard to water supply, especially as it relates to policy, planning, production and funding. While Chapter 373, F.S., contains those sections of statutory law that address these important issues, they have been added over many years and are scattered throughout the chapter. This disjointed presentation of these important sections of law has made it difficult for interested parties to fully understand the legislature's intent and purposes with regard to water supply policy, planning, production and funding. In light of the current circumstances, it may be an appropriate time to consider the consolidation of these sections of law into a separate and distinct "Part" in Chapter 373, F.S. Such a reorganization of the water supply components of Chapter 373, F.S. could be very useful in facilitating any discussion of governance structures, including a discussion of whether a state-level entity is even needed.

Before offering options as to the nature of any state-level entity, it is essential to identify the potential functions that such an entity might have. The following is an initial list of what some of those functions could be:¹²

- Be the entity ultimately responsible for implementing the state water policy to ensure the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems and avoid the adverse effects of competition for water supplies.
- Prepare a state water use plan.
- Ensure effective regional water supply planning.
- Ensure the implementation of regional water supply plans.
- Ensure intergovernmental cooperation through the use of inter-local agreements for the creation of the regional water supply entities that will be needed to construct and operate future water supply projects.
- Provide funding to local governments to assist with the creation of regional water supply entities.
- Provide funding to regional water supply entities to assist with the capital costs of the construction of alternative water supply projects.
- If necessary, construct and operate the necessary infrastructure to ensure adequate storage and distribution of water to and between regional water supply entities.
- Set state-wide standards for water conservation and reuse.
- Plan for potential impacts of climate change on water supply.
- Represent the State in inter-state water disputes.¹³

Nevertheless, if there is a clearly established need to create a state-level water supply entity to carry-out any of the listed functions, the following is a list of possible options as to the nature of that entity:¹⁴

- Utilize an existing state agency to carry out the functions. These options include:
 - Expanding the current functions at the DEP Office of Water Policy to include these functions. If the functions include responsibilities for the construction and operation of

¹² In its 2003 report, the Council also provided such an analysis. (See Appendix A.)

¹³ For example, there has been a 20-year feud over water supply that has pitted Florida and Alabama against Florida's neighbor to the north -- Georgia -- over how much water it sends downstream to supply power plants, farms and commercial fisheries. In dispute is Georgia's right to increase its share of the federal reservoir -- Lake Lanier -- to supply water to the greater Atlanta metropolitan area. Heavier withdrawals mean less supply to the detriment for power generation, industry, recreation and commercial fishing in Florida and Alabama. Florida has sided with Alabama in arguing that Georgia has done poor water planning over the decades and has not tied growth development to water resources. Florida and Alabama appeared to have won a battle when, in July 2009, a federal judge ruled that Atlanta and its 4 million residents have almost no rights to Lake Lanier and must stop taking water from it within three years unless Congress authorizes continued withdrawals. But the states have yet to resolve the heart of the dispute, which over the last 19 years has been dubbed the "tri-state water wars." It began in 1990 when the city of Atlanta, after assessing its projected population growth and future water needs, sought a permit from the Army Corps of Engineers to create new reservoirs on the Chattahoochee River, the Flint River, and the Coosa River. The reservoirs would hold back an additional 529 million gallons of drinking water a day to be stored in Lake Lanier, and the city's long-term plan included an increase in withdrawals of 50 percent from the Chattahoochee and the Flint by the year 2010. But downstream, the Apalachicola Bay fishing industry is responsible for \$134 million in direct economic output and an additional \$71 million in indirect value-added impacts. While the tri-state water dispute does not currently threaten drinking water supply in Florida, it is indicative of the increased pressure for states to engage in regional water supply agreements and fast population growth -- particularly in the Southeast -- droughts and concerns over the future impacts of climate change are likely to exacerbate such disputes.

¹⁴ In its 2003 report, the Council also provided such an analysis. (See Appendix A.)

water production infrastructure, then the Florida Turnpike Enterprise could serve as a model.

- Creating a new office within the Governor's office.
- Create a new state-level entity to carry out the functions. These options include:
 - An appointed board/commission - Such an entity could be an appointed board/commission. The appointments could be made jointly by the Governor and Cabinet. The appointees should have broad geographic representation (to ensure that all areas of the state are represented) and should have diverse but appropriate backgrounds and areas of expertise (e.g. local government utilities, environmental community, agricultural community, engineering, regional water supply authority, etc.)
 - An elected board/commission - Such an entity could be the Governor and Cabinet sitting as the state water board. Models for this exist in the form of the Trustees of the Internal Improvement Trust Fund, the Administration Commission, and the former Cross Florida Barge Canal Authority
 - Appointment of a state water "czar" with the responsibility to carry out the functions listed above concentrated in a single individual.

Regardless of the exact nature of the state-level entity, it would need to be staffed by competent professionals knowledgeable in water supply policy, planning, funding, and production. Out-sourcing of many of these responsibilities to qualified private contractors is also a possibility.

