

PROTECTING FLORIDA'S SPRINGS: AN IMPLEMENTATION GUIDEBOOK



February 2008

DEPARTMENT OF COMMUNITY AFFAIRS
2555 Shumard Oak Boulevard
Tallahassee, Fl 32399-2100
Toll Free Number 1-877-352-3222
www.dca.state.fl.us

TABLE OF CONTENTS

PROTECTING FLORIDA’S SPRINGS

| | | PAGE |
|-------|--|-------------|
| 1.0 | Summary | 1-1 |
| 2.0 | Introduction | 2-1 |
| 2.1 | Overview of the Guidebook | 2-1 |
| 2.2 | How to Use the Guidebook | 2-2 |
| 2.2.1 | Amending the local plan | 2-2 |
| 2.2.2 | Data and analysis to support the amendment | 2-3 |
| 2.2.3 | Amending the local land development regulations | 2-3 |
| 2.2.4 | Summary of steps to amend the plan and regulations | 2-3 |
| 3.0 | The Basis for Springs Protection | 3-1 |
| 3.1 | Introduction | 3-1 |
| 3.1.1 | Background | 3-1 |
| 3.1.2 | The Floridan aquifer | 3-1 |
| 3.1.3 | The Florida springs protection area | 3-4 |
| 3.2 | Major Florida Springs and Their Health | 3-5 |
| 3.3 | Major Causes of Problems in Springs | 3-5 |
| 3.3.1 | Landscaping | 3-6 |
| 3.3.2 | Development and urban sprawl | 3-6 |
| 3.3.3 | Water consumption | 3-7 |
| 3.3.4 | Dumping in sinkholes | 3-7 |
| 3.3.5 | Agriculture | 3-7 |
| 3.3.6 | Livestock | 3-7 |
| 3.3.7 | Golf courses | 3-7 |
| 3.3.8 | Recreation | 3-7 |
| 3.4 | Potential Solutions to Protect and Restore Springs | 3-7 |
| 3.4.1 | Avoiding impacts | 3-8 |
| 3.4.2 | Minimizing impacts | 3-8 |
| 3.4.3 | Mitigating impacts | 3-11 |
| 4.0 | Comprehensive Plan Provisions to Protect Springs | 4-1 |
| 4.1 | Introduction | 4-1 |
| 4.1.1 | Using this chapter | 4-2 |
| 4.1.2 | Data and analysis | 4-2 |
| 4.1.3 | Monitoring springs protection implementation | 4-3 |
| 4.2 | Springs Protection Element | 4-4 |
| 4.3 | Future Land Use Element | 4-18 |
| 4.4 | Conservation Element | 4-26 |
| 4.5 | Public Facilities / Infrastructure Element | 4-28 |
| 4.6 | Intergovernmental Coordination Element | 4-32 |

| | | |
|--------|---|------|
| 5.0 | Land Development Regulations to Protect Springs | 5-1 |
| 5.1 | Introduction | 5-1 |
| 5.1.1 | Using this chapter | 5-1 |
| 5.1.2 | Issues to consider in order to implement these regulations | 5-2 |
| 5.2 | General matters | 5-4 |
| 5.2.1 | Title | 5-4 |
| 5.2.2 | Purpose | 5-4 |
| 5.2.3 | Applicability | 5-5 |
| 5.2.4 | Exemptions | 5-5 |
| 5.2.5 | Definitions | 5-5 |
| 5.2.6 | Fee for independent review of applications | 5-5 |
| 5.3 | Springs Protection District(s) | 5-5 |
| 5.3.1 | Alternative 1 – springs protection zoning district | 5-6 |
| 5.3.2 | Alternative 2 – springs protection overlay district | 5-8 |
| 5.3.3 | Alternative 3 – springs protection planned development district | 5-9 |
| 5.4 | Resource Protection and Site Design Standards | 5-10 |
| 5.4.1 | Site design standards | 5-10 |
| 5.4.2 | Open space standards | 5-14 |
| 5.4.3 | Conservation subdivision standards | 5-15 |
| 5.4.4 | Landscaping standards | 5-16 |
| 5.4.5 | Sinkhole protection | 5-18 |
| 5.4.6 | Specific standards for protection of springs | 5-20 |
| 5.4.7 | Specific standards for water bodies | 5-21 |
| 5.4.8 | Specific standards for subsurface channels | 5-21 |
| 5.4.9 | Specific standards for closed depressions | 5-22 |
| 5.4.10 | Design standards for specific uses | 5-22 |
| 5.5 | Stormwater Management Standards | 5-23 |
| 5.5.1 | Generally | 5-23 |
| 5.5.2 | Street drainage | 5-24 |
| 5.5.3 | Drainage design standards | 5-24 |
| 5.5.4 | Recharge standards | 5-25 |
| 5.5.5 | Sediment pumps | 5-26 |
| 5.5.6 | Exfiltration systems | 5-26 |
| 5.5.7 | Karst sensitive area systems | 5-26 |
| 5.6 | Design Standards for All Wastewater Treatment Facilities | 5-28 |
| 5.6.1 | Design standards for central wastewater treatment facilities | 5-28 |
| 5.6.2 | Design standards for on-site wastewater treatment facilities | 5-28 |
| 5.7 | Geotechnical Study Requirements | 5-29 |
| 6.0 | Bibliography – Technical Literature on Springs of Florida | 6-1 |
| 6.1 | General Overviews | 6-1 |
| 6.2 | Geology / Hydrology | 6-5 |
| 6.3 | Hydrology | 6-9 |
| 6.4 | Water Quality / Chemistry | 6-12 |
| 6.5 | Plant Communities | 6-16 |
| 6.6 | Substrata and Benthic Macroinvertebrates | 6-20 |

| | | |
|------|--------------------------|------|
| 6.7 | Fishes | 6-23 |
| 6.8 | Other Vertebrates | 6-25 |
| 6.9 | Whole Ecosystem Studies | 6-27 |
| 6.10 | Management and Economics | 6-28 |
| 6.11 | Online Resources | 6-30 |

Glossary of Terms

Appendix

| | | |
|------|--|--------|
| A.1 | Transfer of Development Rights | A.1-1 |
| A.2 | Legal Foundation for Implementation of Springs Protection | |
| I. | Summary of Legal Issues Regarding Springs Protection | A.2-1 |
| II. | Local Government Authority | A.2-7 |
| III. | Florida Growth Management Framework | A.2-8 |
| IV. | State Preemption | A.2-22 |
| V. | Constitutional Limits on Land Use Regulations | A.2-40 |
| VI. | Bert J. Harris, Jr. Private Property Rights Protection Act | A.2-46 |
| VII. | Transfer of Development Rights | A.2-56 |
| A.3 | Water Budget | |
| 3.1 | Post Equals Pre Recharge for Three Development Scenarios | A.3-1 |
| 3.2 | Hydrologic and Watershed Conditions | A.3-1 |
| 3.3 | Stormwater Management Options | A.3-2 |
| 3.4 | General Findings | A.3-2 |
| 3.5 | Single-family Comparisons to Conservation Cluster Findings | A.3-3 |
| 3.6 | Commercial Development Comparisons to Conservation Cluster | A.3-4 |
| 3.7 | Commercial Development Comparisons with Different Soil Types | A.3-5 |

ACKNOWLEDGEMENTS

Florida Department of Community Affairs

2555 Shumard Oaks Boulevard

Tallahassee, FL 32399-0200

Richard Deadman

Project Manager

Thomas G. Pelham, AICP

Secretary

Charles Gauthier, AICP

Director, Division of Community Planning

Craig Diamond, AICP

Chief of the Office of State Planning

Florida Department of Environmental Protection

3900 Commonwealth Boulevard

Tallahassee, FL 32399

Michael W. Sole

Secretary

Protecting Florida's Springs – An Implementation Guidebook is based on the recommendations contained in the award-winning manual, *Protecting Florida's Springs: Land Use Strategies and Best Management Practices*. The *Implementation Guidebook* was funded by the Florida Department of Environmental Protection. The *Guidebook* was prepared by V. Gail Easley, FAICP, The Gail Easley Company, Crystal River, Florida.

1.0 SUMMARY

Florida's springs are not only a unique and beautiful resource, but also serve an important function. They provide a "window" into a valuable resource – the ground water in the Floridan aquifer system. Over 90% of the State's drinking water comes from this source. Florida's springs occur where the level of water in the aquifer is higher than the ground level. A 40-county region, stretching from Hillsborough County to Walton County, is the land area mapped by the Department of Environmental Protection where the application of best management practices will promote protection of the springs. Nineteen of these counties have first magnitude springs, each discharging more than 64.6 million gallons of water per day.

Protecting Florida's springs means ensuring that water entering the aquifer is free from pollutants. It also means ensuring that adequate levels of water can recharge the aquifer. Because our drinking water comes from the same aquifer that supplies water to the springs, the quality and quantity of water in the springs indicates the quality and quantity of the State's drinking water. There is a significant body of research about the aquifer and Florida's springs. This *Implementation Guidebook* contains an explanation of the scientific basis for protecting springs and provides an overview of this research as a basis for amending local comprehensive plans to ensure protection of springs. Understanding the basis for protection leads to identifying best management practices that ensure protection.

Best management practices are actions that local governments can take to eliminate or reduce adverse impacts to the aquifer and springs. Best management practices include good policies in the local comprehensive plan. The policies in this *Implementation Guidebook* recommend limiting intense land uses as well as those land uses associated with potential negative impacts to the aquifer. The policies also suggest standards for the location and design of development and management of stormwater and wastewater. Best management practices are recommended in this guidebook as regulatory tools to implement the provisions of the comprehensive plan. The regulatory tools provide the details for the design of development projects, limitations on impervious surfaces, protection of open space, the design and management of stormwater facilities, and the design and management of wastewater. While this document presents best practices, which may be used by the public and private sectors, it does not constitute rule or regulation and is intended to be advisory.

2.0 INTRODUCTION

In recognition of the pressures facing Florida's springs, the Florida Springs Task Force was convened in 1999 to recommend strategies for the protection and restoration of these irreplaceable resources. Created by Secretary David Struhs of the Department of Environmental Protection, the task force was comprised of 16 scientists, planners, and other citizens. After meeting for over a year, one product of their work was the publication of a report, entitled, *Florida's Springs – Strategies for Protection & Restoration*, which was issued in November 2000. It identified a wide variety of strategies, including outreach, information, management, regulation, and funding approaches. The work of the Task Force led directly to the development of *Protecting Florida's Springs – Land Use Planning Strategies and Best Management Practices*, produced by the DCA and DEP and released in November 2002. The Department of Community Affairs recommended development of a model code and supporting materials using the principles, strategies, and best management practices recommended in the report. Such a model would provide technical assistance to local governments in Florida who wish to improve local protection to the springs that occur within their jurisdiction. The result is this document, *Protecting Florida's Springs, an Implementation Guidebook*.

2.1 Overview of the Guidebook

This *Implementation Guidebook* is a companion to *Land Use Planning Strategies* and is provided to carry out the recommendation for model provisions. This guidebook provides the information needed by a local government to amend its comprehensive plan and land development regulations for the purpose of protecting Florida's springs. A local government may have provisions in its comprehensive plan that are intended to protect the aquifer, groundwater, and natural resources. However, often such provisions are not specific to springs and do not provide effective policies to ensure not only the health of springs, but also to ensure protection of the aquifer. It is even more often the case that land development regulations are not specifically designed to protect springs and related features.

This guidebook contains three primary components to assist local governments in preparing and adopting provisions in their comprehensive plans and implementing those provisions with land development regulations.

Section 3.0 contains an explanation of the basis for springs protection. Even a casual review of the available literature reveals that a study of springs is a significant undertaking. By summarizing the information into an easy-to-read format, local governments have ready information to serve as the data and analysis necessary to support plan amendments. Chapter 3.0 provides guidance on issues important to springs protection.

Recommended provisions for a local government comprehensive plan are contained in Chapter 4.0. Two approaches are described – the adoption of a separate element

for springs protection, or adoption of policies pertaining to springs protection in several elements of the comprehensive plan. The Springs Protection Element is the recommended approach, as this provides all objectives and policies for springs protection in one location. However, some local governments may prefer to address springs protection in the existing organizational structure of the comprehensive plan, with amendments to Future Land Use, Conservation, Public Facilities, and Intergovernmental Coordination Elements.

Chapter 5.0 contains recommended land development regulations specifically prepared to implement the recommended plan provisions. Several alternative approaches are described, from separate springs protection zoning districts, to overlay districts that work with existing zoning districts, to a special planned development district to be used in springs protection areas. A variety of resource protection and site design standards are provided, along with standards for stormwater management, wastewater treatment, and geotechnical studies.

In addition to the three main components of this *Implementation Guidebook*, there is a bibliography, a glossary, and more detailed information in appendices.

An extensive bibliography is provided in Chapter 6.0. This information will allow the reader to explore more detailed information about springs and specific issues related to springs.

A glossary of terms is provided to help the reader understand specific terms used throughout the document.

Three important sections containing detailed supplemental information are in appendices. The first addresses the transfer of development rights. A detailed legal analysis is provided to explain the relationship of the springs protection measures to legal issues of requirements of the *Florida Statutes*, and constitutional law. A description of the use of a water budget is provided in the third appendix.

2.2 How to Use the Guidebook

2.2.1 Amending the local plan

Development of amendments to local comprehensive plans must begin with two steps. The first step is a review of the comprehensive plan to determine what objectives and policies, if any, are currently incorporated in the comprehensive plan adopted to protect springs. This review should consider not only the availability of the objectives and policies, but also whether the objectives and policies are specific to springs and effective in protecting springs. A comparison of the provisions now in the plan with the recommended provisions is the best way to determine whether the plan is adequate. Second, the local government should consider the approach to be followed – a separate element or amendments to several existing elements.

With this information in hand, the local government can then proceed to select the objectives and policies it needs from Chapter 4.0. Commentary is provided throughout the chapter to guide the reader in selecting and modifying objectives and policies to meet local conditions. A few objectives and policies may work well exactly as written. Many objectives and policies, however, must be modified for consistency with the local comprehensive plan and local circumstances.

2.2.2 Data and analysis to support the amendment

The local government must prepare data and analysis to support the amendments to the local comprehensive plan. This report provides guidance on the kinds of data and analysis that would be appropriate. The bibliography has extensive information to assist in this effort. Start with the online resources about Florida's springs which can lead the researcher to specific locations and specific springs. This additional data and analysis can be a summary of information about local springs along with references to the source of the information.

2.2.3 Amending the local land development regulations

Development of amendments to the land development regulations will follow the same procedure. First review existing regulations to determine if the standards are in place to implement the springs protection provisions of the comprehensive plan. Again, a comparison of the existing regulations with the regulations recommended in Chapter 5.0 of this *Implementation Guidebook* will reveal whether changes are needed. Commentary is provided through this chapter to guide the reader in selecting and modifying regulations for consistency with local terminology, and with local conditions.

For amendments to the comprehensive plan and the land development regulations, review existing definitions to determine if new terms should be added from the glossary in this *Implementation Guidebook*. This review will also reveal existing definitions that should be revised for consistency.

