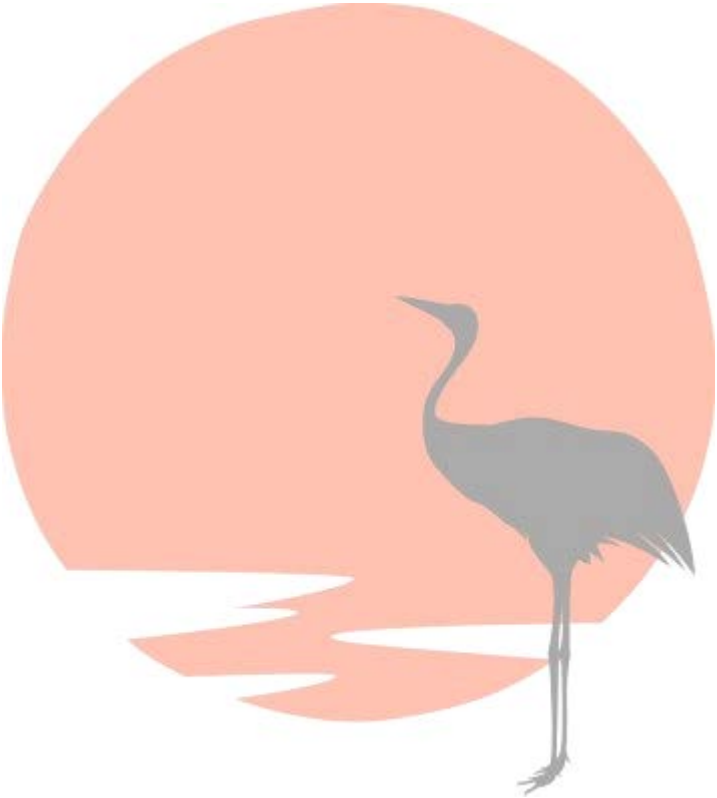
Appendix B
Water Quantity



December 2012

Sarasota County | Southwest Florida Water Management District | Jones Edmunds | Janicki Environmental, Inc.

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1.0 INTRODUCTION

Developing a sustainable water supply is a goal of Sarasota County. The County is committed to providing Sustainable Water Supply through protecting water resources from harm, optimizing the use of alternative water supplies such as reclaimed water and surface waters, providing reliable and cost-effective water supply to the County's residents, and reducing demands on water resources through conservation and low impact development.

Sarasota County meets its water supply needs through several sources. The bulk of the County's annual average daily demand of 19.0 MGD is supplied by the Peace River Manasota Water Supply Authority and Manatee County. Demand on average is expected to increase nearly 6 MGD over the next 6 years with the majority of the new supply coming from existing contracts and its own wellfields. Additional details concerning Sarasota County's water supply and demand are provided in Section 2.

Stormwater runoff is a potential water source for non-potable uses that have been traditionally supplied by groundwater or other potable water sources. Current surface water flows in Sarasota Bay are about 20% higher than historical flows, and future flows are expected to remain near current levels. Section 3 provides details concerning the flow analysis, or water budget, along with results.

Jones Edmunds identified uses for a portion of the excess water in this plan. Section 4 provides specific project and program recommendations to capture and use excess flow. The recommendations focus on stormwater-derived alternative water supplies for irrigation and programs aimed at reducing the potable water supply demand. Potable and reclaimed sources are covered under the County's Comprehensive Plan and water and wastewater master plans.

Sarasota County is aware of the multiple benefits stormwater-harvesting projects can provide and wishes to explore ways to capitalize on stormwater harvesting and reuse opportunities. Stormwater harvesting can provide environmental and cost-savings benefits by reducing:

- Water demand—Using stormwater to supply a portion of water demand reduces groundwater withdrawals and associated environmental impacts and, in the case of potable water, saves treatment costs and differs expansion of existing infrastructure. Transmission costs are also reduced because most stormwater-harvesting projects are located on site.
- Pollutant mass in surface waters—Pollutants carried in the stormwater are removed from the water column and given another opportunity for treatment through natural processes.
- Volume of freshwater discharge—Stormwater harvesting contributes to hydrologic restoration by encouraging aquifer recharge and reducing freshwater pulses that can contribute to less-than-desirable salinities in the estuary.

Water budgets for the Sarasota Bay watershed were estimated for historical, current, and future conditions using the Jones Edmunds SIMPLE (Spatially Integrated Mass Pollutant Loading Estimates) model. The model uses rainfall, land use, and soils data to calculate freshwater inflows to the bay. Selected findings of the water budget investigation include the following and are detailed in following sections.

Rainfall patterns for the bay and watershed were assessed. A distinct spatial trend in rainfall over the watershed was evident, with higher long-term average precipitation in the most inland portions of the watershed and lower precipitation along the coast. The precipitation gradient was significant—more than 10 inches per year difference over a distance of less than 10 miles.

Annual rainfall averaged approximately 49 inches per year for 1989 through 2008 and ranged from about 33 inches/year in 2000 to 66 inches/year in 1995. Spatial variability across the watershed was higher during wet years. Seasonal precipitation followed a pattern typical of peninsular Florida, with rainfall during the summer (June through September) averaging 6 to 8 inches/month and monthly rainfall during the remainder of the year averaging 2 to 3 inches/month.

Atmospheric deposition (direct rainfall on the bay) was the most significant source of freshwater input to the bay for all years under current conditions because the area of the open water estuary is large with respect to the watershed area. Other significant freshwater sources included direct runoff (stormwater) and baseflow (shallow groundwater seepage). Point sources (discharges from wastewater treatment plants and industrial facilities), irrigation (land application of reclaimed water), and septic tank seepage all contributed smaller volumes of freshwater).

The historical and future freshwater budgets were developed using the same 1989 through 2008 rainfall that was used for the current conditions water budget. Using the same rainfall for all scenarios allowed the water budgets to be compared for differences based only on changes to land use and other anthropogenic effects.

Using the SIMPLE model to compare estimated current and historical freshwater inputs indicated that, given the same rainfall, current freshwater inputs to the bay are higher than historical levels. Direct runoff and baseflow were both greater than under historical conditions due to changes in land use within the watershed. Given the similar rainfall used to develop both scenarios, the rates of freshwater inputs for historical and current conditions were similar on both an annual and seasonal basis, with direct rainfall contributing the most freshwater of any single source in both scenarios.

In contrast, there was very little difference between the current and future freshwater inputs. The relative contributions of each of the freshwater sources remained the same. Much of the Sarasota Bay watershed is now highly urbanized, so little opportunity exists for significant changes in land use or other activities that could alter the sources of freshwater inputs to the bay.

2.0 WATER SUPPLY AND DEMAND

Water supply planning is the process by which an agency assesses the projected water demands for a period and the potential sources of water available to meet the demands. The Water Supply Plan helps the County manage one of its greatest resources—water. Water does not have boundaries; it is found in the sky and on, in, and under the ground. Water is seemingly abundant, with a continual supply falling from the sky and stored in the ground and in our bodies. However, recent droughts and the impacts of over pumping have shown us that water is not as abundant as Floridians once thought, and therefore a plan is needed to help neighboring communities share and protect this important resource.

Water supply plans for the region containing the Sarasota Bay Watershed include:

- Sarasota County Comprehensive Plan (2006).
- Sarasota County Water Supply Master Plan Update (2005).
- Sarasota County Wastewater Master Plan Report (2009).
- Southwest Florida Water Management District (SWFWMD) Regional Water Supply Plan (RWSP) (2010).
- 10 Year Water Supply Facilities Work Plan, Carollo (2012).

Additionally, Sarasota Bay Watershed is within SWFWMD's Southern Water Use Caution Area (SWUCA). Regulatory requirements stemming from this distinction are described in the SWUCA Recovery Strategy (SWFWMD, 2006)

Jones Edmunds reviewed the County Comprehensive Plan, both master plans, and SWFWMD's RWSP to understand the supply and demand projections for the Sarasota Bay Watershed and help formulate the best alternative water supply recommendations.

2.1 WATER SOURCES

Potable and reclaimed water within the Sarasota Bay Watershed is distributed by Sarasota County Utilities, which falls within SWFWMD's region for supply management.

2.2 WATER SOURCES WITHIN SWFWMD

The following section summarizes information in *A Sustainable Water Supply*, SWFWMD, 2001: http://www.swfwmd.state.fl.us/about/isspapers/watersupply.html.

The average rainfall of West-Central Florida is 53 inches a year, making it one of the rainiest regions in North America. However, most is lost to evaporation and runoff. The remainder replenishes the region's groundwater, which is rainwater that has soaked into the ground to an aquifer, an area of underground rock and sand, where it is "stored." Surface water refers to water on the surface of the earth, such as lakes, rivers, and streams.

Of the approximately 14 inches of rainfall that remain after evaporation SWFWMD-wide, about 9 inches go to surface waters, leaving only an average of 5 inches to resupply Florida's underground water reserves. Water users in the area regulated by SWFWMD use more than 1 billion gallons of water daily. More than 80% of this water comes from groundwater in the Floridan aquifer, the deepest and most productive of the three aquifers in West-Central Florida and one of the most productive aquifers in the world.

In some areas of SWFWMD, aquifers are connected with the lakes, rivers, and wetlands above them. If too much water is withdrawn from the aquifers, the water level of the lake or river above may decline. Excessive groundwater withdrawals can also cause the saltwater that surrounds the Floridan aquifer to move or intrude into freshwater areas, which decreases the amount of available freshwater and increases the cost for providing clean, potable water to residents. In Sarasota County, the Floridan aquifer is confined and the intermediate aquifer system is the main source of water supply.

Groundwater is expected to always be a source of drinking water, but access to other sources is essential. The balance of the region's water supply comes from surface water. Surface water use will most likely increase because the ability of the groundwater system to satisfy an ever-growing need for freshwater is limited, but surface water has limits as well. By 2030, about 84 million gallons per day (MGD) of additional water may be necessary to meet the projected water demand of all current and future water users within SWFWMD. Potential additional water availability is summarized in Table 2-1 (RWSP, SWFWMD, 2010,).

2.3 WATER SOURCES WITHIN SARASOTA COUNTY

Sarasota County Utilities historically purchased its water from Manatee County and blended it with water from the University Wellfields. As the area grew and water demands increased, Sarasota County began developing its own water supplies and participating in the Peace River Manasota Regional Water Supply Authority as a regional partner. Currently, a variety of public and private water service providers meet the water supply demand in Sarasota County. The Cities of Sarasota, Venice, and North Port and the Town of Long Boat Key are primarily served by the local municipal utility. The unincorporated sections of Sarasota County are served by the Sarasota County Utilities Department, Englewood Water District (EWD), independent water treatment and supply systems, and individual wells. EWD and the Cities of Sarasota, North Port, and Venice own and operate the water systems that provide water within their jurisdictional boundaries. The Town of Longboat Key purchases its water from Manatee County (WSMP, Carollo, 2011).

Table 2-1 Potential Additional Water Availability in Southern Planning Region through 2030 (MGD) (RWSP, SWFWMD, 2010)

County	Surficial Water[1]		Reclaimed Water	Desalination		Fresh Groundwater		Water Conservation		Total
	Permitted Unused	Available Unpermitted	Offset	Seawater	Brackish Groundwater	Surficial and Intermediate	Upper Floridan[2] Unused/ Permitted	Non-Agricultural	Agricultural	
Charlotte	3.7	14.6	6.2		5.5	4.7		1.4	0.7	36.8
DeSoto	17.9	80.4	1.3		0.4	1.8		0.3	2.0	104.1
Sarasota	3.2	74.6	14.5	20.0	10.3	6.0	2.7	2.5	0.7	134.5
Manatee	6.2	3.8	17.4	20.0		4.9	0.8	2.8	3.1	59.0
Total	31.0	173.4	39.4	40.0	16.2	17.4	3.5	7.0	6.53	334.4

1 All available surface water from the Peace River is shown in DeSoto County because the calculation was based on flows in DeSoto County; however, future withdrawals from the Peace River in Hardee and Polk Counties are possible.
2 Groundwater that is permitted but unused for public supply. Estimated 2009 use is based on a linear trend for 2000 through 2008. Permitted quantities were current as of October 2009.

Water demand within the Sarasota County Utility service area is met through its groundwater supplies and interlocal agreements with Manatee County and the Peace River/Manasota Regional Water Supply Authority. The agreement with Manatee County expires in 2025. The agreement with the Authority was amended in 2005 and is valid for 35 years with the option to extend for an additional 35 years (WSMP, Carollo, 2011).

The County-owned water system components include groundwater sources and associated treatment and transmission systems. Groundwater sources for Sarasota County include the Carlton, Venice Gardens, and University Wellfields (Figure 2-1), which withdraw groundwater from Production Zone 3 (PZ3) of the Upper Floridan and Intermediate Aquifer Systems (UFAS). The County obtained its current WUP on May 15, 2012 (WUP No. 20008836.010), which consolidated the County's previous three permits for the individual wellfields with no increase in quantities. The current permit expires on August 28, 2017.

2.4 WATER SOURCES WITHIN THE CITY OF SARASOTA

The City of Sarasota operates, maintains, and provides capital reinvestment to their potable water service. All facilities are public and maintained by the City of Sarasota Public Works Department, which serves the corporate limits of the City. Figure 2-2 shows the locations of the existing potable water facilities that provide service within the City of Sarasota. The potable water treatment facility consists of raw water supply facilities, a water treatment plant, distribution system, and storage and pumping facilities.

The existing water treatment plant came online in 1982. The plant's mechanical infrastructure such as pumps and rotating machinery has a design lifespan of 20 years, while that of the piping and tanks is 50 years. A complete renovation of the Reverse Osmosis Treatment System was completed in 2003.

Raw water supplies are regulated through State Water Use Permits issued by SWFWMD. The City is currently allowed an annual average daily withdrawal of 12 MGD. The City's water supply comes from two sources: the Verna Wellfield 17 miles east of the City and the Downtown Reverse Osmosis. (Sarasota City Plan–Utilities Support Document, City of Sarasota, 2008).

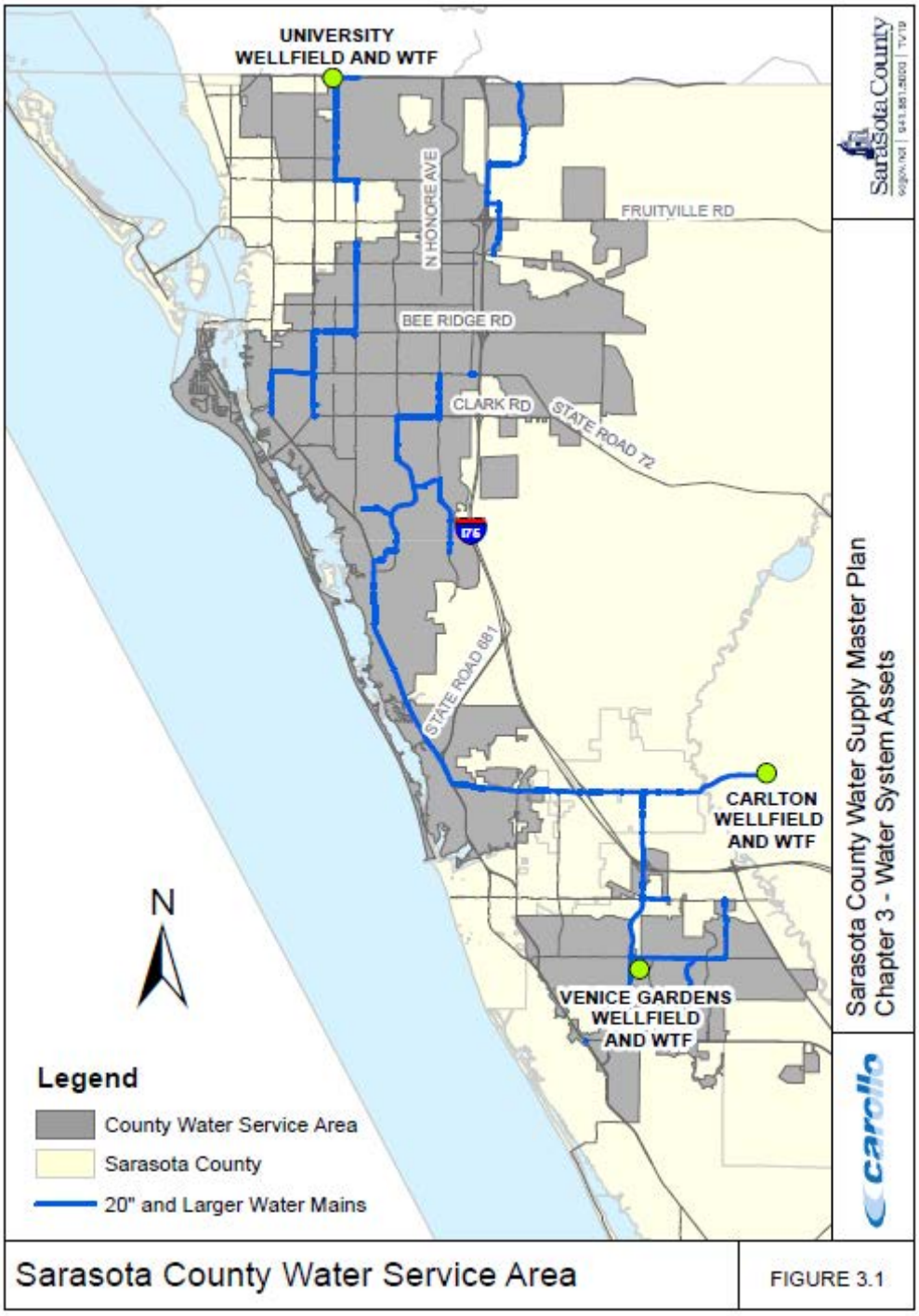


Figure 2-1 Sarasota County Water Service Areas (Sarasota County WSMP, Carollo, 2011)

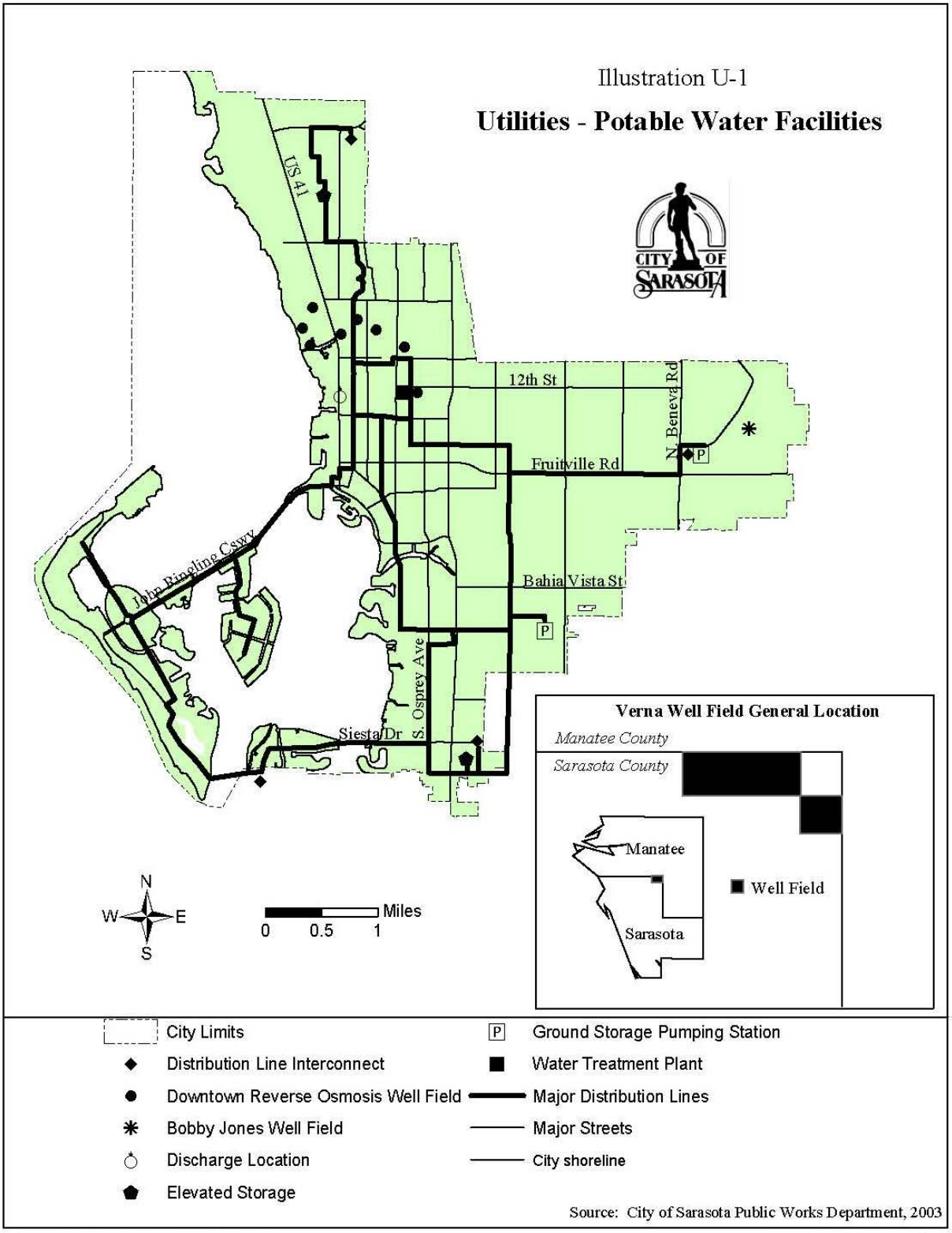


Figure 2-2 City of Sarasota Potable Water Facilities
(Source: Sarasota City Plan and Support Document – The Utilities Plan, City of Sarasota, 2008)

2.5 SARASOTA COUNTY SUPPLY AND DEMAND

Water demand projections were compiled as part of the County's 2011 Water Supply Master Plan. Projected annual average water demands for Sarasota County from the WSMP are shown in Table 2-2.

Table 2-2 Annual Average Water Demands (WSMP, Carollo, 2011)

	2010	2015	2020	2025	2030
Sarasota County	20.81	22.90	25.34	27.46	28.84
City of Sarasota	7.712	7.924	7.959	7.994	8.108
Town of Longboat Key	2.021	2.021	2.021	2.021	2.021

Table 2-3 summarizes average annual and maximum month water demands, facility capacities, and permitted quantities for Sarasota County Utilities. New water supply will need to begin development soon after 2020. The County is working on several options for future supply including the Dona Bay WTF and expansions of existing County-owned facilities, (WSMP, Carollo, 2011)

2.6 AQUIFER RECHARGE AREAS

SWFWMD has identified areas of no or very low recharge in Sarasota County in the vicinity of the City of Sarasota-owned Verna Wellfield. Sarasota County's Comprehensive Plan recommends that the County adopt land development regulations that would guarantee the integrity of these areas; these regulations were adopted.

Table 2-3 Summary of Water Demands, Facility Capacity, and Permits for Sarasota County Utilities (WSMP, Carollo, 2011)

	2011		2016		2021	
	Annual Average	Max Month	Annual Average	Max Month	Annual Average	Max Month
Population Served	218,352	–	245,538	–	276,197	–
Demand (MGD)[1]	21.8	26.2	24.6	29.5	27.6	33.1
Demand per Capita (MGD)	100	140	100	140	100	140
Available Facility Capacity (MGD)	31.83	35.86	33.83	37.98	32.83	36.98
Carlton WTF	5.85	7.7	9.85	1.82	9.85	11.82
Authority	13.225	15.407	13.225	15.407	13.225	15.407
Manatee County	8	8	6	6	5	5
University WTF[2]	2	2	2	2	2	2
Venice Gardens WTF	2.75	2.75	2.75	2.75	2.75	2.75
Future Facility Capacity	–	–	–	–	Note 3	Note 3
Facility Capacity Surplus (Deficit)[4]	9.99	9.65	9.27	8.51	5.21	3.83
Total Permitted/Contracted	34.97	39.91	32.97	37.91	31.97	36.91

Table 2-3 Summary of Water Demands, Facility Capacity, and Permits for Sarasota County Utilities (WSMP, Carollo, 2011)

	2011		2016		2021	
	Annual Average	Max Month	Annual Average	Max Month	Annual Average	Max Month
Amount (MGD)						
Carlton/University/Venice Gardens	13.74	16.50	13.74	16.50	13.74[5]	16.50[5]
Authority	13.225	15.407	13.225	15.407	13.225	15.407
Manatee County	8	8	6	6	5	5
Permitted/Contracted Surplus (Deficit)[6]	13.13	13.70	8.41	8.44	4.35	3.76

Notes:
1. Population and demand projections are based on BEBR Medium projections.
2. Less than 2 MGD may be supplied based on the TDS concentrations of the Manatee County supply and the University Wellfield. The blending ratio is typically 5:1 to meet the TDS limit of 500 mg/L, but blending ratios vary based on the actual TDS concentrations of the source waters.
3. Future supply (expansion of existing facility or new source) to be under development.
4. Calculated by subtracting demand from the available facility capacity.
5. Current WUP expires in 2017. Assume that permit renewal will allow the same withdrawal rate.
6. Calculated by subtracting the demand from the permitted amount.

2.7 SARASOTA BAY WATERSHED SUPPLY AND DEMAND

Developing a sustainable water supply is a goal of Sarasota County.

A general finding from Task II-1, the Water Budget Analysis, is that a significant amount of stormwater in the watershed could be beneficially used while maintaining appropriate flows to the Bay and tributaries. This task (II-4) involves identifying opportunities and developing conceptual alternative water supply plans to reduce excess stormwater runoff. These plans will provide a foundation for developing stormwater-harvesting projects that will help the County meet its sustainable water supply goals.

The Water Budget Analysis (Task II-1 TSDs) found about 20% more freshwater flow to Sarasota Bay (Figure 2-3) today than occurred historically (historical conditions refer to 1948 land use modeled in SIMPLE as part of Task II-1). Additionally, future freshwater flows are projected to be slightly greater than current loads. Higher runoff in the future reflects the increased extent of urban land cover in the watershed compared to the current level of development.

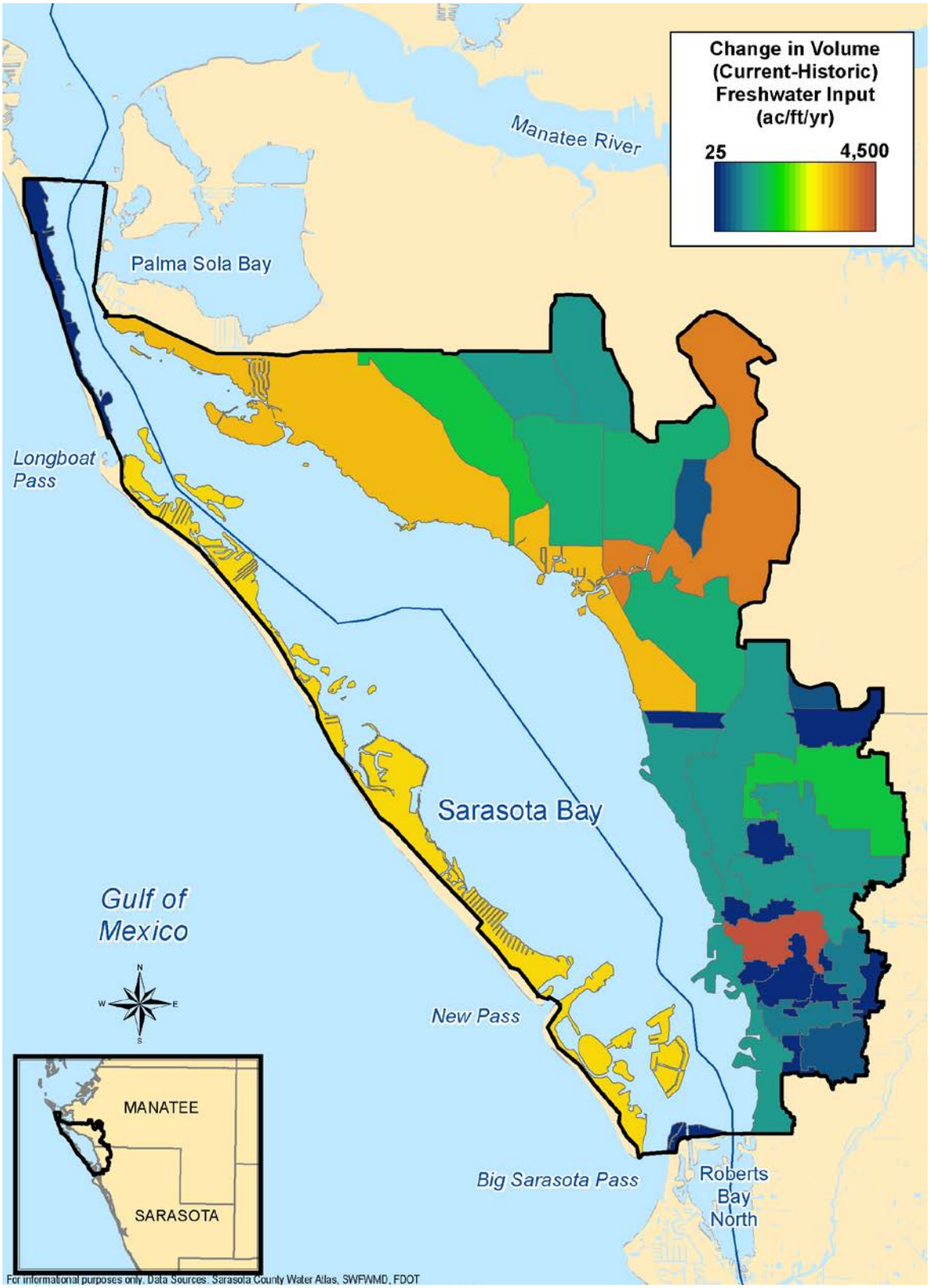


Figure 2-3 Change to Median Annual Freshwater Inputs to Sarasota Bay from Basins within the Watershed from Historical to Current Conditions

2.8 PER CAPITA CONSUMPTION

The average gross per capita water consumption from 2003 through 2007 in Sarasota County was 87 gallons per capita per day (gpcd). This value accounts for water use by commercial and industrial users, as well as for lost and unaccounted-for water. Although the County water system provides approximately 87 gpcd to its customers on average, a demand factor of 100 gpcd was selected to use for planning. This value accounts for any potential changes in water use patterns or shifts in demand. Conservation activities have reduced per capita water use from approximately 110 gallons per capita per day (gpcd) in 1992 (Sarasota County WSMP; Carollo, 2011).

Picture yourself carrying 87 gallons of water in a bucket from a well or stream. Would you still use that much water?

3.0 WATER BUDGET

Water budgets for Sarasota Bay Watershed were estimated for historical, current, and future conditions using the Jones Edmunds SIMPLE (Spatially Integrated Mass Pollutant Loading Estimates) model. The SIMPLE model, co-funded by Sarasota County and SWFWMD, has been applied on numerous projects throughout SWFWMD and elsewhere in Florida. The model uses spatially distributed rainfall, land use, and soils together with constants, mainly defined in lookup tables, to calculate the water budget in six components—atmospheric deposition, direct runoff, base flow, irrigation, point sources, and septic tanks. An in-depth description of the model can be found in Jones Edmunds (2008). Details of the water budget analysis including methodology (Section 3.1) and results (Section 3.2) are provided in the following subsections.

3.1 METHODOLOGY AND DATA USED

The water budgets were prepared by holding rainfall constant at current conditions for all three scenarios and varying the other inputs to simulate historical and future conditions. The results provide a basis for comparison between historical and current conditions as well as current and future conditions. The current conditions were provided by a SIMPLE model run for 1989 through 2008. The modeling was completed for a project funded by the Sarasota Bay Estuary Program (*Numeric Nutrient Criteria for Sarasota Bay*, prepared by Janicki Environmental [2010]). Sources of data and methodologies for current conditions loadings are documented in that report. Data sources and methodologies for historical and future conditions are provided below.

3.1.1 Historical

A Decision Memorandum developed by the Project Team, including the County and SWFWMD, defined the methods used to estimate the historical freshwater inputs as follows. Referenced sources of data and methodologies are documented in *Sarasota County Pollutant Loading Model Development SIMPLE-Monthly Design Report* prepared for Sarasota County and the Southwest Florida Water Management District (Jones Edmunds, 2009).

- Current freshwater inputs were provided by the SIMPLE model run for 1989 to 2008.
- For all modules that require land use/cover data, the historical land use/cover derived from 1948 US Department of Agriculture aerial photographs was used.
- For all modules that require soils data, the soils data used for the current SIMPLE model run were used.
- For all modules that require precipitation and evapotranspiration data, the precipitation and evapotranspiration used for the current SIMPLE model run (1988–2009) were used.

- For the point-source module, the City of Sarasota staff were consulted to develop information regarding the historical loadings from the City's wastewater treatment plant. The plant began operation in 1953 and had a capacity of 4 MGD. The plant has secondary treatment (sand filter, primary settling, biological trickle filter, anaerobic digester, and sludge beds). Effluent was discharged to Whitaker Bayou. The service area generally included some of the south side of the City, the Bayshore area, and downtown (Haas, D. and R. Maikranz, City of Sarasota Utilities Department. Personal communication). However, because sanitary sewer service was not initiated until 1953 and the historical conditions period was 1948 through 1950, to coincide with the land use no point source loadings were included in the historical conditions.
- For the septic tank module, we worked with several individuals (D. Andersen, Hazen and Sawyer, personal communication; Haas, D., City of Sarasota Utilities Department, personal communication) regarding how to address historical septic tanks. We estimated a population density based on census data and photointerpretation of 1948 aerial photographs. Up until the 1940s, most unsewered treatment systems were little more than cesspools. Within the next decade, septic tanks were added to provide initial settling. Because of the lack of design standards, hydraulic failure was common. The US Public Health Service began investigating siting and design guidelines in the late 1940s. Because of the lack of regulation or widespread knowledge of the new guidelines, septic tanks in 1950 could have been built in either lowlands or uplands. Although the technology has not changed significantly, siting requirements to keep the septic tank drainfield 2 feet above the seasonal high groundwater have decreased failure rates and increased efficiency (Anderson and Otis, 2000).

