Water Resources Management

Issue Definition

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 stormwater 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.

Environmental protection is foundational to water resources management in Florida. The water management districts have established environmental protection criteria within the consumptive use permitting program, including minimum flows and levels to protect lakes, wetlands, springs, and rivers from harm due to water withdrawals.

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, stormwater 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.

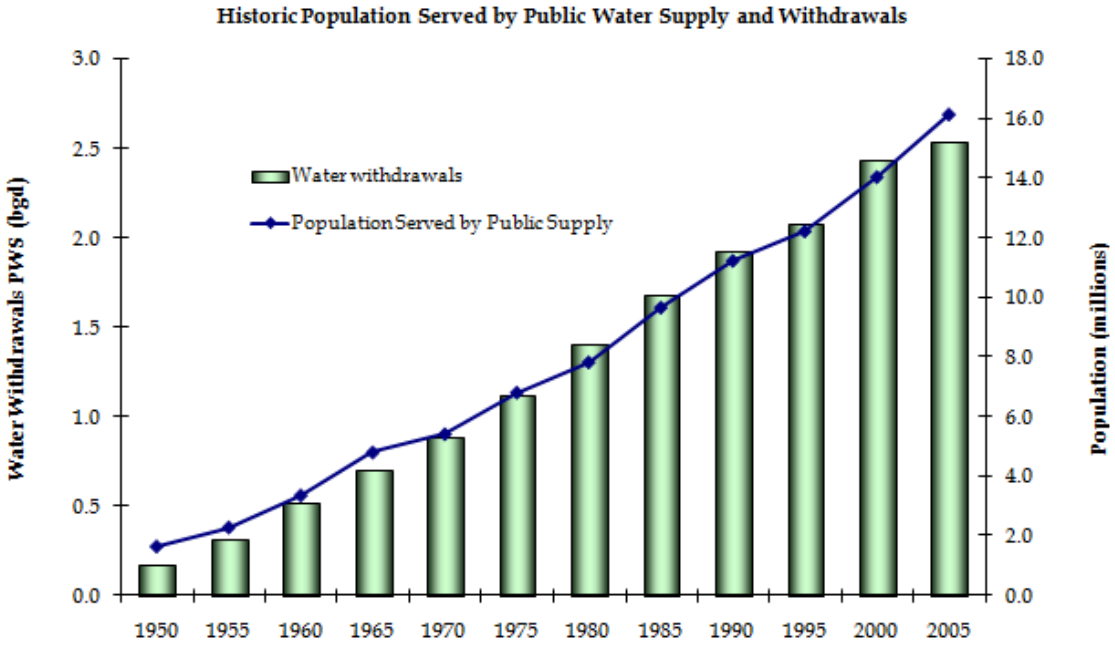
With many objectives, come many stakeholders. Within the public water supply community, stakeholders include elected officials, water utilities, regulators, planners, etc. In a broader sense, stakeholders include business and industry, environmental advocacy groups, agriculture, local governments, landowners,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

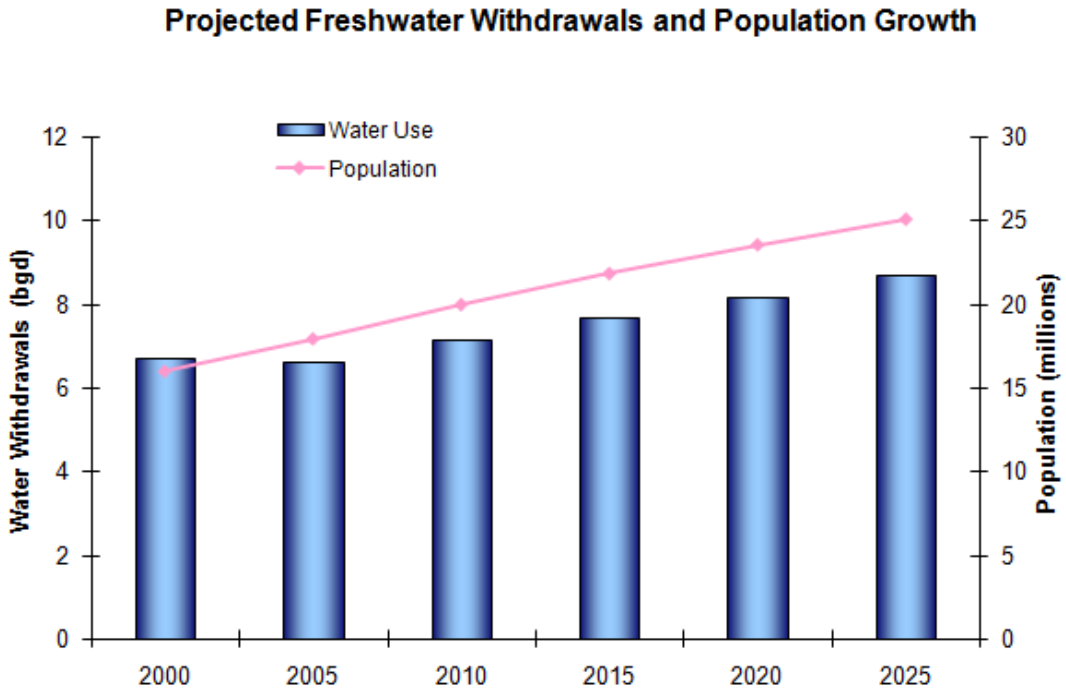
Background

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 for at least the last five decades, with a continued level of growth projected to occur for the near future. Public supply water system demand is projected to increase by two billion gallons per day between 2005 and 2025. Growing demands for water supplies intensify the need

for water conservation, reuse of reclaimed water, and new sources.