2.2.4 Summary of steps to amend the plan and regulations

For both the comprehensive plan and the land development regulations, the approach described above may be summarized in the following steps:

1. Review existing provisions to determine if provisions are present in the local plan and regulations and to determine if the provisions are effective for protecting springs.
2. Compare existing provisions to the recommendations in this *Implementation Guidebook* as part of the review.
3. Select the objectives and policies needed to achieve more effective protection of springs in the local jurisdiction.

4. Use the commentary to make modifications to the objectives and policies, if needed for consistency with local conditions.
5. Prepare a data and analysis report to support the proposed amendments.
6. Select the regulations needed to achieve effective protection of springs and to implement the specific provisions added to the comprehensive plan.
7. Use the commentary to make modifications to the regulations, if needed for consistency with local situations.
8. Add terms and definitions to the local comprehensive plan and land development regulations.

3.0 THE BASIS FOR SPRINGS PROTECTION

3.1 Introduction

This chapter is provided to explain the basis for springs protection. For local governments who amend their local comprehensive plans to adopt objectives and policies to protect springs, this chapter provides important data and analysis to support the amendment. This chapter contains general background information, a discussion of the aquifer, recharge, and the relationship to springs, and a discussion of the vulnerability of springs. The chapter also describes the major springs in Florida, discusses the health of these springs and the major causes of problems in springs, identifies potential solutions, and provides an overview to the legal basis for protecting springs.

3.1.1 Background

Florida's springs are a unique and beautiful resource. The historically crystal clear waters provide not only a variety of unique recreational opportunities and habitats, but also great economic value for recreation and tourism. Springs serve an important function, providing a "window" into a valuable resource – the ground water in the Floridan Aquifer system. Most of the State's drinking water comes from this source. The springs, where groundwater comes to the surface, are major sources of stream flow in a number of rivers such as the Rainbow, Chassahowitzka, Homosassa, and Ichetucknee.

In undisturbed conditions, spring water is very high quality and lacks contaminants. It can be used directly for public water supplies or for irrigation. When pollutants are introduced to the land surface, some will be retained, but some will travel into the aquifer and later appear as spring flow. The closer to the spring that nutrients are introduced, the more rapidly the impact on the spring occurs. Once nutrients reach the springs, the consequences are inevitable. Dissolved nutrients provide for rapid growth of algae and aquatic plants that obscure the spring bottoms and clog the surfaces. While the springs are valuable as recreational or tourist attractions, they also serve as a warning of reduced quality of the water in the aquifer.

3.1.2 The Floridan Aquifer

The Floridan Aquifer system, a limestone aquifer of enormous freshwater storage and transmission capacity, underlies the State of Florida and portions of southern Georgia, Alabama, and South Carolina (See Figure 3-1). The Floridan Aquifer system is comprised of an upper freshwater-bearing part consisting of a thick sequence of carbonate rocks. The top of the rock was later heavily eroded and mostly covered with unconsolidated sand and clay sediments, forming the land surface we see today.



Figure 3-1. The Floridan Aquifer underlies Florida, the southern part of Georgia, and parts of Alabama and South Carolina.

Source: U.S. Geological Survey *Ground Water Atlas of the United States: Alabama, Florida, Georgia, South Carolina*. USGS Publication HA 730-G. 1990.

Surficial aquifers occur within the sandy deposits, forming the land surface. In parts of Florida, the surficial aquifer rests on top of deeper layers of clay-rich sediments, which greatly retard the vertical movement of water. In some areas, these clay beds may contain internal layers of shell and impure limestone deposits, forming thin, but highly transmissive, local intermediate aquifers. The regionally extensive and thick limestone formations of the Floridan Aquifer system underlie these minor aquifers.

In large areas of the State, ground water in the Floridan Aquifer is held under pressure by the overlying clay-rich deposits, and the aquifer is said to be confined. In other areas, the clay beds may be less effective in inhibiting vertical water movement over large areas, and the aquifer is said to be semi-confined or “leaky”. Where limestone at the top of the Floridan Aquifer is at or near the land surface, the aquifer is unconfined, meaning there is little to no resistance to the vertical movement of water into and from the aquifer.

Rainfall, the ultimate source of all fresh ground water in Florida, infiltrates into the surficial aquifer directly beneath the land surface in most parts of Florida. Some water moves laterally as seepage into lakes and streams. The remainder is returned to the atmosphere by evapotranspiration or moves downward to recharge surficial aquifers and, ultimately, the Floridan Aquifer. (See Figure 3-2.)

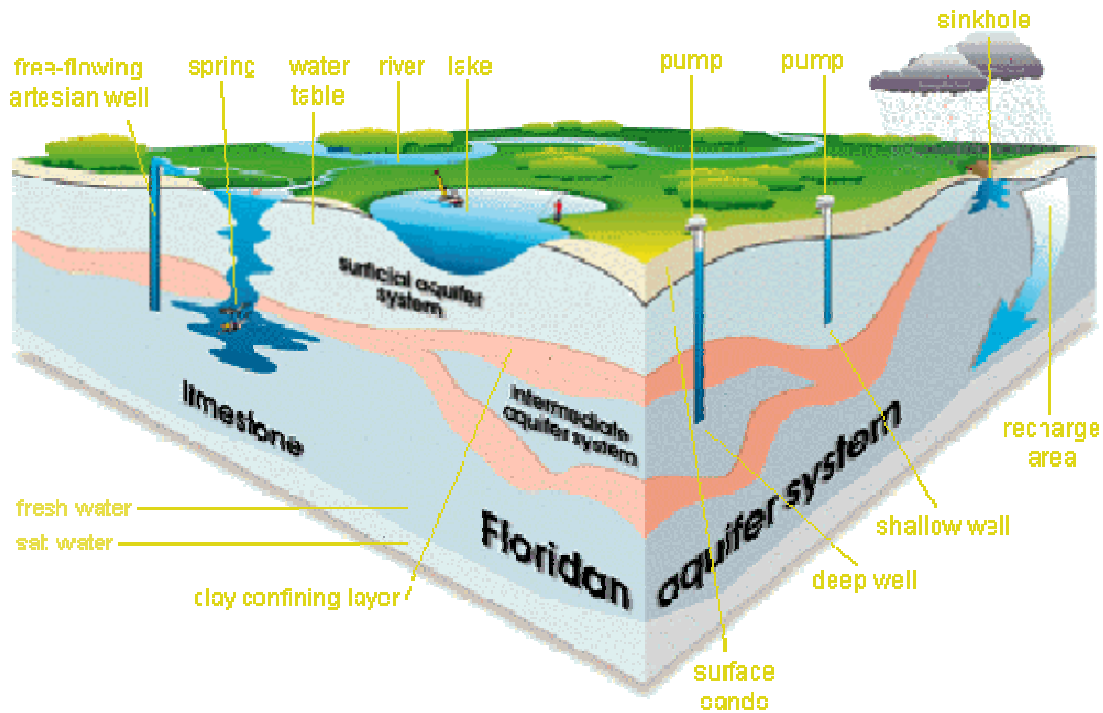


Figure 3-2. The aquifer system.

There are several elements of the natural environment that are important for an understanding of the aquifer system. First, the karst limestone formations of the Floridan Aquifer system are very highly porous and permeable. The caves at springs and dry caves are the large, visible aspects of this feature. Small and large interconnected fractures, solution cavities, and a very porous nature at the microscopic level enable the aquifer to store very large volumes of water and allow water to flow quite freely through the aquifer. (See Figure 3-3.)



Figure 3-3. This photograph shows a typical limestone formation.

3.1.3 The Florida Springs Protection Area

Florida's springs occur where the level of water in the aquifer (called the potentiometric surface) is higher than the ground level. An imaginary line can be drawn around discharge areas where the potentiometric surface exceeds the ground level, dividing the aquifer recharge area from the area where water, under pressure, rises from the aquifer and becomes surface water. Artesian springs are located within the discharge areas. Springs occur where the aquifer is, generally, close to land surface and is penetrated by linked fractures or channels that reach the surface. In discharge areas, the pressure in the aquifer forces water up through the soils and sandy overburden covering the rock, creating wetlands or augmenting stream flows.

Recharge areas for the Floridan Aquifer are of critical concern because these areas are the sources which replenish the aquifer. We withdraw more than nine billion gallons of water per day from the aquifer.¹ The varying flows of springs in response to seasonal and long-term fluctuations in rainfall are a clear indication that any large change in recharge directly affects the quantity of spring discharge.

Florida's springs are located in a 32-county region, stretching from Hillsborough County on the south to Walton County in the northwest (See Figure 3-4). This region is called the Florida Springs Protection Area. This region is the area where comprehensive plans and land development regulations should be adopted to protect springs. This *Implementation Guidebook* is designed to provide assistance to the cities and counties within the Florida Springs Protection Area.

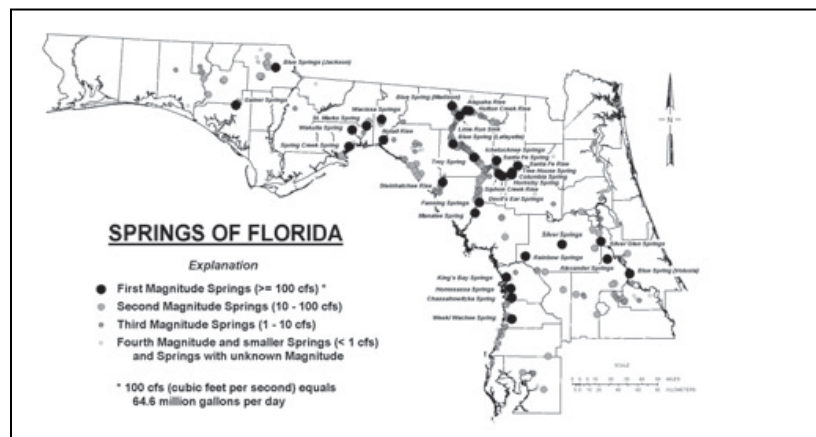


Figure 3-4. The Florida Springs Protection Area.

¹ Ground Water Atlas of the United States: Alabama, Florida, Georgia, South Carolina. USGS Publication HA 730-G. 1990. http://capp.water.usgs.gov/gwa/ch_g/G-text6.html

3.2 Major Florida Springs and Their Health

By 2004, more than 700 springs have been identified in Florida, according to information from the Florida Geological Survey. First magnitude springs, which have a flow greater than 100 cubic feet per second, number 33, which is more than any other state.

Nineteen counties have first magnitude springs, ranging from well-know springs such as Weeki Wachee, Rainbow, and Silver, to lesser known springs, often on private land and known only by a number.

The threat to these springs is very real. The quality of water has already been severely altered. The natural level of nitrates in the Floridan Aquifer, as seen in springs in undisturbed springsheds, is generally less than 0.05 mg/l and has been reported by the Southwest Florida Water Management District to be as low as 0.01 mg/l. Based on FDEP drinking water criteria, the threshold for nitrate is 10 mg/l. Data from the Florida Geological Survey, SWFWMD, and SJRWMD show that numerous springs have nitrate levels far exceeding the background level. While some springs have nitrate levels below 0.4 mg/l, it is more often reported that levels are ten, 20, even 100 times the background level.

Furthermore, the situation is often getting worse. A trend analysis of springs in the SJRWMD shows that from 1995 to 2005, there was either no change or an increase in nitrates in many springs. Those springs that showed a decrease in nitrate often showed only small decreases.

The main attribute of the land in the Florida Springs Protection Area -- rapid and plentiful recharge -- is, unfortunately, the cause of the greatest vulnerability of the aquifer. Human settlement disrupts the system. Roads, parking surfaces and the roofs of our buildings (impervious surfaces) alter the earth's surface, generating more run-off than the natural environments. Settlements introduce a whole series of contaminants that are not present in natural systems. Automobiles bring oils and heavy metals. Agriculture, golf courses, and lawns introduce pollutants in the form of nutrients, herbicides, and pesticides. Wastewater, fertilizers, stormwater, and agriculture introduce waste products loaded with nutrients. There are consumptive uses of water that can draw down water levels and reduce pressure in the aquifer. The development of Florida poses severe threats to the aquifer that often show up first in the springs.

3.3 Major Causes of Problems in Springs

Nature has developed the ground water system over millions of years, resulting in an environment of interconnected systems. When chemicals or biological matter enters the aquifer through the recharge process, water quality and the flora and fauna of the springs and spring runs are affected. As water quality in the aquifer declines, the flora and fauna are negatively affected.

Development by humans has changed the balance of the system. For the last fifty years, Florida has been one of the nation's most rapidly growing states.² New development and agriculture use large quantities of water, which is called consumptive use -- that is, the water is mined and not returned to the aquifer where it was withdrawn. That growth has placed a strain on the aquifer that is seen locally in the disappearance or decrease in flows in the springs. The process of development alters the land and the natural system that sustains the Floridan Aquifer. As homes and businesses are built, the natural areas that permitted great quantities of water to recharge the aquifer are either compacted or converted to impervious surfaces. Instead of soaking into the soil and then recharging the aquifer, water flows off landscape parking lots, roofs, and streets, increasing the quantity of stormwater. Thus, the percentage of rainfall available to recharge the aquifer is reduced. The combination of lower recharge with consumptive uses is a double impact on the resource.

In addition to impacts on the quantity of water, the quality of the water is also altered. Development disturbs the soils and increases erosion. Dirt, oil, metals, and other chemicals are washed off streets, parking lots, and roofs, entering streams and ground water. The beautiful green lawns of homes and businesses are maintained by the application of nutrients and chemicals to foster growth and control pests. Agriculture and forestry apply large quantities of nutrients and chemicals for the same reason, and the nutrients and chemicals appear in the aquifer.

The major causes of problems in Florida's springs can be classified within the following issues.

3.3.1 Landscaping

Landscaping and lawn care affect springs in two ways. First, maintaining lawns and landscaping typically involves large amounts of water. The water consumption for landscaping can ultimately reduce spring flows. Secondly, fertilizers and other chemicals used in managing landscaping and lawns are a source of pollution and contribute nitrates to the aquifer. Invasive species may be introduced that result in rapid growth of the vegetation, choking springs and spring runs.

3.3.2 Development and urban sprawl

Any development increases water runoff and increases the pollutants that enter the aquifer. As development occurs in sprawling patterns at greater distances from urban centers, more roads are required. More roads mean more pavement and increased runoff. The stormwater runoff often contains heavy metals and

² Florida's population has grown from 4,951,560 in 1960 to 15,982,378 in 2000. The average growth rate per decade over this period has been 34.2%, while nationally the growth rate has averaged 11.95% per decade.

petroleum by-products, although other wastes are present that contaminate the water.

3.3.3 Water consumption

Development means more people are living in an area, resulting in greater demand for water – both potable water and water for irrigation and other purposes. Agriculture and industry also place demands on the water supply. These increases in the consumption of water result in reduced spring flow, as the water in the aquifer is not able to sustain historic levels.

3.3.4 Dumping in sinkholes

Where sinkholes are present, it is typical to find that they have been used for illegal dumping. As the dumping is illegal, there is no control on the materials that are disposed, which often contain damaging pollutants, such as household products that are hazardous. These pollutants quickly find their way to the aquifer through the direct connection of the sinkhole.

3.3.5 Agriculture

As mentioned in the description of water consumption, agricultural activity is a major user of water. In addition, row crops require fertilizers and pesticides that are a significant source of pollution to the aquifer.

3.3.6 Livestock

Raising livestock requires the use of chemicals to control pests and also produces animal wastes that are a source of pollution. Especially in confinement feeding facilities, this can be a major threat to springs.

