Reclaimed Water Reuse in Florida and the South Gulf Coast

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Historically, municipalities and utilities in Florida have been charged with managing wastewater in an environmentally sound and cost-effective manner. Nevertheless, as late as the mid 1960's secondary treatment and surface water discharge were the norms[1,2].

The 1950's and 1960's brought unprecedented growth to the state. Between 1950 and 1960, the state's population grew from 2.77 million to about 4.95 million[3]. The boom has continued with the population nearly doubling between 1960 and 1980 and reaching 12.9 million in 1990. The population growth resulted in a tremendous increase in the number of domestic wastewater treatment systems as Florida "discovered" the package plant as a means of keeping up with the the rapidly growing population. By 1966, there were nearly 600 treatment plants in Florida[1,2] This number increased to about 4,250 in 1986[4]. In 1993, the number of facilities has stabilized at about 3,500[2]. The vast majority are small, with about 80 percent having capacities less than 0.1 MGD. These small facilities typically rely on various land application methods. Collectively, they represent only about three percent of the total permitted capacity of all domestic wastewater facilities in the state.

Growing environmental awareness during the 1970's and subsequent decades resulted in increased levels of wastewater treatment. Ensuing state legislation in Florida[5,6] required full advanced treatment in some sensitive coastal areas.

Advanced Wastewater Treatment is defined as 5.0 mg/l CBOD and total suspended solids, 3.0 mg/l total nitrogen, and 1.0 mg/l total phosphorus. Florida's warm, slow-moving streams and sensitive lake and esturine environments required stringent treatment requirements. In some cases surface water discharges were essentially precluded.. The result was an increased interest in land application and reuse technologies.

Early Reuse Projects

Reuse systems serving Tallahassee and St. Petersburg significantly influenced reuse in Florida and paved the way for today's multitude of excellent, innovative reuse projects.

Tallahassee initiated testing of spray irrigation systems in 1961. This has evolved into a major agricultural reuse system on nearly 2,000 acres of farmland[7,8]. From the first experimental work until the present, the University of Florida and the U.S. Geological Survey have been involved in research and monitoring of the system, which has yielded valuable information about agricultural reuse activities.

St. Petersburg[9,10] implemented an urban reuse system in the late 1970's. It features the use of reclaimed water for irrigation of residential properties, golf courses, parks, schools, and other landscaped areas. Experimental work by the State Virologist[11] in support of the St. Petersburg project served as the basis for Florida's high-level disinfection criteria, which are integral to the state's reuse rules. Additional monitoring and review of public health information has been done on this landmark project (12,13).

The 1980's saw the birth of a number of exemplary reuse projects. These included the CONSERV II citrus irrigation project[14, 15, 16] serving portions of Orlando and Orange County, Project APRICOT[17, 18], an urban and residential irrigation project in Altamonte Springs, the Orlando wetlands project[19], and others. While wastewater management remained a prominent driving force, Florida was experiencing an increasing awareness of the water resource management benefits of reuse of reclaimed water.

Florida's Reuse Program

In 1987, DEP began looking at ways to promote reuse of reclaimed water. Table 1 presents a timeline for the development of Florida's reuse program. Florida Statutes[20,21] established the encouragement and promotion of reuse and water conservation as state objectives. It is important to note that these objectives are contained in statutes dealing with environmental quality (including wastewater management) and statutes dealing with water resources.

Table 1. Milestones in Florida's Reuse Program

Date	*Milestone*
1987	Reuse program initiated
1988	Added reuse provisions (including mandatory reuse in WRCAs) to the Water Policy " Chapter 17-40 FAC.
1989	Created reuse rules in Chapter 17410 FAC.
	Established Chapter 17400 FAC for domestic wastewater facilities refined high-level disinfection requirements. State legislation added reuse objectives and reuse feasibility study requirements to Chapter 403 Florida Statutes. Established the Antidegradation Policy in Florida rules.
1990	Revised 17410 FAC — added permitting requirements. Florida enacted the Indian River Lagoon Act - encourages reuse in this area of the central east coast of Florida.
1991	Published guidelines for preparation of reuse feasibility studies. WMDs designated Water Resource Caution Areas.
1992	Reuse Coordinating Committee established
1993	DEP formed (merged Department of Environmental Regulation and Department of Natural Resources). Rules in the Title 17 series became the Title 62 series for DEP. Initiated 2-phased rulemaking to redefine & expand reuse rules in Chapter 62-610, FAC Reuse Coordinating Committee published Reuse Conventions.
1994	Florida enacted the APRICOT Act — established a backup discharge mechanism & expanded indirect potable reuse opportunities. State reuse legislation enacted - refined reuse feasibility study requirements and links DEP and WMD permitting for reuse.
1995	State legislation creates reuse funding programs in the WMDs. Adopted Phase I revisions to Chapter 62-610,F.A.C. - created parts dealing with industrial uses and groundwater recharge/indirect potable reuse.