Source: DEP, 2008

- 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 of more expensive than in the past, has led to challenges by vocal consumers.

- Climate Variability - Media attention on climate change, sea level rise, increases in hurricane frequency and intensity, and drought in the southeast U.S. and portions of Florida have heightened public awareness of this climate variability and change.

- 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.

Issue Criticality for Water Supply

As we seek answers to the water supply issues in Florida, water resources management is import because it addresses all of the committee 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.

Florida 2030 Vision

Creating a sustainable water supply to ensure that all water needs are satisfied within the 2030 planning horizon, while protecting natural systems and sustaining water resources for future generations, is a central theme for the Florida 2030 Vision.

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 these alternative water supply (AWS) sources where needed:

- Expanded use of reclaimed water

- Storm water

- Fresh surface water from lakes and rivers
- Brackish groundwater
- Brackish surface water from rivers
- Seawater

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 20 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, stormwater 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 (FDEP) 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.

In achieving the Florida 2030 Vision for water resources management, each of the following strategies must be implemented:

- Water conservation and reuse of reclaimed water (discussed in Water Conservation Committee Report).
- Integrated water resource planning based on scenario planning & optimization.
- Regional infrastructure for regional solutions.
- Creation of significant new water storage capacity.
- Source water protection.
- Drought management and adaptive management.

Options and Path Forward to Achieve FL 2030 Vision

Integrated water resource planning, based on scenario planning & optimization

Integrating multiple raw water sources with multiple competing objectives, in the context of developing sustainable water supply infrastructure, is a considerable challenge. A sustainable balance of allocations between human and natural systems is difficult even if historic patterns are expected to repeat into the future. Adding uncertainty to the patterns of future trends for water demand, precipitation, temperature, or sea level adds a new set of challenges and calls for new methods of projection.

Integrated water resource planning (also know as "total water management") is foundational to achieving the vision for sustainable water infrastructure in 2030. Effective planning will bring together all of the technical areas and important governance and financing issues addressed by the other Florida 2030 committees.

In addition to integrating water supply planning considerations of demand management and multiple source options, this planning will also often need to address multiple objectives of water supply, flood control, water quality protection/restoration, and habitat protection/restoration. The need for this multi-objective aspect of planning is becoming more common as water supplies are diversified to include reclaimed water, surface water, and seawater to meet not only public supply needs, but also other use sectors such as agriculture and industry. Current mechanisms are generally designed to support a single source of water (e.g., groundwater or surface water). Policy changes are needed to support complex evaluations of multiple new sources, the coordinated use of these multiple sources (conjunctive use), and reuse options. While water management districts (WMD) conduct regional water supply planning, there is no strong linkage to water restoration/protection programs on specific waterbodies that may be potential water supply sources. Fortunately, new methods in integrated water resources planning have emerged as a way to prioritize water supply alternatives across a range of future scenarios. Scenario planning is a planning process that effectively engages stakeholders in defining priorities and evaluating trade-offs over time. It helps to optimize the selection and timing of investments in water supply across a range of performance criteria to find the sets of alternatives that are most resilient in the face of uncertain future conditions. When the human and natural capital costs, risks, and importance of these decisions are considered, scenario planning emerges as a critical step that recoups the initial investment many times over.

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.

Water supply planning in the context of sustainable alternatives requires a long-term planning horizon to adequately capture the possible ramifications and benefits. The current 20-year planning horizon in regional water supply planning is inadequate to consider how water supply options may be structured to best work in conjunction for future projects beyond the 20-year horizon. As a result, it would be beneficial to consider longer planning horizons. Because uncertainty increases as we project into the future and it is difficult to evaluate alternatives over 20, 50, or more years with traditional planning methods. Scenario planning allows examination of a wide range of options from existing infrastructure to various projections of full build-out of an area. With the proper simulation tools, staged scenarios of full re-use, deep conservation, regional reservoirs, and/or localized supply can be evaluated at different time horizons, under different sets of assumptions. Timing and allocation of different conjunctive use and storage options can be assessed. These allocations can be tested under a range of future climates and build-out scenarios. This gives insight into the long-term implications of decisions made today. This type of rigorous planning has been implemented on a limited scale both in Florida and in other parts of the country.

The Florida 2030 vision calls for the routine use of integrated water resource planning in the planning and building sustainable water supply infrastructure. Options are proposed below:

- Extend the current 20-year planning horizon in regional water supply planning, to include a longer horizon (at least 30 years, maybe up to 50 years). A longer planning horizon will help to decrease risk for utilities and public offices that are making investments in future infrastructure.