3.3.7 Golf courses

Golf courses require significant quantities of water for irrigation. Maintenance of the fairways and greens requires fertilizers and pesticides which are a significant source of pollution.

3.3.8 Recreation

Springs and spring runs are desirable locations for recreation activities – swimming, tubing, and other water sports. Access to the springs by foot traffic for swimming or launching watercraft results in bank erosion and often results in trampling native vegetation located around and near the springs. Water activities can increase turbidity of the water, while the concentration of people results in increases in trash and the resulting pollution of the water.

3.4 Potential Solutions to Protect and Restore Springs

As discussed above, the impact to the springs stems from development, which is the process by which Florida grows. Land development in Florida is controlled largely by the local governments, with state oversight. With regard to the aquifer, water

management districts also have a strong regulatory function. However, if springs are to be protected and restored, the solutions occur on the land where recharge water first starts the path to the aquifer. Three general approaches are available – avoiding activity that damages or threatens the aquifer, the springs themselves, and the springs runs and other features of the spring system; minimizing the impact of development and use of springs and related features; and, where necessary, mitigating the effects of the impact to the springs.

3.4.1 Avoiding impacts

The most effective avoidance techniques are acquisition (fee simple) of land in the most important protection areas around springs, the purchase of development rights, or the imposition of a conservation easement. However, despite the availability of acquisition programs, this approach cannot do the whole job. Transfer of development rights (TDR) offers a limited potential, in large part because TDR must work in the marketplace, limiting its ability to protect large areas. A few local governments in Florida have implemented TDR program, with mixed success. See Appendix A-1 for more information.

Avoidance also can be achieved through comprehensive planning that designates highly vulnerable areas for rural, low-density, or even suburban uses. A rural designation or other low-density designations can protect springs by providing a development intensity that allows avoidance through the application of site design techniques.

A particularly useful design technique is the requirement to cluster development. By grouping the allowable development on a small portion of a site, large areas remain open to provide for recharge. When the standards require that the open space be located on the most vulnerable part of the land area, negative impacts are largely avoided. Further, the imposition of site design standards that minimize impacts from the developed portion of the site will further protect the springs and related features.

3.4.2 Minimizing impacts

Impacts can be minimized, even significantly minimized, through the use of site design standards and requirements regarding wastewater treatment. The approaches include:

- ◆ Limiting the types of land uses that can occur on the land area closest to the springs and spring features. This can be accomplished through creating zoning districts, overlay districts, or special purpose planned development districts.
- ◆ Limiting the amount and location of impervious surfaces. It is also important to distinguish between two different types of impervious surfaces – directly connected and disconnected. Directly connected impervious surfaces are those that are directly drained from a site without flowing across permeable areas.

For example, roof gutters that discharge onto paved driveways that in turn flow into streets or stormwater systems are connected. When the roof water discharges onto the lawn, disconnected impervious surfaces result. This helps to recharge the ground water or, at least, be used as supplemental irrigation.

- ◆ Standards for the design and location of stormwater facilities (See Figures 3-5 and 3-6).



Figure 3-5. Swales are one means of managing stormwater runoff and ensuring recharge along residential streets. Swales are preferred over a curb and gutter design in many situations.

© Russell Sparkman/ Fusionspark Media Inc.



Figure 3-6. Street runoff is directed to landscaped bioswales for filtration and treatment. Where curbs are installed, curb cuts allow water to flow into the bioswale, which also provides street landscaping.

- ◆ Specific techniques to reduce runoff, such as green roofs and the use of rain barrels (See Figures 3-7 and 3-8).

Figure 3-7. Landscaping on a rooftop provides another means of managing stormwater.



Figure 3-8. An example of runoff to a rain barrel.
Source: Marty Wanielista, Stormwater Management Academy, University of Central Florida

- ◆ Parking lot standards, considering both the number of spaces, the design of the lot, landscaping requirements for the lot, and the use of permeable pavement materials (See Figures 3-9 and 3-10).



Figure 3-9. Permeable pavement increases recharge and reduces runoff. When combined with drought tolerant vegetation, stormwater is appropriately managed.



Figure 3-10. An example of parking lot landscaping to increase areas for recharge.

Source: Marty Wanielista, Stormwater Management Academy, UCF

- ◆ Resource protection standards, such as setbacks from springs, sinkholes, and other features.
- ◆ Conservation subdivision design standards.
- ◆ Open space requirements and standards for use.
- ◆ Septic tank standards.
- ◆ Wastewater treatment facility standards.
- ◆ Landscaping and irrigation standards, including drought tolerant plants to minimize the need for irrigation, and the incorporation of landscaped areas into the stormwater system.
- ◆ Golf course standards, especially to minimize the need for fertilizers and pesticides.

3.4.3 Mitigating impacts

Mitigation is a strategy used when avoidance and minimization are not possible or will fail to produce an effective level of protection. Mitigation may include attempts to recreate or restore natural conditions, remove pollutants, or set aside lands in locations other than the development site to improve recharge. The most important strategies are avoidance and minimization and are the focus of this *Implementation Guidebook*.

4.0 COMPREHENSIVE PLAN PROVISIONS TO PROTECT SPRINGS

4.1 Introduction

This chapter provides the information needed by local governments to ensure that the comprehensive plan contains the goals, objectives, and policies that will protect springs within the local jurisdiction. Further, the comprehensive plan is the foundation for land development regulations that contain standards for any permissible development that may have an impact on springs within the jurisdiction. Therefore, amendment of the local comprehensive plan to include springs protection provisions will ensure that regulations are based on the plan, consistent with the requirements of the Growth Management Act.

A manual issued by the Florida Departments of Community Affairs and Environmental Protection, entitled *Protecting Florida's Springs, Land Use Planning Strategies and Best Management Practices (called "Springs Protection Manual")* provides important information for the local government setting out to implement provisions to protect springs and springsheds in its jurisdiction. This *Springs Protection Manual* should be a starting point for a local government in preparing an amendment to its local comprehensive plan.

In addition, this document, *Protecting Florida's Springs: An Implementation Guidebook (called "Implementation Guidebook")* also contains strategies and specific regulations for protection of springs within the local government's jurisdiction. By using both documents, the *Springs Protection Manual* and the *Implementation Guidebook*, a local government will have necessary information to develop and support needed amendments to the local comprehensive plan.

The local government must consider the requirements of both the strategic regional policy plan and the State Comprehensive Plan during preparation of amendments to its comprehensive plan. The model provisions in this *Implementation Guidebook* are intended to assist the local government in ensuring consistency with the State Comprehensive Plan and associated growth management legislation.

The State Comprehensive Plan, set forth in Chapter 187 of the *Florida Statutes*, provides a broad goal and several associated policies that are particularly applicable to springs protection. The goal states:

Florida shall assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial and shall maintain the functions of natural systems and the overall present level of surface and ground water quality. Florida shall improve and restore the quality of waters not presently meeting water quality standards.

The associated policies require protection of water recharge areas, aquifers, surface and ground water quality and quantity, and natural water systems. This goal and these policies provide a basis for planning at the local level.

Finally, many local governments must address water supply issues through the preparation of a water supply facilities work plan. Whether the local government has prepared a water supply work plan or not, it is important to coordinate with the water management district's regional water supply plan in the preparation of any plan amendments. Requirements regarding water supply planning are described on the Department of Community Affairs (DCA) website at www.dca.state.fl.us, and are contained in Chapter 163.3177, *F.S.*

4.1.1 Using this chapter

There are two proposed approaches to amending the local comprehensive plan. The recommended approach is to prepare and adopt a Springs Protection Element. This approach will ensure that all goals, objectives, and policies for the protection of springs are contained in one location, thus making it easy to access the requirements. However, a local government may prefer the alternative approach of amending the several elements of the local comprehensive plan that relate to springs protection.

This chapter is organized to assist the reader in either approach. Section 4.2 contains a Springs Protection Element. It provides a complete set of goals, objectives, and policies intended to protect springs. Sections 4.3 through 4.6 contain goals, objectives, and policies for the Future Land Use, Conservation, Public Facilities (Infrastructure), and Intergovernmental Coordination Elements.

Not all goals, objectives, and policies will be appropriate for a particular local government. Some local governments already may have similar objectives and policies in place in their comprehensive plans. The goals, objectives, and policies in this *Implementation* Guidebook should be carefully reviewed and the local government should determine which objectives and policies fit the local situation and are consistent with other provisions in the local comprehensive plan.

4.1.2 Data and analysis

As described in Chapter 3.0, activities on the surface of the land cause impacts to the health of the springs. Many of the planning strategies in these goals, objectives, and policies are based on the degree of vulnerability of the land where recharge water eventually reaches the springs, called the springshed. The amendment to the local comprehensive plan must be supported by data and analysis. This data and analysis must address the location of the springshed and important features within the springshed. Therefore, an important component of the data and analysis to support an amendment to the local comprehensive plan is a map or set of maps to

depict the springshed, features in the springshed that will be protected, and the boundaries of springs protection areas, which may or may not be the same as the boundary of the springshed.

Existing maps in the local comprehensive plan or the supporting data and analysis should already identify such features as the location of water bodies, flood plains, and wetlands. It is also important to know the location of sinkholes, caves, or other natural features that may be connected directly with the aquifer. Therefore, supplementing or revising existing maps may be necessary to map additional features in the springshed.

A useful and important dataset may be available for some jurisdictions from the Florida Geological Survey in the Department of Environmental Protection. This dataset is an assessment of the vulnerability of the aquifer and is called the Florida Aquifer Vulnerability Assessment, or FAVA. Four categories are used to describe the degree of vulnerability: high, moderate, low, or discharge. At the time of printing this *Implementation Guidebook*, FAVA maps are available for the following counties: Citrus, Levy, and Wakulla. In addition, these three counties are expected to engage private contractors to produce FAVA maps: Alachua, Leon, and Marion. Springs protection areas will be defined and mapped, based on such information as the springshed boundary, areas of high or moderate vulnerability on the FAVA maps, or other information as described in Chapter 3.0. The use of the term “springs protection area” within this *Implementation Guidebook* refers to the area defined by the local government in which specific standards are implemented to protect springs. The local government may wish to provide a more specific name to the springs protection area in order to associate it with the specific local springs.

The data and analysis to support a plan amendment should identify the threats to the springs that come from development. The information in the *Springs Protection Manual* and this *Implementation Guidebook* will assist with the data and analysis for a plan amendment. However, the bibliography in this *Implementation Guidebook* provides additional resources to assist the local government when more information is needed. Also, consult the website of the Department of Environmental Protection, in particular the website devoted to Florida’s springs. See www.dep.state.fl.us and www.dep.state.fl.us/springs.htm.

4.1.3 Monitoring springs protection implementation

It is important to consider ways to monitor progress in implementing the local comprehensive plan. In order for springs protection measures to be effective, the local government should have an ongoing program to monitor the results and effectiveness of both the plan and the land development regulations. This monitoring must be more frequent than the periodic evaluations as part of the required Evaluation and Appraisal of the comprehensive plan. This monitoring should be ongoing.

Examples of provisions that should be monitored include tracking septic tanks: 1) the number of septic tanks that are removed when the development connects to a central sewer system; 2) the number of septic tanks replaced with performance based systems; 3) the number of performance based systems that are installed. Other provisions to monitor include the amount of open space that is protected by conservation easements. As development or site plans are reviewed, monitor the implementation of site design requirements that result in reduced impervious surfaces, such as the use of green roofs or rain barrels. Monitor stormwater management designs such as the use of swales rather than curb and gutter and the use of bioretention areas in parking lots.

With ongoing monitoring, the local government can see the growing impact of springs protection measures. The local government can also identify areas where improvements are needed to increase the effectiveness of the protection measures.

Commentary: The following section, 4.2, should be used when you wish to create a separate element in the comprehensive plan to contain all of the springs protection provisions. By consolidating all provisions in one place, it is easier to identify those provisions specifically designed to protect springs and the springshed.

4.2 Springs Protection Element

GOAL: Protect, maintain, and restore water quality and quantity within the springshed in order to maintain and protect environmental, economic, recreational, and natural functions of springs as fragile resources necessary for sustaining the quality of life.

Objective 1. (Primary) Springs Protection Area

Protect 1st < and 2nd and 3rd > magnitude springs through the designation of <insert description of the specific protection area> as the <insert name> Primary Springs Protection Area (-PSPA) as depicted on the <insert name> Map and the implementation of the following policies.

Commentary: Your jurisdiction may have 1st, 2nd and 3rd magnitude springs to be protected. If so, modify the above to include 2nd and, if present, 3rd magnitude springs. Other modifications may include designating the area based on the high vulnerability area on a FAVA map, designating an entire springshed, or designating more than one Springs Protection Area when there are two or more noncontiguous areas to be protected. You should consider implementing a primary protection area when your jurisdiction is entirely or mostly covered by the springshed. This will allow implementation of different standards in the primary and secondary areas. If your jurisdiction identifies the protection area by the name of the associated springs or spring group, include that name as indicated above. Here are some examples: Rainbow Springs Protection Area – RSPA, Wakulla Springs Protection Area

– WSPA. If you identify maps in your comprehensive plan by number or use the term “exhibit” or “figure” you should make the appropriate change to the text above where the term “map” is used.

Policy 1.1: In order to avoid negative impacts to springs, limit or prohibit the following land use activities within the Primary Springs Protection Area: <insert a locally developed list>.

Commentary: The Springs Protection Area likely will be applied to areas with a wide range of land use districts that may allow activities that are potentially harmful to the springs. Site design standards and limitations on location of uses within the Springs Protection Area may be sufficient to control impacts. However, it may be necessary to prohibit some specific uses, such as landfills, mining, or heavy industry. Heavy industry, although it may be defined differently by each local government, typically means those industrial activities that produce, handle, or store solid and sanitary wastes, solvents, pesticides, herbicides, explosives, or hazardous materials. Often, handling or storing such materials is only classified as heavy industry when it exceeds a specifically defined threshold to avoid classifying retailers who sell relatively small quantities of hazardous materials as heavy industrial uses. Your jurisdiction should determine if all or some heavy industrial uses should be prohibited. See Policy 1.2 and the associated commentary for an alternative approach.

Policy 1.2: When heavy industrial uses are permissible according to the land use districts within the Springs Protection Area, a geotechnical study shall be performed in order to determine if the proposed use is acceptable in the proposed location.

Commentary: As an alternative to listed prohibited industrial uses in Policy 1.1, the local government may wish to require a geotechnical study when industrial uses are proposed. If the local government classifies some uses as heavy or high intensity commercial, a similar approach should be considered – requiring a geotechnical study – when those uses are proposed. When both a primary and secondary protection area is established, consider prohibiting heavy industrial uses altogether within the primary protection area.

Policy 1.3: Where it is not possible to fully avoid negative impacts through limiting or prohibiting land use activities, the impact of use and development within the Springs Protection Area shall be minimized and mitigated to the maximum feasible extent.

Commentary: Policy 1.4 below is an alternative to Policies 1.1 and 1.2. If your jurisdiction is able to limit land uses to those with very low intensity, it is not necessary to prohibit those intense land use activities, as described in Policy 1.1, which may have significantly negative impacts.

Policy 1.4: Land uses within the Primary Springs Protection Area shall be limited to extremely low intensity uses, such as conservation, passive recreation, low-intensity agriculture, and very low density residential.