Florida's program focuses on "water resource caution areas" (WRCAs). The WRCAs (shown in Figure 1) have been designated by Florida's five regional water management districts (WMDs) as having existing or projected future (20-year planning period) water resources problems. State legislation[20] requires preparation of reuse feasibility studies for treatment facilities located within the WRCAs and the Water Policy[22] requires use of reclaimed water within the WRCAs, unless use of reclaimed water is not economically, environmentally, or technically feasible. Most of SFWMD and a significant portion of SWFWMD are designated as WRCAs.

Florida's antidegradation policy, which is contained in permitting and surface water quality rules[23, 24] applies to all proposed new or expanded surface water discharges. It requires demonstration that the proposed discharge is clearly in the public interest As part of the public interest test, the applicant must evaluate the feasibility of reuse. If reuse is determined to be feasible, reuse is preferred over surface discharge or other means of disposal.

A key component of Florida's reuse program is Chapter 62-610, FAC, which contains detailed rules for reuse of reclaimed water[25]

Figure 1. Water Resource Caution Areas

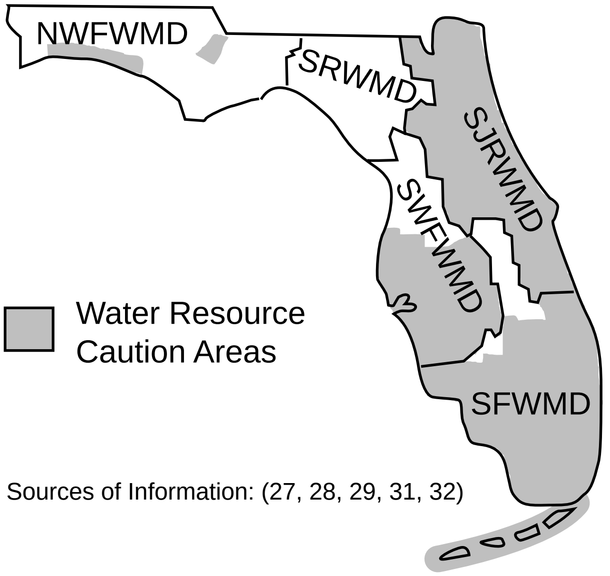


Table 2. Requirements for Irrigation of Public Access Areas, Residential Properties, and Edible Crops

Parameter	*Requirements**
Preapplication Treatment	Secondary treatment & filtration
High-Level Disinfection	Total suspended solids: 5.0 mg/l after filtration Fecal coliforms: At least 75% of observations less than detection. No sample to exceed 25 fecal coliforms/ 100 mL.
Reliability	Class I reliability (36)
Monitoring	Continuous monitoring for turbidity & disinfectant residual
Operational control	Operating protocol is required to enable continuous judgment of quality of reclaimed water based on continuous monitoring.
Staffing	24 hr/day - 7 days/week (may be reduced to 6 hr/day with additional reliability features)
Storage	System storage for acceptable quality water: Minimum 3 days (may be unlined) Reject storage for unacceptable quality water: Minimum I day (must be lined

*Complete rule requirements for reuse are contained in Chapter 62-610, FAC[25]. Complete disinfection requirements are contained in Chapter 62-600, FAC[35].

and regulates slow-rate land application (irrigation), rapid-rate land application systems (rapid infiltration basins), absorption fields (a form of rapid-rate system involving sub-surface placement of reclaimed water), and other land application systems. Part III of the chapter deals with irrigation of public access areas (golf courses, parks, schools, other landscaped areas), residential properties, and edible food crops. Other urban uses of reclaimed water, such as toilet flushing, aesthetic uses, fire protection, construction dust control, and others, also are regulated by Part III. The basic requirements for projects permitted under Part III of Chapter 62-610, FAC, which are consistent with EPA's Guidelines for Water Reuse[26], are presented in Table 2.