3.1.2 Future

A Decision Memorandum developed by the Project Team, including the County and SWFWMD, defined the methods used to estimate the future freshwater inputs. The future conditions period is not intended to portray any specific yearly envelope but rather to reflect the following assumptions:

- Future land use followed the Jones Edmunds approach used for the Roberts Bay North Watershed Management Plan in which undeveloped uplands were converted to medium-density residential.
- Evaporation and evapotranspiration rates were the same as those used for the historical and current conditions model runs.
- Soil coverage was the same as that used for the historical and current conditions model runs.
- The City of Sarasota Wastewater Treatment Plant is the only point source within the Sarasota Bay Watershed. This facility disposes of treated effluent via deep-well injection during the wet season (June–September) and distribution to reuse

during the dry season. The City of Sarasota was contacted to obtain data to use in estimating future loading rates. Although the plant's direct discharge to Whitaker Bayou is proposed to be taken offline in the future there is no definitive schedule. An assumption was made that all direct surface water discharges will be stopped in the future, so there were no point source inputs for future conditions.

- Septic tank coverage was the same as the current.

3.1.3 Results

The analyses of these data included examining and comparing the spatial and temporal variation in freshwater inputs to Sarasota Bay. Spatial, annual, and seasonal variations in rainfall are described (Section 3.2.1), followed by comparisons of historical and current inputs (Section 3.2.2) and current and future flows (Section 3.2.3) by source (e.g., direct runoff).

3.2 RAINFALL

3.2.1 Spatial Variation

A distinct spatial trend is evident in rainfall over the watershed, with higher median precipitation in the most inland portions of the watershed and lower median precipitation along the coast. The precipitation gradient is striking—over 10 inches per year over a distance of less than 10 miles. Figure 3-1 shows the pixels used by the SIMPLE model to estimate rainfall inputs to Sarasota Bay and its watershed. Each pixel is shaded to reflect the median annual rainfall for 1988 through 2009.

3.2.2 Annual Variation

Figure 3-2 shows the total annual precipitation for the watershed as a whole. Annual rainfall ranged from about 33 inches per year in 2000 to approximately 66 inches in 1995.

Annual precipitation varied significantly spatially (i.e., among locations or pixels) for any year. Each box-and-whisker in Figure 3-3 presents the range of total annual rainfall for all pixels for a year. Figure 3-3 demonstrates that there is significant temporal variability in annual precipitation. The median values range from over 60 inches per year (1992 and 1995) to under 40 inches per year (1990, 1999, and 2000). Total annual precipitation also varied significantly between geographic locations (pixels) for any year. There were at least 10 inches of difference between the highest and lowest pixel in all years, with the difference reaching 30 inches per year in some years.

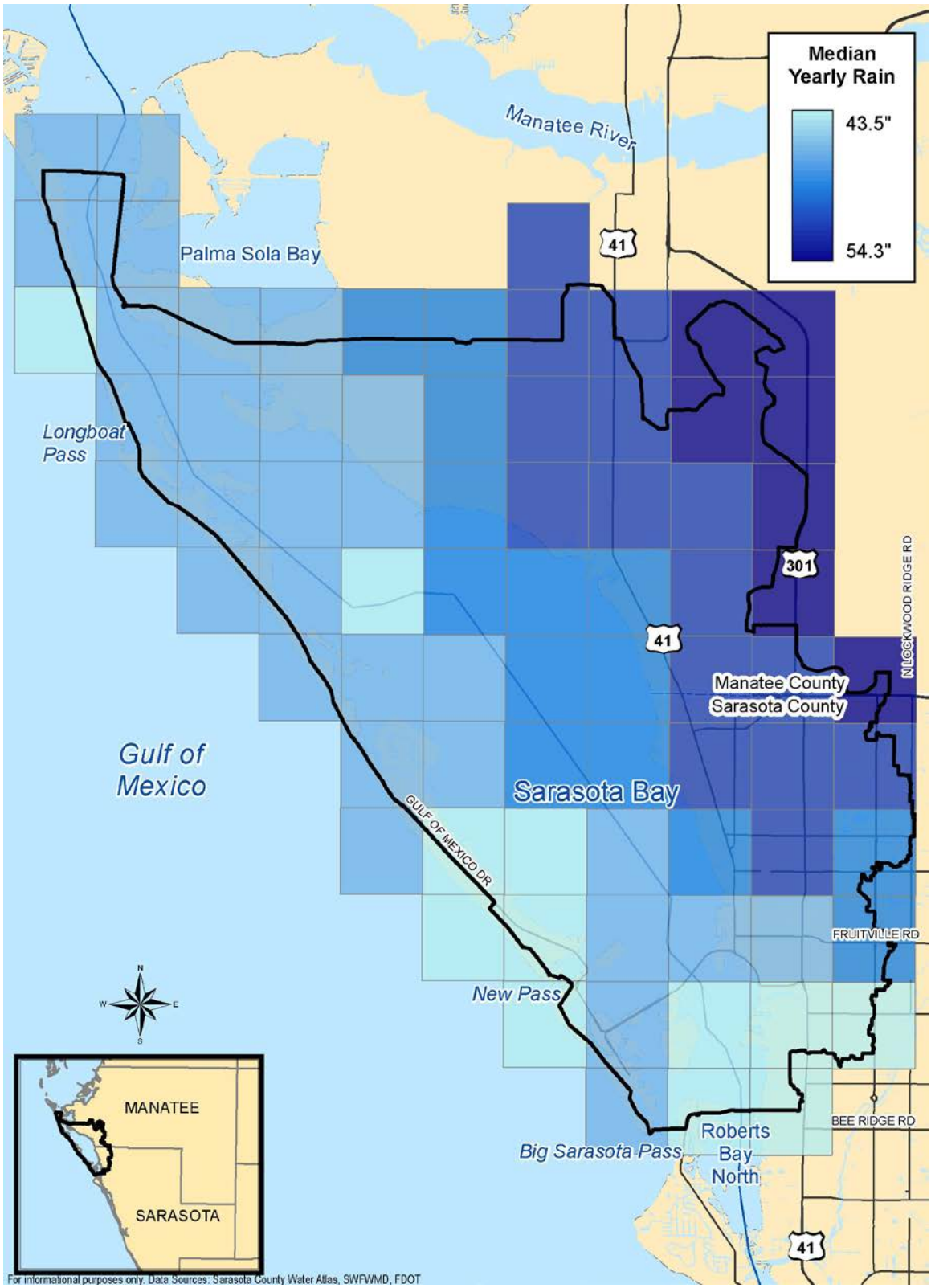


Figure 3-1 Median Annual Rainfall in Each of the Pixels Used in the Sarasota Bay SIMPLE Model

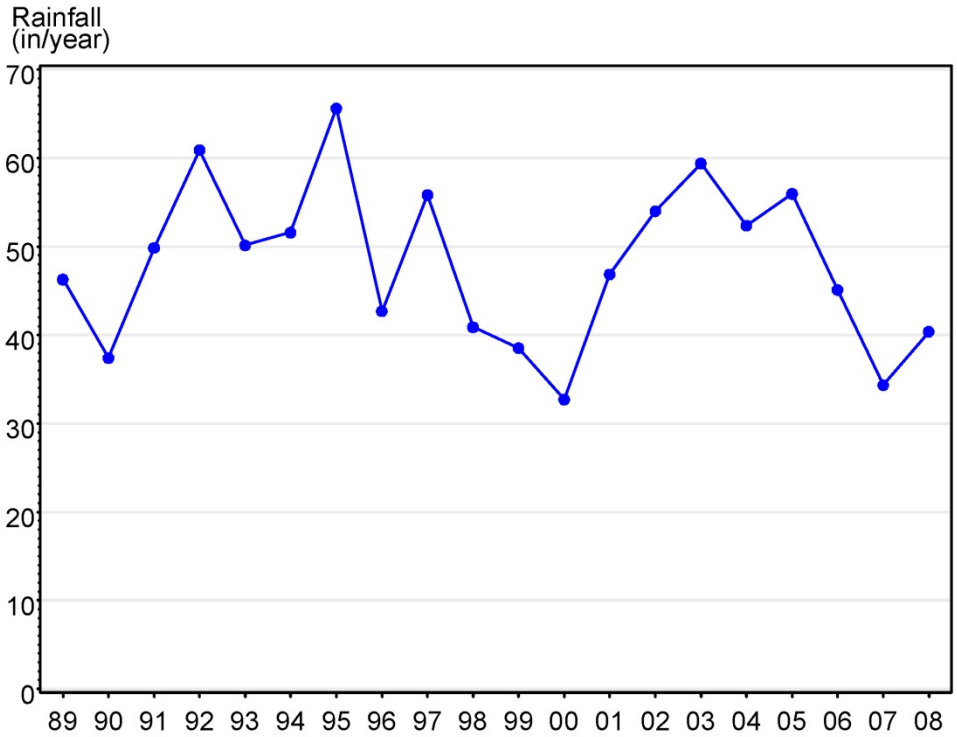


Figure 3-2 Total Annual Rainfall to Sarasota Bay and Its Watershed

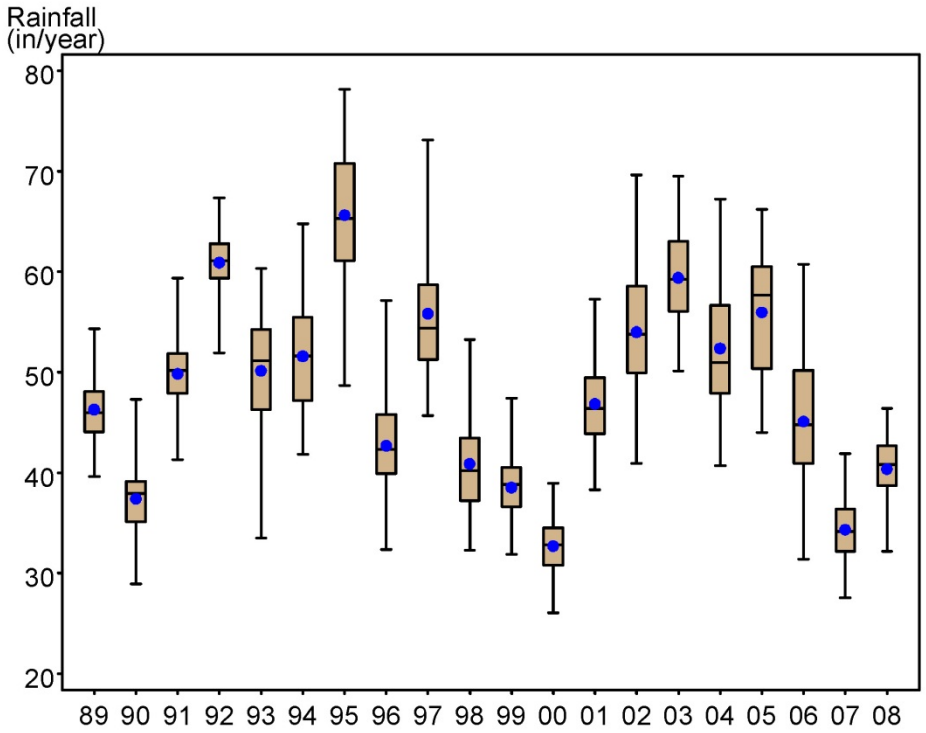


Figure 3-3 Variation in Total Annual Rainfall Among Pixels within Sarasota Bay and Its Watershed

3.2.3 Seasonal Variation

Figure 3-4 presents box-and-whisker plots of the monthly rainfall data used in the Sarasota Bay SIMPLE model. There is a distinct seasonal signal in precipitation in the watershed. As is typical of this region, June through September are significantly wetter than the other eight months. The four wet season months have average precipitation of between 6 and 8 inches, while the eight dry season months average between 2 to 3 inches, with at least one pixel showing zero rainfall for each dry month. The highest monthly rainfall of 28 inches occurred in June.

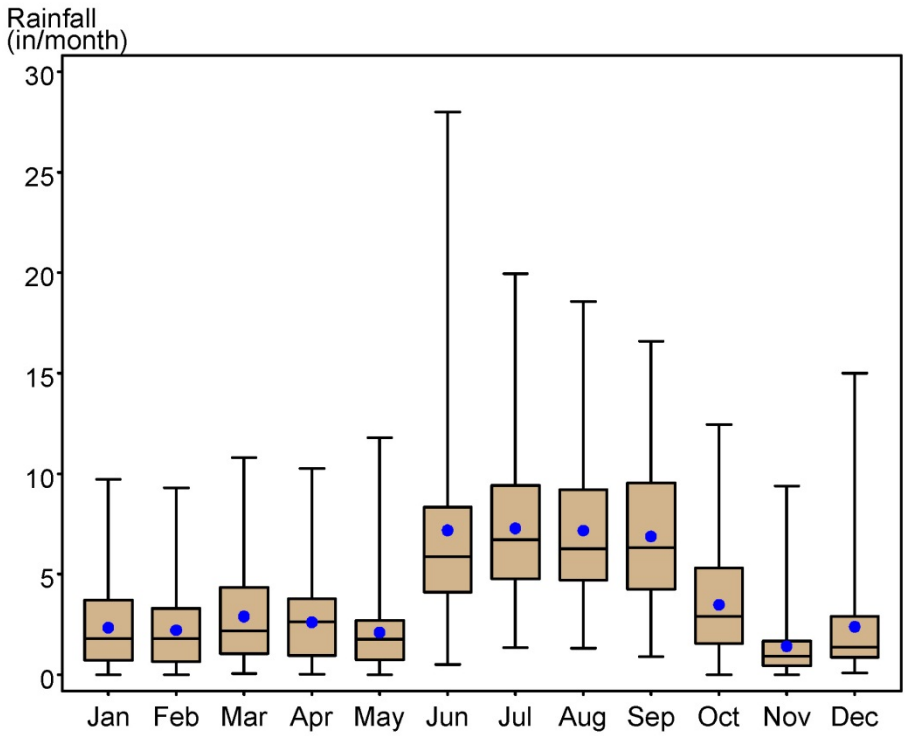


Figure 3-4 Variation in Total Monthly Rainfall to Sarasota Bay and its Watershed

3.3 HISTORICAL AND CURRENT FRESHWATER INPUTS

3.3.1 Total Freshwater Inputs

3.3.1.1 Annual

Figure 3-5 shows total annual freshwater inputs for historical and current conditions. Two patterns are evident. The first is that the freshwater inputs closely follow the precipitation pattern. Total current freshwater inputs range from around 100,000 acre-feet/year to over 200,000 acre-feet per year. The other pattern is that the current freshwater inputs are fairly uniformly larger (about 20%) than historical.

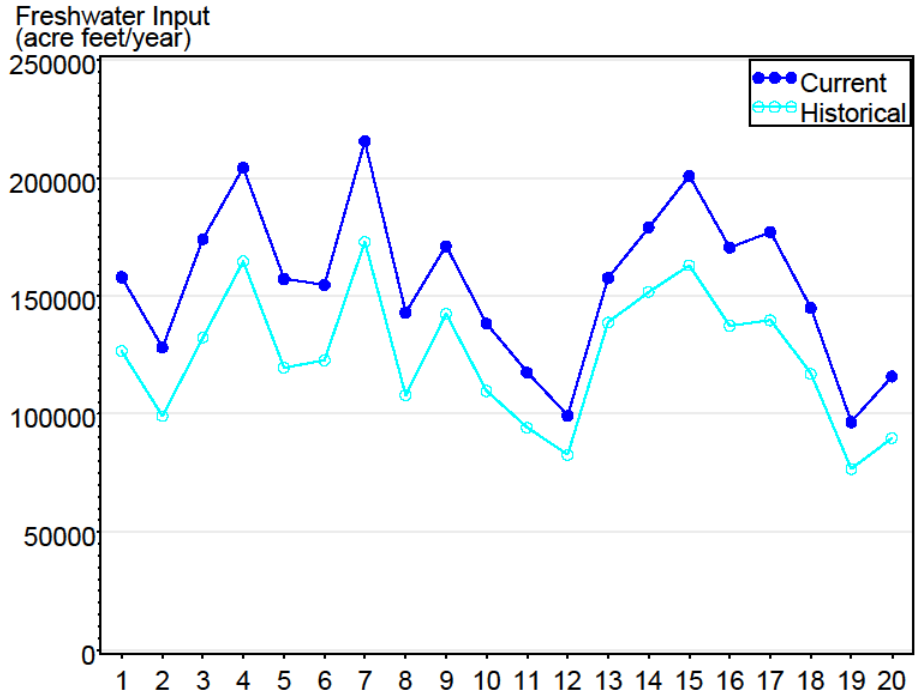


Figure 3-5 Annual Freshwater Inputs to Sarasota Bay Under Current and Historical Conditions

3.3.1.2 Seasonal

Figure 3-6 shows the seasonal variability in total freshwater inputs under historical and current conditions. This figure illustrates a similar wet-dry pattern for both time frames. June has the most extreme events, but months later in the wet season have the higher median inputs. There are no zero-flow months because precipitation-independent sources contribute to freshwater inputs each month.

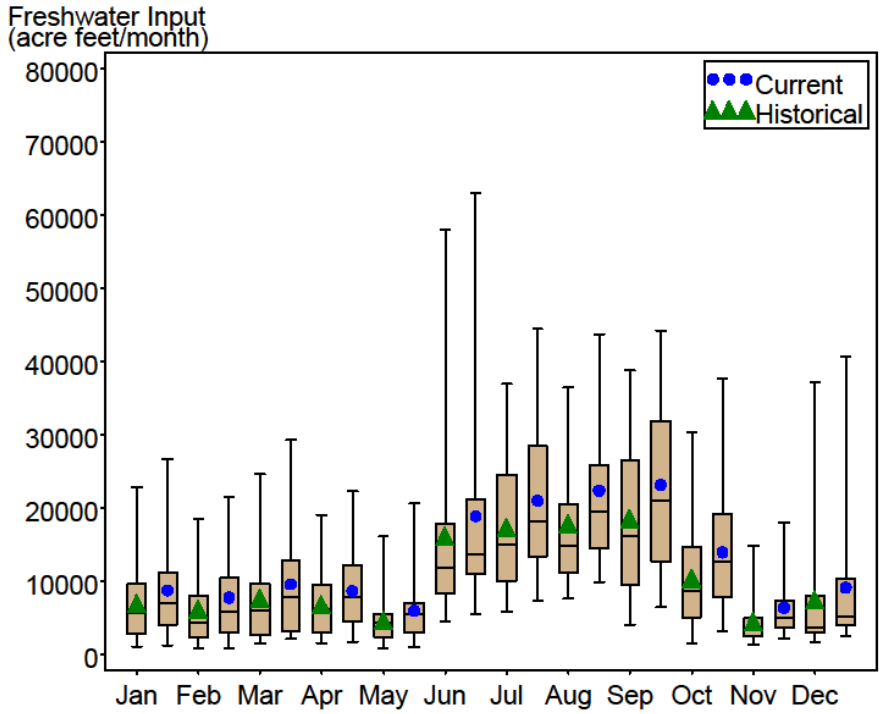


Figure 3-6 Seasonal Variation in Freshwater Inputs to Sarasota Bay under Current and Historical Conditions

3.3.1.3 Spatial

Figure 3-7 presents the changes in total freshwater inputs from each individual basin between the current and historical periods. The basin inputs reflect basin characteristics (e.g., land use, soils) and the size of the basin. The modest increase in inputs for most basins is not surprising, although the south portion of the watershed was already relatively developed in the 1950s.

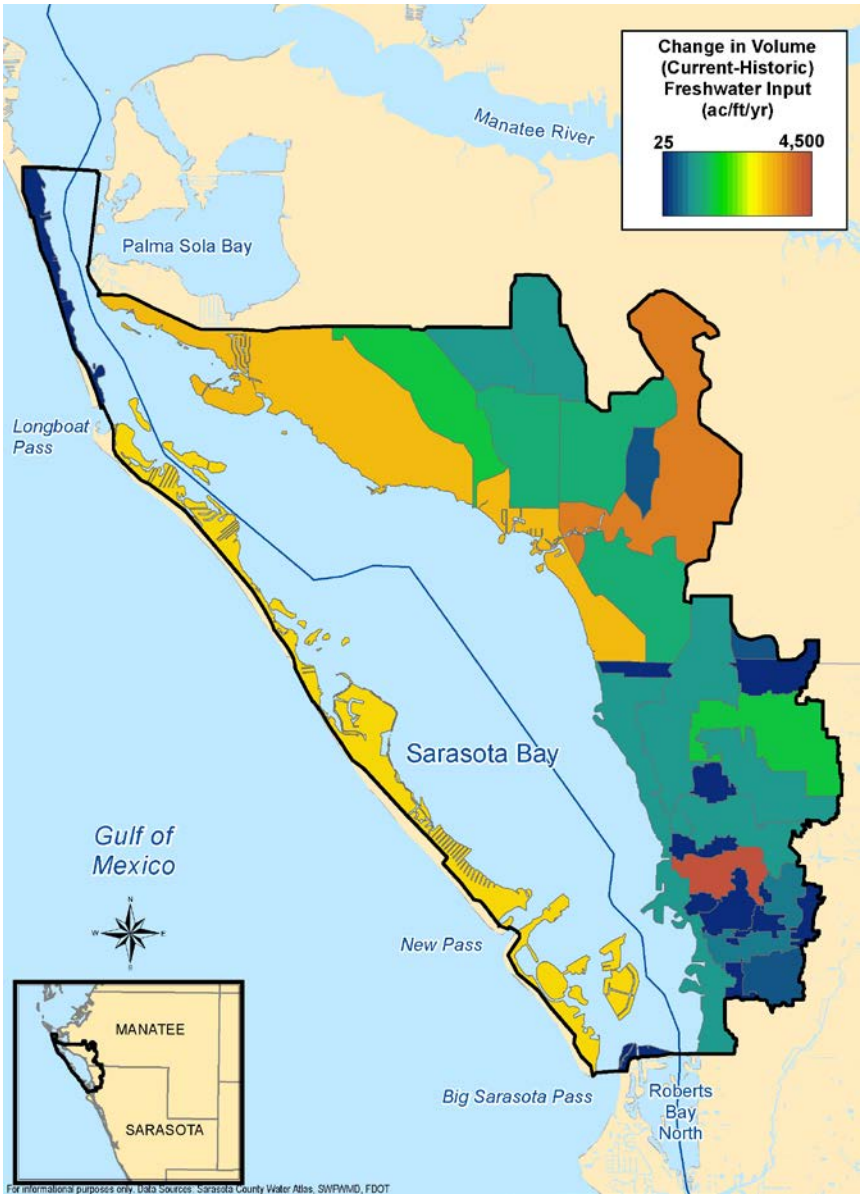


Figure 3-7 Change to Median Annual Freshwater inputs to Sarasota Bay from Basins within the Watershed from Current to Historical Conditions

3.3.1.4 Sources

Table 3-1 compares the sources of freshwater inputs to Sarasota Bay under historical and current conditions. Atmospheric deposition was the major source of freshwater to Sarasota Bay under both conditions. This is a reflection of the ratio of the area of the Sarasota Bay estuary to the area of the Sarasota Bay watershed. Baseflow and direct runoff were also significant contributors of freshwater under both conditions. Point-source inputs were greater under current conditions, reflecting the increased population served under current conditions.

Table 3-1 Current and Historical Freshwater Inputs (ac-ft/yr) to Sarasota Bay by Basin
Total does not include atmospheric deposition.

Period	Basin	Atmospheric Deposition	Base flow	Direct Runoff	Irrigation	Point Sources	Septic Tanks	Total
Current	Canal Road Drain	87,831	272	408	12	0	33	692
	Sarasota Bay Coastal North		3,977	4,380	253	0	0	8,750
	Palma Sola Drain - Bayshore		1,403	1,512	68	0	45	3,029
	Cedar Hammock Creek		3,260	3,244	113	0	238	6,855
	Bowlees Creek		7,036	7,835	205	0	374	15,450
	Longboat/Lido Key		2,156	2,753	161	0	45	5,115
	Sarasota Bay Coastal South		1,679	1820	54	0	0	3,563
	Whitaker Bayou		5,210	5,531	151	5,9740	329	16,939
	Hudson Bayou		2,538	2,810	67	0	9	5,424
	Siesta Key		74	63	4	0	1	141
	TOTAL		27,603	30,356	1,089	5,974	937	65,958
Historical	Canal Road Drain	87,831	188	267	0	0	12	467
	Sarasota Bay Coastal North		2,113	3,447	0	0	25	5,585
	Palma Sola Drain - Bayshore		732	755	0	0	0	1,487
	Cedar Hammock Creek		1,127	2,282	0	0	10	3,419
	Bowlees Creek		3,202	4,872	0	0	32	8,106
	Longboat/Lido Key		1,260	1,774	0	0	6	3,040
	Sarasota Bay Coastal South		130	140	0	0	0	270
	Whitaker Bayou		1,161	987	0	0	2	3,723
	Hudson Bayou		2,811	3,843	228	0	2	6,884
	Siesta Key		1,693	1,489	0	0	4	3,186
	TOTAL		14,417	19,856	228	0	93	36,167

Figure 3-8 presents the sources of freshwater inputs under current and historical conditions by year. The relative contributions were consistent across most years.

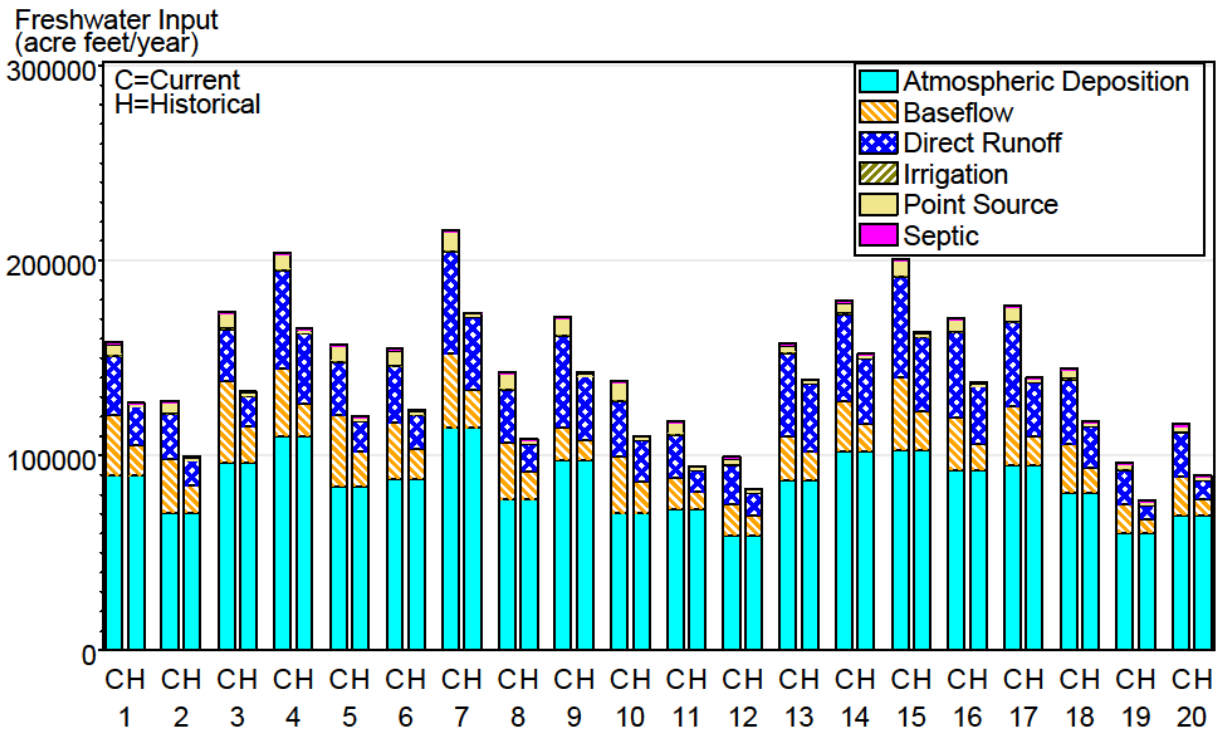


Figure 3-8 Sources of Freshwater Inputs to Sarasota Bay under Current and Historical Conditions

3.3.2 Comparison of Historical and Current Baseflow

3.3.2.1 Annual

Baseflow is shallow groundwater flow that continues even during periods of no precipitation. Figure 3-9 shows annual baseflow freshwater inputs for historical and current conditions. Two patterns are evident. The first is that the freshwater inputs closely follow the precipitation pattern. Total current freshwater inputs range from around 15,000 acre-feet/year to over 40,000 acre-feet per year. The other pattern is that, unlike total inflows, the current freshwater inputs are larger than historical but the difference is not uniform and varies from almost 50% higher during low flows to over 100% during high flows.

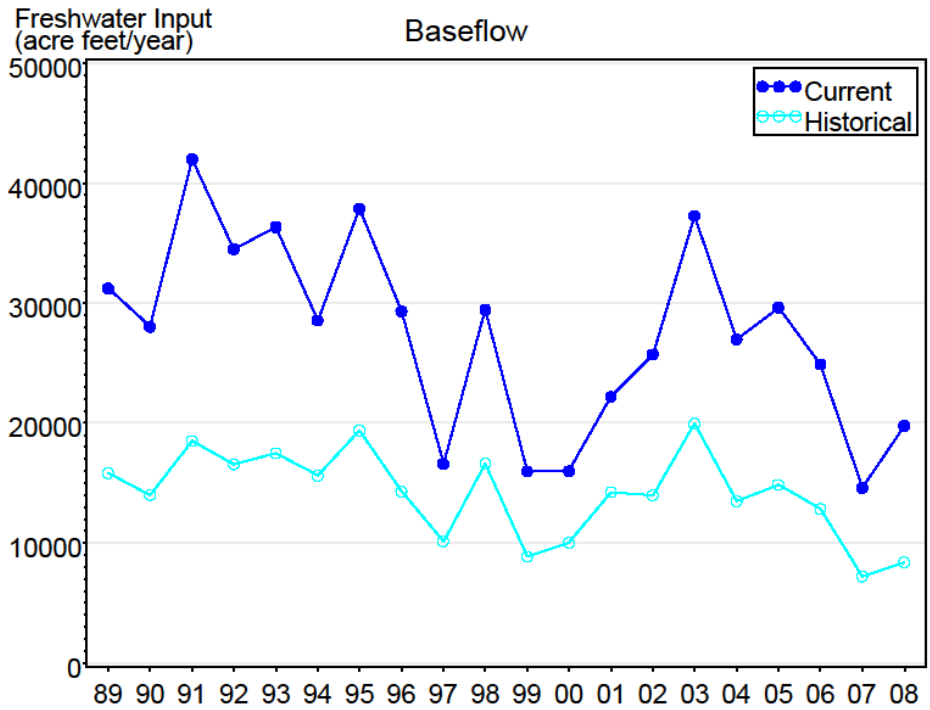


Figure 3-9 Annual Baseflow Freshwater Inputs to Sarasota Bay Under Current and Historical Conditions

3.3.2.2 Seasonal

Figure 3-10 shows the seasonal variability in baseflow freshwater inputs under historical and current conditions. In the figure, the symbol in the box (circle and triangle) represents the mean value for that month and the horizontal line is the median. The closer the symbol and line are, the more normally distributed the data are. The top and bottom of the vertical lines (whiskers) represent the highest and lowest values for that month, respectively.

Like surface runoff, baseflow is driven by rainfall and shows a distinct seasonal pattern. However, the hydrological processes involving baseflow include precipitation infiltrating the shallow water table and subsequent subsurface flow of the groundwater until it discharges into a stream or canal channel. This produces a lag effect in the expression of the baseflow, illustrated in Figure 3-10 by the low June values, increasing baseflows during July, August, and September, and a slow decline for several months after as the water table levels drop when the wet season ends. Current monthly baseflows vary from a low of about 1,200 acre-feet/month in May to a high of over 4,000 acre-feet/month in September. Historical baseflows are lower, ranging from under 1,000 acre-feet/month to just over 2,000 acre-feet/month in September.

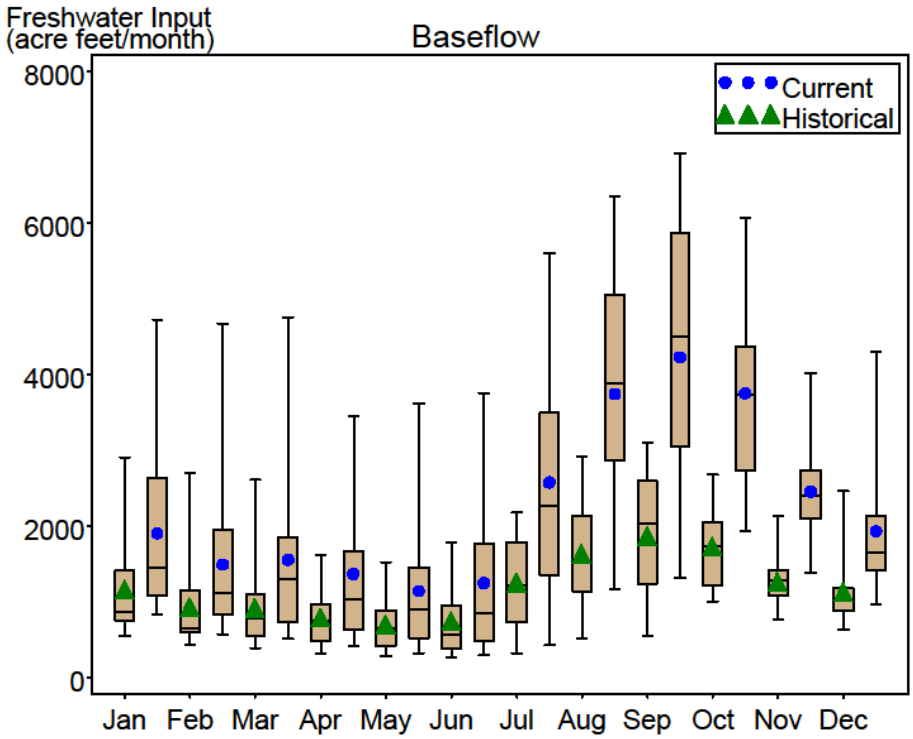


Figure 3-10 Seasonal Variation in Baseflow Freshwater Inputs to Sarasota Bay Under Current and Historical Conditions

3.3.2.3 Spatial

Figure 3-11 presents the changes to baseflow freshwater inputs from each individual basin between historical and current conditions. The volume of baseflow is mainly a reflection of basin size, although land use also accounts for spatial variation. However, in general the larger basins in the north portion of the watershed produce greater volumes of baseflow.