Commentary: If the land use districts within the Primary Springs Protection Area are predominantly very low intensity, Policy 1.4 is a good approach to addressing the types of permissible land use activities. You should adjust the list of land uses described in Policy 1.4 to reflect those very low intensity land uses that are permissible according to your local comprehensive plan. It is also a good idea to establish a maximum residential density, which may be less than permissible in the same land use category outside the Primary Springs Protection Area. If you wish to do this, you should prepare an additional policy according to the example below.

Policy 1.5: The maximum residential density within the Primary Springs Protection Area is <enter density number> units per acre.

Additional Objective and Policies when both a primary and secondary protection area are established:

Objective 2. (Secondary) Springs Protection Area

Protect 1st < and 2nd and 3rd > magnitude springs through the designation of <insert description of the specific protection area> as the <insert name> Secondary Springs Protection Area (--SSPA) as depicted on the <insert name> Map and the implementation of the following policies.

Policy 2.1: In order to avoid negative impacts to springs, limit or prohibit the following land use activities within the Secondary Springs Protection Area: <insert a locally developed list>.

Commentary: When both primary and secondary springs protection areas are implemented, the list of land uses within the primary area should be more limited than the list of land uses within the secondary area.

Policy 2.2: When heavy industrial uses are permissible according to the land use districts within the Secondary Springs Protection Area, a geotechnical study shall be performed in order to determine if the proposed use is acceptable in the proposed location.

Policy 2.3: Where it is not possible to fully avoid negative impacts through limiting or prohibiting land use activities, the impact of use and development within the Secondary Springs Protection Area shall be minimized and mitigated to the maximum feasible extent.

Policy 2.4: Land uses within the Secondary Springs Protection Area shall be limited to extremely low intensity uses, such as conservation, passive recreation, low-intensity agriculture, very low density residential, low density residential, and low intensity commercial development uses.

Objective 3: Development Design Standards

Development within the [Primary/Secondary] Springs Protection Area shall comply with the design standards set forth in the following policies:

Policy 3.1: Residential development within the [Primary/Secondary] Springs Protection Area shall be clustered, based on conservation subdivision design standards.

Commentary: This policy should apply within both the primary and secondary protection areas. Modify the terminology for consistency with the approach in your jurisdiction. Where extremely low density residential land use categories are within the Springs Protection Area, this policy should be revised to eliminate the requirement for clustering for the extremely low density development. Extremely low density residential should include densities of fewer than one (1) unit per five (5) acres.

Policy 3.2: Conservation subdivisions shall comply with the following design standards:

- a. Maximum clustering of units is required, with houses located on small lots, which have small setbacks from lot lines.
- b. Required open space is at least fifty (50) percent of the site, with at least fifty (50) percent of the open space in one contiguous parcel and all open spaces connected to the maximum extent feasible. No more than twenty (20) percent of the open space may be devoted to stormwater facilities. Open space should be located on the most vulnerable portion of the site.

Commentary: The effectiveness of open space is often reduced when the open space is in scattered parcels that are disconnected from each. Some jurisdictions include planting strips adjacent to roads, retention or detention ponds, and land within setbacks as open space. This is acceptable, but should not provide the majority of the open space on a site. In addition, when planting strips are permissible, whether counting as open space or not, these planting strips should be subject to strict limitations on the application of chemicals. Further, the open space – particularly the contiguous open space – should be located for maximum protection of springs, sinkholes, and other karst features.

It often occurs that several types of “open space” occur within a development – required buffers, required landscaping areas, stormwater management areas, building setbacks, and protected open space. When half of a parcel is set aside in protected open space, *plus* the required protection of areas for landscaping, setbacks, and stormwater, the portion of the site devoted to buildings and parking is considerably less than 50 percent. The intent of a provision that allows a portion – but only a small portion – of the open space to be devoted to stormwater accomplishes two purposes. First, there is recognition that a stormwater management area does offer important open space to a development area. Secondly, it limits the use of a stormwater management area to ensure that protected open space is truly “open” in that it is not devoted to other purposes. Furthermore, while buffers and other landscaped areas do provide open space, all of the open space on a site should not be in the form of required buffers and landscaped areas which are often disconnected. Requiring half of the open space in one contiguous parcel also supports local efforts to provide habitat and wildlife corridors.

- c. Required open spaces shall be protected in perpetuity through recorded easements.
- d. Central water and sewer treatment facilities shall be available. This may include investor provided facilities that will be connected to a regional system as soon as the central facility is available.
- e. Development shall be located in such a manner as to minimize the length of new roads and drives from existing public streets to the development.

Commentary: The purpose of this provision is to minimize the amount of impervious surface devoted to roads and driveways. Because of the wide variation in parcel locations relative to existing public roads, it may not be feasible to set a specific standard for maximum length.

- f. Development shall be sited as far away as feasible from springs, spring runs, sinkholes, and swallets. The setback and buffer requirements set forth in Policies 3.4 and 4.3 apply to the development parcel for residential development and not to individual lots within a residential development.
- g. Development shall be designed to minimize site disturbance to the minimum area necessary to accomplish development. This shall include minimizing soil compaction by delineating the smallest disturbance area feasible.

Commentary: If your local government issues grading permits prior to development approval, you should probably adjust your procedures to ensure that the disturbance area is appropriately sited and approved as part of the development plan.

Policy 3.3: Nonresidential development within the [Primary/Secondary] Springs Protection Area shall meet the following location and site design requirements:

- a. Required open space is at least fifty (50) percent of the site, with at least thirty-five (35) percent of the open space located in one contiguous parcel. All open spaces shall be connected to the maximum extent feasible. No more than twenty (20) percent of the open space may be devoted to stormwater facilities. Open space should be located on the most vulnerable portion of the site.

Commentary: The effectiveness of open space is often reduced when the open space is in scattered parcels that are disconnected from each. Some jurisdictions include planting strips adjacent to roads, retention or detention ponds, and land within setbacks as open space. This is acceptable, but should not provide the majority of the open space on a site. In addition, when planting strips are permissible, whether counting as open space or not, these planting strips should be subject to strict limitations on the application of chemicals. Further, the open space – particularly the contiguous open space – should be located for maximum protection of springs, sinkholes, and other karst features.

It often occurs that several types of “open space” occur within a development – required

buffers, required landscaping areas, stormwater management areas, building setbacks, and protected open space. When half of a parcel is set aside in protected open space, *plus* the required protection of areas for landscaping, setbacks, and stormwater, the portion of the site devoted to buildings and parking is considerably less than 50 percent. The intent of a provision that allows a portion – but only a small portion – of the open space to be devoted to stormwater accomplishes two purposes. First, there is recognition that a stormwater management area does offer important open space to a development area. Secondly, it limits the use of a stormwater management area to ensure that protected open space is truly “open” in that it is not devoted to other purposes. Furthermore, while buffers and other landscaped areas do provide open space, all of the open space on a site should not be in the form of required buffers and landscaped areas which are often disconnected. Requiring half of the open space in one contiguous parcel also supports local efforts to provide habitat and wildlife corridors.

- b. Required open spaces shall be protected in perpetuity through recorded easements.
- c. Central water and sewer treatment facilities shall be available. This may include investor provided facilities that will be connected to a regional system as soon as the central facility is available.
- d. Development shall be located in such a manner as to minimize the length of new roads and drives from existing public streets to the development. In order to minimize impervious surface, techniques such as joint access, shared driveways, and cross-access easements are required.
- e. Shared parking shall be required and designed to provide adequate pedestrian access among all buildings. All parking lots with 50 or more spaces shall be designed with a minimum of twenty (20) percent of the parking spaces as pervious area.
- f. Development shall be sited as far away as feasible from springs, spring runs, sinkholes, and swallets. The setback and buffer requirements set forth in Policies 3.4 and 4.3 apply to all development.
- g. Development shall be designed to minimize site disturbance to the minimum area necessary to accomplish development. This shall include minimizing soil compaction by delineating the smallest disturbance area feasible.

Commentary: If your local government issues grading permits prior to development approval, you should probably adjust your procedures to ensure that the disturbance area is appropriately sited and approved as part of the development plan.

Policy 3.4: All development, whether within the Springs Protection Area or outside the designated Springs Protection Area, shall comply with the following setback standards:

Table 3.4. Setback Standards from Specified Features.

| Feature | Minimum Setback (feet) |
|---|------------------------|
| 1 st and 2 nd magnitude springs | 300 |
| 3 rd magnitude and smaller springs | 100 |
| Spring runs | 150 |
| Sinkholes | 100 |
| Caves | 300 |
| Swallet | 100 |

- a. The setback from sinkholes and swallets shall be measured from the drainage divide.
- b. The setback from springs and spring runs shall be measured from the ordinary high water line for fresh water springs and from the mean high water line for tidally connected springs.
- c. The setback for caves shall be measured from the outside edge of the cave.
- d. Where a lot of record is too small to accommodate development in compliance with the setbacks set forth in Table 3.4, an allowable use may be established provided that:
 - the building and associated paved areas are located the maximum distance possible from the features listed in Table 3.4,
 - a swale and berm are located between the development and the feature, and
 - the swale and berm are designed to direct drainage away from the feature.

Commentary: If the local jurisdiction does not have both fresh water and tidally connected springs, the policy should be modified to address only the type of springs within the jurisdiction.

- Policy 3.5: Design of parking lots, sidewalks, buildings, and other impervious surfaces shall minimize connections between impervious surfaces through the following techniques. Not all techniques may be required to accomplish the requirement to minimize connections:
- a. Directing flows from roof drains to vegetated areas or to rain barrels or cisterns for reuse of the water;
 - b. Directing flows from paved areas to vegetated areas;
 - c. Locating impervious surfaces so that they drain to vegetated buffers or natural areas; and

d. Breaking up flow directions from large paved surfaces.

Policy 3.6: Porous pavement materials, such as pervious concrete, pervious asphalt, or other pervious or porous materials shall be used to minimize the amount of impervious surface within all development.

Commentary: If your jurisdiction has established policy about types of pervious materials that are acceptable, you should modify the above policy for consistency with your local standards. Such materials may be called pervious or porous concrete, permeable concrete, pervious asphalt, no-fines concrete, gap-graded concrete, or enhanced porosity concrete. Information and engineering specifications may be found at www.perviouspavement.org.

Policy 3.7: All golf course siting, design, construction, and management shall implement the prevention, management, and monitoring practices, detailed in the golf course siting, design, and management chapter of the *Protecting Florida's Springs Manual – Land Use Planning Strategies and Best Management Practices (November 2002)*. These practices are derived from the Audubon International Signature program.

Objective 4. Landscaping Design

Landscaping design and management practices shall be implemented that reduce impacts to land in the Springs Protection Area.

Policy 4.1: Removal of vegetation shall be limited to the minimum necessary to accommodate development. Buildings and other disturbed areas shall be located to avoid removal of native vegetation to the maximum extent feasible.

Policy 4.2: Native or naturalized species shall be used in all landscaped areas in order to avoid or minimize the use of irrigation and fertilizers. A minimum of 100 percent of installed vegetation in the Primary Springs Protection Area and fifty (50) percent of installed vegetation in the Secondary Springs Protection Area shall be native or naturalized species.

Commentary: Most local governments have requirements regarding the use of native or naturalized plant materials. The local government should review existing landscaping requirements to determine if the recommended policies are already met. However, the requirements for retention or installation of native or naturalized plant materials may be higher within the Springs Protection Area to minimize the use of irrigation and fertilizers.

Policy 4.3: The land area within the required setback set forth in Policy 3.4 is a buffer and all native vegetation shall be retained, except for minimal removal necessary to provide for pedestrian paths or boardwalks.

Paths and boardwalks shall not exceed four (4) feet in width and shall not be paved.

Policy 4.4: All landscaping for development in the Springs Protection Area shall conform to the best management practices as stated in the *Guidelines for Model Ordinance Language for Protection of Water Quality and Quantity Using Florida Friendly Lawns and Landscapes*. (Florida Department of Environmental Protection, September 2, 2003).

Policy 4.5: The <city/county> shall establish guidelines for managing existing and future lawns and landscapes at all <city/county> facilities using the educational guidelines contained in the University of Florida Extension's Florida Yards and Neighborhoods Program, Environmental Landscape Management (ELM) principles and Best Management Practices. Such guidelines shall include practices that are designed to reduce nitrate infiltration into ground and surface water.

Commentary: The purpose of this policy is to ensure that the local government serves as a model in implementing the kinds of landscaping practices required for private development.

Policy 4.6: Establish education and certification program for landscape and lawn-care professionals regarding the use and application of fertilizers and pesticides.

Objective 5. Stormwater Management

The volume, recharge, and treatment of stormwater runoff within the [Primary/Secondary] Springs Protection Area shall be designed to provide protection to springs and springsheds.

Policy 5.1: Best Management Practices (BMPs) shall be used in combination as part of a Best Management Practices treatment train to protect water quality and minimize flooding. Best Management Practices shall be used in the design of stormwater management facilities and systems.

Policy 5.2: The following stormwater Best Management Practices shall be implemented in order to reduce nitrate loading within the [Primary/Secondary] Springs Protection Area:

- a. All residential development shall use swales with swale blocks or raised driveway culverts whenever possible. An exception to this requirement may be granted when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.
- b. Vegetated infiltration areas shall be used to provide stormwater

treatment and management on all sites except when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.

- c. Design of the stormwater systems for all development shall use bio-retention areas (below grade vegetated areas) to increase stormwater treatment and reduce stormwater volume.
- d. Downspouts for all development shall be directed from the roof to vegetated areas for uptake.
- e. Whenever infiltration systems are not feasible, wet detention systems may be used for stormwater treatment and management.

Policy 5.3: Design of stormwater management systems shall implement the following criteria:

- a. Sinkholes, swallets, and stream-to-sink features shall not be utilized as stormwater management facilities or as any part of a stormwater treatment train.
- b. All depressions within a proposed development area will be investigated by a licensed professional using a professionally acceptable methodology for suitability of water retention using generally accepted geotechnical practices with an emphasis on identification of potential connections to the aquifer. If connections are determined to exist, the depression shall not be used for stormwater retention and the area draining to this feature under pre-development conditions shall be preserved through a conservation easement.
- c. All components of the stormwater treatment and management system shall be in common ownership and shall be maintained by the responsible legal entity identified in the stormwater permit, typically a homeowners' or property owners' association.

Policy 5.4: Drainage for streets and roads within the [Primary/Secondary] Springs Protection Area shall be through roadside swales and berms. Curb and gutter design shall not be used.

Policy 5.5: A Master Stormwater Management Plan for the [Primary/Secondary] Springs Protection Area shall be prepared, adopted, and implemented to address existing development, future development and redevelopment. The Plan shall include provisions for correction of deficiencies, assessment of long-range needs, establishment of priorities, requirements for inspection and maintenance of stormwater management facilities, and funding.

Commentary: The local government should consider the above policy if there is no current master stormwater plan. If the local government has a master stormwater plan, there may

be a need to adopt a policy addressing potential revisions to the master plan to address specific needs in the springshed.

Objective 6. Wastewater Treatment

Development within the [Primary/Secondary] Springs Protection Area shall provide a high level of wastewater treatment.

Policy 6.1: Where central wastewater treatment facilities are not available, septic systems for development are limited to performance-based septic tank systems with drip irrigation for effluent disposal. The system shall be designed to provide a recovered water product that contains not more than 10 mg/l or Total Nitrogen, expressed as N.