Reuse in Southwest Florida

Cape Coral recently launched a potentially massive residential reuse program. It supplies reclaimed water supplemented by fresh water from canals in the city to provide irrigation water for residential reuse. It also provides on-demand water for fire control. This ambitious program may eventually supply reclaimed water to an urban area of roughly 100 square miles. The city recently was the recipient of the EPA operation and maintenance award for its wastewater treatment system.

The 1995 annual reuse report prepared by the WMD for the south district in Florida indicates that six percent of the 243 individual water use permits issued included reuse[39,40]. All water use applicants were required to evaluate reuse feasibility. Seventy-five percent of the 163 wastewater treatment plants greater than 100,000 gpd practiced reuse for all or part of their disposition of reclaimed water. The 163 plants treated 772 MGD of domestic wastewater, and 112 MGD (15%) was reused.

A dramatic and unfortunate number, 35%, of the total wastewater treated contained excessive salts and thus had limited or no reuse potential. Most salt enters the sewer through aging collection systems in areas of high permeability near salt water canals. Although many communities in coastal areas, especially the older ones, spend large amounts of money on collection system rehabilitation, little progress is made in correcting infiltration and inflow (I and I) problems. Eighty percent of the wastewater was treated by 16 percent of the treatment plants. In the south district of DEP the majority of treatment plants are smaller than 100,000 gpd. Although many of the plants use percolation ponds or drainfields, which are considered reuse, the plants are too small to provide public access reuse.

In SWFWMD, 310 individual water reuse permits were issued greater than 100,000 gpd. Of those, 3.5 percent involved requirements for reuse. Most of the permits involved public supply or recreational use. Twenty-seven permittees were required to investigate the feasibility of reuse and to implement reuse where it was found to be technically and economically feasible. Including feasibility studies, 12 percent of water use permits had reuse requirements.

SWFWMD is involved in two funding assistance programs. The Cooperative Funding Program will fund up to 50 percent of the cost of design and construction including pumping, storage, and transmission facilities and reuse master plans. A total of 90 Cooperative Funding Program reuse projects have been budgeted though FY 96.

The New Water Sources Initiative Program provides funding for alternative water supply projects. Nine of 16 New Water Sources Initiative projects utilize reclaimed wastewater or stormwater. These combined programs may provide significant additional reclaimed water supplies within the next decade. Forty-two of the District's 48 local governments with wastewater facilities have developed reclaimed water systems. Reflecting the success of the SWFWMD's program, the 1995 Florida Legislature directed the other WMDs, which have designated WRCAs, to implement similar financial assistance programs.

Over half of the 180 largest wastewater treatment plants in SWFWMD supply reclaimed water. In 1995, these plants supplied 104 MGD of reclaimed water, utilizing 33 percent of the total volume of wastewater generated in the district. Since 1990, the volume of water beneficially reused increased by 30 percent, and since 1994 by 6.5 percent. In some areas of the district , the demand for reclaimed water now exceeds the available supply. Reuse is expected to increase significantly within the next ten years.

Program Coordination

The DEP, the five WMDs, and the Florida Public Service Commission (PSC) all play roles in Florida's reuse program. DEP coordinates the reuse program, administers the domestic wastewater permitting program, and has the primary responsibility for administering water quality programs. The regional WMDs have responsibility for regulation of water quantity issues, including the consumptive use permitting program. The WMDs also designate the WRCAs. Particularly within WRCAs, the WMDs may incorporate requirements for reuse in permits for consumptive use of water. The PSC regulates rates for investor-owned utilities located in about half of Florida's counties. Utilities regulated by the PSC are able to distribute the costs of reuse facilities among water, wastewater, and reclaimed water customers.