Data

The critical challenges Florida must make in order to manage the water supply structure should be addressed through creative solutions that support an environment and an economy that sustain a high quality of life standard for generations to come. And regardless of the challenges presented, from preserving the environment to developing alternative energy sources and water supply options, there is a commonality to developing the solutions: Data.

Florida has over 52,000 miles of rivers and streams, nearly 800 lakes, 4,500 square miles of estuaries, and more than 700 springs. Utilities, Cities, Counties, WMDs, DEP, Florida Department of Health, U.S. Environmental Protection Agency (EPA) and many others collect and analyze information on water quality and quantity from these resources for the specific needs of each entity. Since the needs of each entity differ, often the data collection and analytical efforts are not coordinated among those who could benefit from each other's efforts.

To address this, in 2003 the Council called for the establishment of a consolidated "Water Data Center" that could consolidate information from the U.S. Geological Survey and the Florida Geological Survey (based at the University of Florida) and data to be provided by the DEP, the five state's water management districts and other data collection entities. The proposal of such a center, we contended at the time, would create a standardized methodology for reporting and collecting water data and for planning and forecasting needs and would make that critical information available to better inform government and the public as they make decisions about water use.

Since then two main water-related data clearinghouses have formed.

- In 2006, a collaboration including DEP, the five WMDs, the Florida Public Service Commission, the Utility Council of the American Water Works Association, and the Rural Florida Water Association formed Conserve Florida and selected the University of Florida to house, manage and expand the operation of the Conserve Florida Water Clearinghouse, a centralized information repository that is today equipped with tools to facilitate stakeholders' efforts to achieve water

conservation goals. While the initiative is focused primarily on water conservation information and for benchmarking conservation and the public use efficiency of water, it is a major initiative toward building a center of credible water-related data that could be shared by everyone.

- DEP has also taken a step in the direction of delivering better data for decision making by establishing "Water Data Central," to serve as a public-access repository of environmental programs and other information and reports about water issued by DEP or its partner environmental and health agencies. Accessed through the DEP website, the data can be mapped and used to create special-purpose, custom maps, and the maps can be analyzed to identify particular environmental or other concerns.

Existing programs, however, still don't fulfill the Council's 2003 vision of an integrated data center. Coordination in data collection and analysis for similar purposes would allow for maximum leverage of limited funds. Such coordination would allow the information collected and analyzed to be readily accessible, retrievable, and useable (reliable and valid) by all.

Such an integrated center must also be able to perform scenario planning. Scenario planning provides a method of evaluating the ability of alternatives to perform across a range of possible futures (e.g., robustness) and provides a defensible, transparent method of mediation and decision making. Scenario planning & optimization refers to a method of evaluating change in a complex system through a series of "what-if" analyses that includes the following characteristics:

- Facilitation of whole system analysis, including hydrologic, ecologic, financial, and socio-economic variables.
- Scalable analysis in terms of geographic area (utility service area, watershed, water supply planning region) and time horizons.
- Methods of evaluating impacts of risk from uncertainty, by evaluating sensitivity of outcomes to the range of uncertainty.
- Trade-off analysis over time. The marginal benefits of trade-offs may change depending on the time horizon under consideration and the degree of uncertainty associated with defining conditions.
- Identification of key drivers and variables of high impact, with methods of looking at outcomes under ranges of future changes in those variables.
- Support in designing infrastructure that is both adaptable to uncertainties and resilient to change.
- Help in avoiding lock-in or lock-out of options, such as near-term commitment of resources in a non-flexible project that may limit options in the future if conditions change.
- Support in staging and optimizing the timing and magnitude of investments over time to meet needs and maximize flexibility for adaptive management.

To facilitate comprehensive and meaningful analysis, statewide standardization of data and standards is critical. For example --

Given the enormity of the water resources and the numerous entities involved such coordination should occur on the watershed basis. A comprehensive watershed management strategy would view the state based on its natural boundaries, like river and estuary basins, rather than political boundaries. These naturally bounded areas (29 basins or watersheds) have been organized by DEP into five basin "groups" (see Figure 3 below).