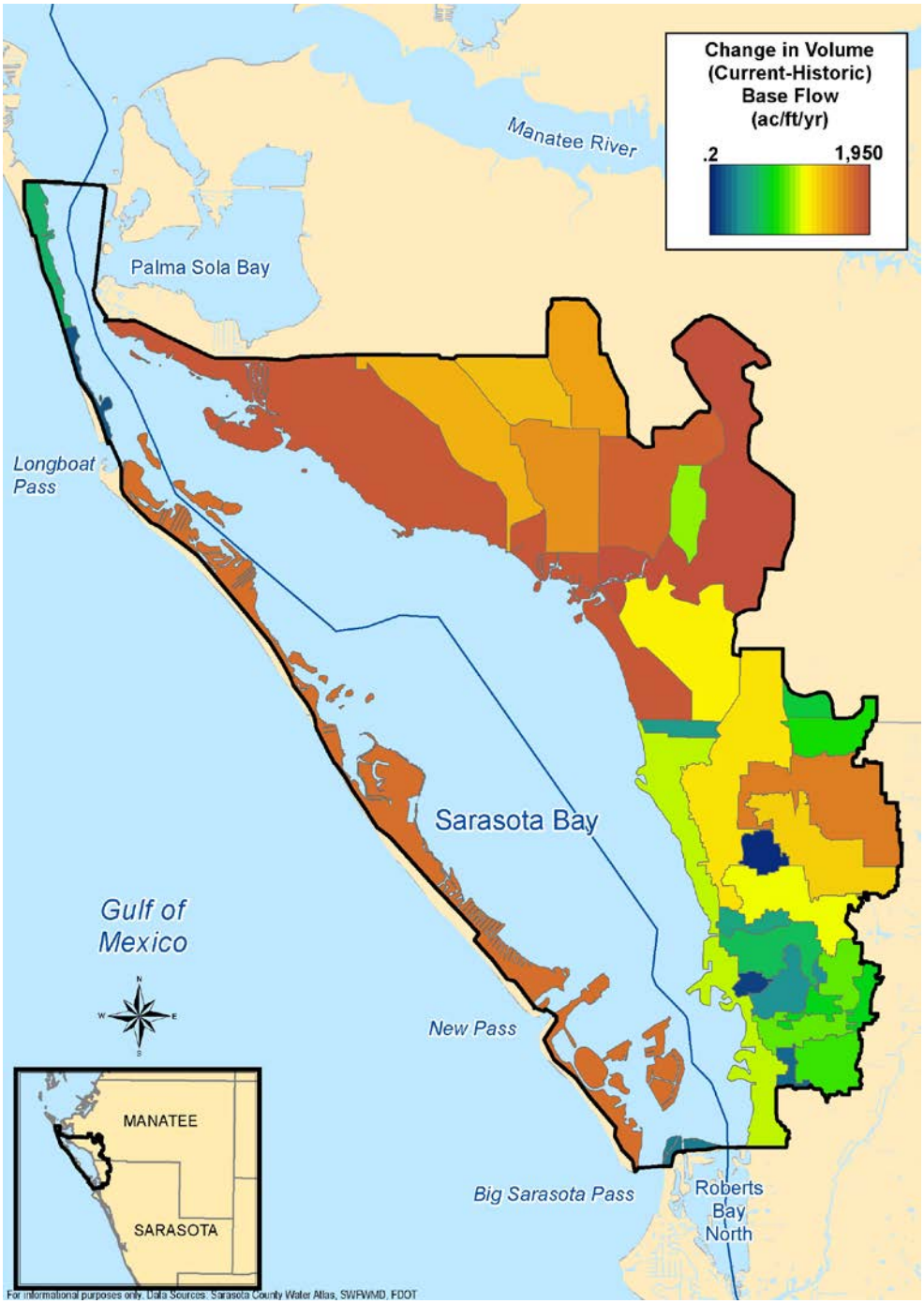


Figure 3-11 Baseflow Freshwater Inputs (acre-feet/year) to Sarasota Bay from Basins within the Watershed

Figure 3-12 presents the change in baseflow freshwater inputs from each of the individual basins corrected for basin area between the periods. Using the unit-area inputs (acre-feet/acre/year) allow large and small basins to be compared on an equivalent basis. Unit loads reflect normalized spatially-specific characteristics to be contrasted. In this case, land use is the dominant feature that affects base flow.

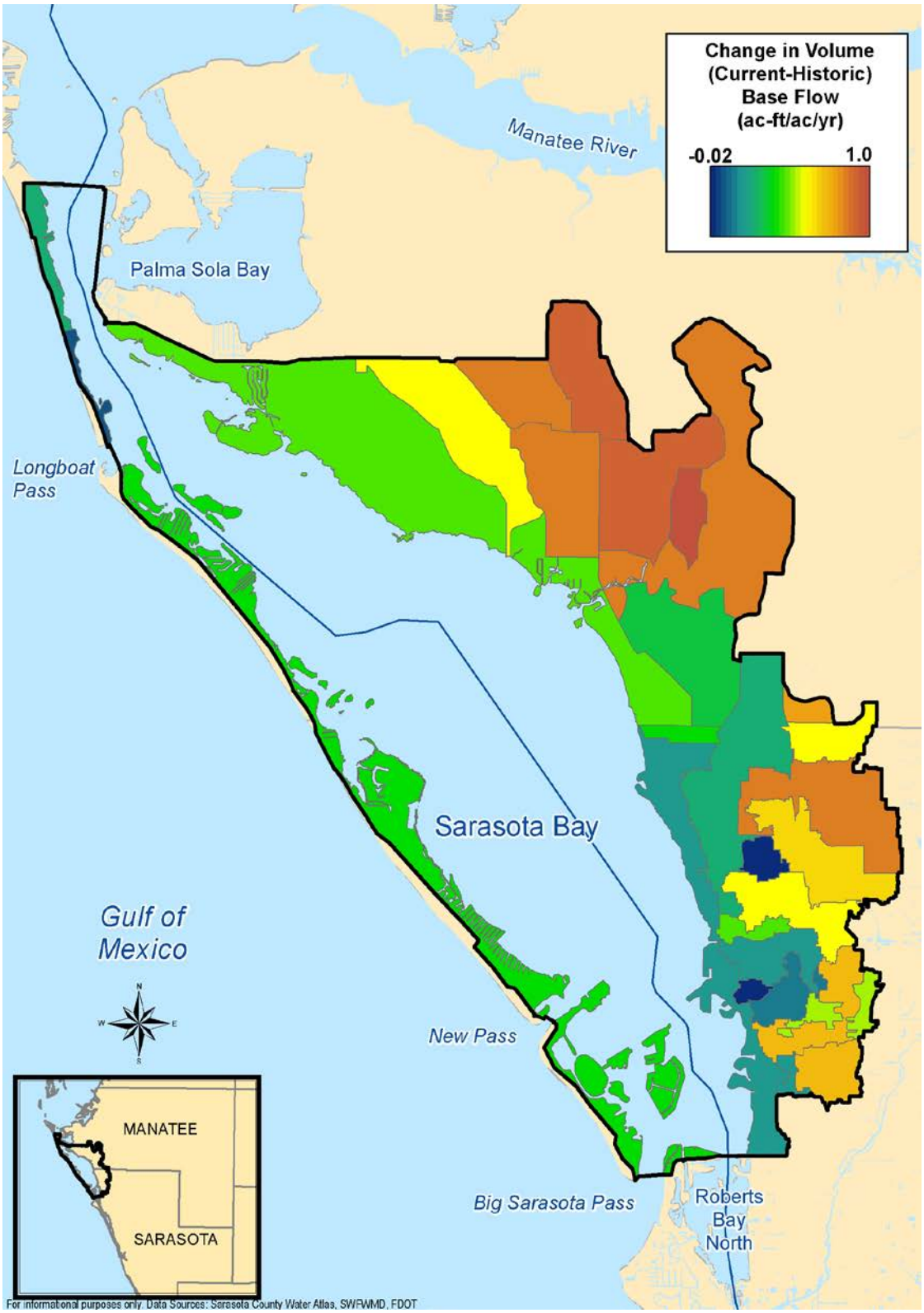


Figure 3-12 Change in Unit-Area Baseflow Freshwater Inputs (acre-feet/acre/year) to Sarasota Bay from Basins within the Watershed between Historical and current Conditions

3.3.3 Comparison of Historical and Current Direct Runoff

3.3.3.1 Annual

Figure 3-13 shows annual direct runoff freshwater inputs for historical and current conditions. Runoff occurs as a result of precipitation, so the annual runoff is a function of annual rainfall. Years of higher rainfall in general produce higher annual runoff values. Current annual runoff ranges from under 20,000 acre-feet/year (2007) to over 50,000 acre-feet/year (2003). Historical annual runoff is lower than under current conditions but follows the same patterns, as the same precipitation was used for both scenarios. Historical annual runoff varied from a low of under 10,000 acre-feet/year to a high of 38,000 acre-feet/year.

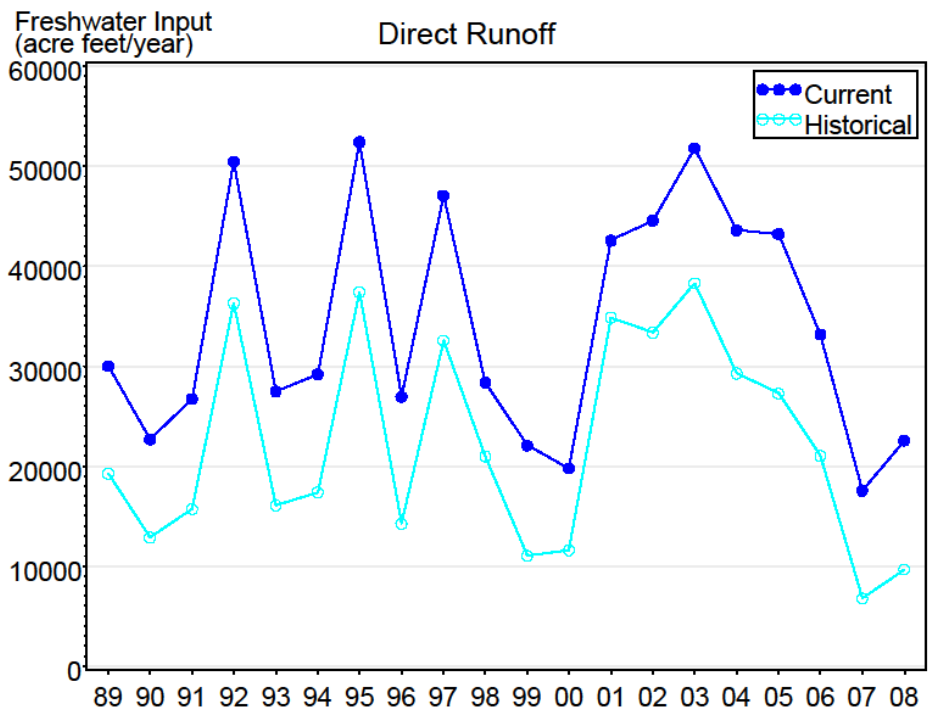


Figure 3-13 Annual Direct Runoff Freshwater Inputs to Sarasota Bay Under Current and Historical Conditions

3.3.3.2 Seasonal

Figure 3-14 shows the seasonal variability in direct runoff freshwater inputs under historical and current conditions. Runoff shows a typical seasonal pattern for both scenarios with higher monthly values during the wet season and drier values during the dry season. Current monthly values range from 6,000 acre-feet/month in September to a low of less than 1,000 acre-feet/month in May. Historical values range from almost 5,000 acre-feet/month in September to a few hundred acre-feet/month in May. The June mean and median values are well-separated. This

indicates that a few extreme events (high value of 25,000 acre-feet/month) skew the distribution of the monthly values.

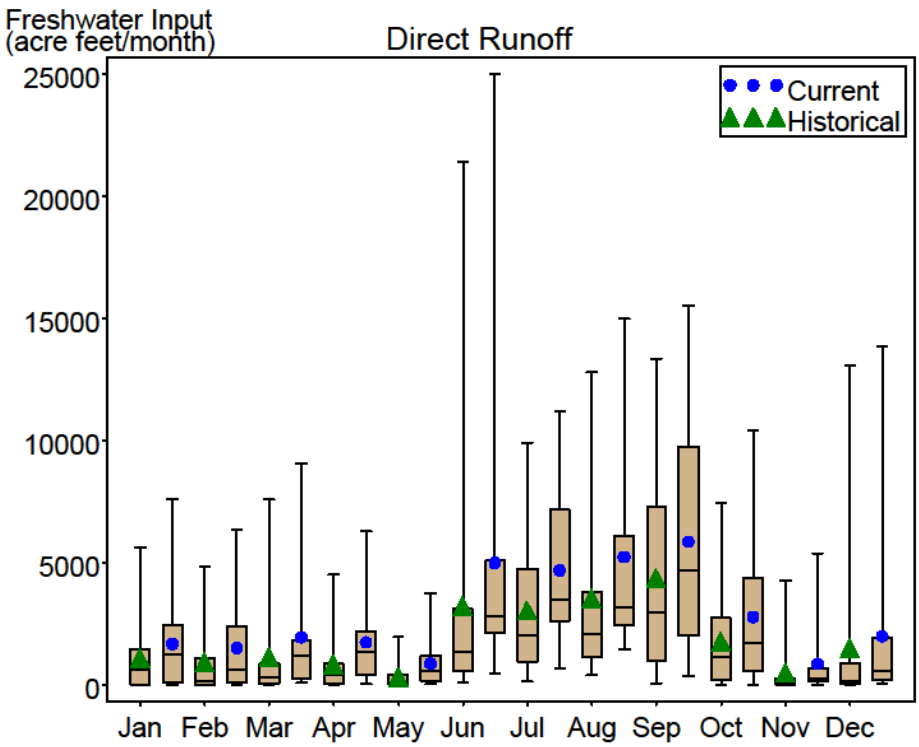


Figure 3-14 Seasonal Variation in Direct Runoff Freshwater Inputs to Sarasota Bay Under Current and Historical Conditions

3.3.3.3 Spatial

Figure 3-15 presents the change to direct runoff freshwater inputs from each individual basin between the historical and current periods. Like baseflow, the total runoff volume for a basin is determined largely by the basin size but also by land use and other factors. Figure 3-15 shows the most runoff originating in the largest basins for current and historical conditions.

Figure 3-16 presents the change to direct runoff freshwater inputs from each individual basin corrected for basin area between current and historical periods. As with baseflow, using the unit-area runoff allows runoff from different size basins to be compared on an equal basis. In this case, land use is the main basin characteristic that affects unit-area runoff, with urbanized basins generating more runoff per acre than undeveloped basins. Some of the largest unit-area volumes are generated by the smaller basins.

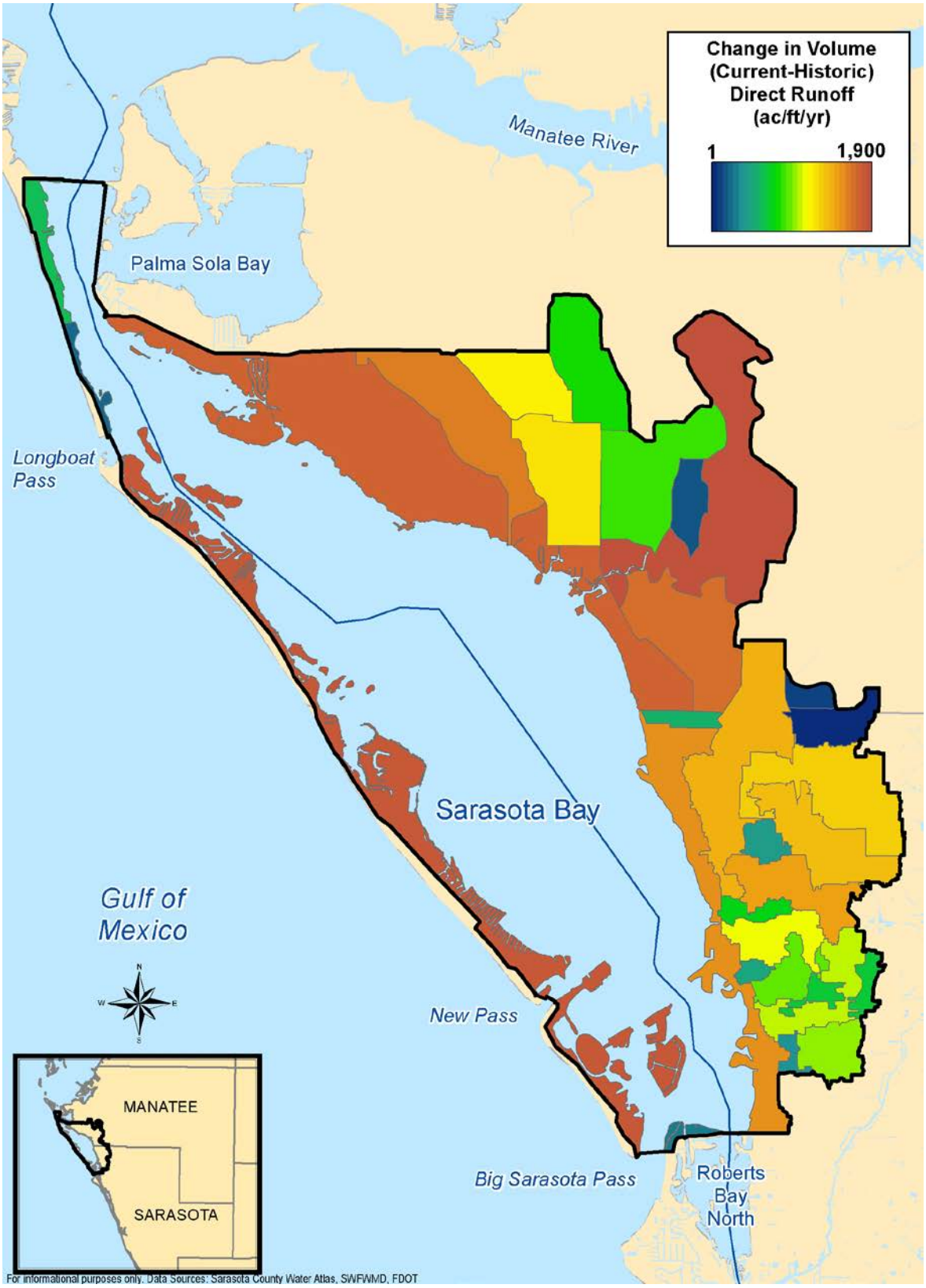


Figure 3-15 Change to Direct Runoff Freshwater Inputs (acre-feet/year) to Sarasota Bay from Basins within the Watershed between Historical and Current Conditions

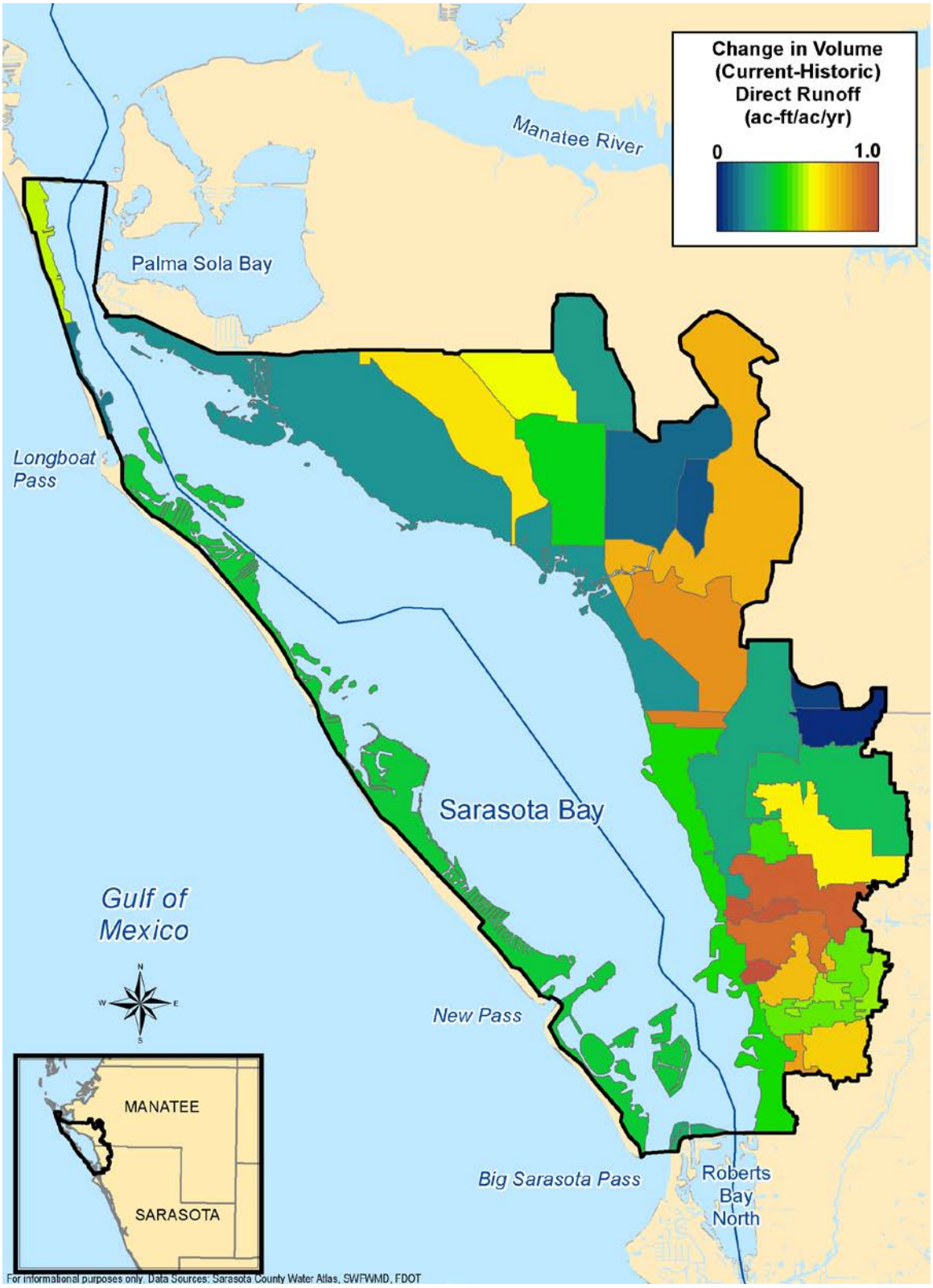


Figure 3-16 Change to Unit-Area Direct Runoff Freshwater Inputs (acre-feet/acre/year) to Sarasota Bay from Basins within the Watershed between Historical and Current Conditions

3.3.4 Rainfall-Freshwater Input Relationships

3.3.4.1 Total Freshwater Inputs

Figure 3-17 presents the ratio of total annual freshwater inputs to annual rainfall derived from the historical and current SIMPLE model runs. The relationship is relatively linear, with more precipitation generating more runoff in both scenarios.

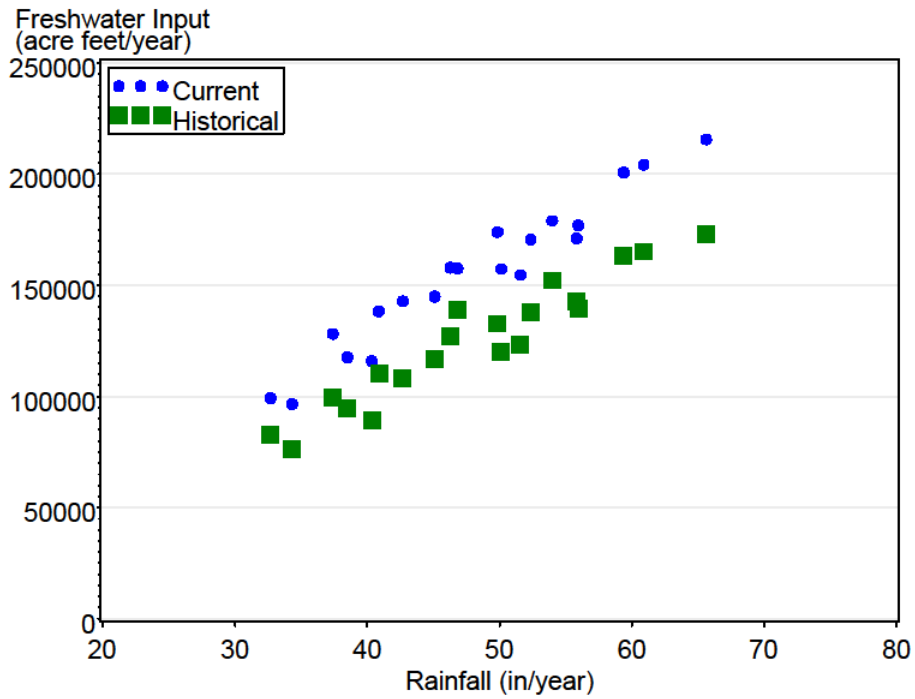


Figure 3-17 Ratio of Total Freshwater Inputs to Total Rainfall in the Sarasota Bay Estuary and Watershed for Current and Historical Conditions

3.3.4.2 Direct Runoff Freshwater Inputs

Figure 3-18 presents the ratio of annual direct runoff freshwater inputs to annual rainfall derived from the historical and current SIMPLE model runs. In the Sarasota Bay watershed, the relationship of precipitation to runoff is generally the same as for precipitation and total runoff. Higher runoff per rainfall unit reflects higher levels of urbanization in the watershed. Also, the relationship shows that runoff is the dominant source of freshwater inputs to the bay.

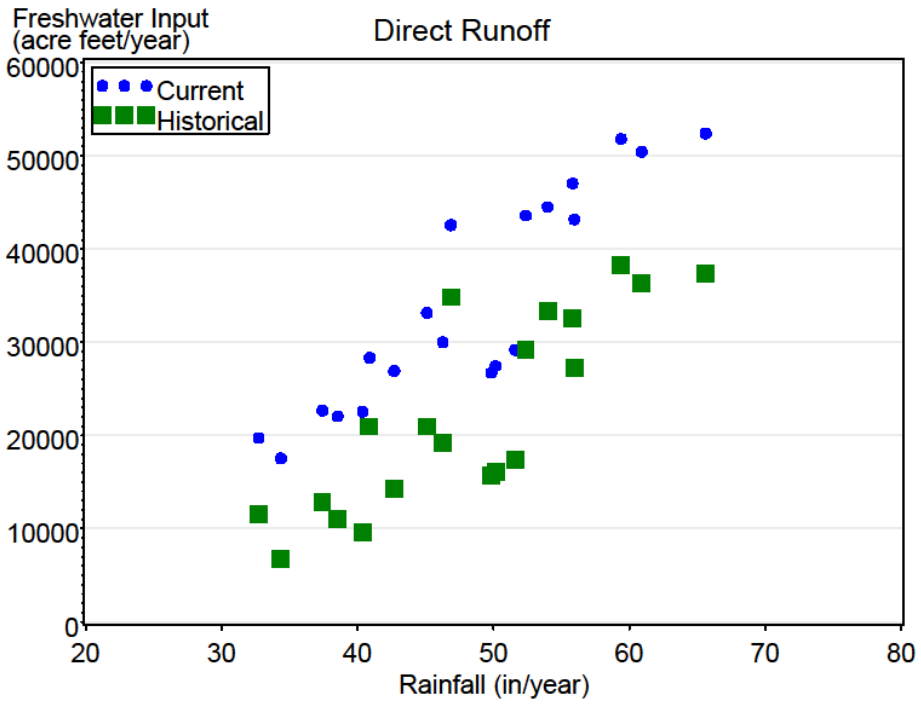


Figure 3-18 Ratio of Direct Runoff Freshwater Inputs to Total Rainfall in the Sarasota Bay Estuary and Watershed for Current and Historical Conditions

3.4 CURRENT AND FUTURE FRESHWATER INPUTS

3.4.1 Total Freshwater Inputs

3.4.1.1 Annual

Figure 3-19 shows total annual freshwater inputs for current and future conditions. Freshwater inputs closely follow the trend for precipitation depicted in Figure 3-2. Total freshwater inputs range from approximately 100,000 acre-feet/year to 225,000 acre-feet per year. There is very little difference between future and current freshwater loads.

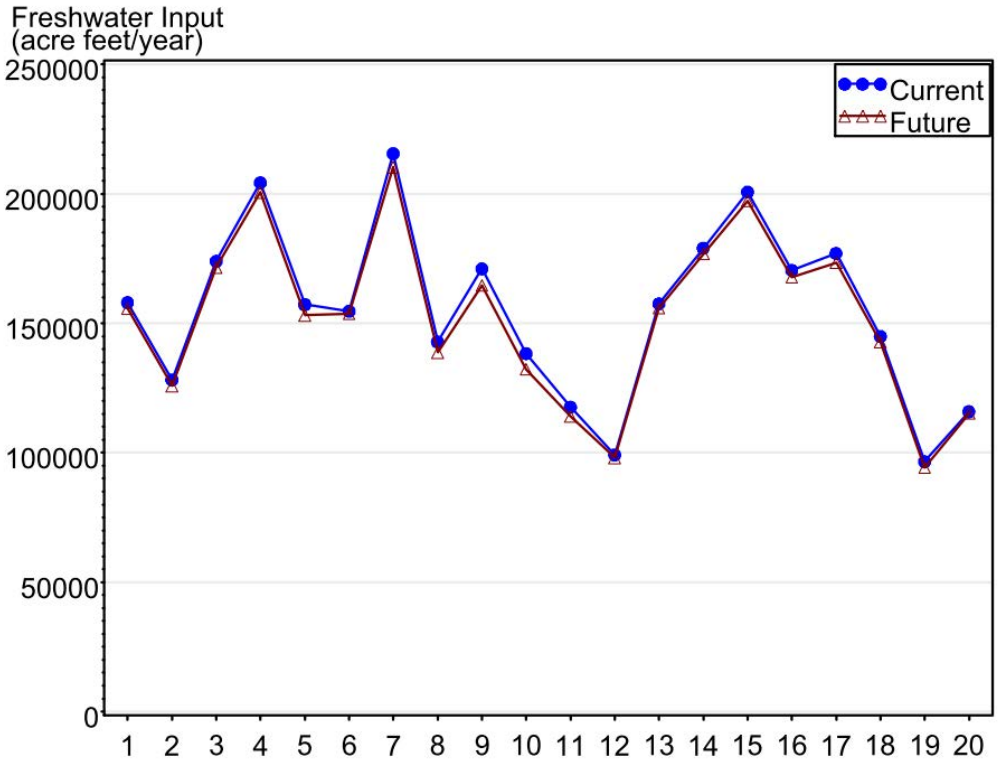


Figure 3-19 Annual Freshwater Inputs to Sarasota Bay under Current and Future Conditions

3.4.1.2 Seasonal

Figure 3-20 shows the seasonal variability in total freshwater inputs under current and future conditions. This figure illustrates a similar wet-dry pattern for both time frames. June has the most extreme events, but months later in the wet season have the higher median inputs. There are no zero-flow months because precipitation-independent sources contribute to freshwater inputs each month.

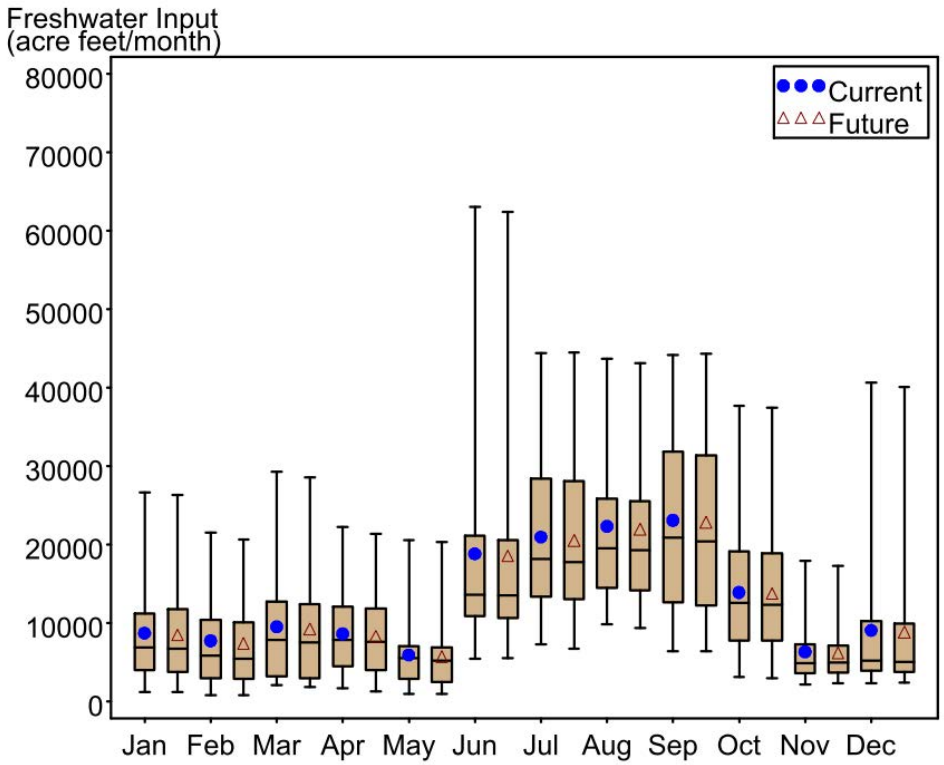


Figure 3-20 Seasonal Variation in Freshwater Inputs to Sarasota Bay under Current and Future Conditions

3.4.1.3 Spatial

Figure 3-21 presents the change in total freshwater inputs by basin between the current and future conditions. Basin inputs are a result of the composition of land use and soils within the basin as well as basin size. For the most part, there is little change in total freshwater inputs from current to future conditions with the exception of the cessation of point source discharges to Whitaker Bayou. This reflects the present high level of urbanization within the watershed and the low potential for any significant increase in urban development.