With multiple agencies involved, effective coordination is essential. The focus is on the Reuse Coordinating Committee. This committee is chaired by DEP's Reuse Coordinator and consists of representatives from the DEP, the WMDs, and the PSC. The committee meets on a regular basis to coordinate reuse related activities and to promote communication. In 1993, the committee published Reuse Conventions[28], which included an overview of the reuse program, made recommendations for increasing program effectiveness, and established standard terminology and procedures to be used by the members in their efforts to encourage and promote reuse.

Ongoing Rulemaking

In September 1993, Florida initiated rulemaking designed to refine the reuse rules in Chapter 62-610, FAC. The primary objectives were to facilitate implementation of reuse and to expand reuse opportunities. The rulemaking is being conducted in two phases. Phase I revisions were adopted in October 1995. Most of the Phase I revisions simply clarify and refine existing rules. Of more significance are two new parts which were added during the Phase I revisions. Industrial uses of reclaimed water now are regulated by Part VII of Chapter 62-610, FAC. In addition, Part V was established to address groundwater recharge and indirect potable reuse. Currently, Part V largely cross-references other Florida rules dealing with groundwater recharge and indirect potable reuse. Brief summaries of these rule requirements are contained in Table 3.

The requirements for injection to formations of the Floridan and Biscayne Aquifers having total dissolved solids of 500 mg/l or less (see Table 3) have significance for groundwater recharge activities in Florida. These requirements were developed with significant input from a technical advisory committee, which included nationally recognized experts in groundwater recharge and indirect potable reuse. These rules were established after 1983 state legislation essentially prohibited injection to these high-quality portions of the Floridan and Biscayne aquifers. The legislative prohibition was enacted in response to opposition to a proposed groundwater recharge project in the Orlando area. State legislation in 1994 (the Florida APRICOT Act) removed this prohibition in order to clear the way for future indirect potable reuse applications in Florida.

Phase II rulemaking will provide an opportunity to refine requirements for groundwater recharge and indirect potable reuse. Preliminary input from the Reuse Technical Advisory Committee indicates that refinements to the requirements for injection to high-quality groundwaters may be appropriate. The full-scale testing requirements probably will be replaced with streamlined pilot testing requirements. The TOC limitation may be tightened to 3 mg/l average and 5 mg/l maximum values. In addition, expansion of the coverage of the requirements for these rules may be considered.

Phase II also provides an opportunity to refine the requirements for Aquifer Storage and Recovery (ASR) and use of reclaimed water for salinity barrier systems. The use of other water sources (surface water, groundwater, stormwater, and potable water) to supplement the supply of reclaimed water will be addressed. In addition, rules governing the blending of concentrate from reverse osmosis and other membrane treatment technologies with reclaimed water will be considered for possible addition to Chapter 62-610, FAC.

Table 3. Groundwater Recharge and Indirect Potable Reuse Rules

Reuse System Type	*Requirements**
Rapid-Infiltration Basins	Secondary treatment Basic disinfection (200 fecal coliforms/lO0 mL) Nitrate: Maximum 12 mg/l as N)
Rapid-Infiltration Basins in Unfavorable Geohydrologic Conditions**	Secondary treatment High-level disinfection Meet primary & secondary drinking water standards
Discharge to Class I Surface Waters (used for potable supply)	Secondary treatment High-level disinfection Meet primary & secondary drinking water standards Total nitrogen: Maximum 10 mg/l
Injection to Groundwater	Secondary treatment High-level disinfection Meet groundwater standards at the point of injection (arc the drinking water standards)
Injection to Formations of Floridan or Biscayne aquifers Having TDS Less Than 500 mg/l	Total Organic Carbon (TOC): Average 5 mg/l Maximum 9 mg/l Total Organic Halogen (TOX): Average 0.2 mg/l Maximum 0.3 mg/l Activated carbon treatment required 2-year full-scale testing program

*Complete rule requirements are contained in Chapters 62-600 and 62.610, F.A.C. (25, 35).
**Applies to systems located in karst areas, systems recharging unconfined aquifers, and continuously loaded systems.