- Elected officials, utility directors, planners, and other decision-makers are educated on the benefits integrated water resource planning, based on well-documented case studies.

- Minimum training standards for scenario planning & optimization are adopted by the water utility industry in Florida through the Florida Section American Water Works (FSAWWA) and the Florida Water Environment Association (FWEA).

- WMDs develop and implement scenario planning and optimization methods in the regional water supply planning process.

- Financial incentives provided by the State, WMDs, and others to conduct this type of planning, through cost-sharing on planning and/or a requirement that cost sharing from WMD and state sources for project construction be contingent on integrated water sources planning based on scenario planning and optimization.

- WMDs undertake multi-objective planning efforts with all affected stakeholders, to address specific river systems that have or are proposed to have water supply withdrawals, that include other related objectives concerning surface water restoration and protection (example could include St. Johns River, Hillsborough River, Alafia River, etc.).

- Existing WMD consumptive use permitting programs are reviewed and revised as needed to facilitate integrated permitting of multiple sources, with coordinated use (conjunctive use) of groundwater, surface water, and reclaimed water. One goal of this effort would be to facilitate permits with the longest duration possible.

Regional infrastructure for regional solutions

In 1997, the legislature recognized the important of regional planning and regional solutions for water supply and required water management districts to conduct regional water supply planning. There are significant benefits of regional water supply planning, including:

- 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, stormwater management, flood control, and water quality, and environmental restoration.

- Economies of scale in developing water supply projects of a larger scale that serves multiple water utilities.

- Provides economically feasible option 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.

There will continue to be opportunities for such multi-jurisdictional projects that address water supply and related issues with particular regions. WMD regional water supply plans currently provide a starting point for regional water supply project options.

Barriers to moving regional projects forward include:

- Establishing and maintaining rapport and trust between communities that may not have a history of working together on regional solutions.

- Developing the goals, objectives and strategies to resolve the problems(s).

- Allocating costs and attributing benefits equitably among communities.

- Governance of multi-jurisdictional projects, including determining the lead governmental entity.

- Public opposition because of misunderstanding of the project scope and benefits (for instance, confusing a regional project, with an “inter-regional” project and the perception that some will win and some will lose out.

- Funding required to implement regional solutions as opposed to individual utility solutions.

- Cost of transmission of water longer distances and the complexity of creating a series of transmission pipelines within a region to facilitate regional project development.

- Public interest criteria in section 272.223 (3) Florida Statute (F.S.), commonly know as “local sources first” which may inadvertently discourage cooperation within a region.

- Lack of sufficient incentives to foster cooperative and collaborate solutions as opposed to individual utility solutions.

The Florida 2030 vision requires that sustainable infrastructure be planned and implemented in a way that addresses the collective needs of each region of the state. Often, this can best be done by working together on regional scale projects. Options are proposed, in no particular order:

- Water utilities participate in the WMD regional water supply planning process in order to collaboratively develop project options and to select projects for implementation.

- Major public education initiative, explaining the benefits of regional projects that serve the collective water needs within a region, and differentiating such projects with “inter-regional” project proposals.

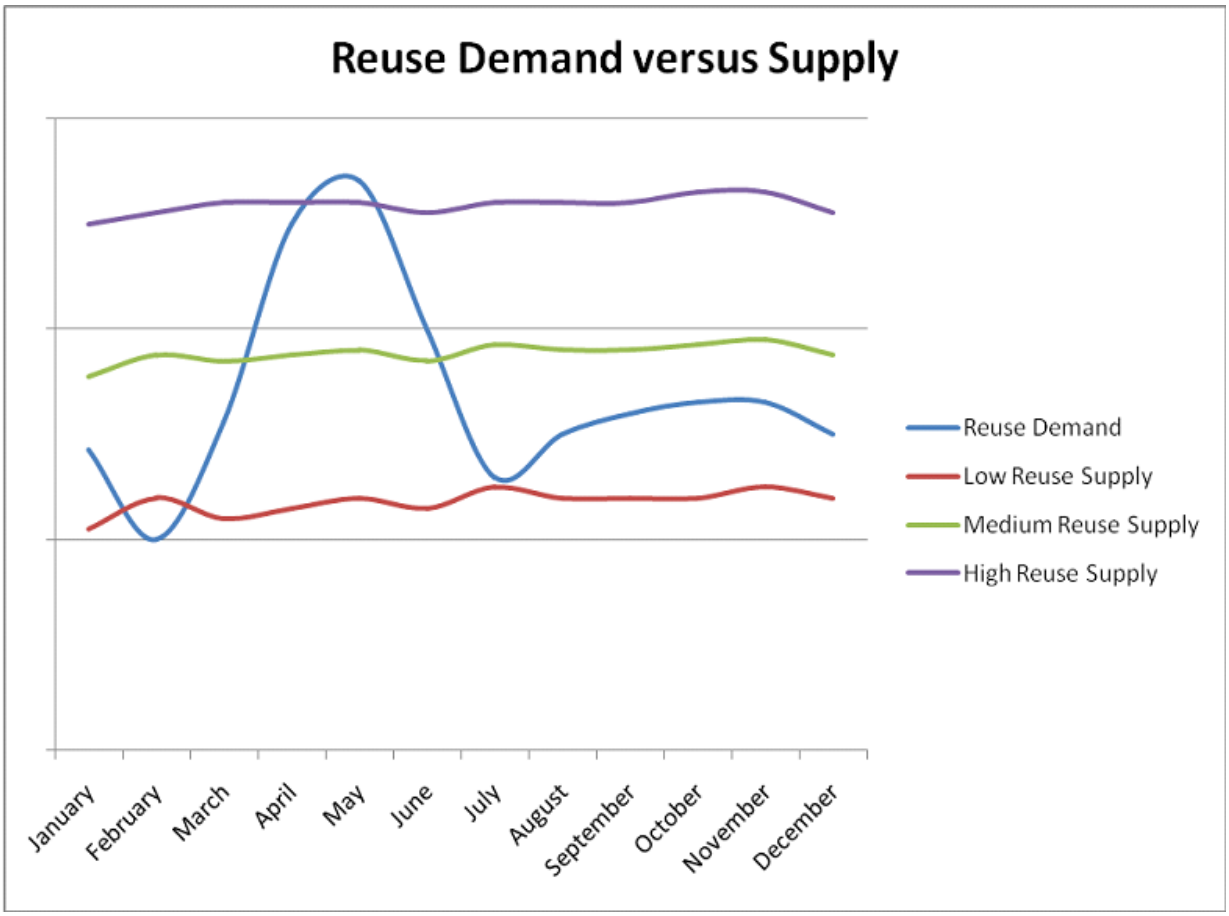
- Creation of regional water transmission planning entities comprised of utilities, associated WMD(s), and the Florida Department of Transportation that would plan for the effective transmission of raw or treated water within a region that may involve the use of state road rights-of-way.