Policy 6.2: All existing and new septic systems shall be inspected within a time frame not to exceed every five (5) years, or upon sale of the property, for maintenance and upgrade. Inspection shall be conducted by a licensed septic system contractor.

Policy 6.3: Existing septic systems shall be replaced with performance-based septic systems when the existing system fails or otherwise requires replacement. The system shall be designed to provide a recovered water product that contains not more than 10 mg/l or Total Nitrogen, expressed as N.

Alternative

Policy 6.3: Existing septic systems shall be replaced with a performance based system, with drip irrigation for effluent disposal installed with appropriate vegetative cover, or equivalent system that provides a recovered water product that contains not more, on a permitted annual average basis, than 10 mg/l of Total Nitrogen, expressed as N, at the time the existing septic system fails or requires repairs, based on a determination by the Department of Health, provided that a central sewer system is not available within 1,320 feet.

Commentary: The alternative policy is more detailed and includes the provision that an equivalent system may be provided.

Policy 6.4: Wastewater treatment facilities within the [Primary/Secondary] Springs Protection Area shall be Type I or II and shall comply with the following standard:

Advanced Wastewater Treatment (AWT) levels (3 Milligrams/Liter (mg/L) for nitrogen) for all Type I (design capacity of 500,000 gallons per day to 12.5 million gallons per day) and Type II (100,000 to 500,000 gallons per day) central wastewater treatment facilities using Rapid Infiltration Basins.

Policy 6.5: Evaluate the potential for installation of lines for reused water within the [Primary/Secondary] Springs Protection Area and implement a program when a reused water system is determined to be feasible.

Commentary: The local government should consider the possibility of a master wastewater facility plan, as set forth in the following policy, especially a joint master plan including all local governments within the springshed. In most situations, the springshed for a spring or group of springs extends over two or more jurisdictions. In such instances, the protective measures in a single jurisdiction will have only limited effectiveness. It is important that all jurisdictions within a springshed engage in the implementation of protective measures. The development of a master plan for wastewater facilities is one action that should be undertaken jointly if at all possible.

Policy 6.6: A Wastewater Facility Plan shall be developed in order to establish a comprehensive method to ensure adequate levels of wastewater treatment, disposal, and reuse. (City/county) shall coordinate with (other local governments within the county and/or the county and any service providers) in order to develop a wastewater facility plan for joint planning areas or joint utility service areas. The facility plan shall ensure that measures are included to minimize nutrient input into the groundwater in the springshed.

Objective 7. Intergovernmental Coordination

Coordinate with local governments throughout the springshed area(s) to ensure a consistent approach to springs, springshed, and aquifer protection.

Policy 7.1: The <city/county> shall propose an interlocal agreement that specifies responsibilities for land development regulation, stormwater management, and other matters that impact the springs and springshed. The interlocal agreement shall contain joint strategies for springs protection to be implemented by all local governments within a springshed.

Policy 7.2: The <city/county> shall propose the creation of a joint development review board to be composed of representatives from all local governments within the identified springsheds, as well as affected regional and state agencies.

Policy 7.3: <City/county> shall coordinate with the Department of Community Affairs, the Department of Environmental Protection, and the Water Management District regarding plan amendments and proposed development that will impact springs and springsheds. This coordination should occur prior to transmitting proposed plan amendments whenever possible.

Objective 8. Review of Development Plans

All development proposed within the [Primary/Secondary] Springs Protection Area, including site plans, planned unit developments, subdivision plats, and master plans, shall be reviewed according to the following policies.

- Policy 8.1: In order to evaluate the vulnerability of proposed development sites to the leaching of nitrates into groundwater, an application for development approval shall be accompanied by an analysis of the site to determine the location and nature of sinkholes and other karst features of the property, such as stream-to-sink and other direct connections to the aquifer.
- Policy 8.2: An application for development approval shall be accompanied by a geophysical analysis to determine the depth of the water table, location of the Floridan Aquifer relative to ground surface and thickness and extent of the bedrock or other confining layers over the aquifer.
- Policy 8.3: An application for development approval shall include documentation to demonstrate that the proposed construction methods are suitable for the underlying geology of the site.

Objective 9. Plan Amendments

All proposed amendments to the Comprehensive Plan, including amendments to the Future Land Use Map and amendments to the Springs Protection Elements, shall meet the criteria in the following policies.

- Policy 9.1: Demonstrate that the proposed uses are appropriate, considering the environmentally sensitive nature of the site.
- Policy 9.2: Demonstrate that the uses permissible in the proposed land use category are able to be developed consistent with Best Management Practices and the specific requirements set forth for the Springs Protection Area.
- Policy 9.3: Document that the uses permissible in the proposed land use category will not include a concentration or storage of hazardous materials without adequate secondary containment.
- Policy 9.4: Demonstrate that the proposed land use category is the least intensive category that will meet a clearly demonstrated need for the use.
- Policy 9.5: Provide a geophysical analysis with at least the following information: the characteristics of on-site soils; locations of geologic features including sinkholes, depressions, and swallets; depth of the water

table; location of the Floridan Aquifer relative to ground surface and thickness and extent of the bedrock or other confining layers over the aquifer.

- Policy 9.6: If the geophysical analysis confirms a direct connection to the aquifer, a comparative nitrate loading analysis shall be prepared by a licensed professional geologist using professionally acceptable methodology based on the designation on the Future Land Use Map at the time of the proposed amendment versus the proposed land use designation, considering the maximum intensity possible under the proposed land use designation. The analysis must demonstrate that there is no significant and measurable net increase in nitrate loading to groundwater.

Commentary: As described in Section 4.1.1, the Springs Protection Element is the recommended approach. Such an element contains all objectives and policies pertaining to the protection of springs and the springshed. However, if the local government prefers to amend each element of its comprehensive plan, the following sections provide the policies applicable to each element.

Objective 10. Transfer of Development Rights

In order to protect areas within the [Primary/Secondary] Springs Protection Area, a transfer of development rights (TDR) program is established. Development rights, as determined by the land use category on the Future Land Use Map, may be transferred as described by the following policies.

- Policy 10.1: Areas described as <enter identification information> shall be sending areas for the purpose of implementing a TDR program.

- Policy 10.2: Areas described as <enter identification information> shall be receiving areas for the purpose of implementing a TDR program. Development rights in the form of residential dwelling units or square feet of non-residential development may be granted as set forth in the TDR program.

- Policy 10.3: When development rights are approved for transfer from a sending area, a conservation easement or other recordable instrument shall be provided that designates the sending parcel as open space in perpetuity.

- Policy 10.4: Areas designated as receiving areas shall have a two-tier density and intensity standard. The first, and lower tier, establishes the density or intensity for each parcel without a transfer of rights. The second tier establishes the maximum density or intensity when development rights are transferred. Development at the density or intensity for the

second tier shall be consistent with level of service requirements and shall be compatible with the surrounding neighborhood.

Policy 10.5: A parcel which has received a transfer of density or intensity shall not be eligible for a plan amendment that would further increase the density or intensity of development.

Commentary: Refer to Appendix A.1 for a detailed discussion of transfer of development rights.

Commentary: When you choose to implement springs protection through amendments to existing elements of your comprehensive plan, you should use Sections 4.3 through 4.6. The policies provided in Section 4.2 (Springs Protection Element) are repeated in Sections 4.3 through 4.6, but are assigned to the relevant element of the plan. This provides the local government with an alternative approach.

4.3 Future Land Use Element

Objective 1. Amend the Future Land Use Map to depict a Primary Springs Protection Area (--PSPA) in order to protect 1st, 2nd, and 3rd magnitude springs. Implement the protective measures set forth in the following policies:

Commentary: The local government may wish to depict the Primary Springs Protection Area on the Future Land Use Map or prepare a separate map depicting only the Primary Springs Protection Area. Your jurisdiction may have 1st, 2nd and 3rd magnitude springs to be protected. If so, modify the above to include 2nd and, if present, 3rd magnitude springs. Other modifications may include designating the area based on the high vulnerability area on a FAVA map, designating an entire springshed, or designating more than one Springs Protection Area when there are two or more noncontiguous areas to be protected.

You should consider implementing a primary protection area when your jurisdiction is entirely or mostly covered by the springshed. This will allow implementation of different standards in the primary and secondary areas.

If your jurisdiction identifies the protection area by the name of the associated springs or spring group, include that name as indicated above. Here are some examples: Rainbow Springs Protection Area – RSPA, Wakulla Springs Protection Area – WSPA. If you identify maps in your comprehensive plan by number or use the term “exhibit” or “figure” you should make the appropriate change to the text above where the term “map” is used.

Policy 1.1: In order to avoid negative impacts to springs, limit or prohibit the following land use activities within the Primary Springs Protection Area: <insert a locally developed list>.

Commentary: The Springs Protection Area likely will be applied to areas with a wide range of land use districts that may allow activities that are potentially harmful to the springs. Site design standards and limitations on location of uses within the Springs Protection Area

may be sufficient to control impacts. However, it may be necessary to prohibit some specific uses, such as landfills, mining, or heavy industry. Heavy industry, although it may be defined differently by each local government, typically means those industrial activities that produce, handle, or store solid and sanitary wastes, solvents, pesticides, herbicides, explosives, or hazardous materials. Often, handling or storing such materials is only classified as heavy industry when it exceeds a specifically defined threshold to avoid classifying retailers who sell relatively small quantities of hazardous materials as heavy industrial uses. Your jurisdiction should determine if all or some heavy industrial uses should be prohibited. See Policy 1.2 and the associated commentary for an alternative approach.

Policy 1.2: When heavy industrial uses are permissible according to the land use districts within the Primary Springs Protection Area, a geotechnical study shall be performed in order to determine if the proposed use is acceptable in the proposed location.

Commentary: As an alternative to listed prohibited industrial uses in Policy 1.1, the local government may wish to require a geotechnical study when industrial uses are proposed. If the local government classifies some uses as heavy or high intensity commercial, a similar approach should be considered – requiring a geotechnical study – when those uses are proposed. When both primary and secondary protection areas are established, consider prohibiting heavy industrial uses altogether within the primary protection area.

Policy 1.3: Where it is not possible to fully avoid negative impacts through limiting or prohibiting land use activities, the impact of use and development within the Primary Springs Protection Area shall be minimized and mitigated to the maximum feasible extent.

Commentary: Policy 1.4 below is an alternative to Policies 1.1 and 1.2. If your jurisdiction is able to limit land uses to those with very low intensity, it is not necessary to prohibit those intense land use activities, as described in Policy 1.1, which may have significantly negative impacts.

Policy 1.4: Land uses within the Primary Springs Protection Area shall be limited to extremely low intensity uses, such as conservation, passive recreation, low-intensity agriculture, and very low density residential.

Commentary: If the land use districts within the Springs Protection Area are predominantly very low intensity, Policy 1.4 is a good approach to addressing the types of permissible land use activities. You should adjust the list of land uses described in Policy 1.4 to reflect those very low intensity land uses that are permissible according to your local comprehensive plan. It is also a good idea to establish a maximum residential density, which may be less than permissible in the same land use category outside the Springs Protection Area. If you wish to do this, you should prepare an additional policy according to the example below.

Policy 1.5: The maximum residential density within the Primary Springs Protection Area is <enter density number> units per acre.

Additional Objective and Policies when both primary and secondary protection areas are established:

Objective 2. (Secondary) Springs Protection Area

Protect 1st < and 2nd and 3rd > magnitude springs through the designation of <insert description of the specific protection area> as the <insert name> Secondary Springs Protection Area (--SSPA) as depicted on the <insert name> Map and the implementation of the following policies.

Policy 2.1: In order to avoid negative impacts to springs, limit or prohibit the following land use activities within the Secondary Springs Protection Area: <insert a locally developed list>.

Commentary: When both primary and secondary springs protection areas are implemented, the list of land uses within the primary area should be more limited than the list of land uses within the secondary area.

Policy 2.2: When heavy industrial uses are permissible according to the land use districts within the Secondary Springs Protection Area, a geotechnical study shall be performed in order to determine if the proposed use is acceptable in the proposed location.

Policy 2.3: Where it is not possible to fully avoid negative impacts through limiting or prohibiting land use activities, the impact of use and development within the Secondary Springs Protection Area shall be minimized and mitigated to the maximum feasible extent.

Policy 2.4: Land uses within the Secondary Springs Protection Area shall be limited to extremely low intensity uses, such as conservation, passive recreation, low-intensity agriculture, very low density residential, low density residential, and low intensity commercial development uses.

Objective 3. Development Design Standards

Development within the [Primary/Secondary] Springs Protection Area shall comply with the design standards set forth in the following policies:

Commentary: This policy should apply within both the primary and secondary protection areas. Modify the terminology for consistency with the approach in your jurisdiction. Where extremely low density residential land use categories are within the Springs Protection Area, this policy should be revised to eliminate the requirement for clustering for the extremely low density development. Extremely low density residential should include densities of fewer than one (1) unit per five (5) acres.

Policy 3.1: Residential development within the [Primary/Secondary] Springs Protection Area shall be clustered, based on conservation subdivision design standards.

Policy 3.2: Conservation subdivisions shall comply with the following design standards:

- a. Maximum clustering of units is required, with houses located on small lots, which have small setbacks from lot lines.
- b. Required open space is at least fifty (50) percent of the site, with at least fifty (50) percent of the open space in one contiguous parcel and all open spaces connected to the maximum extent feasible. No more than twenty (20) percent of the open space may be devoted to stormwater facilities. Open space should be located on the most vulnerable portion of the site.

Commentary: The effectiveness of open space is often reduced when the open space is in scattered parcels that are disconnected from each. Some jurisdictions include planting strips adjacent to roads, retention or detention ponds, and land within setbacks as open space. This is acceptable, but should not provide the majority of the open space on a site. In addition, when planting strips are permissible, whether counting as open space or not, these planting strips should be subject to strict limitations on the application of chemicals. Further, the open space – particularly the contiguous open space – should be located for maximum protection of springs, sinkholes, and other karst features.

It often occurs that several types of “open space” occur within a development – required buffers, required landscaping areas, stormwater management areas, building setbacks, and protected open space. When half of a parcel is set aside in protected open space, *plus* the required protection of areas for landscaping, setbacks, and stormwater, the portion of the site devoted to buildings and parking is considerably less than 50 percent. The intent of a provision that allows a portion – but only a small portion – of the open space to be devoted to stormwater accomplishes two purposes. First, there is recognition that a stormwater management area does offer important open space to a development area. Secondly, it limits the use of a stormwater management area to ensure that protected open space is truly “open” in that it is not devoted to other purposes. Furthermore, while buffers and other landscaped areas do provide open space, all of the open space on a site should not be in the form of required buffers and landscaped areas which are often disconnected. Requiring half of the open space in one contiguous parcel also supports local efforts to provide habitat and wildlife corridors.

- c. Required open spaces shall be protected in perpetuity through recorded easements.
- d. Central water and sewer treatment facilities shall be available. This may include investor provided facilities that will be connected to a regional system, as soon the central facility is available.
- e. Development shall be located in such a manner as to minimize the length of new roads and drives from existing public streets to the development.

Commentary: The purpose of this provision is to minimize the amount of impervious surface devoted to roads and driveways. Because of the wide variation in parcel locations relative to existing public roads, it may not be feasible to set a specific standard for maximum length.