Statewide Reuse Experience

Reuse has grown rapidly in popularity in Florida. Figure 2 shows the numbers of treatment facilities making reclaimed water available for beneficial uses. Trends in the flows being reused and the capacity of reuse systems are presented in Figure 3. Between 1986 and 1994, the number of domestic wastewater treatment facilities providing reclaimed water for beneficial use increased from 118 to 392[4,27,29,30,31,32]. During this period, the amount of reclaimed water used increased from 206 to 354 MGD and the total reuse capacity increased from 362 to 696 MGD. The 1995 figures for reuse in SFWMD and SWFWMD now show 216 MGD dedicated to reuse, or about 20 percent of the actual wastewater flow. The total permitted reuse capacity represents roughly one-third of the state's total

Figure 2. Florida's Reuse Projects

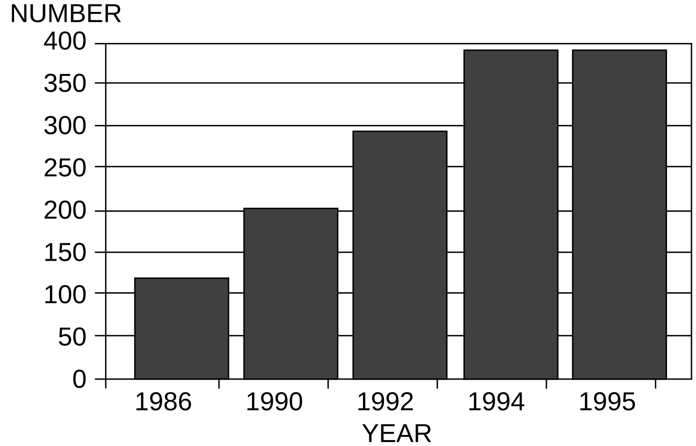


Figure 3. Reuse Flow and Capacity

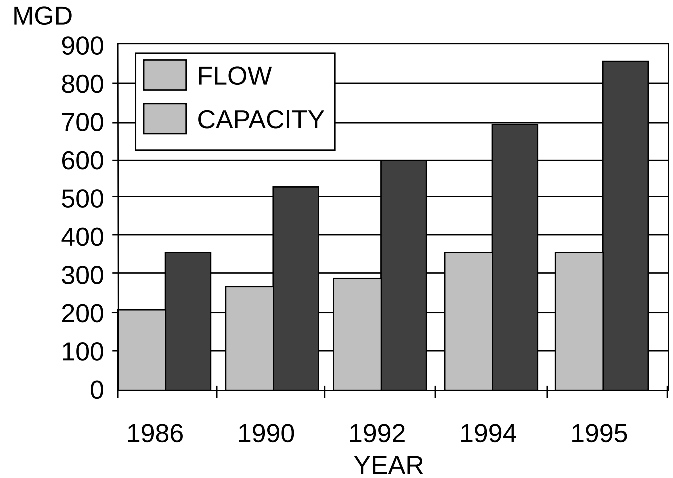
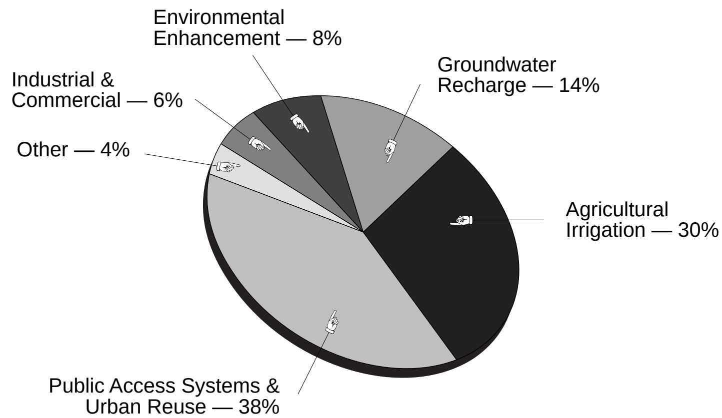


Figure 4. Reuse Activities



capacity for all domestic wastewater treatment facilities. The distribution of types of reuse activities in Florida is depicted in Figure 4.

There is growing interest in groundwater recharge and indirect potable reuse in Florida. The city of Tampa[33,34] is pursuing a proposal to use reclaimed water to augment their surface water supply. Tampa proposes to discharge a very high-quality reclaimed water into a surface water body, which would be linked to the Hillsborough River, its drinking water source.

Several other projects designed to augment groundwater supplies are being developed in the Tampa Bay area. They involve a variety of land application technologies to introduce reclaimed water into the groundwater. A total of $29.9 million of federal funds were appropriated for these projects in federal fiscal year 1995. Partial funding for the Tampa project is included.