- Strong financial incentives provided by cost-sharing through an expanded Water Protection and Sustainability Program that is funded by the water management districts, and the legislature through a dedicated funding source, for multi-jurisdictional projects that serve to solve the water supply problems within specific regions.

- Evaluate the effectiveness of existing additional public interest criteria in Chapter 373.223, F.S., commonly known as “local sources first” provision. In some cases, the current statutory provision may actually discourage regional planning and water supply projects that meet the collective needs within regions. The legislature should review the effectiveness of the current provisions to insure that regional solutions are not discouraged.

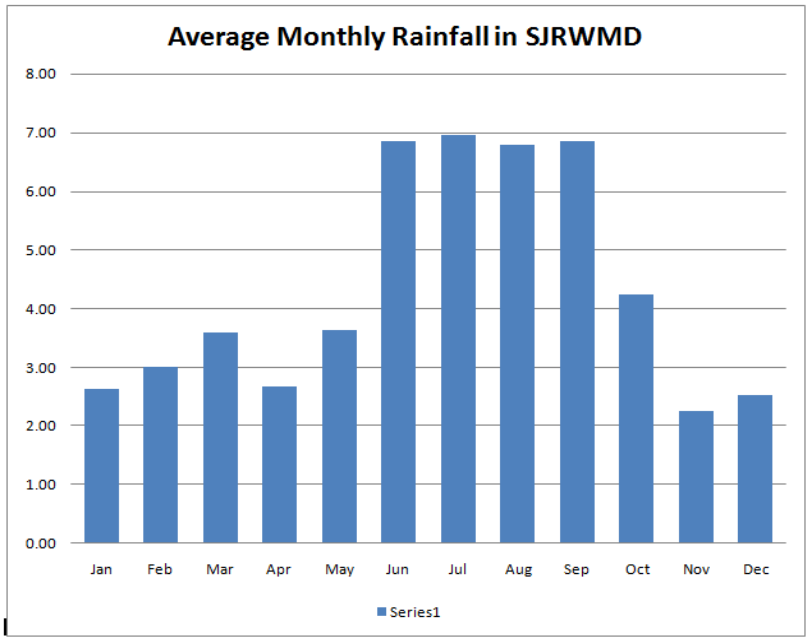
Creation of significant new water storage capacity

Both reclaimed water and surface water are sources that are very significant in quantity, but highly variable in sufficiency to meet demand. In the case of reclaimed water, the supply is fairly constant all year, but the demand for irrigation is highly variable, with peak irrigation demands typically occurring in the late spring at the end of the dry season, with a much lower demand during the wet season and into the winter months. As reclaimed water supplies grow, seasonal storage sufficient to balance seasonal demands is typically required to fully utilize reclaimed flows to meet irrigation demands, illustrated by the conceptual diagram below.