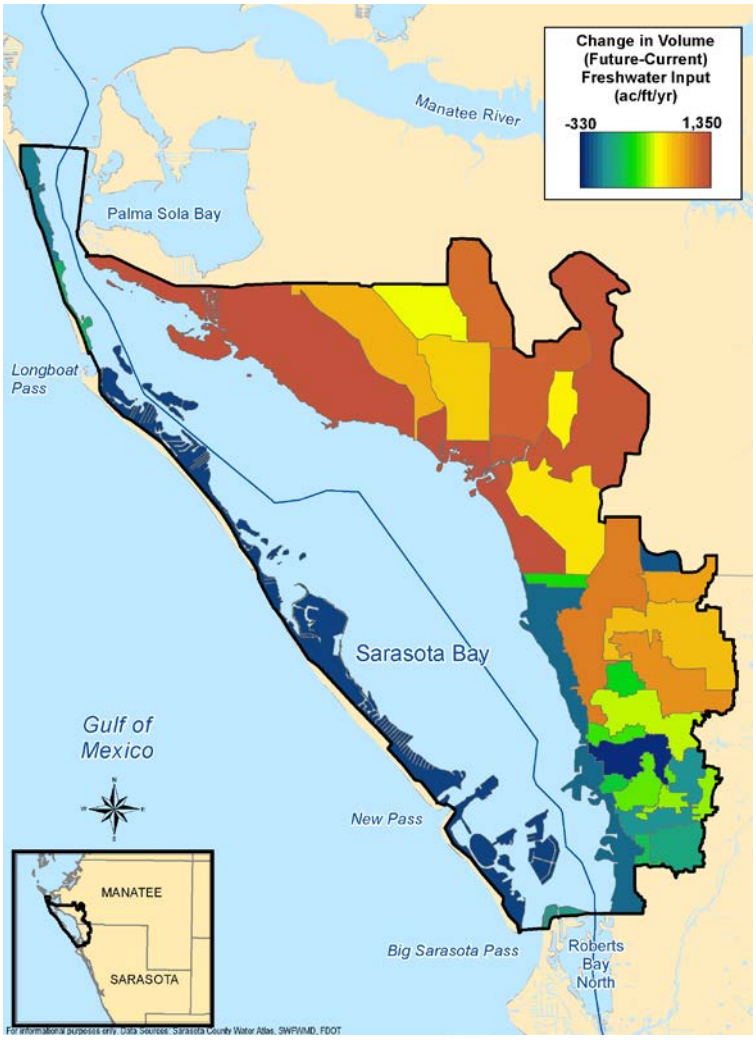


Figure 3-21 Change in Median Annual Freshwater Inputs to Sarasota Bay from the Various Basins within the Sarasota Bay Watershed Between Current and Future Conditions

3.4.1.4 Sources

Table 3-2 compares the sources of freshwater inputs to Sarasota Bay under current and future conditions. Atmospheric deposition was the major source of freshwater to Sarasota Bay under current and future conditions. This is a reflection of the ratio of the area of the Sarasota Bay estuary to the area of the Sarasota Bay watershed. Baseflow and direct runoff were also significant contributors of freshwater under both conditions. Point-source inputs were greater under the current conditions, reflecting the transition of the City of Sarasota plant from surface water discharges to deep-well injection and reuse irrigation under future conditions.

Figure 3-22 presents the sources of freshwater inputs under current and future conditions by year. The relative contributions of each source, except point source, were slightly higher under future conditions compared to current estimates of freshwater inputs.

Table 3-2 Current and Future Freshwater Inputs (ac-ft/yr) to Sarasota Bay by Basin
Total does not include atmospheric deposition.

Period	Basin	Atmospheric Deposition	Base flow	Direct Runoff	Irrigation	Point Sources	Septic Tanks	Total
Current	Canal Road Drain	87,831	272	408	12	0	33	692
	Sarasota Bay Coastal North		3,977	4,380	253	0	0	8,750
	Pala Sola Drain - Bayshore		1,403	1,512	68	0	45	3,029
	Cedar Hammock Creek		3,260	3,244	113	0	238	6,855
	Bowlees Creek		7,036	7,835	205	0	374	15,450
	Longboat/Lido Key		2,156	2,753	161	0	45	5,115
	Sarasota Bay Coastal South		1,679	1820	54	0	0	3,563
	Whitaker Bayou		5,210	5,531	151	5,974	329	16,939
	Hudson Bayou		2,538	2,810	67	0	9	5,424
	Siesta Key		74	63	4	0	1	141
	TOTAL		27,603	30,356	1,089	5,974	937	65,958
Future	Canal Road Drain	87,831	275	400	12	0	0.3	687
	Sarasota Bay Coastal North		4,909	4,641	337	0	141	10,027
	Pala Sola Drain - Bayshore		1,446	1,535	72	0	45	3,098
	Cedar Hammock Creek		3,322	3,257	118	0	238	6,935
	Bowlees Creek		7,377	8,002	229	0	374	15,983
	Longboat/Lido Key		2,345	2,743	166	0	45	5,299
	Sarasota Bay Coastal South		1,772	1,770	55	0	10.4	3,607
	Whitaker Bayou		5,747	5,914	169	0	72	11,902
	Hudson Bayou		2,615	2,902	71	0	8.6	5597
	Siesta Key		81	62	4.0	0	0.5	148
	TOTAL		29,891	31,226	1,233	0	935	63,284

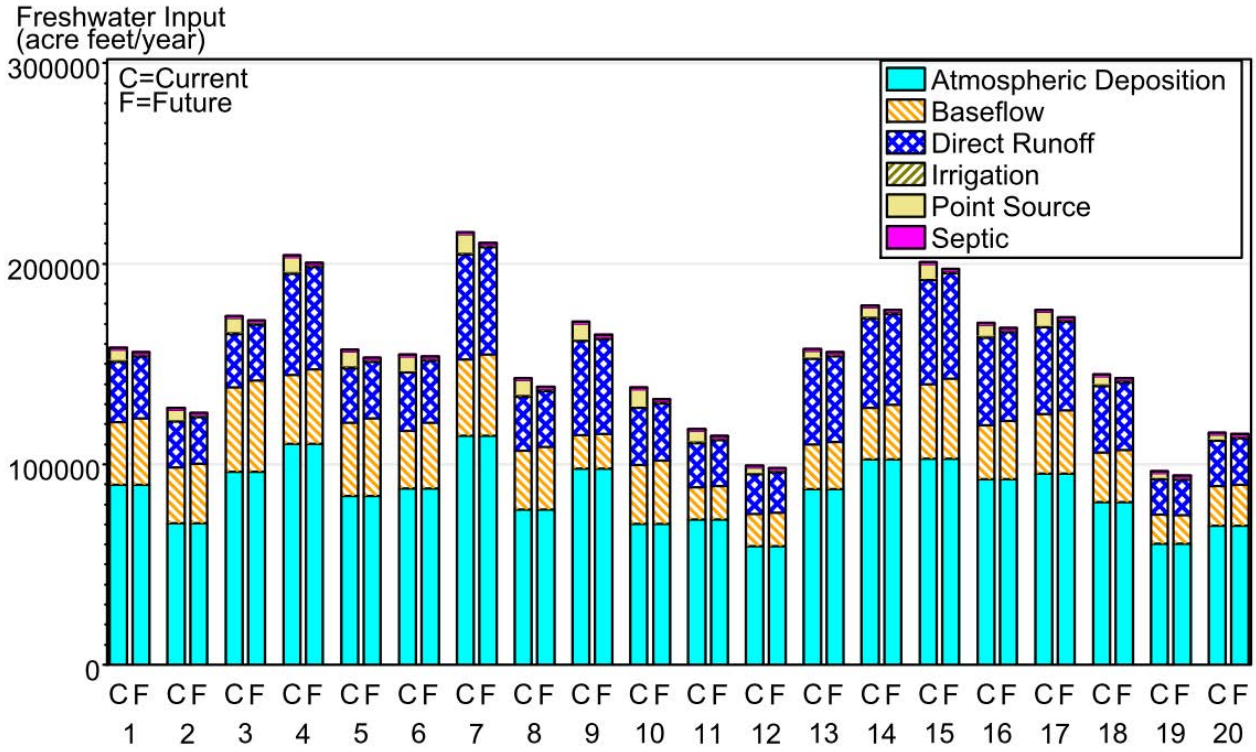


Figure 3-22 Sources of Freshwater Inputs to Sarasota Bay Under Current and Future Conditions

3.4.2 Comparison of Current and Future Freshwater Inputs from Baseflow

3.4.2.1 Annual

Baseflow is shallow groundwater flow that continues even during periods of no precipitation. Figure 3-23 shows annual baseflow freshwater inputs for current and future conditions are. Baseflow is greater under future watershed conditions, although the increase is <10% of current loads. As with total freshwater inputs, baseflow volumes reflect the annual variation in precipitation shown in Figure 3-2.

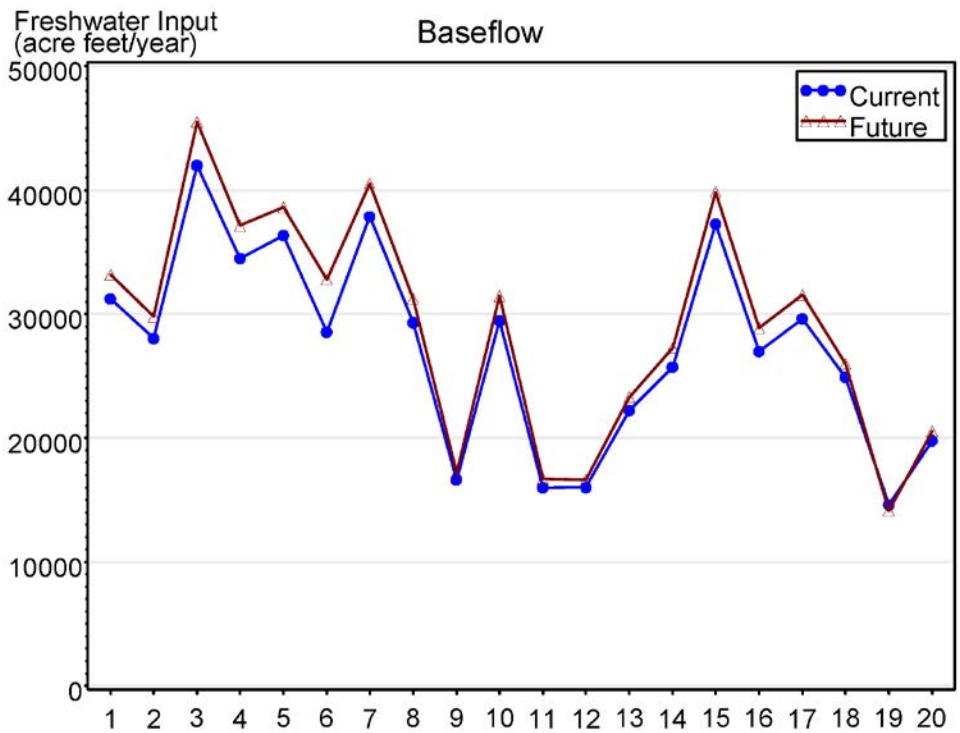


Figure 3-23 Annual Baseflow Freshwater Inputs to Sarasota Bay Under Current and Future Conditions

3.4.2.2 Seasonal

Figure 3-24 shows seasonal variability in freshwater inputs from baseflow under current and future conditions. In the figure, the symbol in the box (the circle and triangle) represents the mean value for that month and the horizontal line is the median. The closer the symbol is to the median line, the more normally distributed the data are. Vertical lines (whiskers) represent the highest and lowest values for the month.

Baseflow is driven by rainfall and exhibits distinct seasonality with greater baseflow during the wet months of June through September compared to the drier months of October through May. A lag effect is observed as a result of the time required for precipitation to infiltrate the shallow water table and discharge to surface waters. This lag effect is apparent in Figure 3-24 as low June values; increasing baseflow during July, August, and September; and a slow decline for several months following the peak wet season as the water table drops and returns to dry-season levels. Current and future monthly baseflows are similar during most months but are slightly higher during the wet season for future conditions compared to current freshwater loads. Baseflow varies from a minimum of about 500 acre-feet/month in June to a maximum of over 7,000 acre-feet/month in September. Mean monthly baseflow varied between the wet and dry seasons and ranged from approximately 1,000 to 4,500 acre feet/month during current and future conditions.

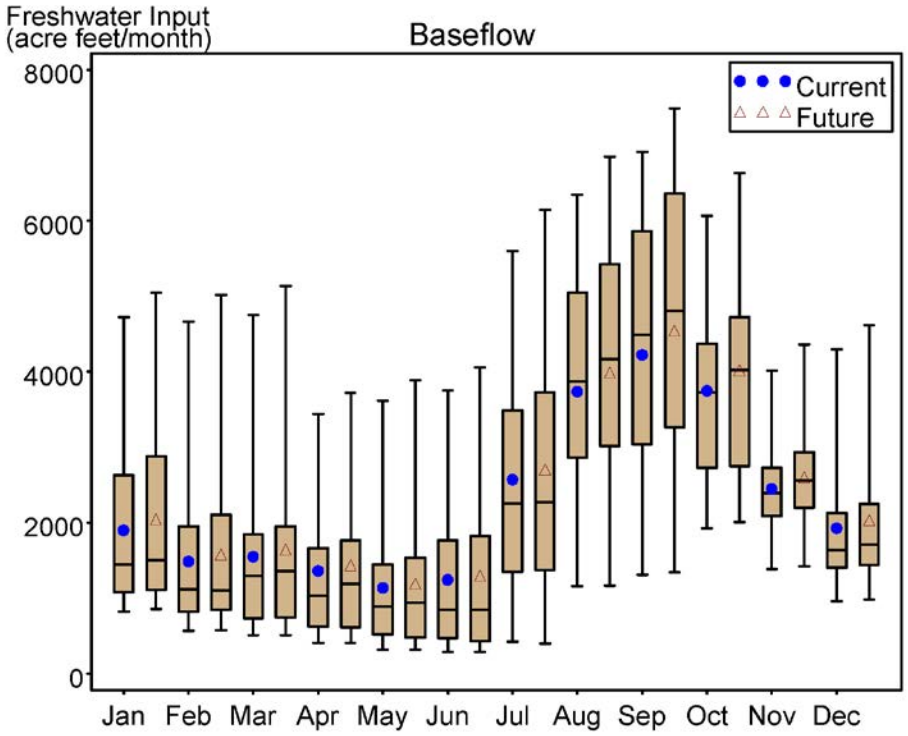


Figure 3-24 Seasonal Variation in Baseflow Freshwater Inputs to Sarasota Bay Under Current and Future Conditions

3.4.2.3 Spatial

Figure 3-25 presents changes to the freshwater inputs contributed by baseflow between the current and future periods. In both periods, baseflow is mainly a function of basin size, although land use and soil type also account for some of the observed spatial variation. In general, larger basins in the northern portion of the watershed exhibit greater volumes of baseflow. As with total freshwater inputs, there is little change from current to future conditions, again reflecting the present high level of urbanization within the watershed and the low potential for any significant increase in urban development. The most prominent increases in total freshwater inputs appear to be in the coastal basins.

Figure 3-26 illustrates changes to the unit-area-corrected freshwater inputs contributed by baseflow between the current and future periods. When baseflow is standardized for basin size, more apparent increases in freshwater inputs are observable. Again, coastal basins appear to have the largest increase in baseflow from the current to future conditions.

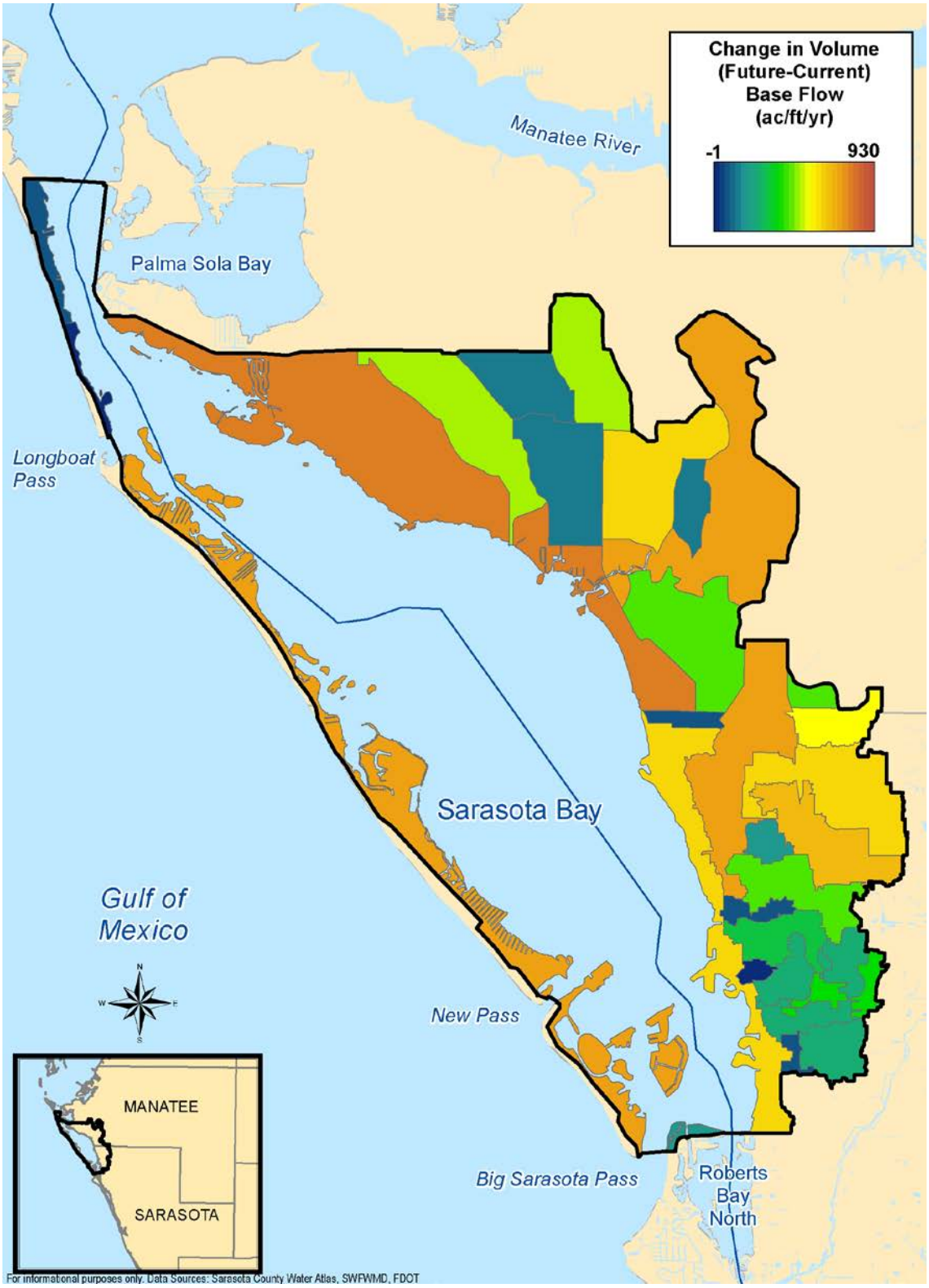


Figure 3-25 Changes to Freshwater Inputs from Baseflow (acre-feet/year) to Sarasota Bay between Current and Future Conditions

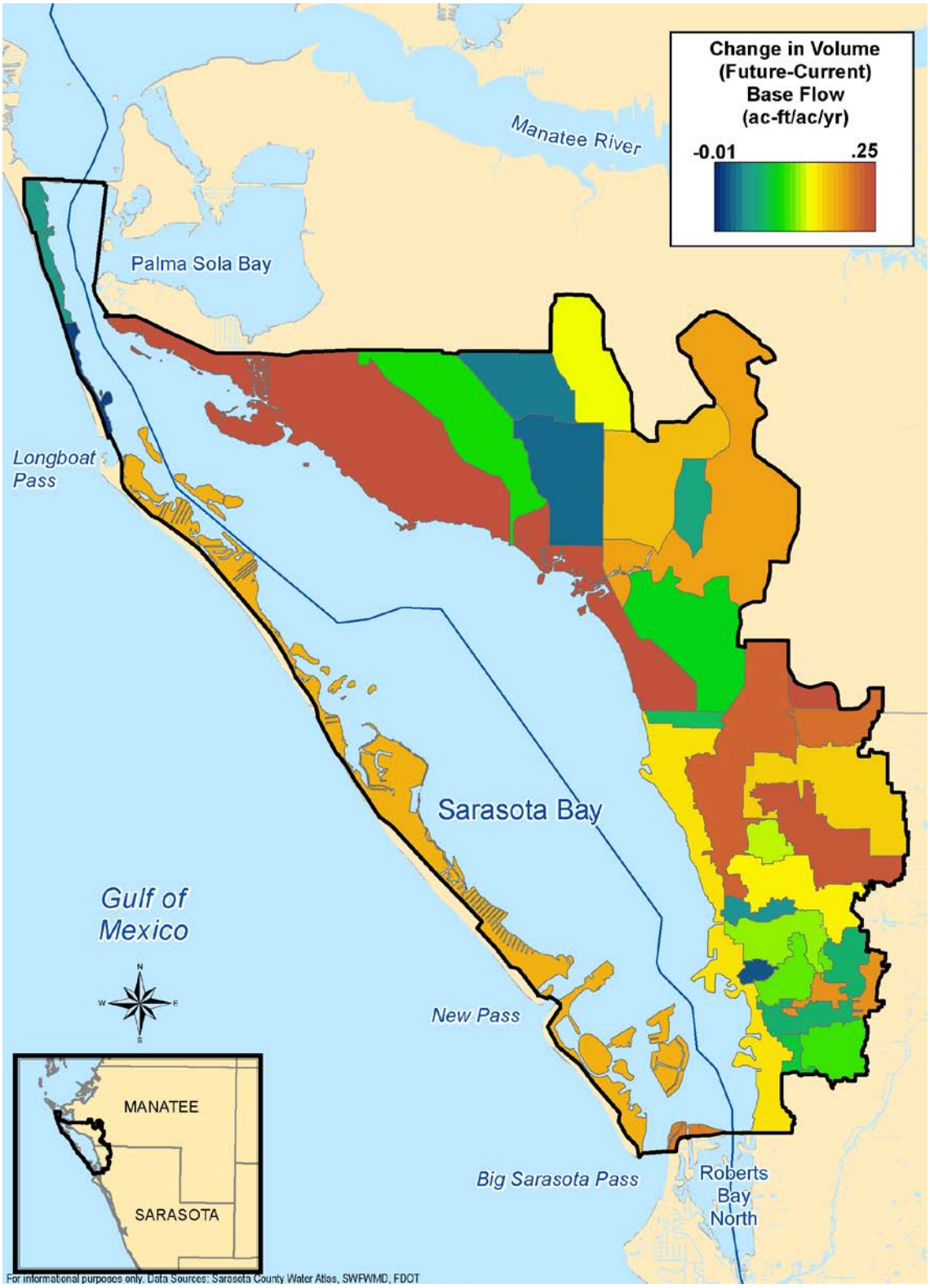


Figure 3-26 Changes to Unit-Area Freshwater Inputs from Baseflow (acre-feet/acre/year) to Sarasota Bay Between Current and Future Conditions

3.4.3 Comparison of Current and Future Freshwater Inputs from Direct Runoff

3.4.3.1 Annual

Figure 3-27 shows annual variation in freshwater inputs from direct runoff the current and future periods. Runoff occurs as a result of precipitation, so the annual runoff is a function of annual rainfall. Years of higher rainfall generally produce higher annual runoff values. Current annual runoff ranges from approximately 20,000 acre-feet/year to just over 50,000 acre-feet/year. Current annual runoff is lower than that estimated for future conditions, although runoff estimates for both periods exhibit a similar trend because the same precipitation record was used for both scenarios. Estimates of annual runoff for the future condition were very similar to those observed for current conditions.

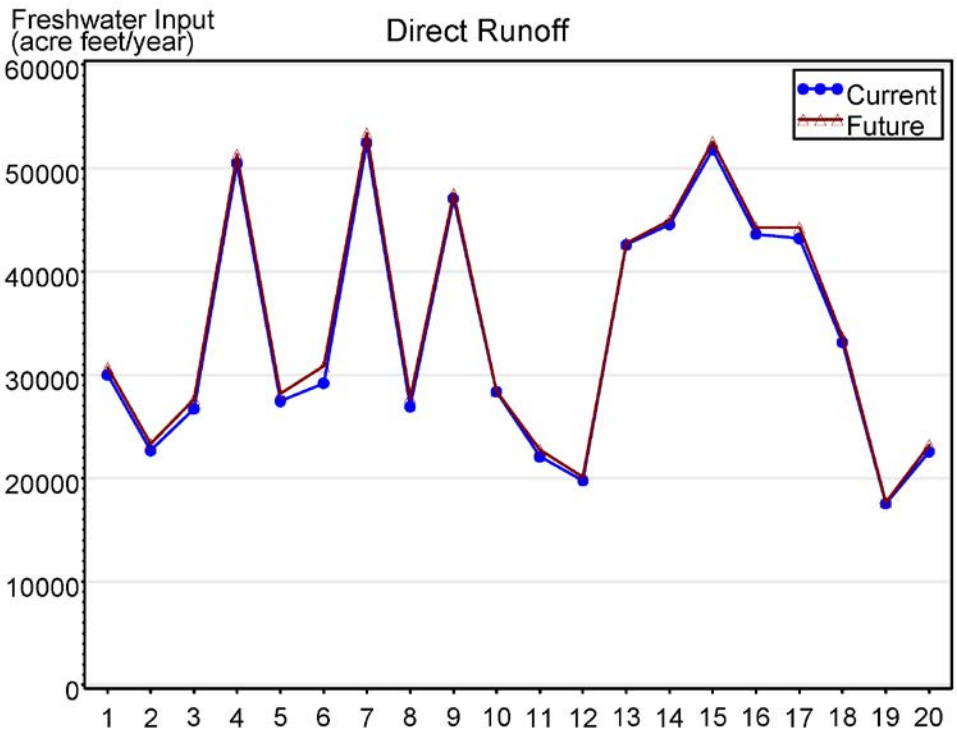


Figure 3-27 Annual Direct Runoff Freshwater Inputs to Sarasota Bay Under Current and Future Conditions

3.4.3.2 Seasonal

As with baseflow, direct runoff is driven by rainfall and shows a distinct seasonal pattern. This seasonal variation under current and future conditions is represented by higher monthly values during the wet season and lower values during the dry season as shown in Figure 3-28. Current monthly values range from a maximum of 25,000 acre-feet/month in September to nearly 0 acre-feet/month in May. Future runoff values were very similar to those for current conditions. The mean and median values for June are well-separated, indicating that a few extreme rain events

skewed the distribution of monthly values (i.e., high value of 25,000 acre-feet/month). Mean monthly runoff varied by an order of magnitude between the wet and dry seasons and ranged from 500 to 5,000 acre feet/month during current and future conditions.

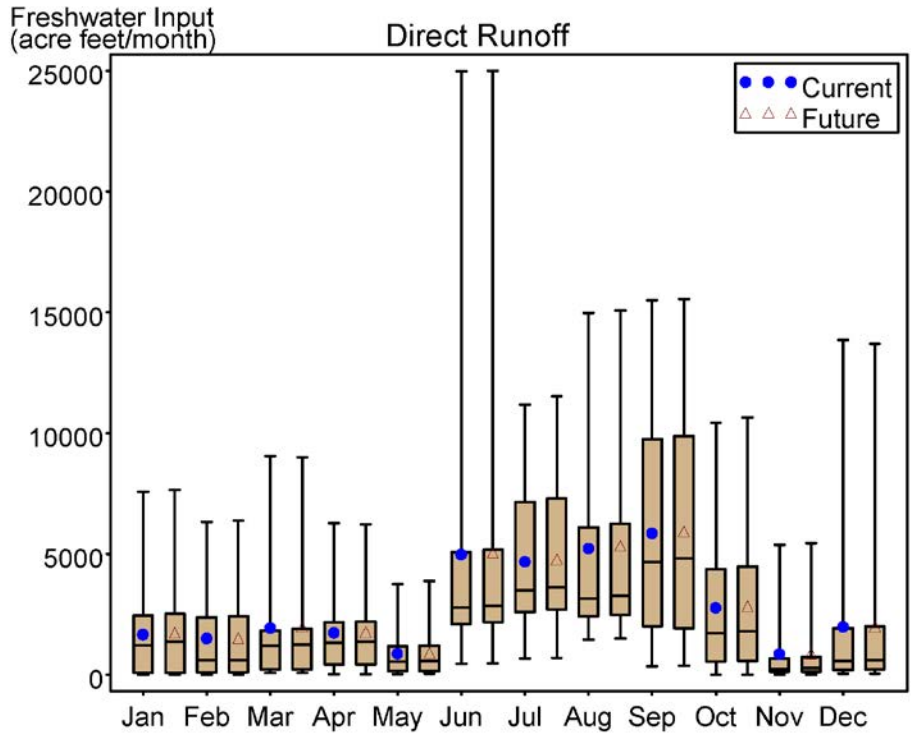


Figure 3-28 Seasonal Variation in Direct Runoff Freshwater Inputs to Sarasota Bay Under Current and Future Conditions

3.4.3.3 Spatial

Figure 3-29 presents changes to the spatial distribution of freshwater inputs from direct runoff between the current and future periods. Like baseflow, the total direct runoff from a basin is determined largely by the basin size but also by land use, soil type, and other factors. Figure 3-29 shows the most runoff originating in the largest basins in future and current conditions, although there is little difference in runoff volumes between current and future conditions.

Figure 3-30 depicts changes to the unit-area corrected freshwater inputs from direct runoff between the current and future periods. Standardizing by basin area makes it possible to identify basins contributing a disproportionate volume of freshwater to the estuary. In the case of Sarasota Bay, land use appears to be closely related to unit-area runoff, with more urbanized basins generating more runoff per acre than less developed basins. Some of the largest unit-area volumes originate in the smaller basins. The largest change in runoff from current to future conditions appears to be in the more southern basins of Sarasota County.