In addition, there is increased interest in groundwater recharge and indirect potable reuse in southeast Florida. The area faces continued population growth along with growing competition for water supplies (including the need to provide increased freshwater flows to the Everglades) and concerns for salt water intrusion.

The Future

Figure 5 presents forecasts of reuse flows and capacity through 2020. These forecasts were based on the assumption that 75 percent of new domestic wastewater capacity added after 1995 will involve reuse. Lower percentages were assumed for Duval, Dade, Broward, Palm Beach, and Monroe Counties.

Summary

Reuse rapidly has become very popular in Florida. For the most part, public acceptance has been high. Patterns of increased growth will continue to make South Florida and especially the South gulf coast of Florida very active areas for the reuse of reclaimed water.

As evidence by the rapid increase in reuse activity in Florida, the move is on to: USE IT AGAIN FLORIDA.

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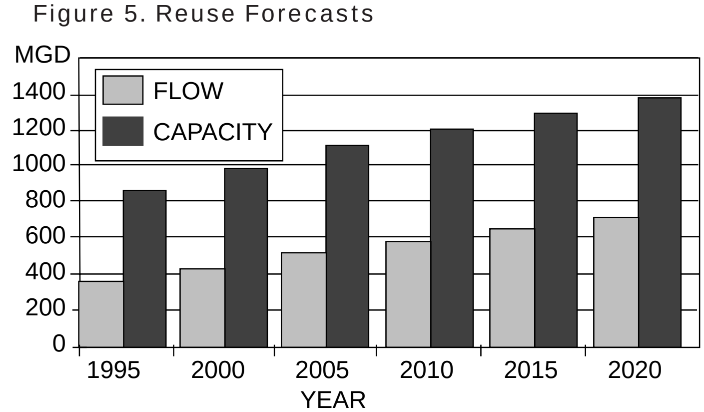
Figure 5. Reuse Forecasts



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Impact Of Population Trends On Reuse

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A great deal has been spoken and written on the subject of population. More than a quarter century ago Paul Ehrlich at Stanford University called attention to the runaway growth of the world population (Ehrlich, 1968) and to the serious implications in store. The message was updated in 1990 (Ehrlich and Ehrlich, 1990). The demands on the natural system and stress on the environment have been pointed out by Lester Brown of the Worldwatch Institute (Brown, 1995; Brown and Kane, 1994) and by Joel Cohen of Rockefeller University (Cohen, 1995). Contrasting views of Norman Meyers (environmentalist) and Julian Simon (economist) have been published (Myers and Simon, 1994).

The relationship of population growth to technology and resource utilization has been discussed (Ausubel, 1996). It is easy to become confused about the subject and to tune out the entire discussion. A very readable book on geography and related topics (including population) is that of Harm de Blij (de Blij, 1995). Other books particularly relate to Florida (Fernald and Purdum, 1992, and Pierce, 1994).

Florida population has followed a steady exponential increase from the first Census in 1830 of 34,730 to the latest one in 1990 of 12,937,926. Average doubling time during this period has been 19 years. In fact, this trend is described very closely by the so-called “Malthus model” of geometric increase. If future trends follow this model, Florida’s population in 2050 will exceed 100 million!

If we apply what most experts consider a more realistic approach, the logistic self-limiting model, the estimate for 2050 becomes 39 million. No way, you say. Perhaps not, but the momentum of these historic trends is more than generally recognized. Popular accounts only touch on fragments of this picture.

We need to recognize and plan for future water demands in various sectors (urban, agricultural, industrial, and recreational) of society. Availability of suitable water is one of the major constraints on quality of life and even survival. Competition for water will become more intense in Florida as it has in California and other parts of the USA and the world. Fresh water withdrawal for all uses increased from about 0.9 10^9 gallons/day in 1950 to 7.3 10^9 gallons/day in 1980. This large demand on groundwater has led to increased emphasis by regulatory agencies on beneficial water reuse in Florida.

A 1992 inventory by DEP listed 295 water reuse systems in Florida. Promotion of reuse of reclaimed water and of water conservation has been established in Section 403.064 of the Florida Statutes.