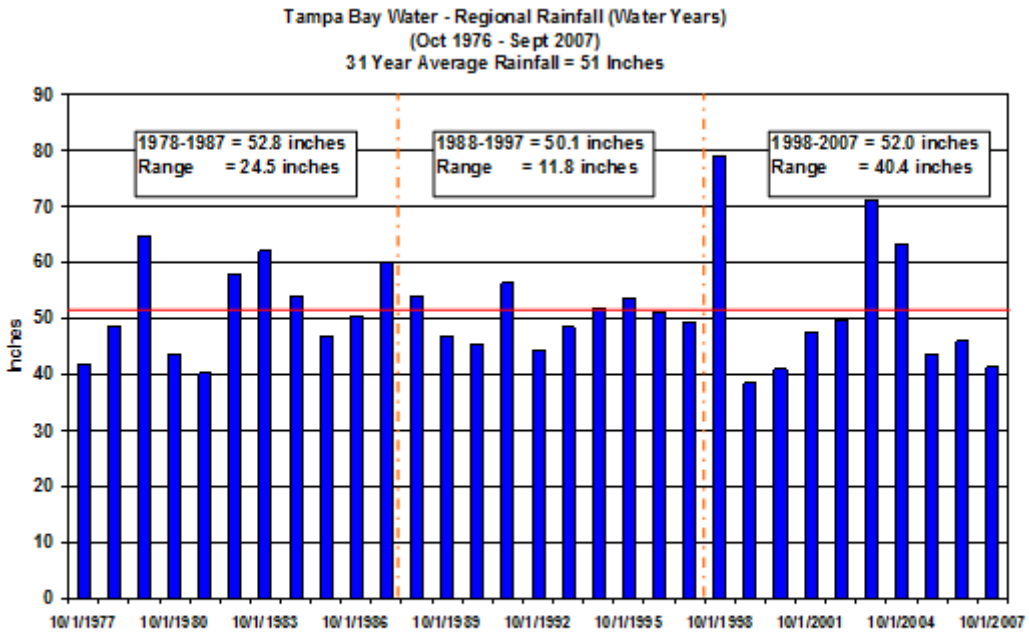
In the case of surface water, availability is highly variable and typically dependent on rainfall conditions that vary significantly both from year to year and in distribution throughout the year. The first graphic below illustrates the magnitude of seasonal variation in rainfall within the St.

Johns River WMD, which is typical throughout the state. The second graphic illustrates rainfall variability from year to year, compiled by Tampa Bay Water for their region of operation.



In inches, based on SJRWMD period-of-record data from 1891 to 2007

Source: SJRWMD 2008



Source: Tampa Bay Water – June 2008

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 two feasible options; both have already been implemented in Florida: surface reservoirs and aquifer storage and recovery (ASR) well systems.

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.

The other primary large-scale storage component for the 2030 vision is surface reservoirs. 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 offstream storage reservoir, which has a storage capacity of 15.5 billion gallons.

Tampa Bay Water's C.W. Bill Young Regional Reservoir – photograph from Tampa Bay Water

The reservoir has been operational since June 2005 and is used to maintain production at Tampa Bay Water's Regional Surface Water Treatment Plant at about 60 mgd even in dry periods. This provides approximately 30% of the region's current public water supply needs. During 2007, Tampa Bay Water used about 11 billion gallons of storage before the wet season started and river flows rebounded. The treatment plant will be expanded to 99 mgd by 2011, and at the point, river flows and reservoir storage are expected to provide 45% of the Tampa Bay region public supply needs.

Recent experience with this reservoir and other smaller-scale projects, points out there are both tremendous benefits in terms of water supply development, along with significant

challenges, including availability of land, land acquisition and construction costs, and securing the necessary state and federal environmental permits .

Beyond conventional reservoir storage, the potential exists to significantly increase natural storage within both natural systems and artificial systems that have been controlled with water management subjects and subject over-drainage based solely on flood control objectives. With the recent recognition that surface water resulting from rainfall is an important alternative water supply source, the paradigm for surface water management in Florida needs to change and become multi-objective, including both drainage/flood control, and water supply storage. More creative strategies, such as seasonally controlled water levels, staged water levels along canals or within other open waterbodies, and mitigative actions to offset higher wet season water levels on flood protection, are needed. A related beneficial effort would be the recapture of stormwater flows that have historically been artificially diverted to tidal waters via drainage canals.

The Florida 2030 vision calls for actions to be taken now to overcome barriers and challenges, to create the significant storage needed to fully utilize both reclaimed water and surface water resources as an environmentally sustainable and reliable water supply. Options are proposed, in no particular order:

- Effective education of all stakeholders on the importance of reservoir storage and ASR, including the environmental benefits, environmental protection, and cost-effectiveness of these measures in achieving a sustainable water supply infrastructure.

- FDEP, WMDs, FSAWWA, and other stakeholders work together to update current Underground Injection Control (UIC) regulations to address permitting ASR systems as part of sustainable water supply scenarios in Florida, built on ongoing pilot projects demonstrating the use of pre-treatment of water to prevent mobilization of arsenic from aquifer formations.

- Establish dedicated State/WMD funding that would provide cost-sharing applicable to the total capital costs for reservoirs, including both construction and land acquisition. An example would be for the legislature to establish dedicated funding for the current Water Protection and Sustainability Program, and expanding the current program to allow for cost-sharing on not only construction of reservoirs, but land acquisition for reservoirs.