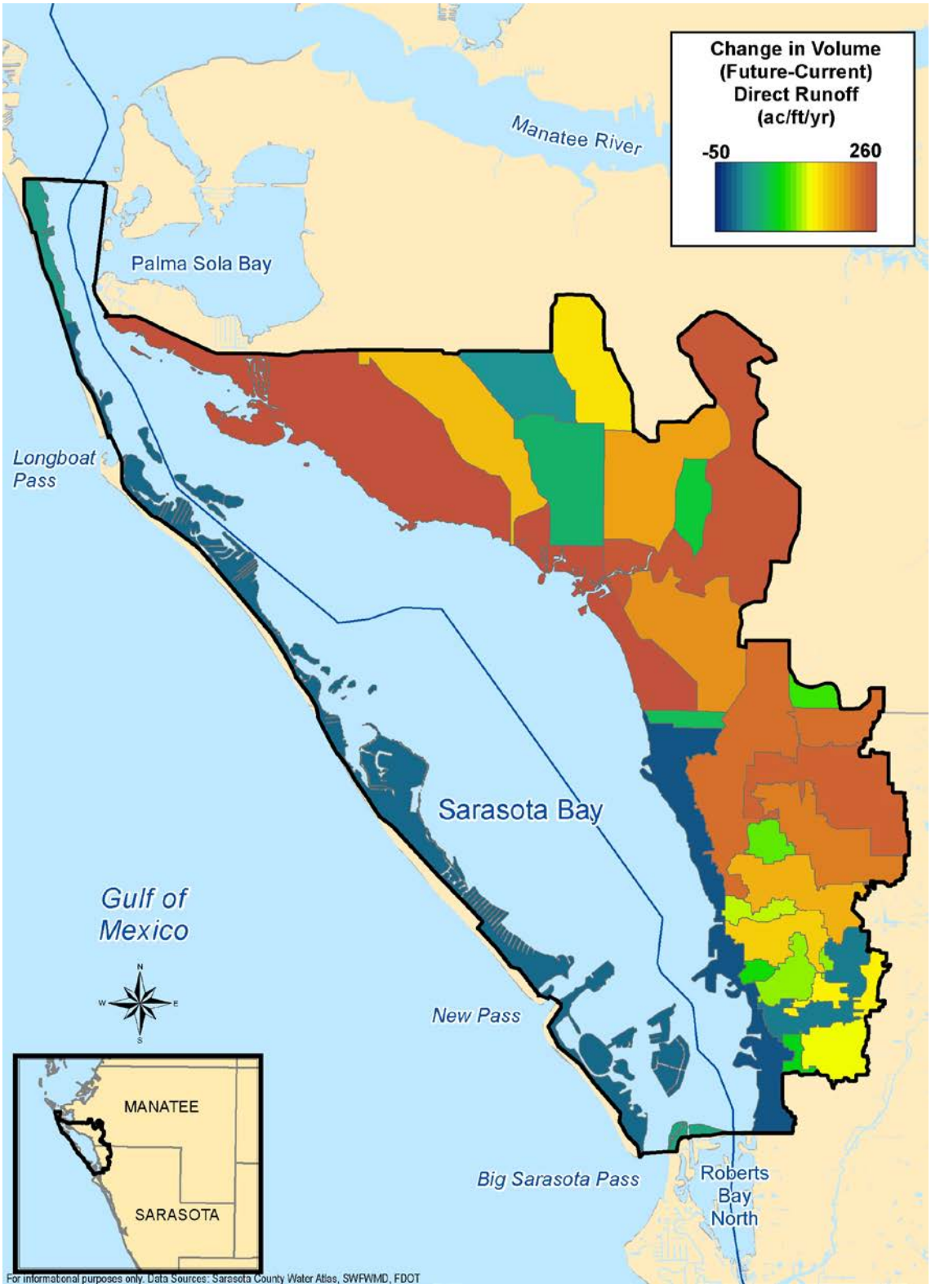


Figure 3-29 Changes to Freshwater Inputs from Direct Runoff (acre-feet/year) to Sarasota Bay between Current and Future Conditions

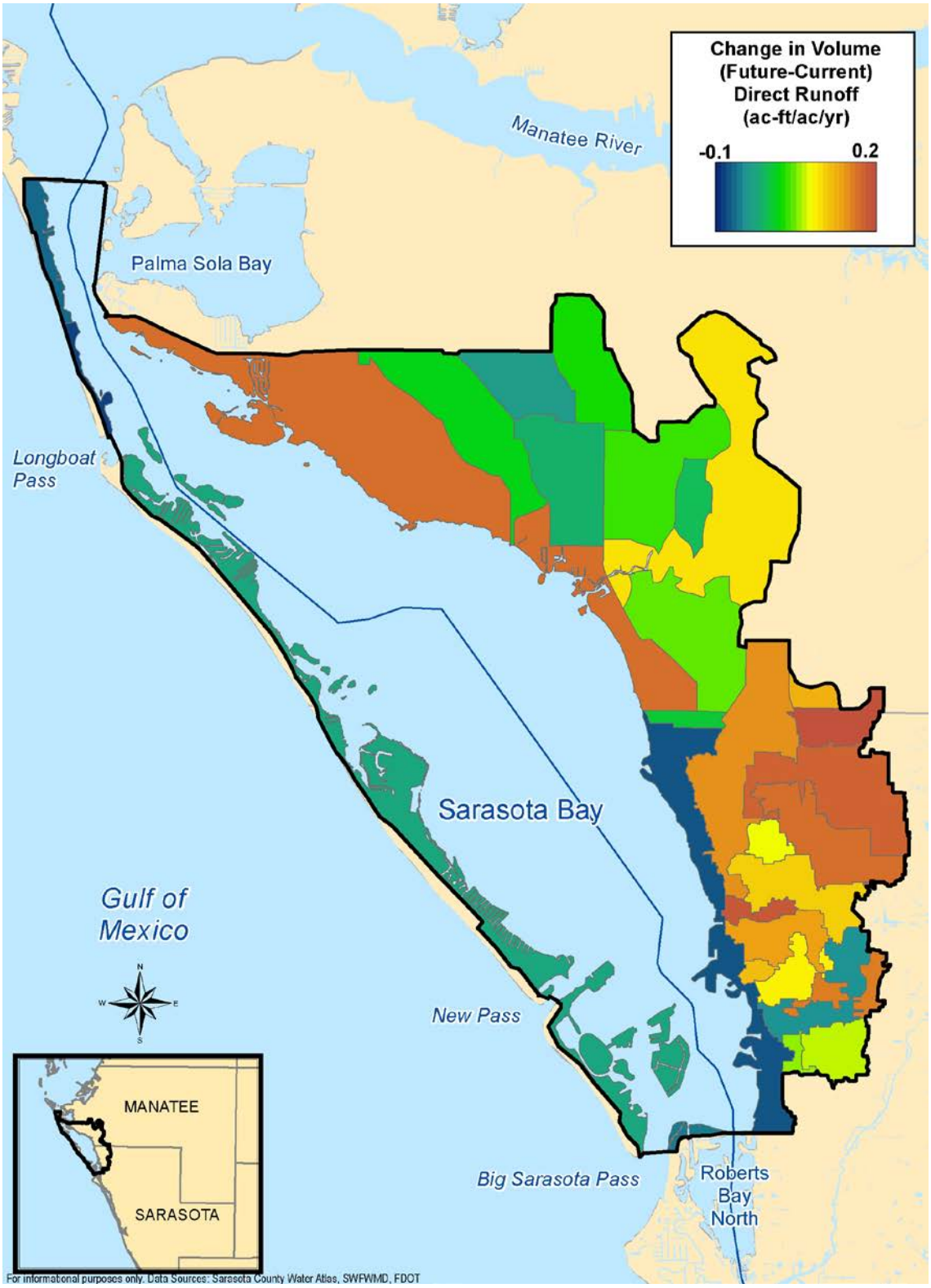


Figure 3-30 Changes to Unit-Area Freshwater Inputs from Direct Runoff (acre-feet/acre/year) to Sarasota Bay Between Current and Future Conditions

3.4.4 Relationships between Rainfall and Freshwater Input

3.4.4.1 Total Freshwater Inputs

Figure 3-31 compares total annual rainfall to freshwater loadings for the current and future periods. There is a positive relationship between rainfall and freshwater inputs, with more precipitation generating greater volumes of freshwater. Freshwater inputs are only slightly greater for a given amount of rainfall in the future scenario relative to current estimates.

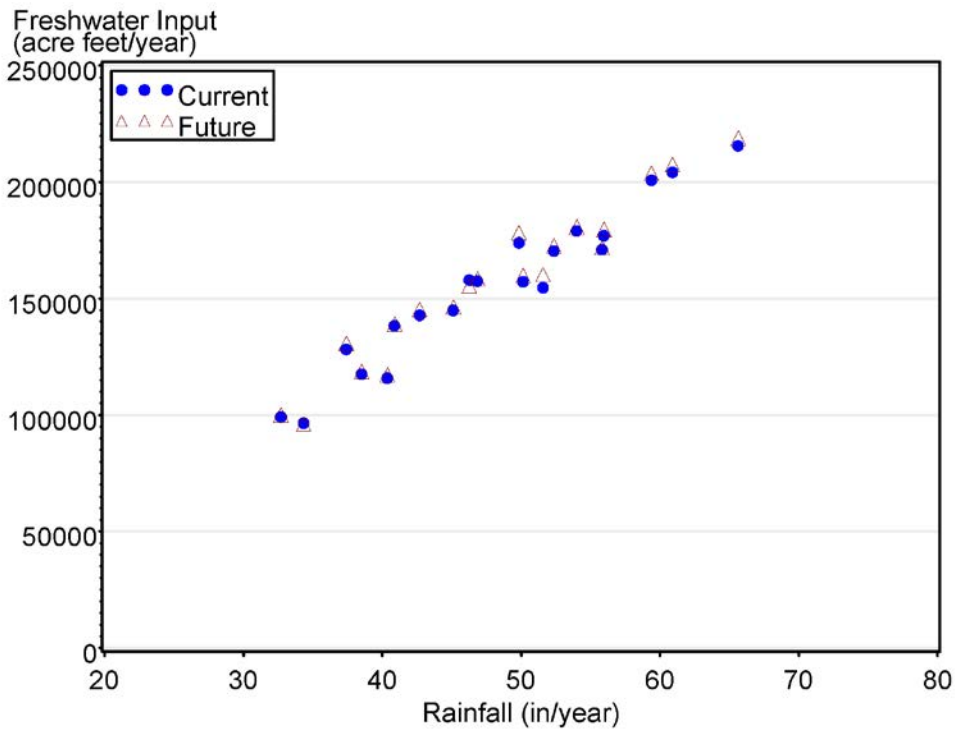


Figure 3-31 Relationship Between Total Freshwater Inputs and Total Rainfall for Current and Future Conditions in the Sarasota Bay Watershed

3.4.4.2 Direct Runoff Freshwater Inputs

Figure 3-32 compares total annual direct runoff as a function of annual rainfall amounts for current and future periods. In the Sarasota Bay watershed, the relationship between precipitation and direct runoff is generally the same as that for total freshwater inputs. Higher runoff during the future period reflects the increased extent of urban land cover in the watershed compared to the current level of development.

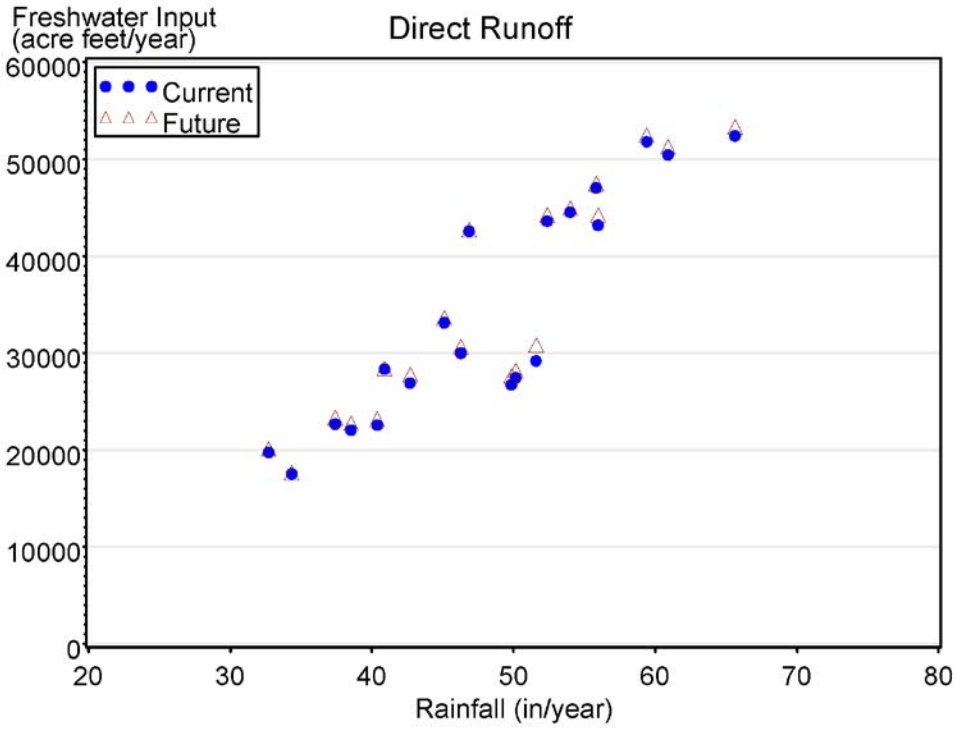


Figure 3-32 Relationship Between Direct Runoff Freshwater Inputs and Total Rainfall for Current and Future Conditions in the Sarasota Bay Watershed

4.0 PROJECT AND PROGRAM RECOMMENDATIONS

Sarasota County is innovative in its intent to evaluate alternative means of water supply and on-site storage to meet irrigation needs and reduce stormwater runoff to the bay. For this plan, we will look at alternative methods of stormwater harvesting. Jones Edmunds identified potential conservation and stormwater harvesting opportunities in the Sarasota Bay Watershed. Project and site-selection methodology is provided in Section 4.1, and the site investigation process is described in Section 4.2. Analysis of project and programmatic recommendations to reduce potable water demands are described in Section 4.3.

For this TSD, all the projects are identified as stormwater-harvesting projects. While augmenting reclaimed water with harvested stormwater is permittable (62-610.472(3), FAC), design and operational issues associated with this type of system will require special attention. Specifically, a one-way flow device must be installed so reclaimed water is not introduced to the stormwater system, a condition that is not permittable. From an operational standpoint, disinfection must be provided and the fecal coliform and total suspended solids limits established for high-level disinfection must be met (62-600.440(5), FAC) for the treated surface water or stormwater supply before mixing with the reclaimed water.

Augmenting stormwater-harvesting ponds with reclaimed water is also permittable and does not require the special considerations listed above. Rule 62-610.464(4)(c), FAC, states "Existing or proposed lakes or ponds (such as golf course ponds) are appropriate for storage of reclaimed water and stormwater management if all Department rules are met and the use of lakes or ponds for reclaimed water storage will not impair the ability of the lakes or ponds to function as a stormwater management system. Rule 62-610.830, FAC, contains permitting requirements for these types of storage lakes or ponds. Lakes or ponds (such as golf course ponds) used to store reclaimed water are not required to meet the storage pond design, construction, and operation requirements in Rules 62-610.414(7) and (8), FAC." If the ponds discharge intermittently or continuously to waters of the state, the discharge must be permitted under 62-620, FAC (62-610.830, FAC).

Stormwater-harvesting opportunities in the County can be divided by scale: regional, subregional, and local. Regional-scale projects impact water supply for the entire watershed, subregional-scale projects impact communities such as irrigation systems within a subdivision, and local-scale projects are implemented by homeowners for individual property conservation and use such as rain barrels and cisterns.

Harvesting stormwater runoff provides a source for an alternative water supply while maintaining flows to Sarasota Bay and its tributaries.

At the largest (i.e., regional) scale, stormwater may be available to supplement the County water supply. At the next largest (i.e., subregional) scale, stormwater may be available largely as a non-potable irrigation source or supplement. Opportunities at the subregional scale will typically serve a limited number of larger entities, such as a residential development or a golf course. At the smallest (i.e., local) scale, stormwater-harvesting opportunities are typically confined to the individual property owner. Regardless of scale, the following four components are necessary to implement a stormwater-harvesting project:

- Sustainable supply—A sufficient volume of stormwater is needed to satisfy all or a significant percentage of the intended end use. The available volume must exceed the volume needed to sustain a healthy downstream ecosystem.

- Storage—The timing between the availability of stormwater and the needed end use rarely coincides. Thus, storage is required to bridge the timing gap between supply and demand. Larger storage volumes translate to higher rates of use for harvested stormwater but at larger costs. New storage opportunities at the regional and subregional scale in a relatively developed watershed like Sarasota Bay are typically space-constrained due to the lack of available land.

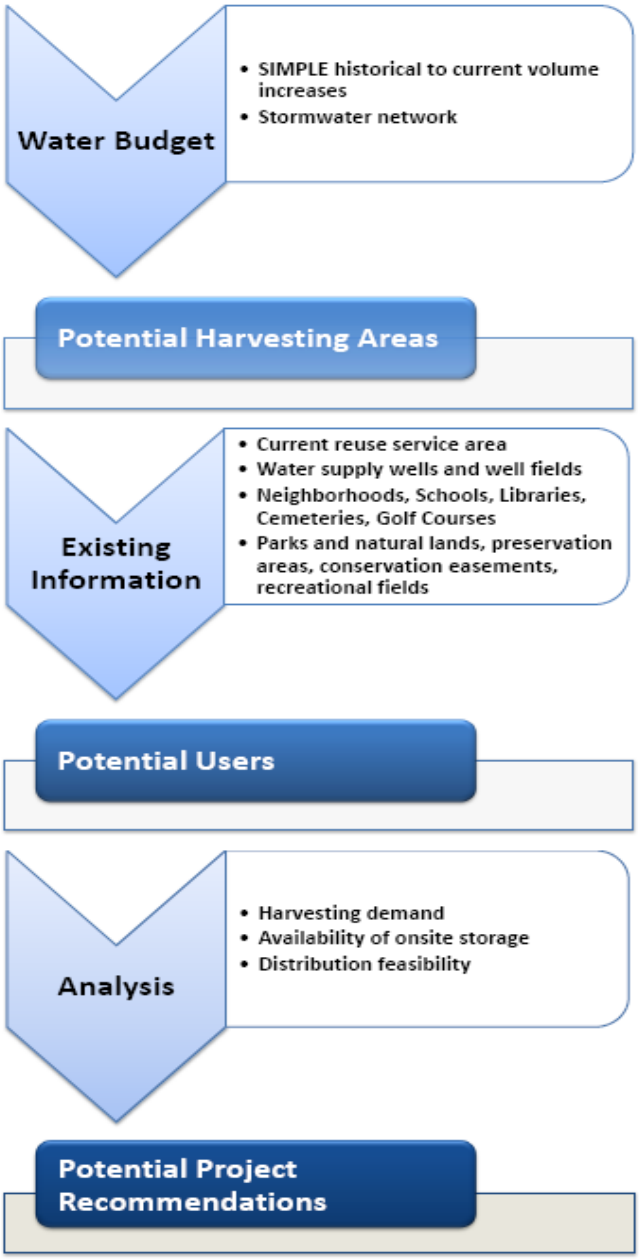
- Transmission/distribution system—Distance and elevation differences between the supply/storage location and the end use must be overcome with a transmission/distribution system. At the regional scale, the relative cost of this component is typically not as large since the distribution system to the end user usually exists. At the local scale, the distribution system is often simple to construct and maintain. The transmission/distribution system at the subregional scale is often the limiting factor for stormwater-harvesting opportunities because of the relatively high cost of the component—particularly for retrofits, which is more of a necessity in a relatively developed watershed such as Sarasota Bay.

- End use—A beneficial end use is necessary to implement a stormwater-harvesting project. At the regional scale, the end use is typically as a potable water source. At the subregional and local scale, it is typically a supplemental irrigation source. Although end uses for stormwater are ubiquitous throughout the Sarasota Bay Watershed, the challenge is in cost-effectively matching end use with the other three components—sustainability, storage, and transmission/distribution. Regardless of whether the end use of the stormwater is potable or non-potable, effective conservation measures should remain in place.

Although not listed as a necessary component above, treatment in some form is usually needed in stormwater-harvesting projects at the two larger scales. The type of treatment varies by end use.

4.1 METHODOLOGY

Jones Edmunds collected and assembled information, including existing reports, plans, and GIS data, to identify potential stormwater-harvesting opportunities in the Sarasota Bay Watershed. Jones Edmunds began the investigation with a GIS desktop analysis to identify potential stormwater-harvesting areas and potential user areas throughout the watershed. These areas were then refined to potential stormwater-harvesting project sites. Finally, Jones Edmunds evaluated project feasibility at the sites. The following summarizes this methodology, and Section 4.3 provides the results from the analysis and potential project and program recommendations.



4.2 INVESTIGATION

Details concerning the elements of Jones Edmunds' investigations are provided in the following subsections.

4.3 IDENTIFICATION OF POTENTIAL HARVESTING AREAS

Jones Edmunds used GIS to compile and review data developed from the Pollutant Loading Model input and results together with aerials and other base data and information obtained from Sarasota County and SWFWMD. These datasets and information included the following:

- Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE) model input and results (i.e., irrigation areas and changes in direct runoff volumes).
- Sarasota County Interconnected Channel and Pond Routing (ICPR) watershed models.
- Sarasota County Stormwater Inventory.
- Sarasota County Utilities Inventory (reclaimed water lines).
- 2010 SWFWMD aerial imagery.

A GIS desktop analysis of the parameters above yielded potential sources of stormwater in the watershed (Figure 4-1). SIMPLE volume results are detailed in the Water Budget Technical Support Document: *Historical and Current Water Budget Loadings*.

4.4 IDENTIFICATION OF POTENTIAL USERS

Jones Edmunds used GIS to screen the Sarasota Bay Watershed for potential stormwater users. The screening focused on larger neighborhoods with neighborhood associations, schools, parks, recreational fields, libraries, cemeteries, and other locations. The datasets and information used in the screening were obtained from Sarasota County and SWFWMD and included the following:

- Current reuse service area.
- Neighborhoods, public schools, libraries, and public golf courses.
- Parks and natural lands, preservation areas, conservation easements, and recreational fields.

A GIS desktop analysis of the parameters above yielded potential users of stormwater in the watershed (Figure 4-2).

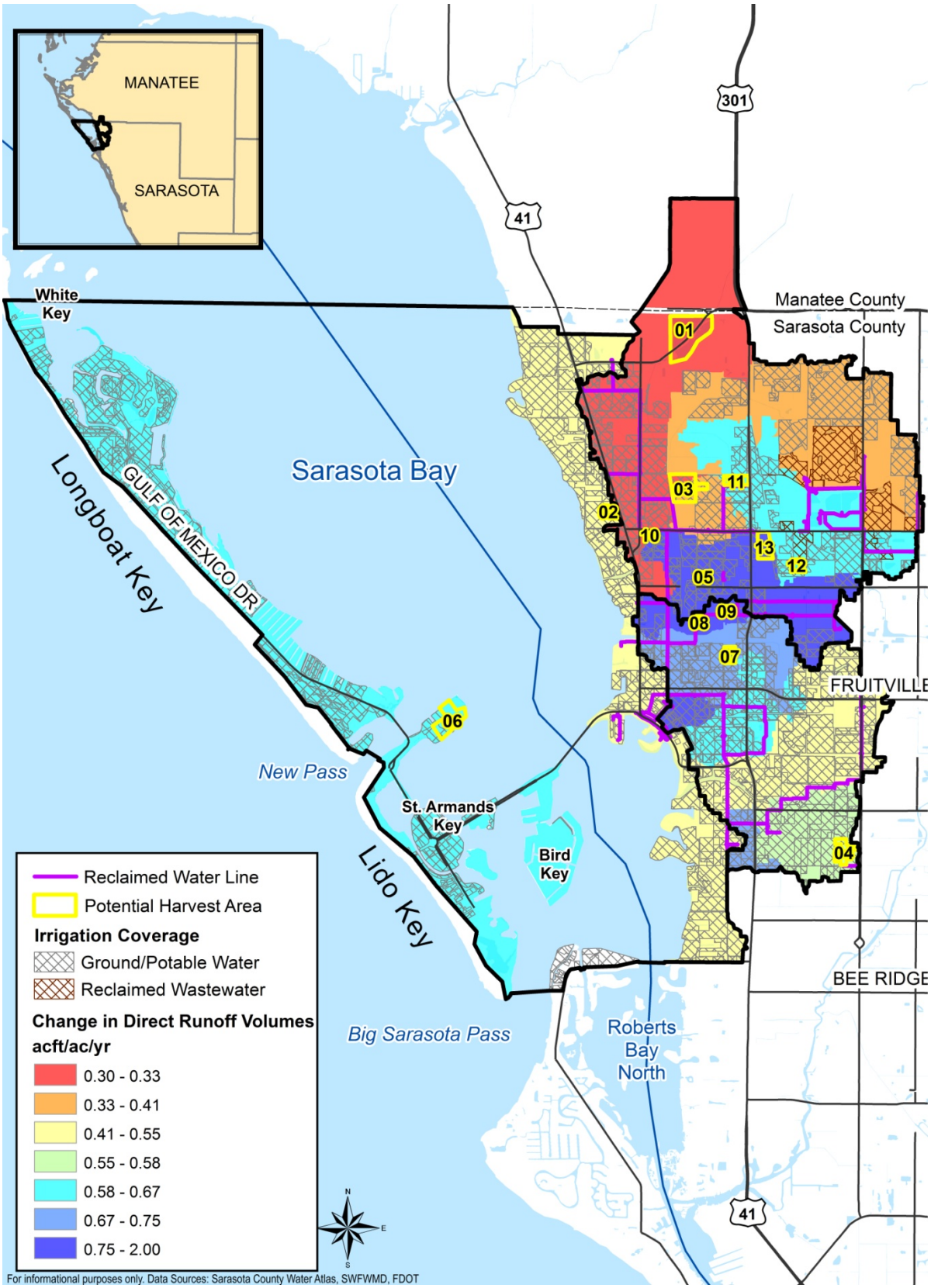


Figure 4-1 Potential Stormwater Harvesting Identification Parameters

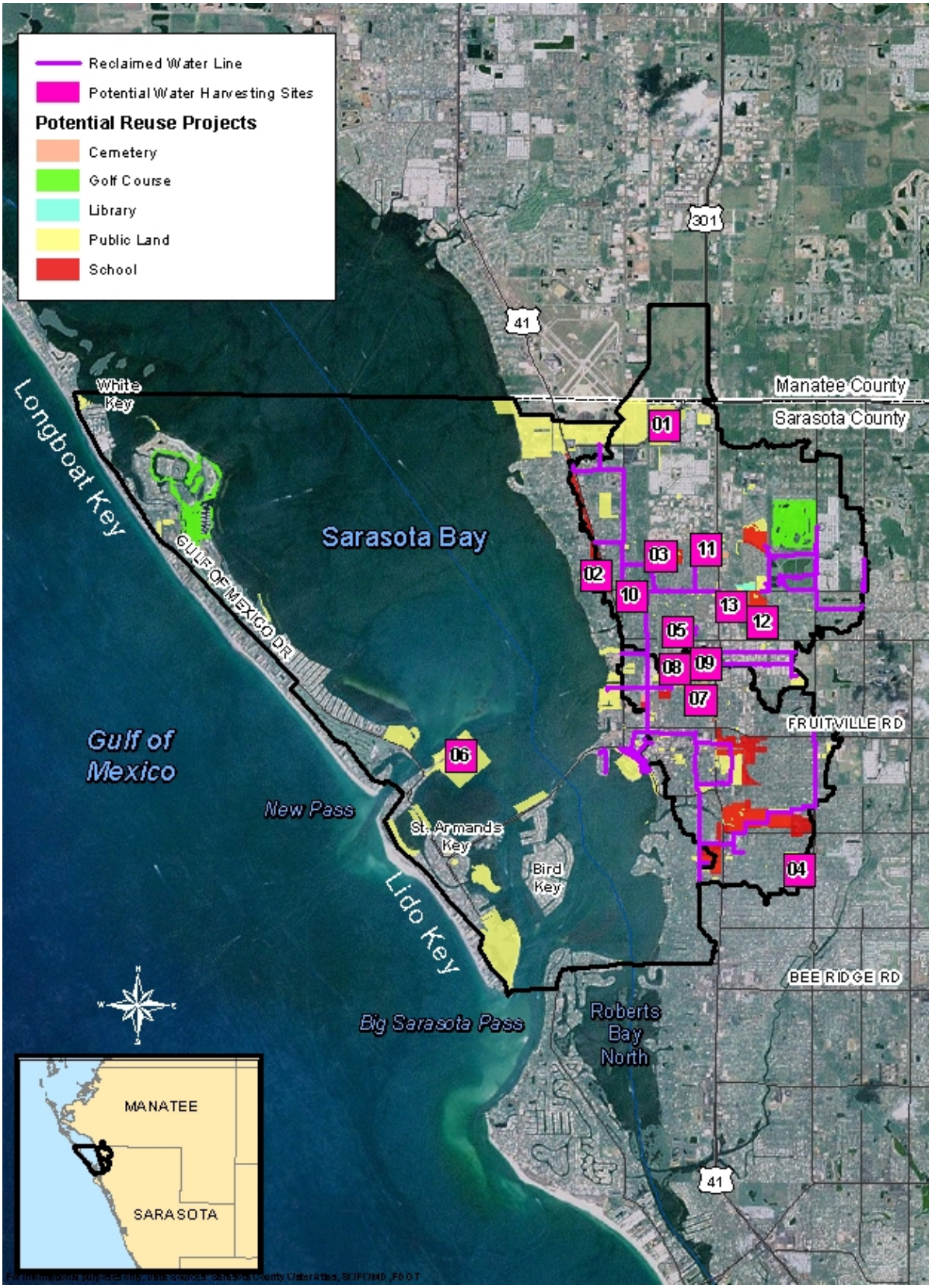


Figure 4-2 Potential Stormwater Harvesting Projects

4.4.1 Identification of Potential Projects

Using the criteria discussed below, a scoring system was established for ranking the potential locations as stormwater-harvesting projects. The criteria have cost and feasibility implications. In each case, a higher score indicates a more favorable value with respect to the harvesting opportunity at the site.

- Distribution—This criterion reflects the relative difficulty of constructing a stormwater-harvesting distribution system, with values ranging from 0 to 2. A value of 0 represents a new distribution system that would need to be constructed in an area with many site constraints. A value of 2 represents a distribution system that is largely built and only needs a relatively small number of additions or improvements.

- Availability of on-site storage—Values in this category range from 0 to 2, with 0 representing that all storage would need to be constructed, 1 representing that usable storage is present but significant expansion would be required, and 2 representing that it may be possible to use existing storage with little to no modification.

- Harvesting demand—Values in this category range from 0 to 3, with 3 representing the highest irrigation needs in terms of volume over the site area. These values are largely based on the rates from the irrigation feature class developed for the SIMPLE-monthly model.

- Level of runoff—Values in this category range from 0 to 2, with 0 representing the areas where the direct runoff is currently lowest, and 2 representing areas where the direct runoff is the highest and therefore in the greatest need of water capture. These values are based on the volumes (acres per foot per year) of each watershed basin in the direct runoff feature class developed for the SIMPLE-monthly model.

Points were assigned to each category. Because of their relative respective impacts to cost using the value ranges discussed above, a weighting factor of 2 was applied to distribution and availability of on-site storage. After applying the weighting factor, the values were summed in the three categories for an overall score. Figure 4-3 shows the 13 sites evaluated, and Table 4-1 shows the unweighted scores for each criterion and total weighted scores.

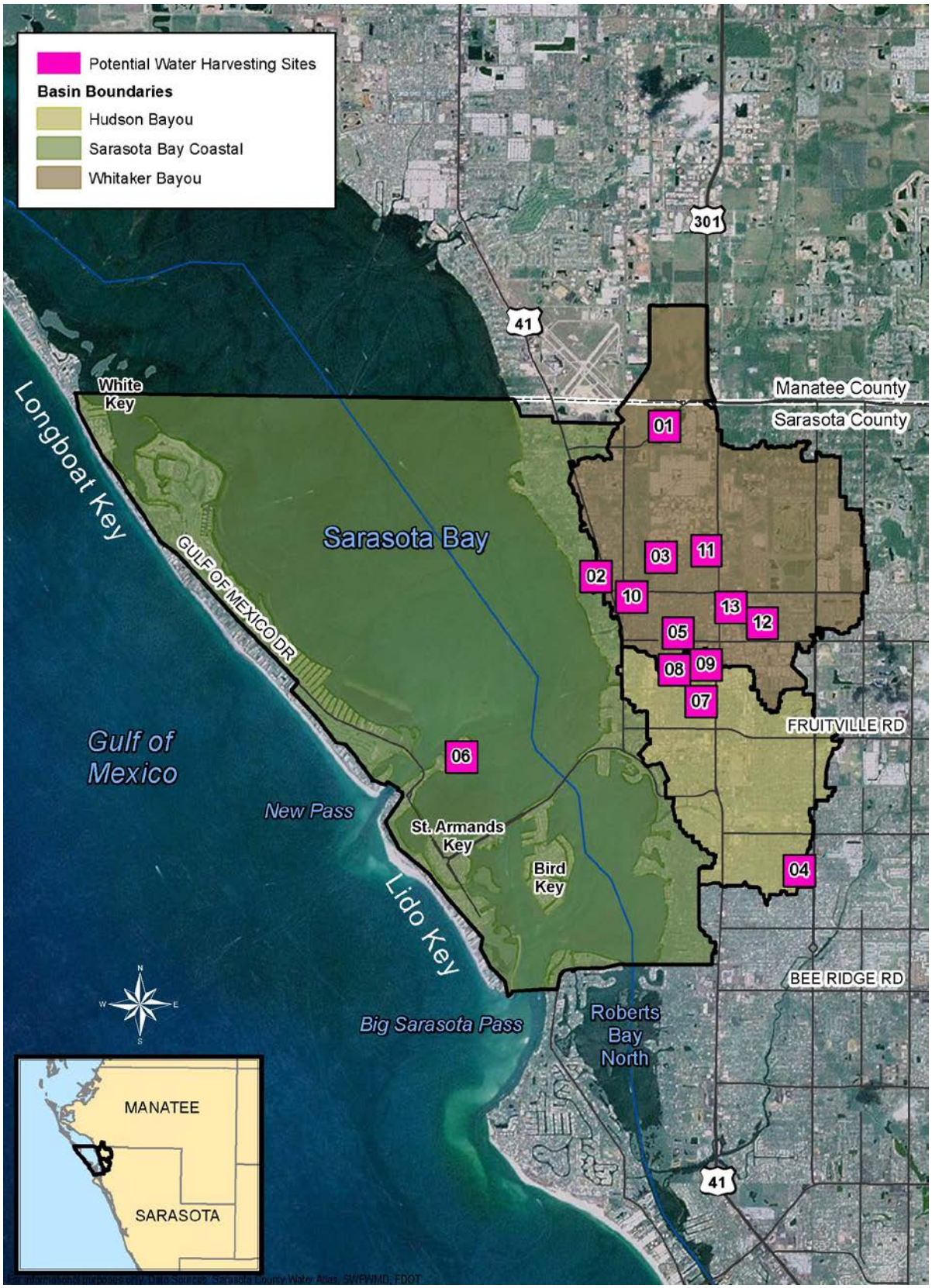


Figure 4-3 Potential Stormwater Harvesting Project Sites

Table 4-1 Summary of Potential Stormwater Reuse Projects

Project Site ID	Site Name	Owner	Scale	Area (acres)	Distribution	Demand	Storage	Level of Runoff	Weighted Total	Recommended
1	Airport Ponds	Sarasota County	Regional	73.2	2	3	2	0	11	No
2	Bay Haven Elementary School	Sarasota County School Board	Subregional	5.4	2	1	0	1	6	Yes
3	Booker High School	Sarasota County School Board	Subregional	38.6	2	2	1	0	8	Yes
4	Arlington Park and Aquatic Complex	City of Sarasota	Subregional	14.6	2	2	1	1	9	Yes
5	Orange Avenue Park	City of Sarasota	Subregional	4.9	2	3	0	2	9	Yes
6	Ken Thompson Park	City of Sarasota	Subregional	3.7	1	2	0	1	5	Yes
7	Gillespie Park	City of Sarasota	Subregional	9.6	2	2	1	2	10	Yes
8	City of Sarasota Wastewater Treatment Plan	City of Sarasota	Regional	2.5	2	3	2	2	13	No
9	12th Street Pond	City of Sarasota	Subregional	2.7	2	3	2	2	13	No
10	Martin Luther King Park	City of Sarasota	Subregional	32.1	2	3	0	1	8	Yes
11	Robert Taylor Community Complex	City of Sarasota	Subregional	12.1	2	2	0	1	7	Yes
12	Lime Lake Park	Sarasota County	Subregional	4.6	1	2	3	1	11	Yes
13	Marion Anderson Place	City of Sarasota	Subregional	18.7	0	2	0	2	4	No

4.5 ANALYSIS\RECOMMENDATIONS

The following sections provide investigation summaries and recommendations for the selected project sites as well as program recommendations to help manage water supply in the watershed.