- f. Development shall be sited as far away as feasible from springs, spring runs, sinkholes, and swallets. The setback and buffer requirements set forth in Conservation Policies 1.1 and 2.3 apply to the development parcel for residential development and not to individual lots within a residential development.
- g. Development shall be designed to minimize site disturbance to the minimum area necessary to accomplish development. This shall include minimizing soil compaction by delineating the smallest disturbance area feasible.

Commentary: If your local government issues grading permits prior to development approval, you should probably adjust your procedures to ensure that the disturbance area is appropriately sited and approved as part of the development plan.

Policy 3.3: Nonresidential development within the [Primary/Secondary] Springs Protection Area shall meet the following location and site design requirements:

- a. Required open space is at least fifty (50) percent of the site, with at least thirty-five (35) percent of the open space located in one contiguous parcel. All open spaces shall be connected to the maximum extent feasible. No more than twenty (20) percent of the open space may be devoted to stormwater facilities. Open space should be located on the most vulnerable portion of the site.

Commentary: The effectiveness of open space is often reduced when the open space is in scattered parcels that are disconnected from each. Some jurisdictions include planting strips adjacent to roads, retention or detention ponds, and land within setbacks as open space. This is acceptable, but should not provide the majority of the open space on a site. In addition, when planting strips are permissible, whether counting as open space or not, these planting strips should be subject to strict limitations on the application of chemicals. Further, the open space – particularly the contiguous open space should be located for maximum protection of springs, sinkholes, and other karst features.

It often occurs that several types of “open space” occur within a development – required buffers, required landscaping areas, stormwater management areas, building setbacks, and protected open space. When half of a parcel is set aside in protected open space, *plus* the required protection of areas for landscaping, setbacks, and stormwater, the portion of the site devoted to buildings and parking is considerably less than 50 percent. The intent of a provision that allows a portion – but only a small portion – of the open space to be devoted to stormwater accomplishes two purposes. First, there is recognition that a stormwater management area does offer important open space to a development area. Secondly, it limits the use of a stormwater management area to ensure that protected open space is truly “open” in that it is not devoted to other purposes. Furthermore, while buffers and other landscaped areas do provide open space, all of the open space on a site should not be in the form of required buffers and landscaped areas which are often disconnected. Requiring half of the open space in one contiguous parcel also supports local efforts to provide habitat and wildlife corridors.

- b. Required open spaces shall be protected in perpetuity through recorded easements.
- c. Central water and sewer treatment facilities shall be available. This may include investor provided facilities that will be connected to a regional system as soon as the central facility is available.
- d. Development shall be located in such a manner as to minimize the length of new roads and drives from existing public streets to the development. In order to minimize impervious surface, techniques such as joint access, shared driveways, and cross-access easements are required.

Commentary: The purpose of this provision is to minimize the amount of impervious surface devoted to roads and driveways. Because of the wide variation in parcel locations relative to existing public roads, it may not be feasible to set a specific standard for maximum length.

- e. Shared parking shall be required and designed to provide adequate pedestrian access among all buildings. All parking lots with 50 or more spaces shall be designed with a minimum of twenty (20) percent of the parking spaces as pervious area.
- f. Development shall be sited as far away as feasible from springs, spring runs, sinkholes, and swallets. The setback and buffer requirements set forth in Conservation Policies 1.1 and 2.3 apply to all development.
- g. Development shall be designed to minimize site disturbance to the minimum area necessary to accomplish development. This shall include minimizing soil compaction by delineating the smallest disturbance area feasible.

Commentary: If your local government issues grading permits prior to development approval, you should probably adjust your procedures to ensure that the disturbance area is appropriately sited and approved as part of the development plan.

Policy 3.4: All golf course siting, design, construction, and management shall implement the prevention, management, and monitoring practices, detailed in the golf course siting, design, and management chapter of the *Protecting Florida's Springs Manual – Land Use Planning Strategies and Best Management Practices (November 2002)*. These practices are derived from the Audubon International Signature program.

Objective 4. Review of Development Plans

All development proposed within the [Primary/Secondary] Springs Protection Area, including site plans, planned unit developments, subdivision plats, and master plans, shall be reviewed according to the following policies.

- Policy 4.1: In order to evaluate the vulnerability of proposed development sites to the leaching of nitrates into groundwater, an application for development approval shall be accompanied by an analysis of the site to determine the location and nature of sinkholes and other karst features of the property, such as stream-to-sink and other direct connections to the aquifer.
- Policy 4.2: An application for development approval shall be accompanied by a geophysical analysis to determine the depth of the water table, location of the Floridan Aquifer relative to ground surface and thickness and extent of the bedrock or other confining layers over the aquifer.
- Policy 4.3: An application for development approval shall include documentation to demonstrate that the proposed construction methods are suitable for the underlying geology of the site.

Objective 5. Plan Amendments within the [Primary/Secondary] Springs Protection Area

All proposed amendments to the comprehensive plan, including amendments to the Future Land Use Map and amendments to the [Primary/Secondary] Springs Protection Element, shall meet the criteria in the following policies.

- Policy 5.1: Demonstrate that the proposed uses are appropriate, considering the environmentally sensitive nature of the site.
- Policy 5.2: Demonstrate that the uses permissible in the proposed land use category are able to be developed consistent with Best Management Practices and the specific requirements set forth for the Springs Protection Area.
- Policy 5.3: Document that the uses permissible in the proposed land use category will not include a concentration or storage of hazardous materials without adequate secondary containment.
- Policy 5.4: Demonstrate that the proposed land use category is the least intensive category that will meet a clearly demonstrated need for the use.
- Policy 5.5: Provide a geophysical analysis with at least the following information: the characteristics of on-site soils; locations of geologic features including sinkholes, depressions, and swallets; depth of the water table; location of the Floridan Aquifer relative to ground surface and thickness and extent of the bedrock or other confining layers over the aquifer.

Policy 5.6: If the geophysical analysis confirms a direct connection to the aquifer, a comparative nitrate loading analysis shall be prepared by a licensed professional geologist using professionally acceptable methodology based on the designation on the Future Land Use Map at the time of the proposed amendment versus the proposed land use designation, considering the maximum intensity possible under the proposed land use designation. The analysis must demonstrate that there is no significant and measurable net increase in nitrate loading to groundwater.

Objective 6. Transfer of Development Rights

In order to protect areas within the [Primary/Secondary] Springs Protection Area, a transfer of development rights (TDR) program is established. Development rights, as determined by the land use category on the Future Land Use Map, may be transferred as described by the following policies.

Policy 6.1: Areas described as <enter identification information> shall be sending areas for the purpose of implementing a TDR program.

Policy 6.2: Areas described as <enter identification information> shall be receiving areas for the purpose of implementing a TDR program. Development rights in the form of residential dwelling units or square feet of non-residential development may be granted as set forth in the TDR program.

Policy 6.3: When development rights are approved for transfer from a sending area, a conservation easement or other recordable instrument shall be provided that designates the sending parcel as open space in perpetuity.

Policy 6.4: Areas designated as receiving areas shall have a two-tier density and intensity standard. The first, and lower tier, establishes the density or intensity for each parcel without a transfer of rights. The second tier establishes the maximum density or intensity when development rights are transferred. Development at the density or intensity for the second tier shall be consistent with level of service requirements and shall be compatible with the surrounding neighborhood.

Policy 6.5: A parcel which has received a transfer of density or intensity shall not be eligible for a plan amendment that would further increase the density or intensity of development.

Commentary: Refer to Appendix A.1 for a detailed discussion of transfer of development rights.

4.4 Conservation Element

Objective 1. Protection of Groundwater

In order to minimize the contribution of nitrates to groundwater with its resultant effects on increased growth of vegetation in the spring and river and loss of water clarity, and to foster long-term stewardship of springs, special design and best management practices (BMPs) shall be required for all development located within a Springs Protection Area.

Commentary: The local comprehensive plan likely has objectives and policies pertaining to groundwater protection. This objective and the associated policies should be coordinated with existing objectives and policies for consistency. This coordination may require deleting or revising existing policies.

Policy 1.1: All development shall comply with the following setback standards:

Table 1.1. Setback Standards from Specified Features.

| Feature | Minimum Setback (feet) |
|---|------------------------|
| 1 st and 2 nd magnitude springs | 300 |
| 3 rd magnitude and smaller springs | 100 |
| Spring runs | 150 |
| Sinkholes | 100 |
| Caves | 300 |
| Swallet | 100 |

- a. The setback from sinkholes and swallets shall be measured from the drainage divide.
- b. The setback from springs and spring runs shall be measured from the ordinary high water line for fresh water springs and from the mean high water line for tidally connected springs.
- c. The setback for caves shall be measured from the outside edge of the cave system.
- d. Where a lot of record is too small to accommodate development in compliance with the setbacks set forth in Table 1.1, an allowable use may be established provided that:
 - the building and associated paved areas are located the maximum distance possible from the features listed in Table 1.1,
 - a swale and berm are located between the development and the feature, and

- the swale and berm are designed to direct drainage away from the feature.

Commentary: If the local jurisdiction does not have both fresh water and tidally connected springs, the policy should be modified to address only the type of springs within the jurisdiction. Further, the local comprehensive plan may have objectives and/or policies requiring setbacks from other environmental resources, such as wetlands or water bodies. The local government may wish to modify existing policies to add setbacks from springs and associated features. In any case, this policy should be located in the portion of the plan where resource protection includes setback requirements.

Objective 2. Landscaping and Vegetation in the [Primary/Secondary] Springs Protection Area

Landscaping design, landscaping management practices, and vegetation protection requirements shall be implemented that reduce impacts to land in the [Primary/Secondary] Springs Protection Area.

Policy 2.1: Removal of vegetation within the [Primary/Secondary] Springs Protection Area shall be limited to the minimum necessary to accommodate development. Buildings and other disturbed areas shall be located to avoid removal of native vegetation to the maximum extent feasible.

Policy 2.2: Native or naturalized species shall be used in all landscaped areas in the [Primary/Secondary] Springs Protection Area in order to avoid or minimize the use of irrigation and fertilizers. A minimum of 100 percent of installed vegetation in the Primary Springs Protection Area and fifty (50) percent of installed vegetation in the Secondary Springs Protection Area shall be native or naturalized species.

Commentary: Most local governments have requirements regarding the use of native or naturalized plant materials. The local government should review existing landscaping requirements to determine if the recommended policies are already met. However, the requirements for retention or installation of native or naturalized plant materials may be higher within the Springs Protection Area to minimize the use of irrigation and fertilizers.

Policy 2.3: The land area within the required setback set forth in Policy 1.1 is a buffer and all native vegetation shall be retained, except for minimal removal necessary to provide for pedestrian paths or boardwalks. Paths and boardwalks shall not exceed four (4) feet in width and shall not be paved.

Commentary: The local comprehensive plan may already have provisions regarding buffers and the ability to install paths and boardwalks to cross a buffer. This policy should be coordinated with any existing and similar policies. Alternatively, existing policies may be modified to address springs protection and development requirements within the [Primary/Secondary] Springs Protection Area.

Policy 2.4: All landscaping for development in the [Primary/Secondary] Springs Protection Area shall conform to the best management practices as stated in the *Guidelines for Model Ordinance Language for Protection of Water Quality and Quantity Using Florida Friendly Lawns and Landscapes*. (Florida Department of Environmental Protection, September 2, 2003).

Policy 2.5: The <city/county> shall establish guidelines for managing existing and future lawns and landscapes at all <city/county> facilities using the educational guidelines contained in the University of Florida Extension's Florida Yards and Neighborhoods Program, Environmental Landscape Management (ELM) principles and Best Management Practices. Such guidelines shall include practices that are designed to reduce nitrate infiltration into ground and surface water.

Commentary: The purpose of this policy is to ensure that the local government serves as a model in implementing the kinds of landscaping practices required for private development.

Policy 2.6: Establish education and certification program for landscape and lawn-care professionals regarding the use and application of fertilizers and pesticides

4.5 Public Facilities/Infrastructure Element

Objective 1. Impervious Surface

Impervious surfaces shall be limited in order to increase the land area for recharge.

Policy 1.1: Design of parking lots, sidewalks, buildings, and other impervious surfaces shall minimize connections between impervious surfaces through the following techniques. Not all techniques may be required to accomplish the requirement to minimize connections:

- a. Directing flows from roof drains to vegetated areas or to rain barrels or cisterns for reuse of the water;
- b. Directing flows from paved areas to vegetated areas;
- c. Locating impervious surfaces so that they drain to vegetated buffers or natural areas; and
- d. Breaking up flow directions from large paved surfaces.

Policy 1.2: Porous pavement materials, such as pervious concrete, pervious asphalt, or other pervious or porous materials shall be used to minimize the amount of impervious surface within all development.

Commentary: If your jurisdiction has established policy about types of pervious materials that are acceptable, you should modify the above policy for consistency with your local standards. Such materials may be called pervious or porous concrete, permeable concrete, pervious asphalt, no-fines concrete, gap-graded concrete, or enhanced porosity concrete. Information and engineering specifications may be found at www.perviouspavement.org. You may also wish to place the above policies in the Future Land Use Element with policies related to site design. In this *Implementation Guidebook* these policies are in the Infrastructure Element as they deal with parking and sidewalks and pavements which are often matters addressed in Infrastructure policies.

Objective 2. Stormwater Management

The volume, recharge, and treatment of stormwater runoff within the [Primary/Secondary] Springs Protection Area shall be designed to provide protection to springs and springsheds.

Policy 2.1: Best Management Practices (BMPs) shall be used in combination as part of a BMP treatment train to protect water quality and minimize flooding. Best Management Practices shall be used in the design of stormwater management facilities and systems.

Policy 2.2: The following stormwater Best Management Practices shall be implemented in order to reduce nitrate loading within the [Primary/Secondary] Springs Protection Area:

- a. All residential development shall use swales with swale blocks or raised driveway culverts whenever possible. An exception to this requirement may be granted when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.
- b. Vegetated infiltration areas shall be used to provide stormwater treatment and management on all sites except when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.
- c. Design of the stormwater systems for all development shall use bio-retention areas (below grade vegetated areas) to increase stormwater treatment and reduce stormwater volume.
- d. Downspouts for all development shall be directed from the roof to vegetated areas for uptake.
- e. Whenever infiltration systems are not feasible, wet detention systems may be used for stormwater treatment and management.

Policy 2.3: Design of stormwater management systems shall implement the following criteria:

- a. Sinkholes, swallets, and stream-to-sink features shall not be utilized as stormwater management facilities.

- b. All depressions within a proposed development area will be investigated by a licensed professional using a professionally acceptable methodology for suitability of water retention using generally accepted geotechnical practices with an emphasis on identification of potential connections to the aquifer. If connections are determined to exist, the depression shall not be used for stormwater retention and the area draining to this feature under pre-development conditions shall be preserved through a conservation easement.
- c. All components of the stormwater treatment and management system shall be in common ownership and shall be maintained by the responsible legal entity identified in the stormwater permit, typically a homeowner or property owners association.

Policy 2.4: Drainage for streets and roads within the [Primary/Secondary] Springs Protection Area shall be through roadside swales and berms. Curb and gutter design shall not be used.