- Identify opportunities to include wet season water storage within both natural and artificial water management systems currently subject to water control for flood control and drainage objectives. This strategy can be implemented at all levels, including local government and local district water management works, and water management district regional flood control facilities. This will likely be more expensive than least cost solutions to achieve drainage and flood control objectives only, so it is reasonable that these additional costs would be paid for by entities receiving water supply storage benefits.

<u>Drought Management and Adaptive Management</u>

Florida’s utilities are increasingly being built upon a diversity of water resources, which are subject to uncertainty such as climate variability and severe drought. The utilities must be able

to adapt to changing conditions and become more drought-resistant. Adaptive management strategies must be implemented to provide a framework for making short-term adjustments to the utilization and operation of these water resources based on periodic feedback on external conditions affected project performance, along with project performance itself. Examples of external conditions affecting project infrastructure performance include climatic conditions, source water quality and availability, water demands, and economic conditions. Examples of project performance include finished water quality, reliability, cost of operation, and impacts to the environment resulting from the project operation (such as effects of water withdrawals on hydrology and resulting environmental impacts).

The objective of the adaptive management is to provide an integrated, flexible, and diverse water resource system. The Plan identifies ecosystem conditions that will be used to enter or exit various water supply strategies and includes an operating protocol implementation process for making operational adjustments during the life of the project. Similar to scenario planning conducted in project planning, adaptive management seeks to optimize the operating strategy under various environmental conditions encountered during project operation.

The best example of the need for adaptive management is in addressing droughts. Droughts are a natural part of the Florida climate. The 1999-2001 and 2007-2008 periods have been examples of recent periods of significantly below-average rainfall in much of the state. In July 2007, Lake Okeechobee, a primary source of water for south Florida, reached a record low of 8.82 feet. In early June 2008, it was only at about 9.29 feet. Other regions of Florida have also experienced severe drought conditions. Fortunately, recent conditions have somewhat improved and seasonal climate forecasts call for average or above average precipitation for the rest of 2008. However, Lake Okeechobee remains critically low and seasonal forecasts have substantial uncertainty. It is certain that droughts will continue to occur; what is uncertain is the frequency and severity of droughts. Historical records provide some insight that is use in planning; however, global warming is projected by many scientists to likely increase the frequency and severity of droughts.

At present, water is allocated to users in quantities adequate to accommodate needs during a moderate (1-in-10 year) drought. During dry periods, the WMDs respond to drought by implementing a system of water shortage phases. Each phase includes increasingly stringent restrictions on water use that can be implemented sequentially as drought conditions worsen. This approach relies on “sharing the burden” of a water shortage among all water users and use types that rely on the source affected by the drought, such that all water uses can continue albeit at a level less than optimally needed.

While drought is foremost in everyone’s mind, there are other significant uncertainties that need to be accounted for in adaptive management. Examples include rate of population growth and resulting water demand, the efficacy of water conservation efforts and its impact on demands, cost of fuel and labor that affect project economic performance, and environmental effects from project operation. These types of uncertainties are first addressed in the integrated water resource planning, and then further addressed through operational adjustments based on a feedback loop of additional data and information over time.

The Florida 2030 vision must consider drought and other uncertainties and provide for adaptive management strategies such as drought management plans to deal with this uncertainty. Options are provided in no particular order:

Adaptive management in general:

- Stakeholders (Legislators, utility directors, environmental advocacy groups, etc) educated on the fact that there will be some uncertainties in any long term water supply plan.

- Water supply project plans include an adaptive management component, with sufficient flexibility to address the range of identified uncertainties.

- Mechanisms are routinely used by both water suppliers, and regulatory agencies through permit, to collect data ongoing and re-evaluate operation and adjust operation and subsequent project phases.

Drought management:

- Establish statewide priorities for water use in the most extreme drought scenarios, where the current water shortage mechanisms of “shared pain with reductions by all users” are insufficient.

- Water utilities adopt utility-specific drought management plans that address both system operation and demand management during drought, including “drought water rate structures” for customers.

- Coordinated effort between with WMDs, local governments and water utilities in implementing drought management. For example, a set protocol where WMDs declare water shortage based on input from utilities, local governments implement local ordinances enforcing WMD water shortage declarations; water utilities implement drought management plans and drought rates based on WMD water shortage declaration.

Source Water Protection

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 FDEP’s Class I designation for waterbodies 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.

Pollutants with human health concerns include: microorganisms; nutrients; heavy metals; toxic industrial chemicals; and pharmaceutical and personal care products (PPCPs) including endocrine-disrupting substances.

Source water protection is the first of four barriers ensuring the safety of drinking water supply system (FDEP barrier name in parentheses):

1. Source Water Selection and Protection (Risk Prevention Barrier)

2. System Design and Operation (Risk Management Barrier)

3. Monitoring/Testing (Risk Monitoring and Compliance Barrier)

4. Public Education (Individual Action Barrier)

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.

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.

Source water protection also helps maintain consistent raw water quality critical for utility treatment design and operation, as well as maintaining system reliability- this aspect may be even more important where multiple source types (e.g., groundwater and seawater desalination) are blended to meet drinking water demands while also minimizing environmental impacts.