This section contains water supply project descriptions. Including proposed projects does not confer any special status, approval, permitting, standing, or funding from SWFWMD. All proposed projects are subject to regulatory review and permitting. Requests for funding assistance will have to meet the requirements of funding programs and be subject to SWFWMD's Governing Board appropriating funds.

4.6 REGIONAL-SCALE PROJECTS

Conditions for regional-scale stormwater-harvesting projects are generally unfavorable in this watershed for two primary reasons. First, the most favorable storage locations in terms of having the largest contributing area are in essentially built-out portions of the watershed that thus have little room for storage. Second, a considerable amount of new infrastructure through urbanized areas would be required to convey flows to a treatment facility.

4.6.1 Site 1 – Airport Ponds

This County-owned site just southeast of the Sarasota Bradenton International Airport (Figure 4-4) in the Whitaker Bayou basin has sizable surface water impoundments that cause this site to stand out as a potential water supply project.

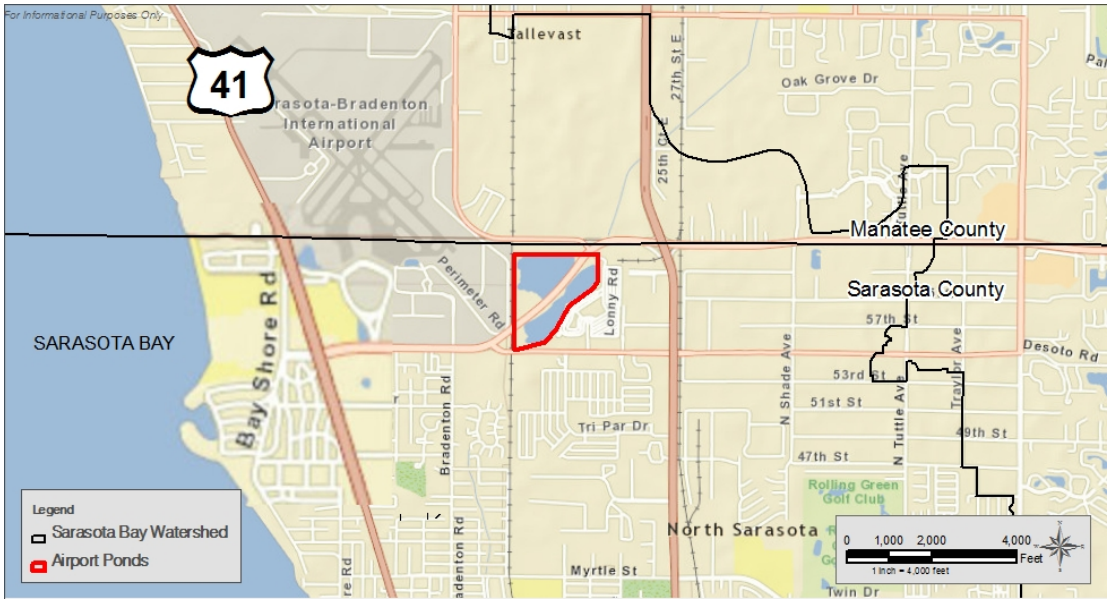


Figure 4-4 Airport Ponds Location Map

4.6.1.1 GIS Desktop Analysis

According to the SIMPLE model, this region is showing a slight increase in direct runoff from historical conditions. Direct runoff has increased significantly more in other areas across the watershed, which makes this location a candidate to receive excess runoff transferred from other areas, especially since a large on-site surface water impoundment already exists. Reclaimed and irrigation water lines are lacking in this area, but the extensive inventory of stormwater structures on this site should be evaluated to determine if a regional-scale distribution system would be feasible for this area to offset potable and groundwater use (Figure 4-5).

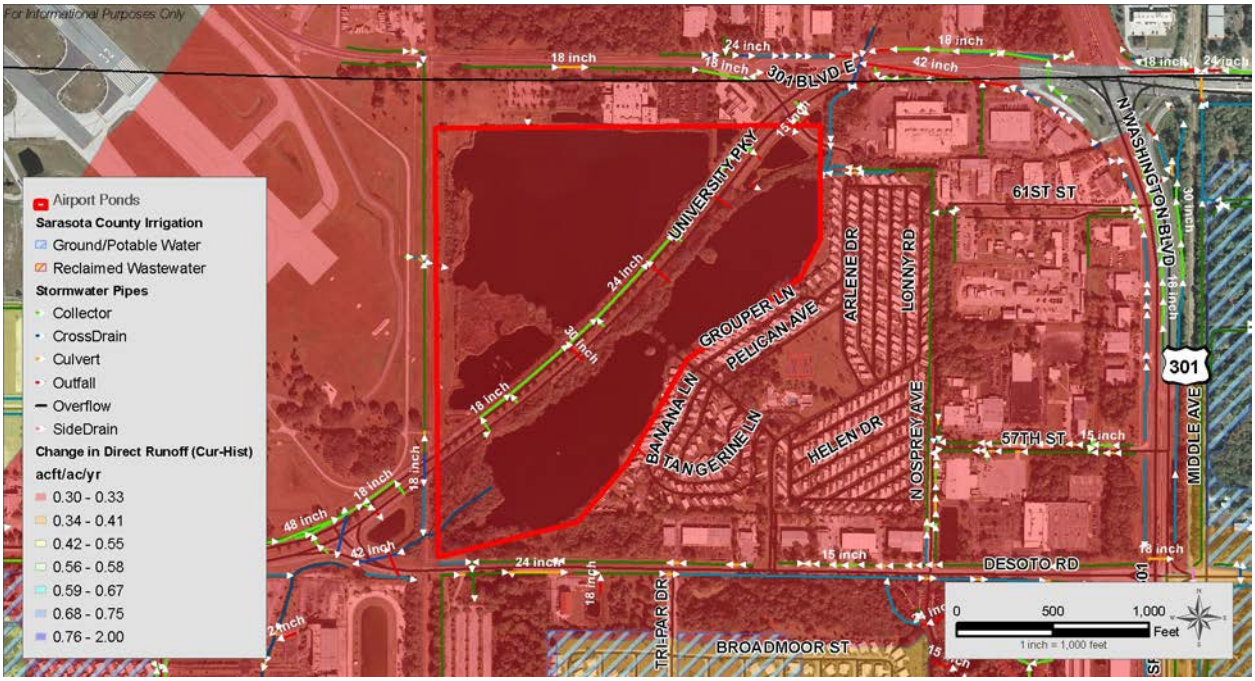


Figure 4-5 Airport Ponds GIS Analysis Map

4.6.1.2 Recommendation

Jones Edmunds does not recommend a project at this site at this time because further investigation showed that the parcels are owned by Manatee County. The County only wishes to consider publicly owned lands for this plan. We recommend that the County work with Manatee County to identify potential partnering opportunities.

4.6.2 Site 8 – City of Sarasota Wastewater Treatment Plant and Site 9 – 12th Street Pond

Site 8 is in the Hudson Bayou basin at the southeast corner of 12th Street and Orange Avenue (Figure 4-6), and Site 9 is across the street on the north side of 12th Avenue. Both sites are owned by the City of Sarasota.

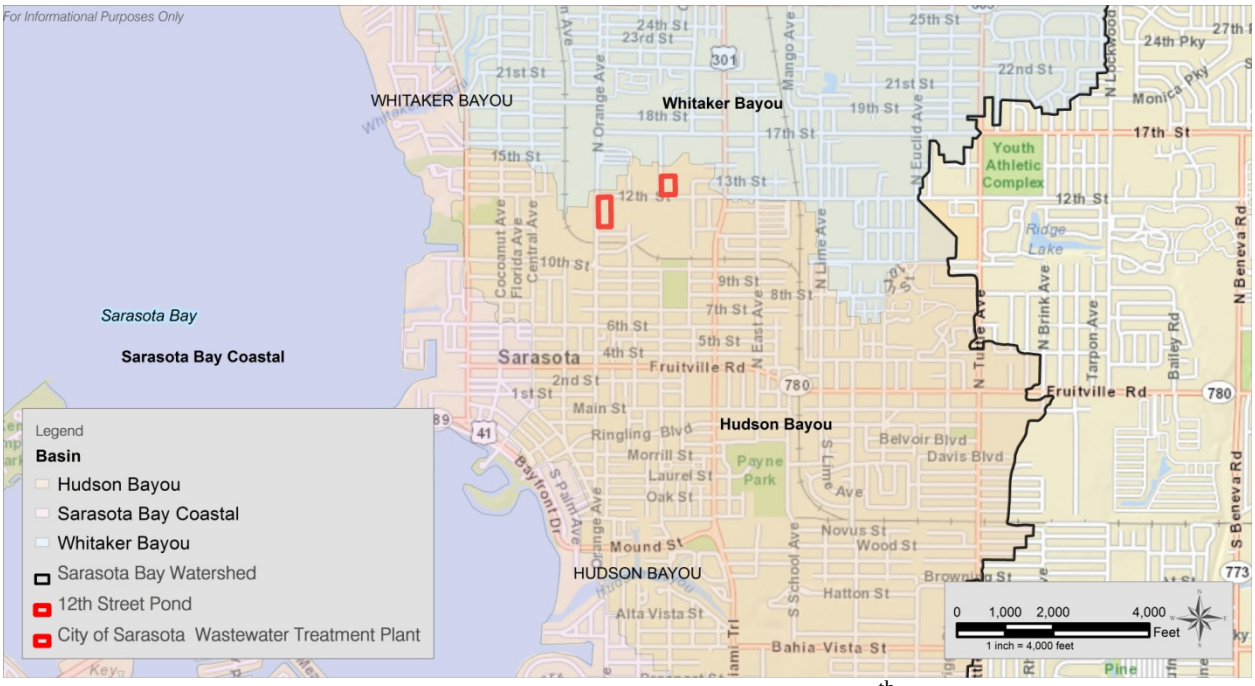


Figure 4-6 City of Sarasota Wastewater Treatment Plant and 12th Street Pond Location Map

4.6.2.1 GIS Desktop Analysis

Sites 8 and 9 are adjacent to the City of Sarasota Wastewater Treatment Plant and have large ponds available for storage. According to the SIMPLE model, this region is showing a high increase in direct runoff from historical conditions, so capturing the increased runoff before it leaves the site would be beneficial. The captured stormwater could be directed to the treatment plant, treated, and used as reclaimed water, thus reducing runoff in the area (Figure 4-7).

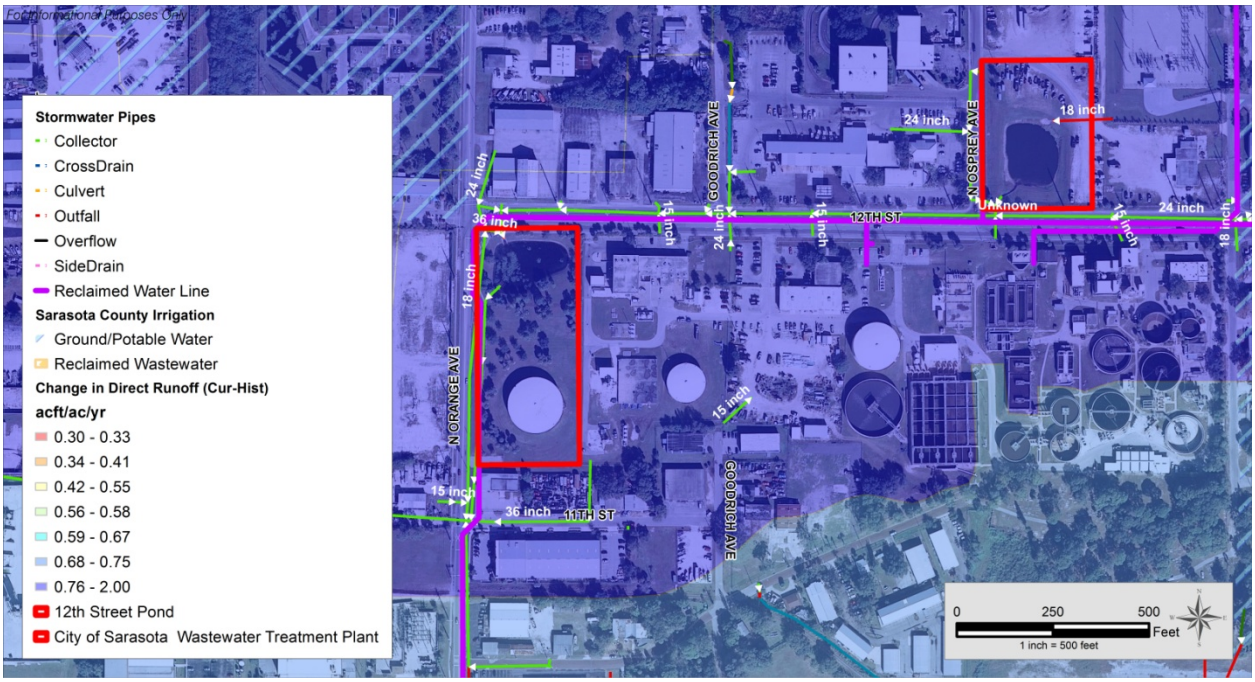


Figure 4-7 City of Sarasota Wastewater Treatment Plant GIS Analysis Map

4.6.2.2 Recommendation

Jones Edmunds does not recommend this project at this time because the County has more available reclaimed water than demand and the benefits would not justify the cost. If the County reclaimed water demand increases, the project should be re-evaluated to direct stormwater from the pond to augment the system.

4.7 SUBREGIONAL-SCALE PROJECTS

Subregional-scale stormwater-harvesting opportunities in the Sarasota Bay Watershed exist largely as projects that can provide a non-potable irrigation source or supplement. Subregional-scale projects will typically serve one or two larger users (e.g., a school). Sustainable supplies are relatively plentiful throughout the watershed. The Water Budget Analysis indicates greater average-annual direct runoff under existing conditions than under historical conditions (Figure 4-8). Because of the relatively small storage footprint required for a stormwater-harvesting system, an abundance of potential withdrawal locations exist throughout the watershed in the form of potential storage areas that can capture the excess runoff and distribute it on site, thus removing it from the overall system that ultimately drains to the Bay. Potential storage areas would rely on retrofitting existing ponds or constructing new ponds or cisterns on public properties.

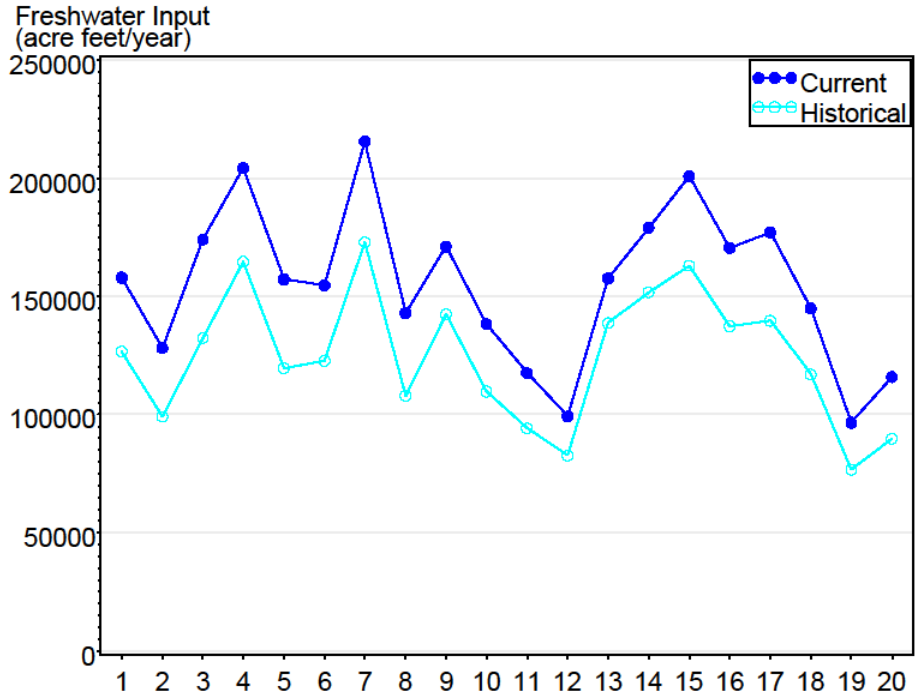


Figure 4-8 Annual Direct Runoff Freshwater Inputs to Sarasota Bay under Current and Historical Conditions

Transmission/distribution is one of the most limiting factors for stormwater-harvesting opportunities in this watershed. Irrigation systems that use stormwater cannot be connected to potable distribution systems because of potential contamination of the potable source. Retrofitting existing urban land uses (e.g., residential development) with separate or disconnected irrigation systems is typically cost-prohibitive. Therefore, subregional opportunities are limited to areas where separate distribution systems already exist or where retrofitting the distribution system may not be cost-prohibitive.

4.7.1 Site 2 – Bay Haven Elementary School

This potential project site is at Bay Haven Elementary School just west of US 41 and south of Patterson Drive (Figure 4-9). The school is in the Sarasota Coastal watershed basin.

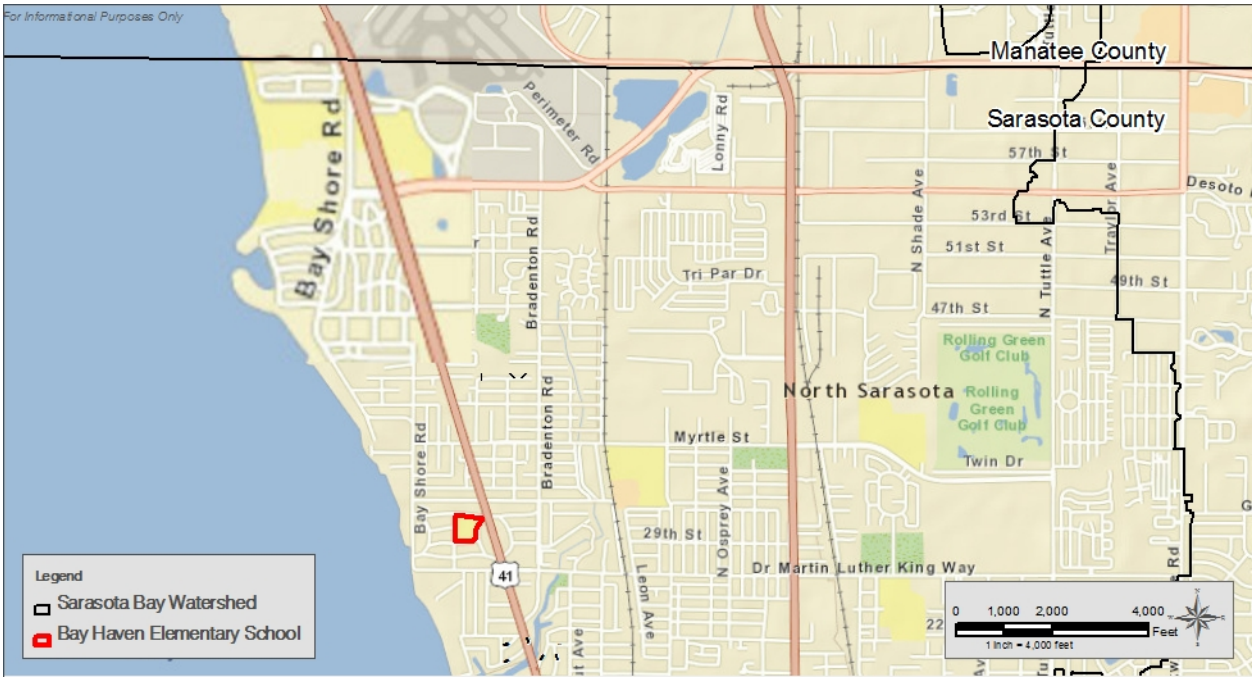


Figure 4-9 Bay Haven Elementary School Location Map

4.7.1.1 GIS Desktop Analysis

This school is an appropriate site for a cistern (Figure 4-10), and the school currently irrigates its grounds using potable water. Runoff volumes at Bay Haven Elementary are slightly higher than historical conditions, and the area is not served by reclaimed line (Figure 4-11).

Figure 4-10 Bay Haven Elementary School Aerial Map

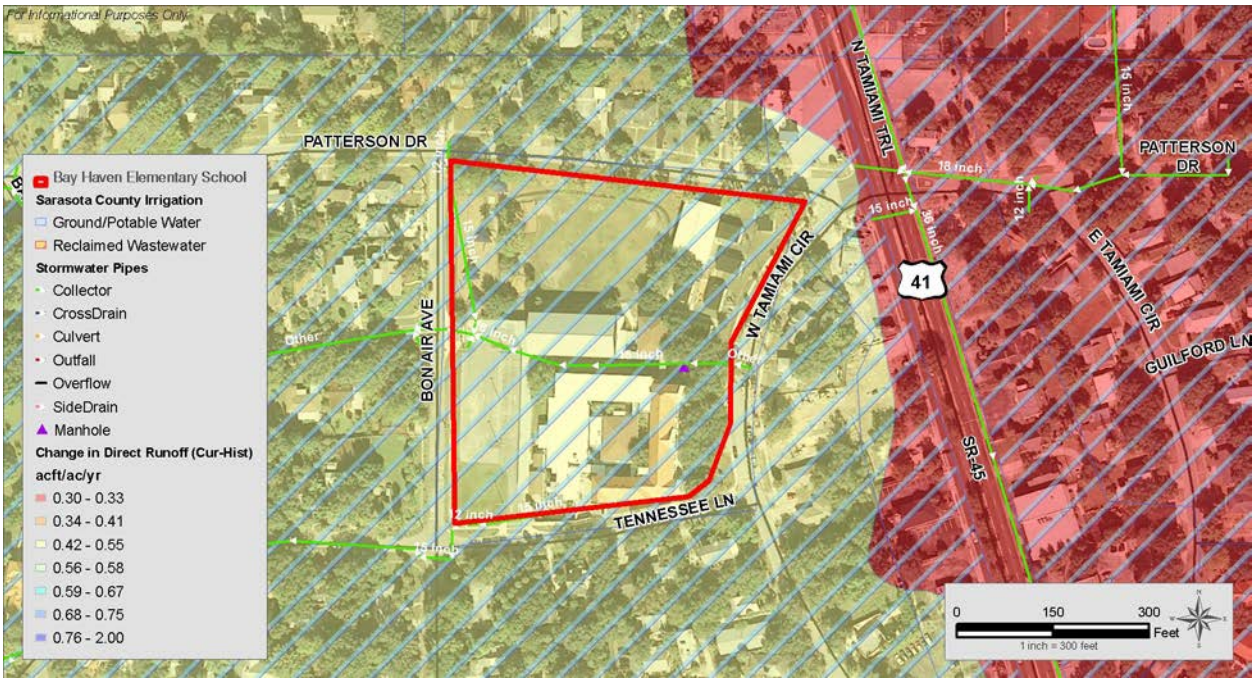


Figure 4-11 Bay Haven Elementary School GIS Analysis Map

4.7.1.2 Recommendation

Jones Edmunds recommends working with the school to install roof-top cisterns to offset the potable water uses such as irrigation. Additionally, the County could work with school staff to implement an educational outreach program. The faculty and students could install and maintain rain barrels and monitor the amount of rainwater captured and used throughout a school year. This educational component would teach students to conserve stormwater and facilitate shared learning in their communities.

Summary:

- Install cisterns.
- Irrigate with harvested rainwater before potable water.
- Install rain barrels.
- Start educational program with students and faculty.

4.7.2 Site 3 – Booker High School

Booker High School is in the Whitaker Bayou basin south of Myrtle Street and east of Orange Avenue (Figure 4-12).

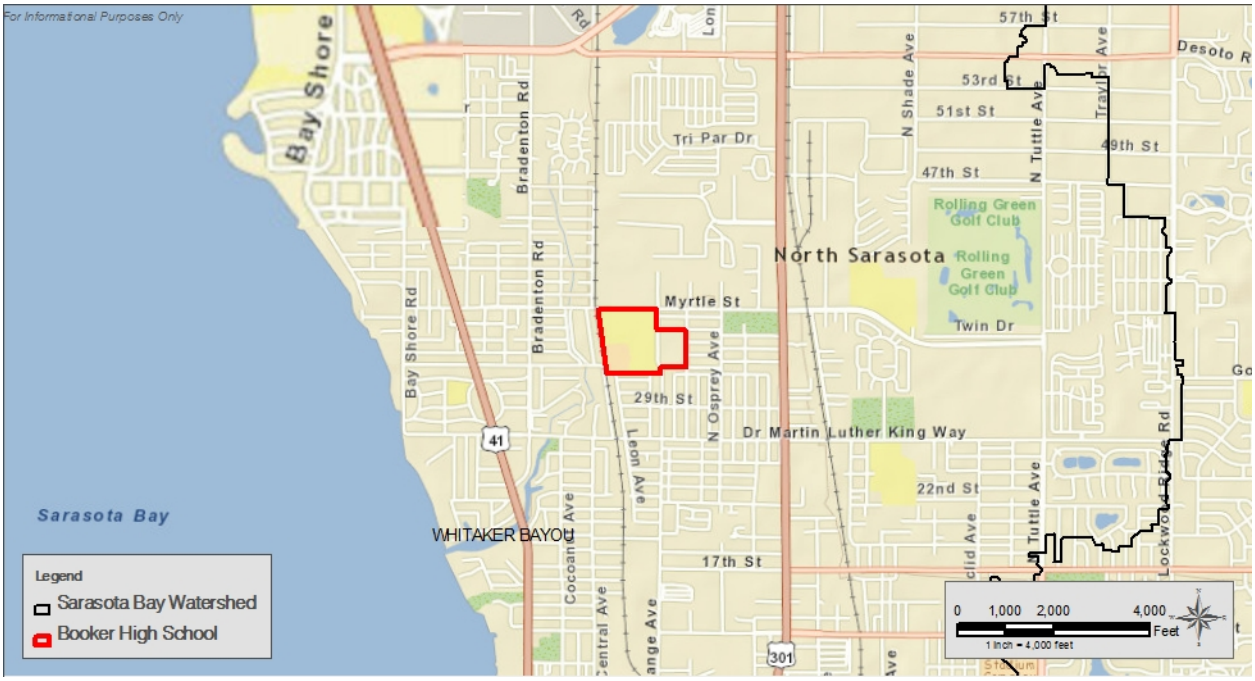


Figure 4-12 Booker High School Location Map

4.7.2.1 GIS Desktop Analysis

Sarasota County landfill files indicate that the Booker High School site may have been an old landfill; however, Sarasota staff reviewed historical aerials (Figure 4-13) and were unable to confirm the site's previous landfill status.

Figure 4-13 Booker High School 1948 Aerial Map

Booker High School is currently under renovation. Construction is scheduled to be completed in 2013, and the re-routed Orange Avenue is expected to open in early February. Renovations to the school include adding five new buildings and major renovations to five buildings.

The Booker High School Project site encompasses two adjacent parcels owned by the Sarasota County School Board. The off-site parcels contain an extensive stormwater system that currently discharges through a series of ponds before discharging through a pipe network south and west to Whitaker Bayou. The school parcel discharges through several storm drain collection systems via open channels and pipe networks to the south and then west to Whitaker Bayou.

The school has several recreational facilities, including a baseball field, a football field, and tennis courts. The school currently irrigates with potable water (Figure 4-14 and Figure 4-15).

Figure 4-14 Booker High School 2010 Aerial Map

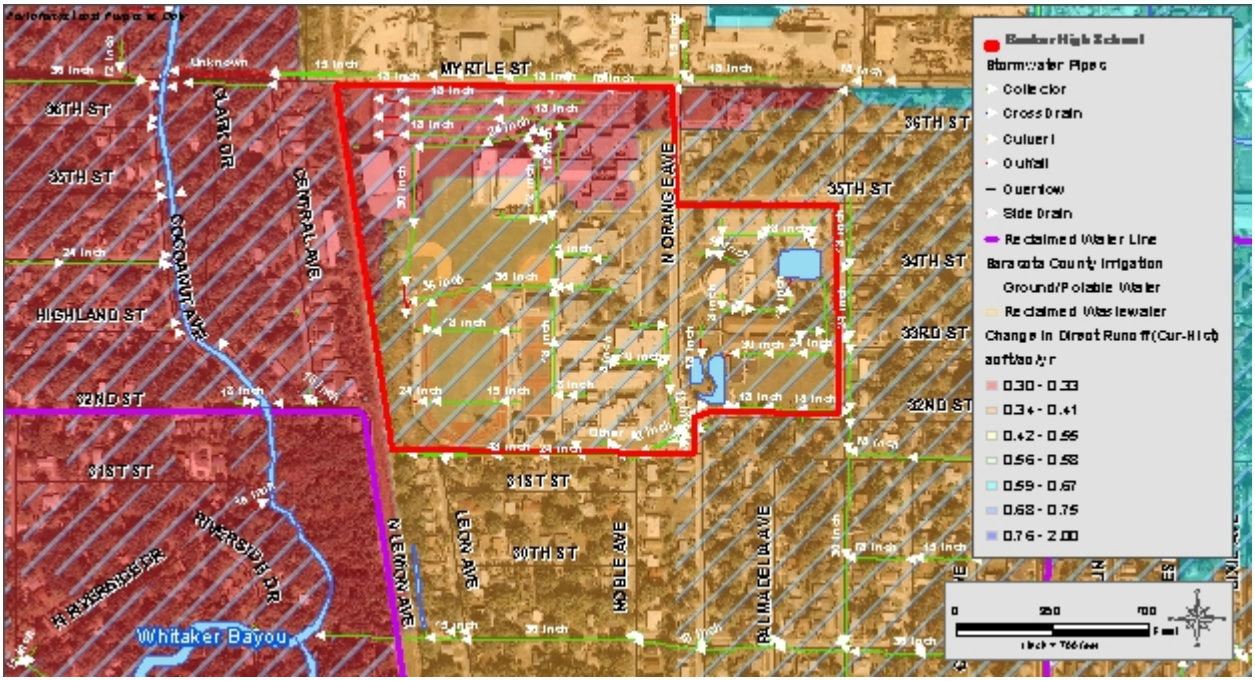


Figure 4-15 Booker High School GIS Analysis Map

4.7.2.2 Recommendation

Jones Edmunds recommends working with the high school to convert the ponds on the east parcel to stormwater-harvesting ponds with some water quality components and re-directing the majority of the site runoff to the ponds for storage and irrigation use. Jones Edmunds also recommends evaluating the construction plans for the current renovations to see if adding Low Impact Development (LID) options to reduce the amount of runoff leaving the site is feasible. Rooftop cisterns, rain barrels, and parking pavers would be low-cost, feasible options that can be incorporated into Booker High School's Science, Technology, Engineering, and Math (STEM) Program as an educational outreach element to teach students about water conservation.

Summary:

- Install cisterns.
- Convert the ponds on the east parcel to stormwater-harvesting ponds for irrigation.
- Install rain barrels.
- Install permeable pavers in parking lot.
- Work with the STEM Program for educational opportunities related to water conservation.

4.7.3 Site 4 – Arlington Park and Aquatic Complex

The Arlington Park and Aquatic Complex is in the Hudson Bayou basin. The complex is east of Tamiami Trail between Waldemere and Hyde Park Streets (Figure 4-16). The park is owned by the City of Sarasota; operated by Sarasota County Parks and Recreation; and offers recreational as well as aquatic services such as multiple pools, basketball, tennis, and racquetball courts, playground, walking trail, and gymnasium.