Alternative

Policy 2.4: Drainage for streets and roads within the [Primary/Secondary] Springs Protection Area shall be through roadside swales and berms. Curb and gutter with cuts may be used, with appropriate spacing requirements specified in the land development regulations.

Policy 2.5: A Master Stormwater Management Plan for the [Primary/Secondary] Springs Protection Area shall be prepared, adopted, and implemented to address existing development, future development, substantial redevelopment, and non-substantial redevelopment. The Plan shall include provisions for correction of deficiencies, assessment of long-range needs, establishment of priorities, requirements for inspection and maintenance of stormwater management facilities, and funding.

Commentary: The local government should consider the above policy if there is no current master stormwater plan. If the local government has a master stormwater plan, there may be a need to adopt a policy addressing potential revisions to the master plan to address specific needs in the springshed.

Objective 3. Wastewater Treatment

Development within the Springs Protection Area shall provide a high level of wastewater treatment.

Policy 3.1: Where central wastewater treatment facilities are not available, septic systems for development are limited to performance-based septic tank systems with drip irrigation for effluent disposal. The system shall be designed to provide a recovered water product that contains not more than 10 mg/l or Total Nitrogen, expressed as N.

Policy 3.2: All existing and new septic systems shall be inspected every five (5) years or upon sale of the property for maintenance and upgrade. Inspection shall be conducted by a licensed septic system contractor.

Policy 3.3: Existing septic systems shall be replaced with performance-based septic systems when the existing system fails or otherwise requires replacement.

Alternative

Policy 3.3: Existing septic systems shall be replaced with a performance based system, with drip irrigation for effluent disposal installed with appropriate vegetative cover, or equivalent system that provides a recovered water product that contains not more, on a permitted annual average basis, than 10 mg/l of Total Nitrogen, expressed as N, at the time the existing septic system fails or requires repairs, based on a determination by the Department of Health, provided that a central sewer system is not available within 1,320 feet.

Commentary: The alternative policy is more detailed and includes the provision that an equivalent system may be provided.

Policy 3.4: Wastewater treatment facilities within the [Primary/Secondary] Springs Protection Area shall be Type I or II and shall comply with the following standard:

Advanced Wastewater Treatment (AWT) levels (3 Milligrams/Liter (mg/L) for nitrogen) for all Type I (design capacity of 500,000 gallons per day to 12.5 million gallons per day) and Type II (100,000 to 500,000 gallons per day) central wastewater treatment facilities using Rapid Infiltration Basins.

Policy 3.5: Evaluate the potential for installation of lines for reused water within the [Primary/Secondary] Springs Protection Area and implement a program when a reused water system is determined to be feasible.

Commentary: The local government should consider the possibility of a master wastewater facility plan, as set forth in the following policy, especially a joint master plan including all local governments within the springshed. In most situations, the springshed for a spring or group of springs extends over two or more jurisdictions. In such instances, the protective measures in a single jurisdiction will have only limited effectiveness. It is important that all jurisdictions within a springshed engage in the implementation of protective measures. The development of a master plan for wastewater facilities is one action that should be undertaken jointly if at all possible.

Policy 3.6: A Wastewater Facility Plan shall be developed in order to establish a comprehensive method to ensure adequate levels of wastewater

treatment, disposal, and reuse. (City/county) shall coordinate with (other local governments within the county and/or the county and any service providers) in order to develop a wastewater facility plan for joint planning areas or joint utility service areas. The facility plan shall ensure that measures are included to minimize nutrient input into the groundwater in the springshed.

4.6 Intergovernmental Coordination Element

Objective 1. Intergovernmental Coordination for Development in the Springshed

Coordinate with local governments throughout the springshed area(s) to ensure a consistent approach to springs, springshed, and aquifer protection.

Policy 1.1: The <city/county> shall propose an interlocal agreement that specifies responsibilities for land development regulation, stormwater management, and other matters that impact the springs and springshed. The interlocal agreement shall contain joint strategies for springs protection to be implemented by all local governments within a springshed.

Policy 1.2: The <city/county> shall propose the creation of a joint development review board to be composed of representatives from all local governments within the identified springsheds, as well as affected regional and state agencies.

Policy 1.3: <City/county> shall coordinate with the Department of Community Affairs and the Department of Environmental Protection regarding plan amendments and proposed development that will impact springs and springsheds. This coordination should occur prior to transmitting proposed plan amendments whenever possible.

5.0 LAND DEVELOPMENT REGULATIONS TO PROTECT SPRINGS

5.1 Introduction

This chapter provides the information needed by local governments to ensure that the land development regulations implement the provisions of the comprehensive plan when that plan has been amended to protect springs within the local jurisdiction. It is important to first amend the local comprehensive plan to adopt provisions such as the model objectives and policies contained in Chapter 4.0. With the plan provisions as a foundation, regulations such as the ones found in this chapter may be adopted to ensure protective measures are implemented. Chapter 4.0 and 5.0 are companion documents intended to ensure that local regulations are based on the local comprehensive plan, consistent with the requirements of the Growth Management Act.

However, it is important to recognize that the regulations presented in this chapter should not be adopted without careful review. Such a review will be useful to meet the following purposes:

- ♦ to determine if the regulation is consistent with other regulations already adopted by the local government;
- ♦ to identify existing regulations that should be changed to ensure consistency of regulations throughout the entire set of land development regulations;
- ♦ to determine if existing regulations accomplish the purposes of springs protection; and
- ♦ to adapt the regulations in this model to best meet the specific needs and regulatory approaches adopted by the local government.

Commentary: Consistency among regulations means that regulations in one section do not conflict with regulations in another section. For example, an important protective measure for sinkholes is a buffer. Many local governments have existing regulations that require buffers in certain situations. When the buffer requirements to protect a sinkhole are different, it is possible that the regulations could be written in a way that results in conflict or confusion. Refer to Section 5.1.2 below for tips on avoiding such conflict.

Another issue to consider is the technical expertise available through the local government staff. Regulations may be adopted that require the use of a technical expert to ensure implementation. Where such experts are not on the local government staff, the local government should determine how the regulations will be implemented. Tips are provided in Section 5.1.2 below.

5.1.1 Using this chapter

Chapter 4.0 described two approaches to amending the local comprehensive plan. Whether the local plan is amended to adopt a Springs Protection Element or to amend several elements to address springs protection requirements, the same types

of regulations will be needed. Therefore, this chapter proposes those regulations that will be needed to implement the objectives and policies no matter how they are organized in the comprehensive plan.

There are several regulatory issues pertaining to springs protection that already may be addressed in the local government land development regulations. These issues, such as nonconformities, apply to many situations and are not limited to springs protection. A brief discussion of these issues is contained in Section 5.1.2 to help the local government ensure that important issues are not overlooked. Other issues and tips for implementation are provided in Section 5.1.2.

5.1.2 Issues to consider in order to implement the regulations

A. Conflicting regulations

Careful review of existing regulations compared to the regulations proposed to protect springs may result in identifying some potential conflicts. Many local governments have regulations regarding the quantity and location of landscaping materials, use of drought-tolerant landscaping plants, prohibitions on exotic or invasive species, or the installation of irrigation systems. Other regulations may address the requirement to provide buffers in specific situations, the number and location of plants in buffers, and the size and shape of the buffer. Regulations may limit the amount and location of impervious surfaces, specify certain types of stormwater facilities, require clustered development in certain locations, require open space, protect natural resources, or limit the use or type of septic systems. These are all examples of the types of regulations proposed in this chapter. When adopting regulations to protect springs, the following methods should be considered in order to avoid conflict among the regulations.

1. Review the existing regulations and determine if they are adequate as written. If the regulations are adequate, modify the existing regulations by making them clearly applicable to lands identified for springs protection.
2. When adopting separate regulations that apply to springs protection areas, provide a statement such shown in Section 5.2.3.B

B. Using technical experts to determine compliance with springs protection standards

Some of the regulations may require review by a technical expert to ensure compliance of development proposal with the standards to protect springs. Many mid-size and small local governments are not able to employ such experts as full-time members of the local government staff. However, one useful method to provide the necessary review is to seek assistance from the water management district, the Florida Geological Society, or to engage the services of a consultant who has the expertise to conduct the review. Section 5.2.6 contains

a provision to give the local government the authority to engage an expert at the expense of the applicant.

C. Applicability

Local government regulations often contain a general statement about applicability of regulations to ensure that all use and development of land within the jurisdiction of the local government is in compliance with the requirements of the regulations. However, some local government regulations contain more specific provisions by listing those instances where development approval is required. For example, development approval may be required for land clearing or modification, tree removal, construction of any building or structure, and the installation of utilities, streets, driveways, drainage systems, building systems (electrical, gas, mechanical, or plumbing), accessory structures, and for any other construction, reconstruction, site improvements, or modifications to the land or water on a site.

It is likely that a separate statement regarding applicability may be necessary, as the springs protection area will be less than the entire jurisdiction. Carefully review the existing provisions regarding the applicability of regulations and work with the local government attorney to ensure that the requirements to comply with springs protection provisions are clear.

D. Exemptions

Local government regulations typically contain provisions to identify those situations that are exempted from either the standards or the procedures in the regulations. Most regulations exempt applications that are under review at the time the regulations are adopted from compliance with these newly adopted regulations. Often there is a time limit associated with this exemption. The following is an example of such an exemption:

- ♦ *Projects for which a development permit has been lawfully issued, provided:*
 1. *The development permit has not expired prior to the effective date of the LDC or amendment of the LDC;*
 2. *The development activity authorized by the development permit commenced on or before the effective date of this LDC and continues in good faith according to the applicable time limits; and*
 3. *The development activity authorized by the development permit is in accordance with all applicable development permits.*

Another typical exemption is for a single-family detached home constructed within an approved subdivision, which must obtain a building permit, but is not required to obtain development approval. The concept is that the approval of the subdivision plat included consideration of all regulations, and that the single-

family home constructed on the approved lot in the subdivision need not be reviewed again.

E. Site plan requirements

Some local governments require site plans or development plans only for major developments or for certain types of development. Effective springs protection must require site plan or development plan review for all development within the protection area. Carefully review the local procedures and determine how best to ensure that all proposed development within the springs protection area is subject to a full site plan review process. It is best to work with the local government attorney in preparing this requirement.

5.2 General Matters

5.2.1 Title

This ordinance [or “these regulations”] shall be known as and entitled the “[city/county] Springs Protection Ordinance.”

Commentary: If the local government has a unified land development code and wishes to insert the springs protection regulations into the code, a more appropriate title might be “springs protection regulations.” Throughout this chapter, the term “Springs Protection Ordinance” is used. The local government should substitute whatever title is locally adopted. Where the local government will insert appropriate regulations throughout its existing regulations, rather than consolidating the springs protection regulations into one location, a title is not needed.

5.2.2 Purpose

This *Springs Protection Ordinance* is adopted for the purpose of implementing the Comprehensive Plan provisions regarding the protection of springs and associated features within [city/county] jurisdiction. Further, this *Springs Protection Code* is intended to:

- A. Protect the Floridan Aquifer and the ability of the aquifer to continue to meet the needs of the State for clean, safe, potable water;
- B. Maintain and improve the quality and quantity of water recharging the Floridan Aquifer;
- C. Conserve water resources and promote reuse of water; and
- D. Protect and preserve springs, springsheds, and associated springs features.

Commentary: The local government may have existing purpose statements regarding resource protection that are similar to the above. Depending on the organization of the local government regulations, consider whether additional purpose statements are needed.

5.2.3 Applicability

- A. The provisions of the *Springs Protection Ordinance* apply to all land and all development within the districts described in Section 5.3.

Commentary: Refer to the discussion in Section 5.1.2.C above regarding a statement of applicability. When the local government has determined whether one or more zoning districts will be established or one or more overlay districts established, a more specific reference can be provided in the statement of applicability.

B. Conflicting regulations

When the regulations provided herein are found to be in conflict with other regulations applicable to the same lands, the stricter standard shall apply. The term “stricter standard” means the standard that results in the greater amount of protection for the springs or a karst feature.

5.2.4 Exemptions

Construction of a single-family dwelling on a lot of record is exempt from the provisions of this *Springs Protection Ordinance*, provided that the dwelling is located at least 150 feet from a karst feature that has a direct connection to the aquifer.

Commentary: Refer to the discussion in Section 5.1.2.D above regarding whether an additional statement of exemptions is needed. Consider adding the exemption described in this section.

5.2.5 Definitions

Commentary: Definitions which may be needed for springs protection are contained in the glossary of terms within this guidebook. If your land development regulations have a master list of definitions, be sure to amend the list to include those terms necessary for the *Springs Protection Ordinance*. Otherwise, provide those definitions here.

5.2.6 Fee for independent review of applications

The [city/county] is authorized to enter into a contract with persons who have expertise necessary for the independent review of an application or a specific technical aspect of an application. The costs of such review shall be paid by the applicant.

5.3 Springs Protection District(s)

Commentary: The purpose of districts, whether zoning districts or overlay districts, is to provide a means of modifying the site design requirements applicable to the development within the specified area. It is necessary to modify the site design requirements in order to ensure protection of springs, springsheds, and associated springs features within the jurisdiction. There are two alternatives described below – two zoning districts, one for the

primary protection area and another for the secondary protection area, and two overlay districts, also for the primary and secondary protection areas. However, especially for the creation of zoning districts, the local government may determine that more than two zoning districts are needed. For example, if the existing and planned uses are very different throughout a protection area, a zoning district that allows some limited commercial might be needed, or any of a variety of districts. The local government should take care in establishing zoning districts beyond one for the primary protection area and one for the secondary area. It becomes more difficult to ensure adequate protection when there are multiple districts with a variety of uses and design standards.

One basis for establishing additional districts is the presence of karst features within a specific portion of the springs protection area. For example, if caves or a number of sinkholes are in one portion of the protection area, an additional zoning district could be created with even fewer permitted uses than described below for the SPZ-1. The natural resource map and future land use map in the comprehensive plan are the best guide to the creation of zoning or overlay districts to protect springs.

5.3.1 Alternative 1 – Springs protection zoning district

The following zoning district(s) [is/are] hereby established:

- A. SPZ-1 Springs Protection Zone – 1 is established for the area depicted on Map [insert the map name and number]. It is intended to provide maximum protection to the primary springs protection area as described in the comprehensive plan.

Commentary: Determining the location of the primary springs protection area should be based on travel time. Travel time refers to the length of time between water entering the ground as recharge and flowing to the spring. The length of time is affected by distance to the spring, likelihood of conduit flow, type of soils, and the slope of the potentiometric surface. The primary springs protection area may be defined as the two-year springshed or ten-year springshed. The definition will depend in part on the availability of data along with an evaluation of the strategies that could be implemented within the primary area. The secondary protection area is typically the entire springshed outside the primary springshed, and is typically defined as the 100-year springshed.

1. The following are permissible uses within SPZ-1:
 - ◆ Conservation activities
 - ◆ Open space
 - ◆ Passive recreation
 - ◆ Low intensity agriculture
 - ◆ Very low density residential, limited to conservation subdivision design as set forth in Section 5.4.3, and not to exceed [insert number] units per acre.
 - ◆ [continue the list of those uses that are permissible within the primary protection area for the local jurisdiction]

Commentary: Where only one protection area is established in the comprehensive plan, the district may be called SPZ or some other term rather than SPZ-1.