The Florida 2030 vision needs to include an improved level of source water protection, considering an increased reliance on surface water. Options are proposed as follows, in no particular order of priority:

- Coordination of both WMD regional water supply planning & consumptive use permitting, with FDEP source water protection rules. For example, before a surface waterbody is identified in a WMD regional water supply plan as an alternative water supply option, consideration will be given to the current waterbody classification, and FDEP's assessment of the potential for reclassification to Class I designation. Before a surface waterbody is permitted for a potable water supply, FDEP would proceed with rulemaking to reclassify to Class I.

- FDEP review current process for classification of Class I water bodies, with the goal of achieving the most simplified and well documented process possible, in order to facilitate the appropriate classification of source water bodies. Some water suppliers are reluctant to pursue the current process of designation as it is not defined; if FDEP establishes a defined designation process, training in the process could be provided.

- In formulating and evaluating the benefits of new stormwater regulations, FDEP and WMDs also consider the issue of source water protection.

- "Low impact development" (LID) becomes the standard for development for Florida, required in FDEP/WMD environmental resource permitting programs, and through local government regulations. LID is already being encouraged and is increasing in frequency of use. LID offers many benefits, in addition to contributing to source water protection, and needs to be considered as a minimum standard for new development in Florida.

- FDEP includes consideration of source water protection in setting Total Maximum Daily Loads) (TMDLs) for specific waterbodies. There are two primary considerations: include any constituents of particular concern in waterbodies used for water supply; and, account for any reductions in flow or water level resulting from the future use of the waterbody for water supply in the future, as provided for in a WMD regional water supply plan or specific consumptive use permits.

Advantages and Disadvantages

Option	Pros	Cons
Extend the current 20-year planning horizon in regional water supply planning, to include a longer horizon (at least 30 years, maybe up to 50 years)	Consider ultimate solutions for build-out condition. Better understanding of implications of decisions.	Greater uncertainty in the distance future, additional cost of planning & using more sophisticated tools
Elected officials, utility directors, planners, and other decision-makers are educated on the benefits integrated water resource planning, based on well-documented case studies.	Gives a path toward united agreement on approach and a broad base of support; provides education on how water decisions are made to avoid problems in future.	Takes time and possibly some funding; today's political realities often seen as more important than tomorrow's potential problems.
Minimum training standards for scenario planning & optimization are adopted by the water utility industry in Florida through FSAWWA and FWEA.	Training standards give consistent baseline understanding; scenario planning could become standard operating procedure for water users.	Diversity of applications and situation specific needs may make standards somewhat vague and less meaningful.

Option	Pros	Cons
WMDs develop and implement scenario planning and optimization methods in the regional water supply planning process.	Addresses uncertainty and gives framework for true adaptive management; helps develop robust and flexible plans that recognize uncertainty in future trends; helps avoid 'lock-out' of future options from decisions made today.	Possible additional cost to WMD and time for planning; will require strong participation from stakeholders
Financial incentives provided by the State, WMDs, and others to conduct this type of planning, through cost-sharing on planning, and/or a requirement that cost sharing from WMD and state sources for project construction be contingent on integrated water sources planning based on scenario planning & optimization.	Provide water users with incentive to properly plan and avoid problems due to poor planning.	Too broad based of an incentive; might just lead to uncoordinated efforts.
WMDs undertake multi-objective planning efforts with all affected stakeholders, to address specific river systems that have or are proposed to have water supply withdrawals, that includes other related objectives concerning surface water restoration and protection (example could include St. Johns River, Hillsborough River, Alafia River, etc.).	Gain collaborative insight on constraints and trade-offs over time of various positions; avoid litigation, reach consensus through defendable process; address valid concerns for potential environmental issues associated with surface water withdrawals.	Greater cost for WMD regional water supply planning; requires commitment for all stakeholders to participate in the process
Existing WMD consumptive use permitting programs are reviewed and revised as needed to facilitate integrated permitting of multiple sources, with conjunctive use of groundwater, surface water, and reclaimed water.	Provide water users with greater certainty of how new sources fit in with current sources of supply; encourages conjunctive use of multiple sources.	Time and effort to conduct WMD rulemaking

Option	Pros	Cons
Water utilities participate in the WMD regional water supply planning process in order to collaboratively develop project options and to select projects for implementation.	Fully leverage existing regional water supply planning efforts for best outcome; identify projects for implementation and potentially for funding assistance from state & WMD.	None identified.
Major public education initiative, explaining the benefits of regional projects that serve the collective water needs within a region, and differentiating such projects with “inter-regional” project proposals.	Communicate benefits of regional project and solutions to decision-makers; correct misunderstanding about regional projects.	None identified.
Creation of state or regional water transmission planning entities.	Provide planning for regional projects by proposing transmission facilities for multiple sources within a region.	May be perceived as promoting transmission of water from one region to another, rather than facilitating projects within a region.
Strong financial incentives provided by cost-sharing through an expanded Water Protection and Sustainability Program that is funded by the legislature through a dedicated funding source, for multi-jurisdictional projects that serve to solve the water supply problems within specific regions.	Reliable funding stream to provide ongoing incentive for water utilities and local governments to overcome conventional barriers to reaching regional solutions.	Presumes that new water supply development cannot be funded through user rates; competition for state funding with other state priorities.
Evaluate the effectiveness of the public interest criteria in Chapter 373.223, F.S., commonly known as “local sources first” provision.	Insure that current law does not inadvertently discourage regional projects that solve collective needs within a region.	Strong constituency for this provisions; concern about water transfers to other regions, or even within regions.
Effective education of all stakeholders on the importance of reservoir storage and ASR, including the environmental benefits, environmental protection, and	Promotes the development of significant storage; provides perspective of overall environmental benefits, even though mitigation measures sometime required (such as	