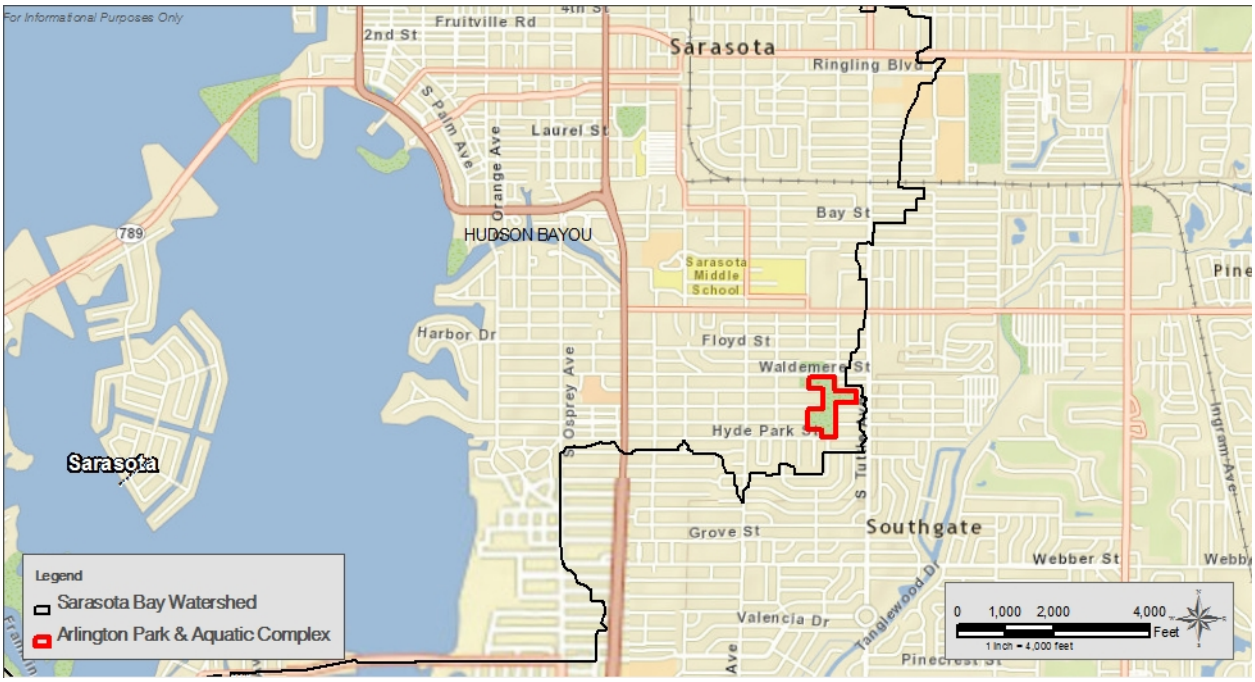


Figure 4-16 Arlington Park and Aquatic Complex Location Map

4.7.3.1 GIS Desktop Analysis

The Arlington Park and Aquatic Complex is an approximately 15-acre site that appears to be partially irrigated with potable water. Stormwater runoff from the site and adjacent areas drain to a large on-site stormwater pond via swales and open ditches (Figure 4-17). The pond discharges off site to the west via an open channel to the Hudson Canal (Figure 4-18). The direct stormwater runoff for the area has increased 0.58 acre-foot/acre/year from historical conditions according to the SIMPLE model, which makes this site ideal with respect to supply.

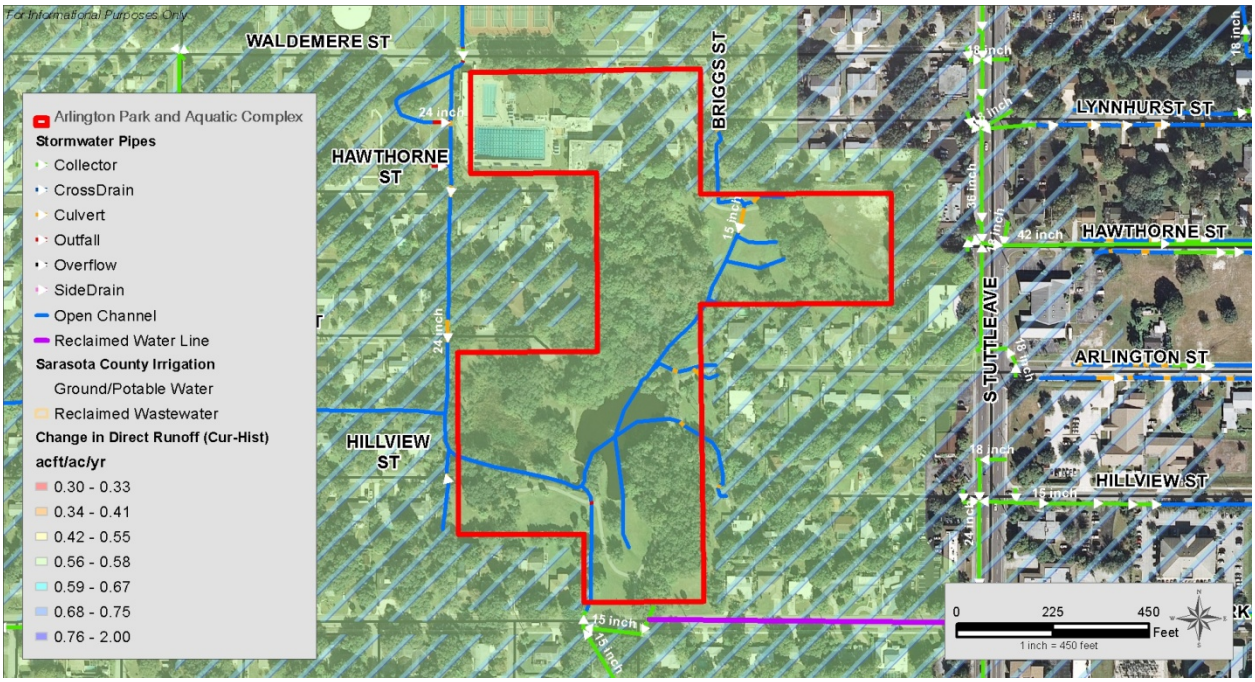


Figure 4-17 Arlington Park and Aquatic Complex GIS Analysis Map

Figure 4-18 Arlington Park and Aquatic Complex Aerial Map

4.7.3.2 Recommendation

Jones Edmunds recommends converting the existing pond to a stormwater-harvesting pond to supply irrigation to the complex. We also recommend investigating the feasibility of working

with local residents to supply harvested stormwater to offset residents' potable water irrigation needs and installing public education signs.

Summary:

- Convert the on-site ponds to stormwater-harvesting ponds.
- Install a public education kiosk to display how water is harvested and re-used.
- Work with local residents to augment their irrigation with harvested stormwater.

4.7.4 Site 5 – Orange Avenue Park

Orange Avenue Park is in the Whitaker Bayou basin at the northeast corner of 18th Street and Orange Avenue (Figure 4-19). The park is owned by the City of Sarasota and operated by Sarasota County Parks and Recreation. The park is a small community park within walking distance to neighborhoods and features a basketball court, playground, and picnic benches.

Photo credits (http://sarasota.patch.com/, William Mansell)

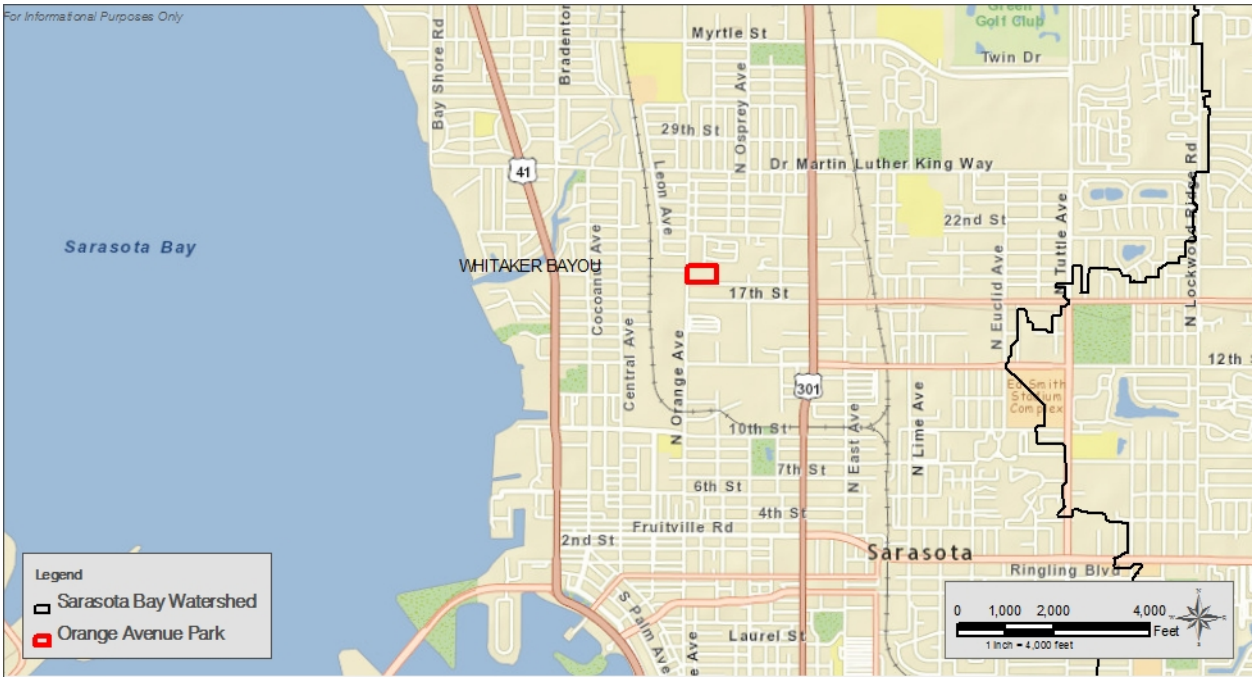


Figure 4-19 Orange Avenue Park Location Map

4.7.4.1 GIS Desktop Analysis

Orange Avenue Park is in an area with a high increase in stormwater runoff from historical conditions. The park is approximately 5 acres in size. According to the Sarasota County GIS irrigation layer, the site is irrigated by potable water (Figure 4-20). The nearest reclaimed lines are more than a mile from the park. The stormwater inventory shows a 42-inch pipe along the south property line of the parcel (Figure 4-21).

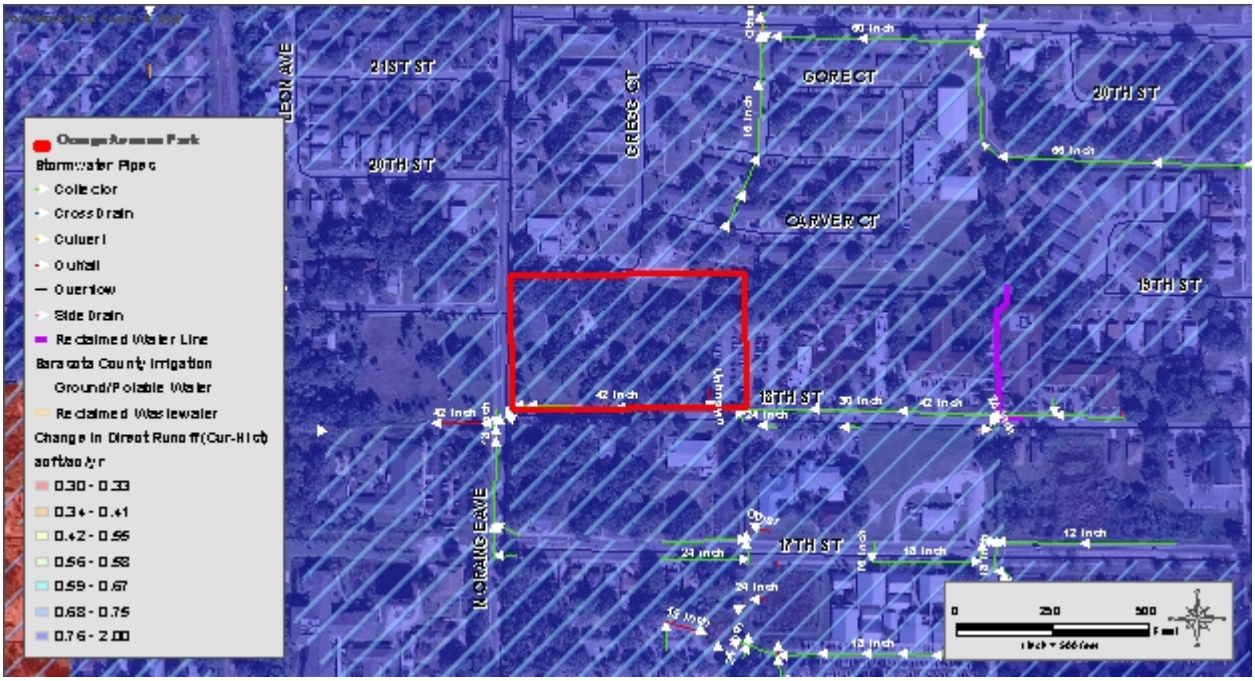


Figure 4-20 Orange Avenue Park GIS Analysis Map

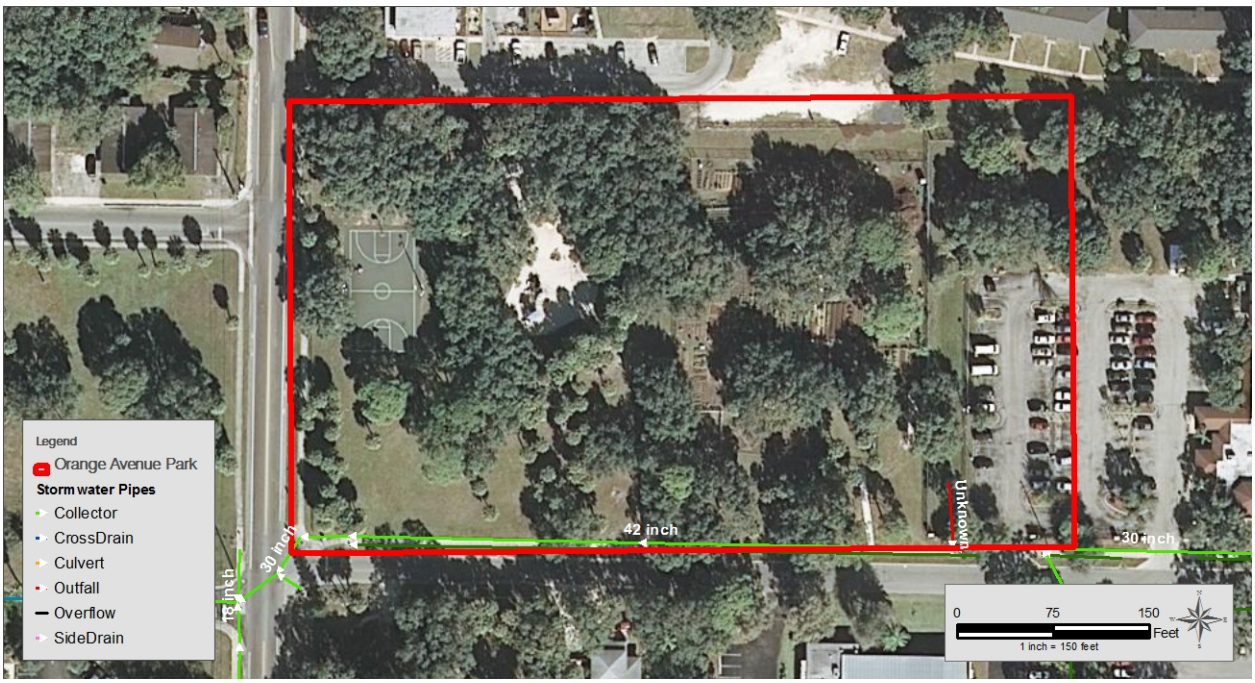


Figure 4-21 Orange Avenue Park Aerial Map

4.7.4.2 Recommendation

Jones Edmunds recommends evaluating the construction of a stormwater-harvesting pond at the southwest corner of the park. The pond should be designed to be large enough to augment the park's irrigation needs during the rainy season. Public education signs or kiosks should be displayed near the ponds.

Summary:

- Install a stormwater-harvesting pond.
- Irrigate the park with harvested water.
- Install a public education kiosk to display how water is harvested and re-used.

4.7.5 Site 6 – Ken Thompson Park Preserve

Ken Thompson Park is in the Sarasota Coastal basin on Ken Thompson Parkway on City Island (Figure 4-22). This 92-acre park is owned by the City of Sarasota and operated by Sarasota County Parks and Recreation. The park is a waterfront park with boardwalks through mangroves and tidal marsh restoration areas and features a boat ramp, canoe/kayak launch, fishing pier, playground, bait shop, and rest rooms.

Photos courtesy of http:\\discovernaturalsarasota.org

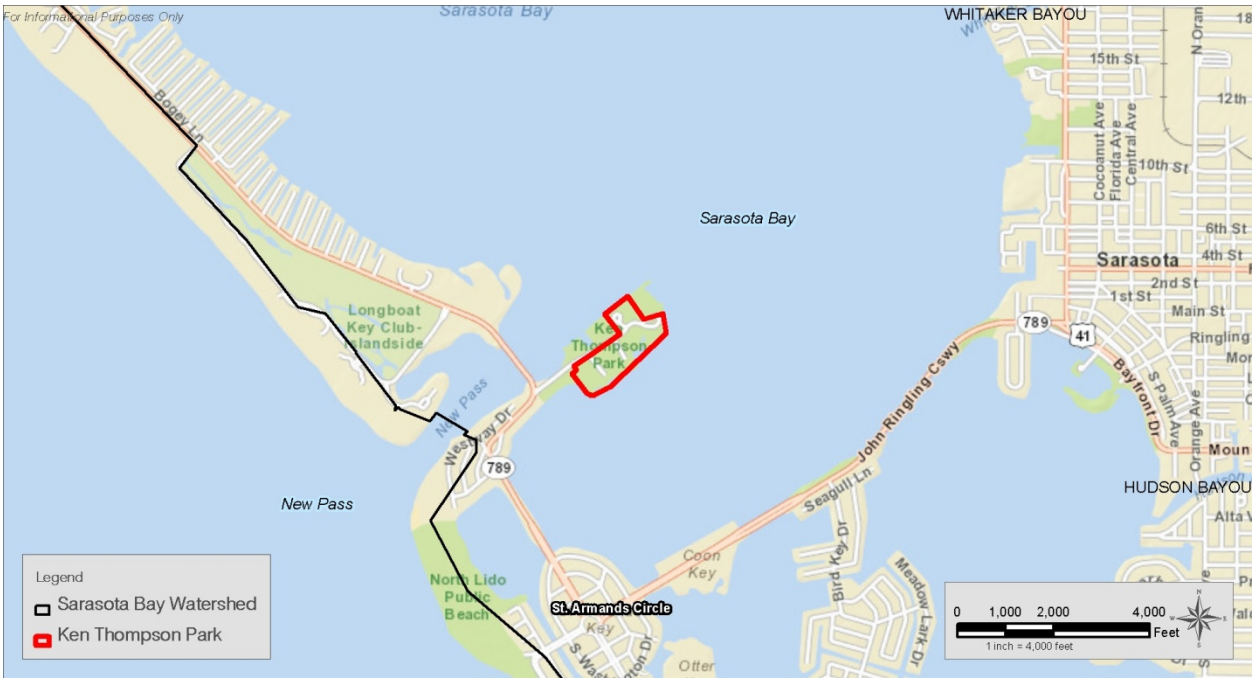


Figure 4-22 Ken Thompson Park Location Map

4.7.5.1 GIS Desktop Analysis

Ken Thompson Park is in an area with a high increase (0.59-acre-foot/acre/year) in stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the southwest portion of the park is irrigated by potable water (Figure 4-23). The 2010 SWFWMD aerial photos show several buildings in the irrigated area (Figure 4-24).

Figure 4-23 Ken Thompson Park GIS Analysis Map

Figure 4-24 Ken Thompson Park Aerial Map

4.7.5.2 Recommendation

Jones Edmunds recommends installing greenroofs and rain barrels on the larger buildings in the southwest portion of the park. We also recommend installing cisterns on other City-owned buildings in the area, such as the large buildings to the west leased by Mote Marine. The cisterns will collect rainwater to irrigate the plants.

Summary:

- Install greenroofs on the park buildings.
- Install cisterns or rain barrels on the other City-owned buildings.
- Install a public education kiosk to display how water is harvested and re-used and the benefits of a greenroof.
- Replace parking lot asphalt with pervious pavers

4.7.6 Site 7 – Gillespie Park

Gillespie Park is in the Hudson Bayou basin north of 7th Street between Osprey and Gillespie Avenues (Figure 4-25). The park was originally platted in 1917 as part of the City's experimental farm (http://sarasotagov.com) and was sold to the City in 1924. This approximately 10-acre park is owned by the City of Sarasota and operated by Sarasota County Parks and Recreation. The park is named after the first mayor of Sarasota and features a Gallery of Patriots, lawn bowling, tennis courts, playgrounds, walking trails, and picnic areas.

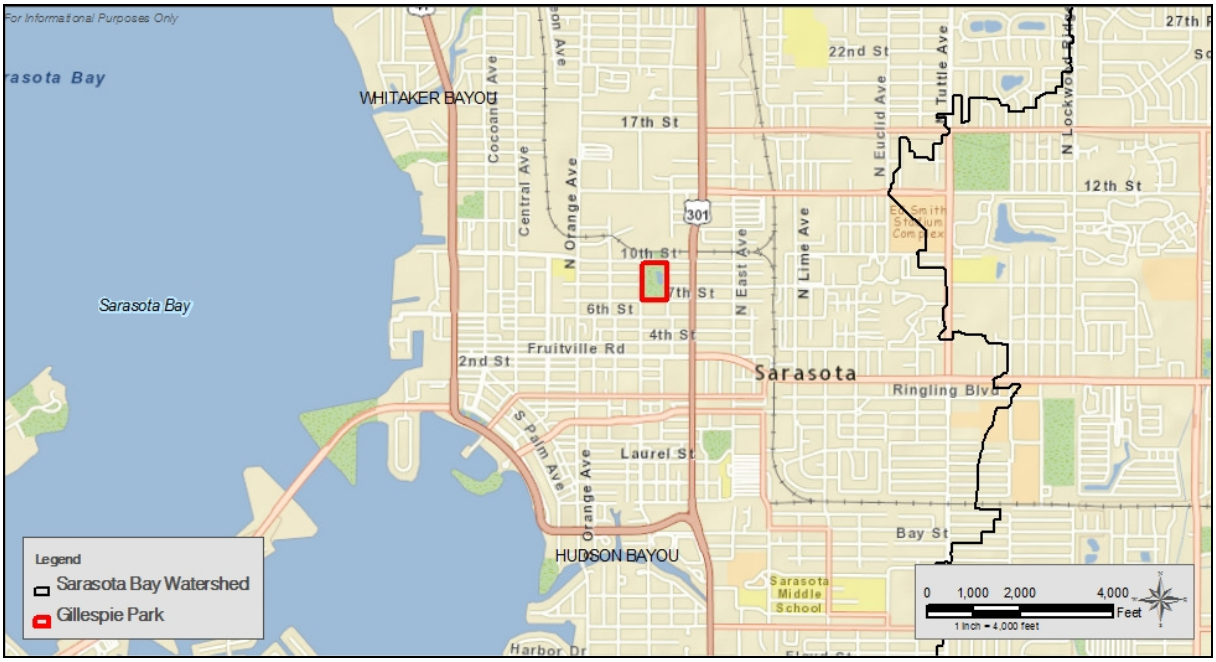


Figure 4-25 Gillespie Park Location Map

4.7.6.1 GIS Desktop Analysis

Gillespie Park is in an area with a high increase (0.73-acre-foot/acre/year) in stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the park does not irrigate on site; however, several nearby residents have potable irrigation systems and may be able to beneficially use the stormwater captured onsite (Figure 4-26 and Figure 4-27).

Figure 4-26 Gillespie Park GIS Analysis Map

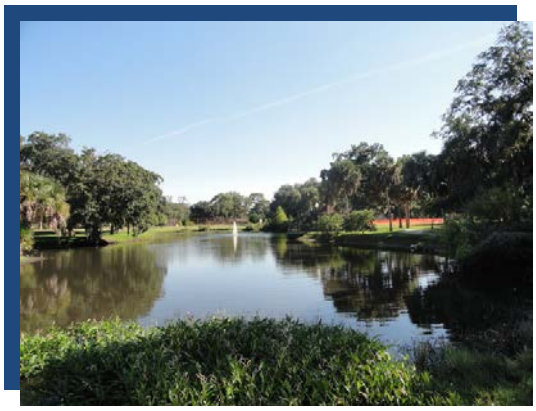


Photo credit: William Mansell

4.7.6.2 Recommendation

Jones Edmunds recommends installing greenroofs on the buildings in the southwest portion of the park to reduce runoff from the site. We recommend installing rain barrels on the buildings, converting the on-site pond to a stormwater-harvesting pond to collect rainwater to irrigate plants, and adding public education kiosks and sign.

Summary:

- Install greenroofs on the park buildings.
- Install rain barrels on the park buildings.
- Convert the existing stormwater pond to a stormwater-harvesting pond for on-site irrigation and other uses.
- Install a public education kiosk to display how water is harvested and re-used and the benefits of a greenroof.

Figure 4-27 Gillespie Park GIS Aerial Map

4.7.7 Site 10 – Martin Luther King Park

Martin Luther King Park is in the Whitaker Bayou basin at the southwest corner of Dr. Martin Luther King Jr. Way and Coconut Avenue (Figure 4-28). This small neighborhood park features picnic areas and a rest room. Whitaker Bayou runs along the west boundary of the park.

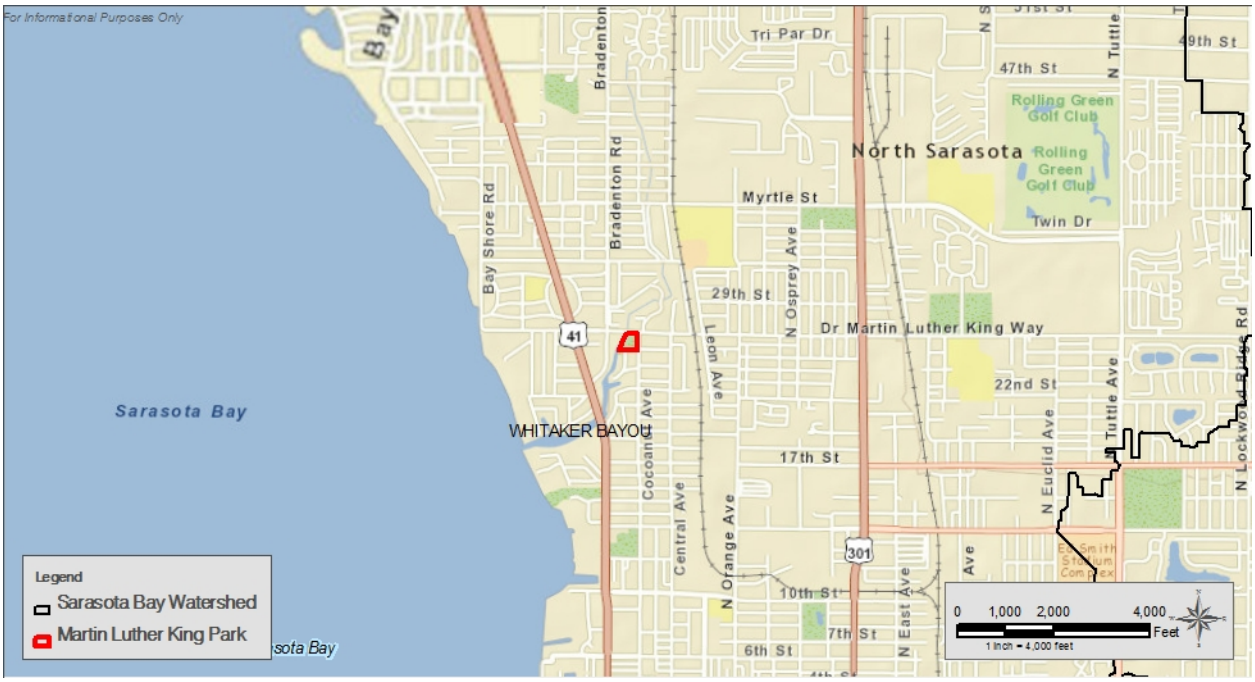


Figure 4-28 Martin Luther King Park Location Map

4.7.7.1 GIS Desktop Analysis

Martin Luther King Park is in an area with an increase of 0.32-acre-foot/acre/year of stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the park does not have an on-site irrigation system (Figure 4-29). The park is immediately adjacent to Whitaker Bayou and does not have on-site storage.

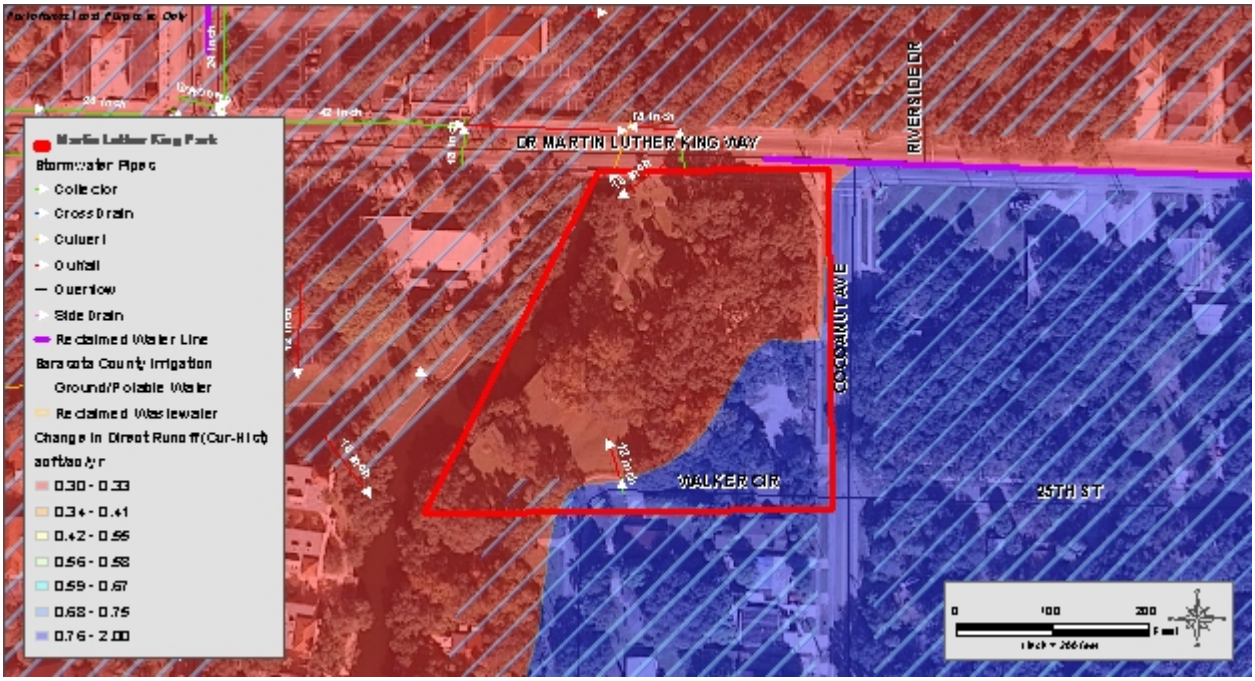


Figure 4-29 Martin Luther King Park GIS Analysis Map

4.7.7.2 Recommendation

Jones Edmunds recommends installing a greenroof and rainbarrels on the larger building to reduce runoff from the site. Because Wilson Miller-Stantec is working with the Sarasota Bay Estuary Program (SBEP) to develop conceptual plans to renovate the park, we recommend working with SBEP to incorporate the greenroof and rainbarrels into the design.

Summary:

- Work with SBEP to include the following components into their design:
  - Install a greenroof on the park building.
  - Install rainbarrels on the park building.
  - Install a public education kiosk to display how water is being harvested and re-used and the benefits of a greenroof.
  - Replace parking lot asphalt with pervious pavers

4.7.8 Site 11 – Robert Taylor Community Complex

Robert Taylor Community Complex is in the Whitaker Bayou basin at the southwest corner of US 301 and Myrtle Street (Figure 4-30). The complex is a historical community center with a 13-acre campus that houses a 44,000 square-foot facility. The complex features indoor and outdoor amenities such as a fitness center, childcare, computer lab, recording studio, aquatic center, amphitheater, and basketball courts.

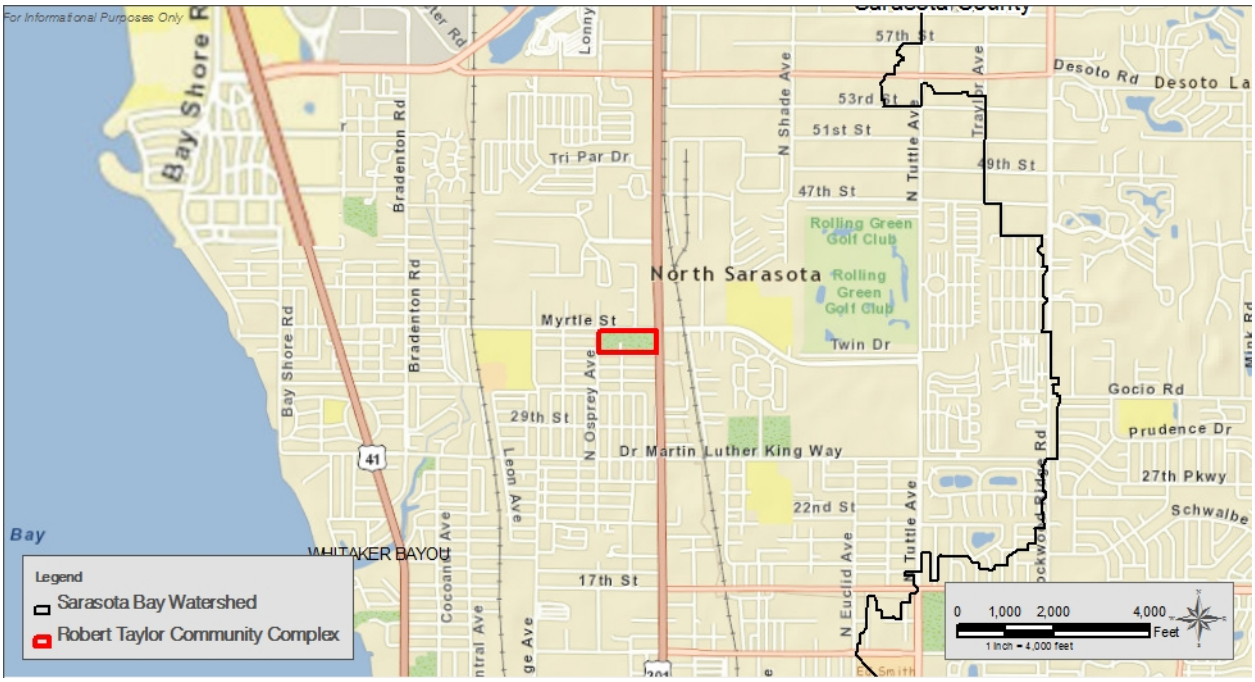


Figure 4-30 Robert Taylor Community Complex Location Map

4.7.8.1 GIS Desktop Analysis

The Robert Taylor Community Complex is in an area with an increase of 0.66-acre-foot/acre/year of stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the complex does not have an on-site irrigation system (Figure 4-31). Storage is not readily available on site, but there is room on site for a storage pond.