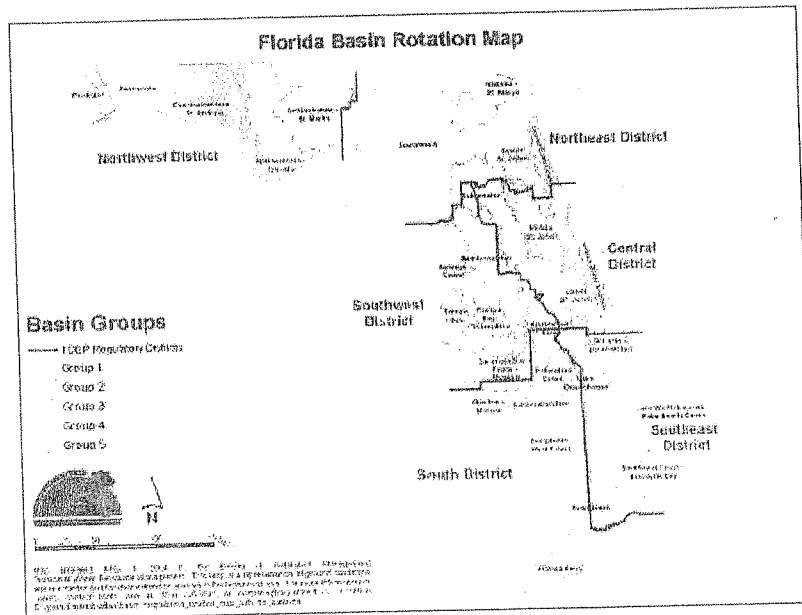


Figure 3 – Florida Basin Rotation Map

Although all entities are encouraged to coordinate their data collection efforts with DEP's Integrated Water Resource Monitoring Network to provide statewide data and information on the important chemical, physical, and pertinent biological characteristics of water for the major surface water bodies, the major aquifer systems, and the coastal waters of the state, it's not mandated. The information generated by the integrated network could be used for reporting and advising relevant entities on the status and trends of Florida's water quality and available quantities.

Furthermore, state law requires the establishment of Minimum Flows and Levels (MFL) to prevent significant harm to water bodies that may be affected by water withdrawals. However, each WMD may use differing (but approved) data, methodologies, models, and assumptions in determining the MFLs for the water bodies in its jurisdiction. Establishment of accepted and consistent common methodologies would be helpful in this arena as in the establishment of water demands and water use permitting criteria for transfers.

Water Quality

Source water is untreated water present in Florida streams, rivers, lakes, bays, and aquifers currently or potentially used as public water supply. Source water protection is any activity that develops or implements measures to protect source water against point and non-point sources of pollution. Current measures employed to provide source water protection for groundwater, include wellhead protection ordinances enacted by local governments in vulnerable areas and DEP's Class I designation for water bodies provide protection for potable surface water supplies. Point source pollution includes discharges from industrial facilities, domestic wastewater plants, septic systems, landfills, or underground storage tanks. Non-point source pollution includes storm water runoff and atmospheric deposition. Water quality may be affected by improper use of fertilizers and pesticides (agricultural and/or residential), contaminants from industrial sites, illegal dumpsites, improper land application of biosolids, or soil erosion from construction sites.

Source water protection benefits include protection of public health, protection of the environment, safeguarding the public investment, assuring clean and safe water sources for future generations, and economic development (e.g., tourism). To provide adequate and affordable drinking water, source water protection in general and protection of surface waters in particular, will become more important as the population of Florida continues to grow, increased dependence on surface water occurs, and as emerging-contaminant issues increase treatment challenges.

In addressing present and emerging water quality issues as they affect Florida's drinking water supplies, DEP and the Florida Department of Health are the primary state agencies involved in addressing regulatory/permitting issues affecting such. To enhance the present system that has been established between DOH and DEP to effectively implement federal and state laws and rules that affect utilities, communication/coordination with utilities could also be enhanced. DEP does involve stakeholders when it develops and adopts drinking water system rules and informally provides utilities with educational opportunities to assist them with compliance. The issuance of permits for specific projects often involves both state and local governments and their respective rules. This tends to complicate the goal of achieving compliance with those rules and receiving approval of given water resource projects. Additionally, many local governments require additional reviews and required permit fees for these projects.

Another innovation is water quality trading. Just as "wetland mitigation" is a euphemism for wetland destruction in one area in trade for wetland preservation in a different place, water quality trading is another name for allowing continuing or increasing pollution in one area while decreasing it somewhere else in the water body. The Legislature believes that this type of pollution trading will improve overall water quality in Florida. In 2008, House Bill 547 made changes to the Florida Watershed Restoration Act that primarily addressed water quality trading. The amendment authorizes permitted polluters to trade credits when a reduction in their permitted loads is achieved. Today, this program is limited to a pilot project in the Lower St. Johns River Basin (though it appears that trading won't begin until 2011). According to DEP, there is interest in pollutant trading credits because they will allow market forces to find the most cost-efficient solutions to water quality problems due to differing abatement costs between sources. DEP also believes it will be generally cheaper, which means that there will be greater and faster reductions in loading for the same fixed costs.

Options and Recommendations

Although water resources management has been a popular topic since the publishing of the Council's 2003 report, there has been little movement on the recommendations. Since then, various organizations have discussed the topic ad nauseam and issued numerous sets of recommendations.

For purposes of this preliminary draft, three of those key reports are provided as appendices to this report.

- Appendix A – Improving Florida's Water Supply Management Structure, Florida Council of 100, September 2003
- Appendix B – Florida 2030: A Vision for Sustainable Water Infrastructure, American Water Works Association, March 2009 (Related draft issue papers can also be found at <http://fsawwa.org/displaycommon.cfm?an=1&subarticlenbr=39>.)
- Appendix C – 2008 Water Congress, Consensus Recommendations, Century Commission for a Sustainable Florida, September 2008

For now, these ideas, options, and recommendations (some concurring, some conflicting) lay a good foundation for issue discussion and subsequent report drafts.