On the other hand, we should recognize the needs and opportunities these demands offer for training and employment of professional and technical practitioners. This offers challenges for educational institutions, public agencies, and the private sector to meet these needs in society. Awareness and training should start early in life with young children and should reach all the way to senior citizens and volunteers.

Analyses of population trends involves two aspects: (I) data and (2) models. Estimates of world population have been summarized from various sources (Cohen, 1995, Appendix 2). Data for the United States can be derived from the Census conducted every decade. The database for Florida is taken from Andriot (1993), and can also be found in the *World Almanac* published each year and which is readily available in most communities. Models cover a wide spectrum from the geometric model of Malthus to the logistic model of Verhulst to more complicated demographic models which incorporate geographic and age distributions (Caswell, 1989). Virtually all models are open to criticism at some level or other. We have chosen the relatively simple logistic model, which describes the essence of the trends and is relatively easy to use. It has been used to model various social indicators as well (Marchetti, 1986) .

Population Trends And Projections

In this document we focus on two models of population: (1) geometric and (2) logistic. Both are relatively simple mathematically, but are useful in describing general trends. In 1755 Benjamin Franklin pointed out that the U. S. population appeared to double every 25 years. In 1798 Thomas Malthus published an essay on population (Petersen, 1979) in which he noted the tendency toward geometric (exponential) increase:

Population, when unchecked, increases in a geometric ratio. Subsistence only increases in an arithmetic ratio.

The essay set off a debate which continues to this day. Since such a trend cannot continue indefinitely, the Belgian mathematician Verhulst proposed the logistic (sigmoid) model, which is self-limiting in form. These models have the form

geometric: $$P = P_o\, e^{k(Y - 1800)} \qquad [1]$$

logistic: $$P = A/[1 + e^{b - c(Y - 1800)}] \qquad [2]$$

where

P = estimated population
Y = year
Po = estimated population at year 1800
k = geometric response coefficient
A = estimated maximum population
b = logistic intercept parameter
c = logistic response coefficient

The logistic model is considered to be the more realistic of the two, since it approaches a maximum and is self-limiting. Results presented here are excerpted from a document in preparation by the authors (Overman and Pirozzoli, 1995).

Projections for Florida

The state trend is best illustrated by the log graph (Figure 1) shown below. Note that the vertical axis is logarithmic, and covers the range 0.0347 million (34,700) in 1830 to 12.9 million (12,900,000) in 1990. The straight line is given by

$$P \text{ (millions)} = 0.0125\, e^{0.0366 (Y - 1800)} \qquad [3]$$

Several things may be noted. The geometric (Malthus) model describes the trend rather well for the 160-year period of data, with an average doubling time of 19 years. If this trend were to continue, then the Florida population would reach 100 million by 2050. While this seems impossible, who would have thought in 1930 that the population would grow from 1.5 million to 13 million in 1990 (60 years later), a nearly ten-fold increase. This graph demonstrates the strong momentum of such trends. Many of the factors which have contributed to population growth in Florida have been discussed by Marth and Marth (1990).

A more realistic alternative is to use the logistic model to describe the Florida trend:

$$P \text{ (millions)} = 50/[I + e^{8.30 - 0.0380 (Y - 1800)}] \qquad [4]$$

It is shown as the curve in Figure 1. Within the range of data to 1990, both models appear to fit equally well. Since we expect the trend to level off, the logistic model appears more acceptable. This model projects a population of 25 million (50% of maximum) by the year 2018 and 37.5 million (75% of maximum) by 2047.

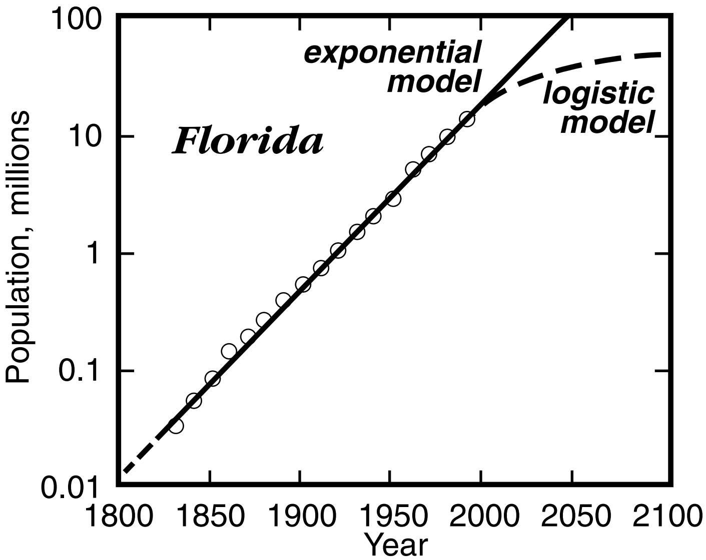

Figure 1. Florida Population Trend—Log Scale.