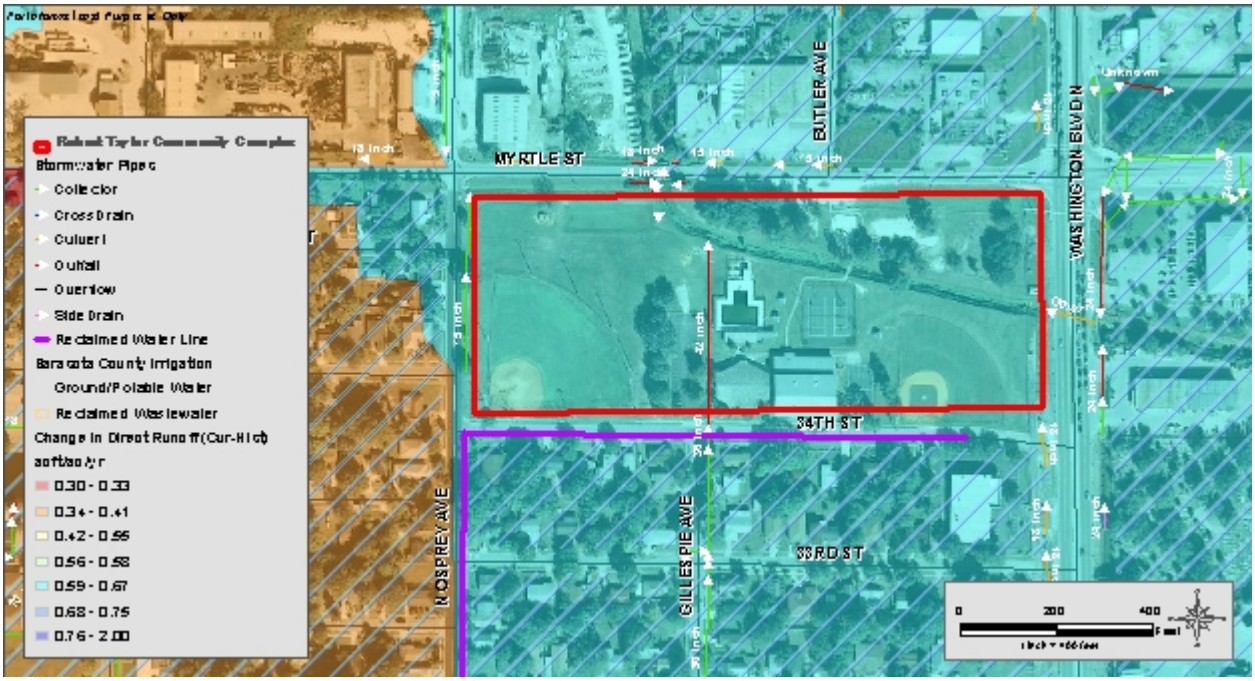


Figure 4-31 Robert Taylor Community Complex GIS Analysis Map

4.7.8.2 Recommendation

Jones Edmunds recommends working with the complex to install roof-top cisterns to offset the potable water uses such as washing recreational areas. Additionally, the County could work with staff to implement an educational outreach program. The staff and local student groups or residents could install and maintain rain barrels and monitor the amount of rainwater captured and used throughout each year. This educational component would teach residents to conserve stormwater and facilitate shared learning in their communities.

Summary:

- Install cisterns/rain barrels
- Wash recreational areas with rainwater before potable water.
- Start educational program.
- Install a public education kiosk to display how water is harvested and re-used.

4.7.9 Site 12 – Lime Lake Park

Lime Lake Park is in the Whitaker Bayou basin approximately 0.4 mile east of US 301 and between 22nd and 20th Streets (Figure 4-32) at the end of Lime Avenue. The park is a small neighborhood park that was recently renovated to include a walking trail around the perimeter of the lake, a fishing pier, gazebo, solar-powered aerator in the middle of the lake (for filtration and aesthetics), benches, picnic tables, ADA parking spaces, areas for shoreline plantings/ restoration, and educational signage (see Figure 4-33).

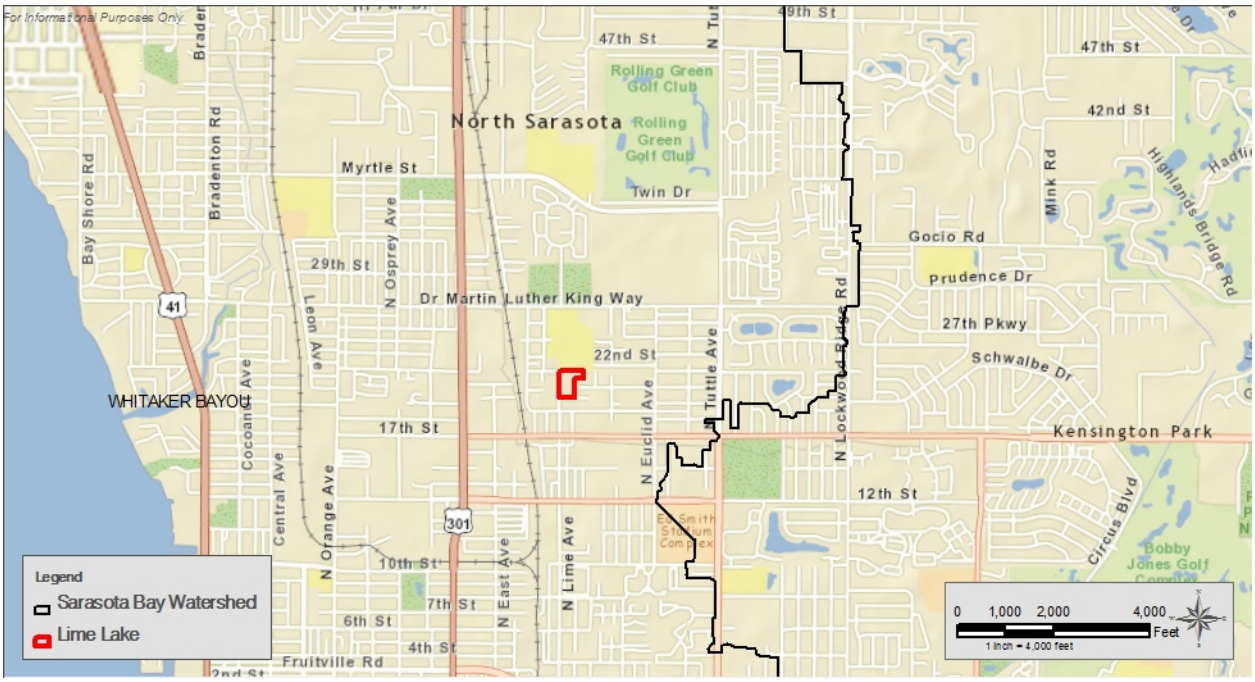


Figure 4-32 Lime Lake Park Location Map

Figure 4-33 Lime Lake Park Concept Plan (courtesy of http:\\scgov.net)

4.7.9.1 GIS Desktop Analysis

Lime Lake Park is in an area with an increase of 0.66-acre-foot/acre/year of stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the park does not have an on-site irrigation system (Figure 4-34), and local residents irrigate with potable water. Storage is available in the on-site 3-acre pond.

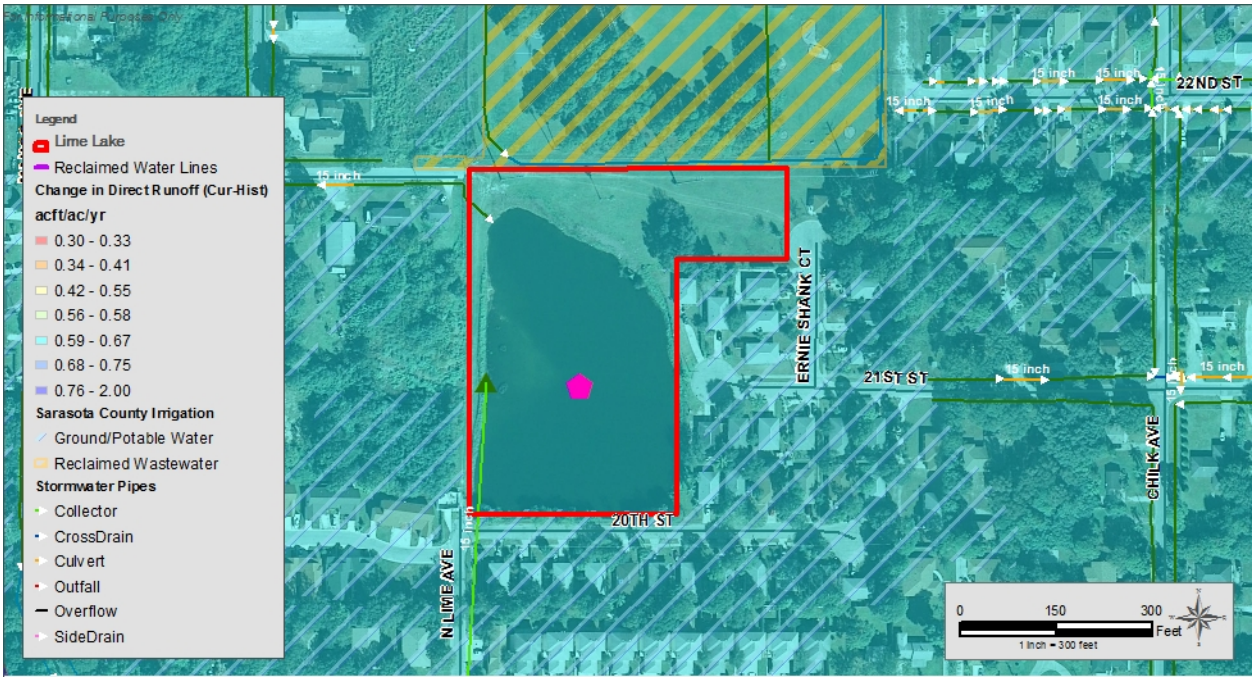


Figure 4-34 Lime Lake Park GIS Analysis Map

4.7.9.2 Recommendation

Jones Edmunds recommends converting the existing pond to a stormwater-harvesting pond to supply irrigation to the park landscaping. We also recommend working with local residents to supply them with harvested stormwater to offset residents' potable water irrigation needs.

Summary:

- Convert the on-site ponds to stormwater-harvesting ponds.
- Irrigate with harvested rainwater before potable water.
- Install a public education kiosk to display how water is harvested and re-used.

4.7.10 Site 13 – Marion Anderson Place

The Marion Anderson Site is in the Whitaker Bayou basin south of Dr. Martin Luther King Jr. Way and east of US 301 (Figure 4-35). The site is a historical landfill with 13 acres of cleared and fenced property within the Newtown Community Redevelopment Area (CRA).

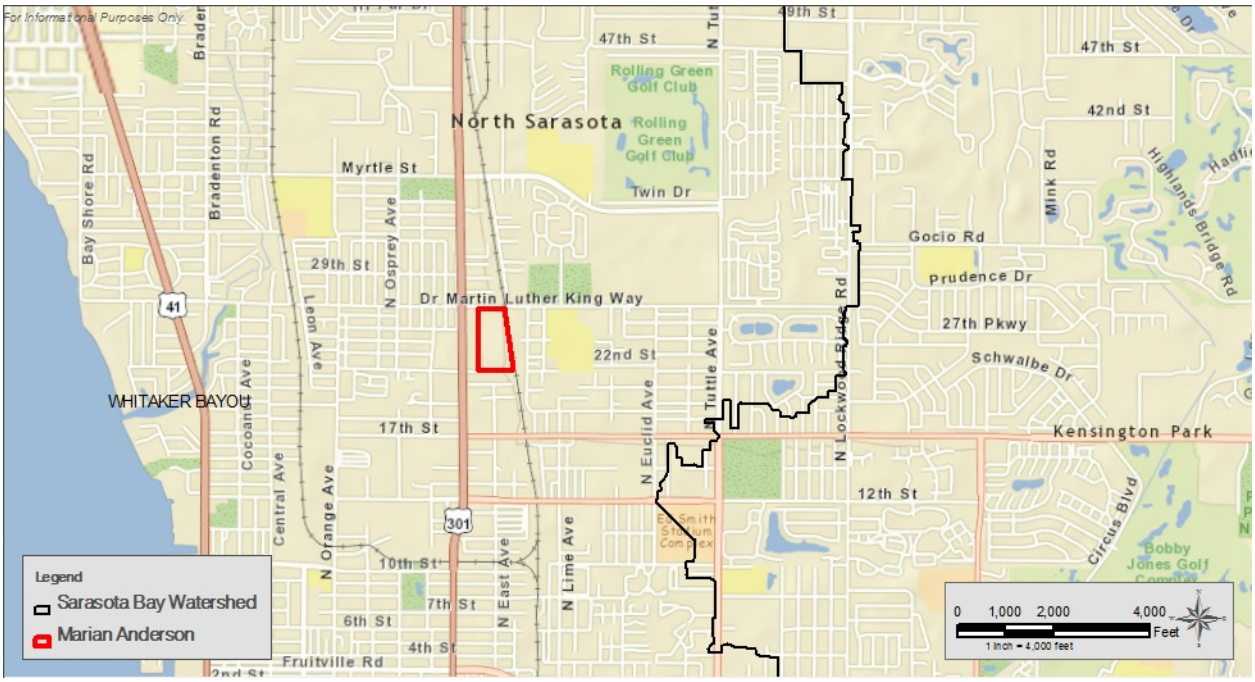


Figure 4-35 Marion Anderson Place Location Map

4.7.10.1 GIS Desktop Analysis

The Marion Anderson Site is in an area with an increase of 0.75-acre-foot/acre/year of stormwater runoff from historical conditions. According to the Sarasota County GIS irrigation layer, the site does not have an on-site irrigation system and nearby parcels are not irrigated with potable water (Figure 4-36). Additionally, the Marion Anderson Place Landfill Opportunity Report recommends that this site be designated for a quality commercial redevelopment project, which is in line with the CRA requirements.

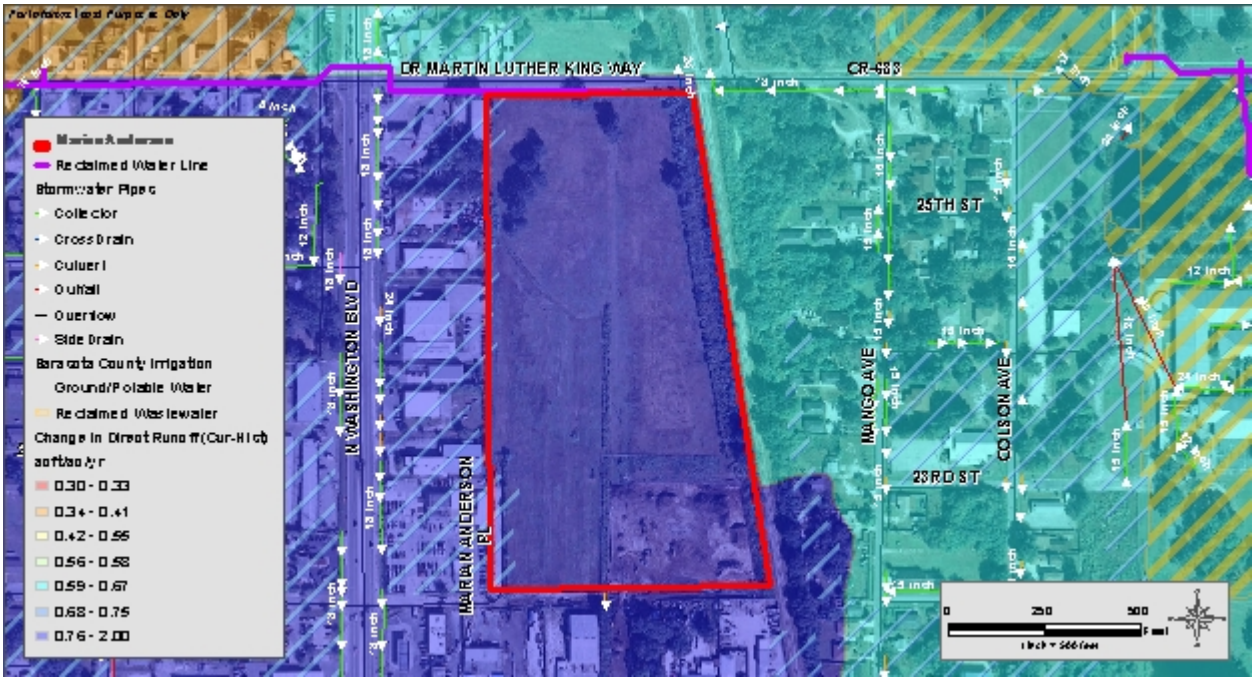


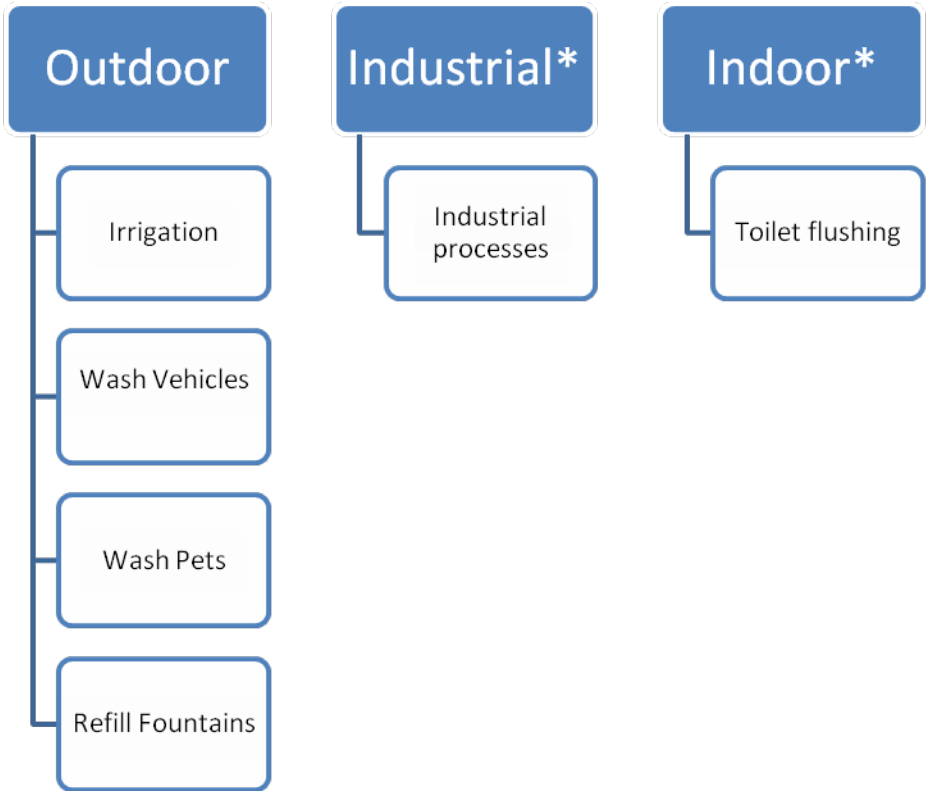
Figure 4-36 Marion Anderson Place GIS Analysis Map

4.7.10.2 Recommendation

Jones Edmunds does not recommend a project at this site. We recommend that the County work with the City of Sarasota and Newtown CRA to identify potential stormwater-harvesting opportunities as part of the site redevelopment.

4.8 LOCAL-SCALE PROGRAMS

Local-scale stormwater-harvesting projects typically consist of pond pumps, cisterns, or rain barrels that serve individual properties. Since local-scale stormwater-harvesting projects typically consist of construction on private property, the County is unlikely to participate directly in the construction of most of these projects. However, local-scale harvesting projects are highly recommended since they provide the same potable-water offset, freshwater balance, and pollutant-loading reduction benefits as any other form of reuse. Possible uses for stormwater include:



* May require additional treatment before use.

Local-scale projects will vary in efficiency based on the amount of storage provided and how the stored water is used for beneficial purposes. Based on some typical values, an individual homeowner may achieve a roughly 5% reduction in average annual flows and loads by using rain barrels at each downspout on a guttered house. Although estimates for reductions using larger cisterns are more variable because of differences in cistern sizes, a reduction of approximately 15% for cisterns may be a reasonable value to use for planning.

The effectiveness of a local-scale stormwater-harvesting project will depend on how well the individual property owner maintains and operates their system.

Customers tend to use more harvested stormwater and reclaimed water than potable water because potable water is generally more expensive and restricted. For example, a single-family residence with an in-ground irrigation system connected to potable water uses about 300 gpd for irrigation. However, if the same single-family residence converts to unmetered, flat-rate, reclaimed water irrigation supply without day-of-week restrictions, the residence will use approximately two and one-half times (804 gpd) that amount. In this example, the offset rate would be 37% (300 gpd offset for 804 gpd reclaimed water utilization). SWFWMD's goal is to achieve a 75% offset efficiency (RWSP, SWFWMD 2011).

The effectiveness of a local-scale stormwater-harvesting project will depend on how well the individual property owner maintains and operates their system and reduces their use of potable water. A storage device that is never used is not a worthy investment. There are countless opportunities for residents and businesses to personally implement practices to reduce their use of potable water. Additionally, a range of possibilities exists for funding assistance of local-scale harvesting projects. Below are some of the programs offered through Sarasota County and its partners.

4.8.1 Sarasota County Rain Barrel Harvesting Program

4.8.1.1 Description

In September 2009, Resolution 2009-178 was passed that allowed Sarasota County Air and Water Quality to implement a rain barrel water conservation program by making rain barrels available for purchase by Sarasota County residents for the wholesale cost of $37.00 each. The rain barrels are 55-gallon, food-grade quality, recycled polyethylene barrels. Harvested stormwater collected in the barrels is considered non-potable.

To implement the program, Air and Water Quality staff partnered with UF/IFAS Sarasota County Extension (http://sarasota.extension.ufl.edu/FYN/Rainbarrel.shtml). The County Extension received grant funding from SWFWMD for a part-time Florida Yards and Neighborhoods Homeowner Outreach Educator. Public education and monthly workshops have been scheduled every year since 2010. Workshop dates and locations are listed on the website.

Residents can register for upcoming classes at http://sarasota.ifas.ufl.edu/. The following topics are included as part of public education to residents:

- Rainwater harvesting can reduce the use of potable water and provide cost savings on water and wastewater utility bills.
- Rain barrels help reduce stormwater runoff by diverting and storing runoff from impervious areas such as roofs, decreasing the undesirable impacts of runoff.
- The use of rain barrels is a sustainable practice that conserves water.

4.8.1.2 Recommendation

Jones Edmunds recommends that the County continue to partner with SWFWMD and UF/IFAS to offer rain barrel education courses and rain barrels at a reduced rate. The County could encourage and support local-scale rain barrel stormwater-harvesting projects through some form of funding assistance or homeowner rebate program.

4.8.2 Sarasota County Septic to Cistern

4.8.2.1 Description

In June 2009 the County Health Department implemented a procedure for converting abandoned septic tanks into cisterns based on Rule 64E-6.011, FAC. This conversion allows a single-family residence to convert an abandoned septic tank to a cistern by permit within 90 days of connecting the building plumbing to sanitary sewer. Laboratory sampling and health department inspection are required for this procedure, and the water collected in the tank must be used for non-potable irrigation purposes only.

4.8.2.2 Recommendation

Jones Edmunds recommends that the County target areas identified in their septic replacement program. The County should educate residents on the benefits of stormwater harvesting and provide support and instructions on the process. Direct targeting will engage homeowners and continue to show a return on the outreach investment.

4.8.3 Irrigation Utilities for New Development

4.8.3.1 Description

Sarasota County has successfully worked with several communities to establish an irrigation utility at the beginning of a new development, construct a central irrigation system, and limit or prohibiting individual groundwater wells through deed restrictions. This structure requires an active management strategy and resource management to ensure that the type of water used follows the principles and hierarchy established by Water Policy 3.3.4. Demand management strategies include limitations on the amount of water and time of day for irrigation, appropriate plant placement, and drought-tolerant plant selections. Also, demands have been adjusted by the changing community perspective with a general shift away from traditional lawns to a more natural landscape.

As examples, Palmer Ranch, Lakewood Ranch, Stonybrook of Venice, and the Grand Paradiso communities were planned and developed with sustainable community principles. A development-wide piping system designed to supply reclaimed water and use stormwater harvesting to irrigate yards and common areas was installed during construction. A private irrigation utility was set up to administer and maintain the system and serve the customers. Community wells are used to supplement supplies when demands cannot be met through other means. The community wells also have meters to track the amount of groundwater used. Grand Paradiso has a development-wide restriction that does not allow private wells. Encouraging the establishment of private utilities and following the prioritization and hierarchy for supplies outlined in Water Policy 3.3.4, will help the County achieve its sustainability goals as well as offset potable water demand.

4.8.3.2 Recommendation

Jones Edmunds recommends continuing to work with developers to implement irrigation utilities and sustainable community practices.

4.8.4 Public Education on Water Conservation Practices

4.8.4.1 Description

Public education is an important component to water supply planning. The County should continue to educate residents on water conservation practices, such as those listed on its website: http://www.scgov.net/EnvironmentalServices/Water/Conservation/TopWaterUsers.asp

What can you do to save water indoors:

- *Search for and fix leaks.*
- *Install low-flow toilets, faucets, and showerheads.*
- *Flush less (do not use the toilet as a trash can).*
- *Turn off water while brushing your teeth.*
- *Take shorter showers.*
- *Use less water for baths.*
- *Operate appliances only when full.*
- *Purchase water-efficient appliances.*

What can you do to save water outdoors:

Search for and fix leaks:

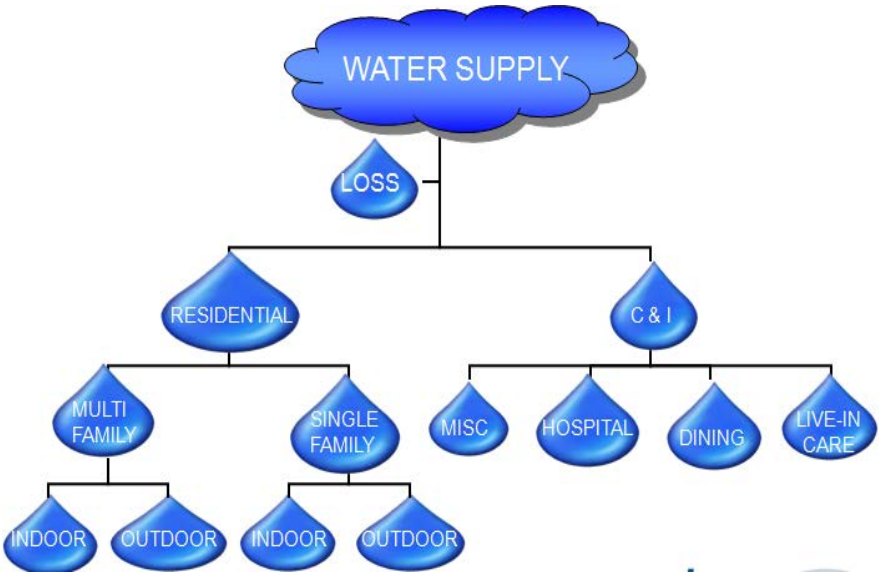
- *Faucets, hoses, and connections.*
- *Sprinkler systems.*
- *Swimming pools.*
- *Service connection lines.*

Irrigate properly:

- *Check local water restrictions.*
- *Water only when needed.*
- *Water in morning or evening.*
- *Evaluate alternative methods such as micro-irrigation.*

4.8.4.2 Recommendation

Jones Edmunds recommends that the County continue its public education practices related to water conservation and enforce the Landscape Efficiency Ordinance (No. 2001-081), which focuses on irrigation system efficiency and limiting plants requiring the most supplemental irrigation for new developments as well as horizontal additions to residential buildings (Sarasota County Ordinance 2001-181, 2001).



4.8.5 Potable Water Demand-Side Management Analysis

4.8.5.1 Description

Evaluating water supply savings potential from customer or demand-side measures requires understanding how water is being used in homes and businesses served by the County utilities. Once the end uses are accounted for, more cost-effective conservation measures can be selected and incentivized by the County to reduce water demands. The County should evaluate demand-side water savings for the following future development conditions:

1. Existing development—This scenario defines the current potential for demand-side management and will be used to estimate the potable water reductions that can be realized through retrofits and programs directed at the existing customer base. This scenario will include estimates of water savings from projects currently being implemented by the County.

2. In-fill of existing development—This scenario will estimate the potential water reductions possible from approved developments that have infrastructure in place with vacant lots to be built on.

3. Approved development without buildings—This scenario will estimate the long-term potential for demand-side management in the County from developments that have been approved but do not have active demands.

4. Conditions at end of planning horizon—This scenario will estimate the long-term potential for demand-side management in the County from developments that have yet to be planned.

The costs and benefits from County demand management programs can be compared against other alternative water supplies.

4.8.5.2 Recommendation

Jones Edmunds recommends that the County partner with the potable water utilities to perform a Demand-Side Management Analysis. SWFWMD has several programs to analyze this information, such as the Conserve Florida and Utility Service Programs. The Analysis should include the following components:

- Data Collection.
- Profile Water Use and Users.
- Estimate Water Use for Four Scenarios.
- Identify Potential Demand-side Management Measures.
- Estimate Potable Water Demand Reductions and Costs.
- Report Findings.

4.8.6 Florida Water Star℠

4.8.6.1 Description

Florida Water Star℠ in Sarasota County
(picture courtesy of SWFWMD)

Florida Water Star℠ is a voluntary certification program for builders and developers designed to increase water efficiency in landscapes, irrigation systems, and indoors. SWFWMD is encouraging good water stewardship to the building industry by offering this recognition program that focuses on water efficiency and water quality protection. Florida Water Star℠ is tailored to the needs of Florida's water resources and is easily integrated into other green certification programs such as Energy Star®, the Florida Green Building Coalition's green standards, and the U.S. Green Building Council's LEED® program.

What are some of the features of Florida Water Star℠?

- Requires micro-irrigation and mulch in plant beds.
- Limits high-volume irrigation system to 50 to 60% of planted landscape area.
- Requires high-performance water-conserving appliances and fixtures.
- Requires points related to water quality issues for homes built near water bodies.
- Requires landscapes for the right plant in the right place.

How does Florida Water Star℠ certification benefit new homebuyers?

- Answers their interest in being "green."
- Saves them money on utilities.
- Decreases landscape maintenance costs.
- Increases resale value.

4.8.6.2 Recommendation

Jones Edmunds recommends that the County continue to work with SWFWMD to encourage participation in the Water Star℠ Program.

5.0 CONCLUSION

Subregional-scale stormwater-harvesting opportunities in the Sarasota Bay Watershed exist largely as projects that can provide a non-potable irrigation source or supplement. Subregional-scale projects will typically serve one or two larger users (e.g., a school). Sustainable supplies are relatively plentiful throughout the watershed since the water budget analysis indicates greater average annual discharge under existing conditions than under historical conditions and because of an abundance of potential withdrawal locations. Because of the relatively small storage footprint required for a stormwater-harvesting system, an abundance of potential storage locations throughout the watershed would also rely on retrofitting existing ponds or constructing new ponds on available property.

Transmission/distribution is one of the most limiting factors for stormwater-harvesting opportunities in this watershed. Irrigation systems that use stormwater cannot be connected to potable distribution systems because of concerns over potential contamination of the potable source. Retrofitting most existing urban land uses (e.g., residential development) with separate or disconnected irrigation systems is typically cost-prohibitive. Therefore, subregional opportunities were limited to areas where separate distribution systems already exist or where retrofitting the distribution system may not be cost-prohibitive.

Jones Edmunds recommends stormwater-harvesting projects at the regional and subregional scales.

Nine of the potential project sites were deemed viable locations for projects designed to reduce potable water use (Table 5-1). Implementing these projects and programmatic recommendations will reduce potable water demand and reduce runoff that will in turn reduce the amount of nutrients leaving the site and entering nearby water bodies.

Jones Edmunds will project benefits, including pollutant-load reductions, develop conceptual plans and cost estimates, and provide project and program rankings for the selected project sites in Task II-7 (Project Analysis).

Table 5-1 Recommended Water Supply Projects

ID	Site Name	Recommended
01	Airport Ponds	No
02	Bay Haven Elementary School	✓
03	Booker High School	✓
04	Arlington Park and Aquatic Complex	✓
05	Orange Avenue Park	✓
06	Ken Thompson Park	✓
07	Gillespie Park	✓
08	City of Sarasota Wastewater Treatment Plan	No
09	12th Street Pond	No
10	Martin Luther King Park	✓
11	Robert Taylor Community Complex	✓
12	Lime Lake Park	✓
13	Marion Anderson Place	No

6.0 REFERENCES

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