Option	Pros	Cons
cost-effectiveness of these measures in achieving a sustainable water supply infrastructure.	wetland impacts from reservoir footprint).	
FDEP, WMDs, FSAWWA, and other stakeholders work together to update current UIC regulations to address permitting ASR systems as part of sustainable water supply scenarios in Florida, built on ongoing pilot projects demonstrating the use of pre-treatment of water to prevent arsenic mobilization from aquifer formations.	Reduce the current uncertainty regarding permitting new ASR facilities; recognizes that ASR is fundamentally different than an injection well; builds on information being collected in ongoing pilot projects.	Will likely require regulatory reforms; may be controversial to some; no likely to succeed without full commitment of regulatory agencies.
Establish a dedicated State/WMD funding that would provide cost-sharing applicable to the total capital costs for reservoirs, including both construction and land acquisition.	Encourage and facilitate the creation of significant new storage by improving economic feasibility; recognizes that land acquisition is significant portion of reservoir costs.	Requires dedicated funding sources that may not be available.
Identify opportunities to include wet season water storage within both natural and artificial water management systems currently subject to water control for flood control and drainage objectives.	Significant potential for providing seasonal storage at a lower cost than conventional reservoirs; promotes multi-objective water resource planning.	Requires multi-objective planning between water supply and storm water/flood control management.
Stakeholders (Legislators, utility directors, environmental advocacy groups, etc) educated on the fact that there will be some uncertainties in any long term water supply plan.	Establishes priority for adaptive management; helps to set realistic expectations.	May move some to inaction, seeking to eliminate all uncertainty.
Water supply project plans include an adaptive management component, with sufficient flexibility to address the range of identified uncertainties.	Leverages the benefits of adaptive management; recognizes inherent uncertainty and plans for adjustments in projects.	Costs for date collection; additional costs associated with building some flexibility into projects.

Option	Pros	Cons
Mechanisms are routinely used by both water suppliers, and regulatory agencies through permit, to collect data ongoing and re-evaluate operation and adjust operation and subsequent project phases.	Leverages the benefits of adaptive management; recognizes inherent uncertainty and plans for adjustments in projects.	Costs for date collection; additional costs associated with building some flexibility into projects.
Establish statewide priorities for water use in the most extreme drought scenarios, where the current water shortage mechanisms of "shared pain with reductions by all users" are insufficient.	Reduces uncertainty in extreme droughts; priorities established in deliberative fashion instead of in crisis mode; useful information in economic investment; advance planning in estimated drought disaster impact and relief.	Likely to be controversial; will require significant effort and possibly legislative action.
Water utilities adopt utility-specific drought management plans that address both system operation and demand management during drought, including "drought water rate structures" for customers.	Utilities are prepared for the inevitable periods when demands must be temporarily reduced; drought rates used to send strong economic signal to conserve while reducing impact on utility revenues.	None readily identified.
Coordinated effort between with water management districts, local governments and water utilities in implementing drought management.	One message to public; leverages the strength of the WMDs, local government & utilities.	Less flexibility for each municipality to act independently.
Coordination of both WMD regional water supply planning & consumptive use permitting, with FDEP source water protection rules.	Source waters could be protected from the onset of use; smaller communities could be encouraged to use surface water if DEP initiates the reclassification process.	Greater hesitancy to move to surface water supply sources; greater uncertainty for costs of new water supplies in planning process.
FDEP review current process for classification of Class I water bodies, with the goal of achieving the most simplified and well documented process possible, in order to facilitate the appropriate classification of source water bodies.	More surface water bodies could be appropriately, timely protected; greater participation in reclassification process by smaller communities.	Lengthy and expensive process inhibits source water protection; treatment costs increase; reluctance to develop alternative water supplies.

Option	Pros	Cons
In formulating and evaluating the benefits of new stormwater regulations, FDEP and WMDs also consider the issue of source water protection.	Greater efficiency in rulemaking; all potentially affected parties would be involved at appropriate points.	Greater uncertainty in review of new regulations; additional rule challenges due to lack of appropriate information.
LID becomes the standard for development for Florida, required in FDEP/WMD environmental resource permitting programs, and through local government regulations.	Reduced water treatment costs in the future; greater certainty in water supply planning; aids in environmental restoration and protection efforts.	Environmental restoration projects are impacted; water treatment costs increase.
FDEP includes consideration of source water protection in setting TMDLs for specific waterbodies.	Effective implementation of TMDL program resulting in water quality improvement for public and environment.	Difficulty meeting established TMDLs; additional litigation related to implementation; less environmental benefit.