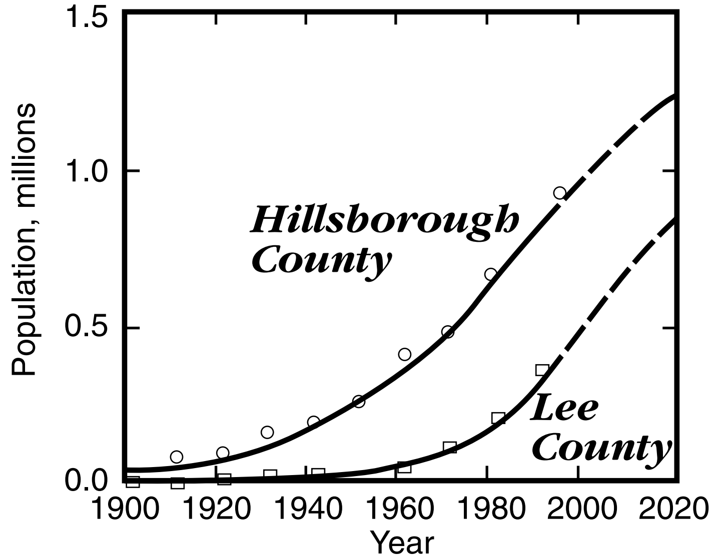

Figure 2. Hillsborough & Lee County Population Trends—Linear Scales.

To illustrate the rapid population growth on the Florida Gulf coast, results are shown in Figure 2 for Hillsborough and Lee Counties, where the curves are drawn from:

Hillsborough Co.: $P(\text{millions}) = I.49/[I + e^{3.75 - 0.0440\,(Y - 1900)}]$ [5]

Lee Co.: $P(\text{millions}) = 1.01/[I + e^{7.l3 - 0.0716\,(Y - 1900)}]$ [6]

Note that in Equations [5] and [6] time has been referenced to 1900. Both trends show rapid growth during the last 20 years, with a time shift of about 30 years between the two counties. By this analysis population is projected to reach 75% of maximum by 2010 and 2015 for Hillsborough and Lee Counties, respectively. Of course, many things, including public policy, will influence these trends in the future.

Counties in Florida exhibit a variety of patterns. We define advanced phase of growth as characterized by having reached more than 75% of projected maximum, which includes 13 counties. Rapid phase describes those which have reached less than 50% of projected maximum, which includes 28 counties. Undetermined include those counties for which the growth trends are not clear, which includes 19 counties. The remaining seven counties are between rapid and advanced phases of growth. Needless to say, many of the counties on the Florida Gulf coast are in the rapid phase of growth.

Conclusions

Florida is now the fourth most populous state in the U.S. During the period 1980-1990 absolute growth was second only to California. In 1990 the net growth rate was approximately 1,000 persons per day, as estimated from Equation [4]. Will rapid growth continue in Florida? Results shown in Figures 1 and 2, along with that of other counties, appear to answer in the affirmative. Results presented in this article confirm the persistence of these trends. Furthermore, world population and that of many countries continue to increase at a rapid rate. These trends will lead to increased competition for water, which is very apparent in Florida. While there are many negative aspects to this growth, it presents challenges and opportunities for professionals in the water field. This extends from water supply to wastewater treatment to water reuse. It includes training of professional and technical staff, as well as policy and regulatory aspects. Cooperation among public agencies (city, county, regional, state, and federal), consulting engineers and scientists, financial institutions, and citizens will be essential in operating programs and systems to maintain a desirable quality of life for the citizens of Florida. The Florida Water Resources Conference will continue to serve a central role in this process.

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