2. The following uses are prohibited within SPZ-1:
 - ◆ Landfills
 - ◆ Wastewater treatment facilities
 - ◆ Mining
 - ◆ Industry
 - ◆ Drainage wells for stormwater disposal
 - ◆ Confinement feeding lots
 - ◆ [continue the list of those uses that are prohibited within the secondary protection area for the local jurisdiction]

Commentary: The lists of permissible and prohibited uses should be determined by the local government. Depending on the size of the primary protection area, it may not be feasible to prohibit a wide range of uses, especially industrial uses or agricultural uses. If the local government does not classify industrial activities as light or heavy, it may be useful to create this distinction in order to prohibit the heavy industrial uses within the primary protection area, or to limit industrial activities based on the use of hazardous materials. Similarly, some agricultural activities may be acceptable, while the full range would not be acceptable. Carefully review the legal discussion in the appendix regarding preemptions of local governments pertaining to agricultural uses. When it is not possible to prohibit potentially damaging uses, be sure to require a geotechnical study as described in Section 5.7.

B. SPZ-2 Springs Protection Zone – 2 is established for the area depicted on Map [insert the map name and number], if applicable. It is intended to provide maximum protection to the secondary springs protection area as described in the comprehensive plan.

1. The following are permissible uses within SPZ-2:
 - ◆ Conservation activities
 - ◆ Open space
 - ◆ Passive recreation
 - ◆ Low intensity agriculture
 - ◆ Low density residential use, not exceed [insert number] units per acre
 - ◆ [continue the list of those uses that are permissible within the primary protection area for the local jurisdiction]

Commentary: Depending on the size and location of the secondary protection area, the local government may wish to require that residential uses are limited to conservation subdivision design standards.

2. The following uses are prohibited within SPZ-2:
 - ◆ Landfills
 - ◆ Wastewater treatment facilities
 - ◆ Mining
 - ◆ Industry
 - ◆ Drainage wells for stormwater disposal
 - ◆ Confinement feeding lots

- ♦ [continue the list of those uses that are prohibited within the secondary protection area for the local jurisdiction]

Commentary: The lists of permissible and prohibited uses should be determined by the local government. Depending on the size of the secondary protection area, it may not be feasible to prohibit a wide range of uses, especially industrial uses or agricultural uses. If the local government does not classify industrial activities as light or heavy, it may be useful to create this distinction in order to prohibit the heavy industrial uses within the secondary protection area. Similarly, some agricultural activities may be acceptable, while the full range would not be acceptable. However, if the secondary area is very large, additional setback standards may be needed to allow such uses at the outer edge of the protection area. Also, carefully review the legal discussion in the appendix regarding preemptions of local governments pertaining to agricultural uses. When it is not possible to prohibit potentially damaging uses, be sure to require a geotechnical study as described in Section 5.7.

5.3.2 Alternative 2 – Springs protection overlay district

The following overlay district(s) [is/are] hereby established:

- A. SPOD-1 Springs Protection Overlay District – 1 is established for the area depicted on Map [insert the map name and number]. It is intended to provide maximum protection to the primary springs protection area as described in the comprehensive plan. The uses set forth for the underlying zoning district(s) continue to apply, except that the following uses are prohibited:
- ♦ Landfills
 - ♦ Wastewater treatment facilities
 - ♦ Mining
 - ♦ Industry
 - ♦ Drainage wells for stormwater disposal
 - ♦ Confinement feeding lots
 - ♦ Residential uses other than those located in a conservation subdivision
 - ♦ [continue the list of those uses that are prohibited within the primary protection area for the local jurisdiction]

Commentary: Where only one protection area is established in the comprehensive plan, the overlay district may be called SPOD or some other term rather than SPOD-1.

The list of prohibited uses should be determined by the local government. Depending on the size of the overlay district, it may not be feasible to prohibit a wide range of uses, especially industrial uses or agricultural uses. If the local government does not classify industrial activities as light or heavy, it may be useful to create this distinction in order to prohibit the heavy industrial uses within the overlay district, or to limit industrial activities based on the use of hazardous materials. Similarly, some agricultural activities may be acceptable, while the full range would not be acceptable. Carefully review the legal discussion in the appendix regarding preemptions of local governments pertaining to agricultural uses. When it is not possible to prohibit potentially damaging uses, be sure to require a geotechnical study as described in Section 5.7.

B. SPOD-2 Springs Protection Overlay District – 2 is established for the area depicted on Map [insert the map name and number]. It is intended to provide maximum protection to the secondary springs protection area as described in the comprehensive plan. The uses set forth for the underlying zoning district(s) continue to apply, except that the following uses are prohibited:

- ◆ Landfills
- ◆ Wastewater treatment facilities
- ◆ Mining
- ◆ Industry
- ◆ Drainage wells for stormwater disposal
- ◆ Confinement feeding lots
- ◆ [continue the list of those uses that are prohibited within the secondary protection area for the local jurisdiction]

Commentary: Depending on the size and location of the secondary protection area, the local government may wish to require that residential uses are limited to conservation subdivision design standards. If so, add that limitation above.

The list of prohibited uses should be determined by the local government. Depending on the size of the overlay district, it may not be feasible to prohibit a wide range of uses, especially industrial uses or agricultural uses. If the local government does not classify industrial activities as light or heavy, it may be useful to create this distinction in order to prohibit the heavy industrial uses within the overlay district, or to limit industrial activities based on the use of hazardous materials. Similarly, some agricultural activities may be acceptable, while the full range would not be acceptable. Carefully review the legal discussion in the appendix regarding preemptions of local governments pertaining to agricultural uses. When it is not possible to prohibit potentially damaging uses, be sure to require a geotechnical study as described in Section 5.7.

5.3.3 Alternative 3 – Springs protection planned development district

A. SPPD – The Springs Protection Planned Development District is established as a development option applicable within the springs protection area as depicted on Map [insert map name and number] to meet the following purposes:

1. Provide flexibility for creative and responsible development projects;
2. Ensure protection of the [name] springs; and
3. Allow for compatible mixed-use development including only low-density residential, limited commercial, and small-scale public, cultural, or civic uses.

Commentary: The local government may have a PUD option in the local land development regulations. However, it may be desirable to create a special purpose PUD that is applicable only within the established Springs Protection Area. This is a means of allowing mixed-use development and providing for greater flexibility in location and design, so long as the SPPD meets the intent of the use and design standards within the comprehensive plan. When a

special purpose PUD is chosen, it should be a floating zone. A floating zone is not mapped, but is established on the zoning map only when an application meeting all requirements for development within the springs protection area is approved. A floating zone, in this case the Springs Protection Planned Development, is described in the text and required within the springs protection area, but not yet mapped until development is proposed, meets all requirements, and ultimately is approved.

- B. The SPPD is a floating zone and shall not be applied to land within the springs protection area without a master site development plan that demonstrates compliance with the resource protection and site design standards and standards for specific uses that may be proposed within the SPPD. Proposed development shall include “green building” practices as outlined in the guidebook from the Florida Department of Environmental Protection, entitled *Creating a Green and Profitable Work Environment*, in order to reduce indoor and outdoor water use. The site development plan may propose variations in the standards set forth herein in order to meet the “green building” practices, so long as there is demonstrated evidence that the variation in the standards will not result in degradation to water quality, damage to the springs, or damage to karst features in the springs protection area. The master site development plan shall demonstrate compliance with the requirements set forth in the comprehensive plan.
- C. The procedure for approval of a master site development plan is set forth in [insert the section number for appropriate procedures established by the local government].

Commentary: The local government may have established terminology for site plans or site development plans. Such terminology should be substituted for the term “master site development plan” used above. Further, if a local government has established a two-step procedure requiring a preliminary or conceptual plan followed by a final development plan, the appropriate terminology should be used above.

5.4 Resource Protection and Site Design Standards

Site design standards applicable to all development within the Springs Protection Area are set forth below. In addition, specific design requirements for residential development in the form of conservation subdivision standards are set forth in Section 5.4.3.

5.4.1 Site design standards

A. Impervious surface connections

1. Development shall be located in such a manner as to minimize the length of new roads and drives from existing public streets to the development in order to minimize the amount of impervious surface in the development.

2. All impervious surfaces shall be designed to minimize to the maximum extent feasible the number and size of connections between the paved or impervious areas. In order to achieve minimum connections, at least one (1) of the following techniques shall be implemented.
 - a. Runoff from roof drains or downspouts shall be directed to a vegetated area of sufficient area for absorption of the runoff. The vegetated area shall be designed as one (1) or more slightly depressed planting beds with drought tolerant ground covers or native plants.

Commentary: The local government may wish to include standards regarding the length of time for percolation of the runoff water in order to avoid standing water or the creation of a retention pond in an area intended for vegetation.

- b. Runoff from roof drains or downspouts shall be directed to a rain barrel or cistern designed to allow reuse of the water. These facilities may be freestanding, designed as an integral part of the buildings, or directed to underground storage. The reuse system shall be shown on the proposed plan for development, and may include irrigation, or other uses that do not require potable water.
- c. Runoff from parking lots, driveways, paved courtyards, and other paved surfaces shall be directed to a vegetated area of sufficient area for absorption of the runoff. The vegetated area shall be designed as one (1) or more slightly depressed planting beds with drought tolerant ground covers or native plants. These are called bio-retention areas. The project engineer shall provide calculations to demonstrate that the vegetated area receiving the runoff is sufficient to absorb the runoff.
- d. Impervious surfaces shall be located only where runoff will drain to vegetated buffers, grassed swales, or natural areas on the development site. The runoff to open spaces containing natural vegetation should be sheet flow, not channelized flow, in order to prevent erosion.

Commentary: The local government may wish to place the above impervious surface standards in the section of the land development regulations that addresses impervious surface requirements.

B. Pervious pavement materials

To the maximum extent possible, pervious pavement materials shall be used. Pervious or porous concrete, pervious asphalt, enhanced-porosity concrete, and other porous pavement materials shall be acceptable to [city/county]. A plan for maintenance of such materials shall be included with the application for development approval in order to demonstrate the methods to be implemented to ensure the continued function of the pervious pavement materials.

Commentary: Some local governments have established procedures for considering and approving pervious pavement materials. For further information regarding pervious

pavements, engineering specifications, and inspection and maintenance of the pavements, the following website may be helpful. www.perviouspavement.org

C. Parking lot design

1. All parking lots with fifty (50) or more spaces shall be designed with a minimum of twenty (20) percent of the parking spaces as pervious area.
2. The number of parking spaces shall not exceed 110 percent of the parking required for the proposed use.

Commentary: Where a local government has existing parking standards that limit the number of parking spaces, the above standard will not be needed. It is also appropriate to add the above standards to the section in the local land development regulations to the section containing all parking requirements.

3. Parking lots shall be designed to include landscaped islands and planting strips between tiers of parking.

Commentary: Many local governments have specific design standards for parking lots, such as limiting the number of parking spaces between landscaped islands or requiring planting strips. If such standards are not in the local land development regulations, consider limiting the number of parking spaces to not more than 10 between landscaped islands. If trees are required in the landscaped island, the island should be a minimum of 400 square feet.

4. Adjacent non-residential uses shall provide for shared parking, which may result in a reduction in the total number of spaces in the shared facility as compared to the total number of spaces if separate parking lots are provided. The parking areas shall be designed to provide adequate pedestrian access among all buildings. A parking study shall be provided to document the proposed number of parking spaces in the shared facility. The study shall include an estimate of the number of spaces required and the source of the estimate. Acceptable sources include parking studies conducted by the Urban Land Institute or the Institute of Traffic Engineers, such as *Parking Generation, 3^d ed.*, from the Institute of Traffic Engineers. Parking data for similar uses may be included, provided that the similar uses are documented as similar in density, scale, bulk, area, type of activity, hours of operation, and location.

Commentary: Many local governments implement provisions for shared parking and for reductions in parking requirements. Typically, such provisions include a requirement for a parking study. Shared parking arrangements should be guaranteed by a legal instrument, such as an easement, that is recorded and grants access to the parking in perpetuity. Such shared parking arrangements must also ensure that the grant of shared spaces does not reduce the grantor's parking below the minimum required.

D. Site disturbance

Land clearing shall be limited to the minimum necessary to clear the building pad, driveway, and access roads.

Commentary: Local governments that issue grading permits prior to development approval should consider modifying the procedures to ensure that the disturbance area is appropriately sited and approved as part of the development plan.

E. Setback standards

1. All development shall be setback from springs, spring runs, sinkholes, caves, and other karst features as shown below. All natural vegetation within the setback area shall be retained.

| Feature | Minimum Setback (feet) |
|---|-------------------------------|
| 1 st and 2 nd magnitude springs | 300 |
| 3 rd magnitude and smaller springs | 100 |
| Spring runs | 150 |
| Sinkholes | 100 |
| Caves (underground flow corridors) | 300 |
| Swallet and other direct connections | 100 |

2. Measuring the setbacks:
 - a. The setback from sinkholes and swallets shall be measured from the drainage divide.
 - b. The setback from fresh water springs and spring runs shall be measured from the ordinary high water line.
 - c. The setback from tidally connected springs shall be measured from the mean high water line.
 - d. The setback for caves shall be measured on the outside edge of the cave.

Commentary: If the local jurisdiction does not have both fresh water and tidally connected springs, the regulation should be modified to address only the type of springs within the jurisdiction.

3. Where a lot of record is too small to accommodate development in compliance with the setbacks set forth in Section 5.4.1.E(1), an allowable use may be established provided that:
 - a. The building and associated paved areas are located the maximum distance possible from the features listed in Section 5.4.1.E(1),
 - b. A swale and berm are located between the development and the feature, and

- c. The swale and berm are designed to direct drainage away from the feature.
- 4. The land area within the required setback is a buffer and all native vegetation shall be retained, except for minimal removal necessary to provide for pedestrian paths or boardwalks. Paths and boardwalks shall not exceed four (4) feet in width and shall not be paved.

5.4.2 Open space standards

- A. The minimum amount of open space shall be thirty-five (35) percent of the gross tract area.
- B. At least fifty (50) percent of the required open space shall be in one (1) contiguous tract.
- C. Not more than twenty (20) percent of the required open space shall be used for stormwater retention or detention facilities. The use of any portion of the open space for such stormwater facilities shall only be allowed when such facility locations are a minimum of 300 feet from springs, karst features, and the springshed.
- D. Development sites shall be located as far away as feasible from springs, spring runs, sinkholes, and swallets in order to ensure that open space provides protection to these natural resources.
- E. Whenever possible, the open space shall adjoin open space designated on any adjacent tracts of land. If open space has not yet been designated on adjacent tracts, the open space shall adjoin habitats, karst features, or natural areas that are candidates for inclusion as part of a future area of protected open space.
- F. All open space shall be permanently protected through a conservation easement or other legal instrument of permanent protection.
- G. Permissible uses of open space may include the following:
 - 1. Conservation of natural, archeological, or historical resources;
 - 2. Walking or bicycle trails or paths, provided that the trails and paths are not paved or paved with pervious pavement materials;
 - 3. Passive parks and recreation areas, such as open play fields, provided that any associated paved areas shall be limited to parking spaces and accessways required to comply with ADA standards;
 - 4. Unpaved picnic areas;

5. Horticulture, silviculture, or continuation of existing pasture uses, provided that all applicable Best Management Practices are used to minimize environmental impacts, and further that such activities are not conducted within 300 feet of springs, spring runs, sinkholes, or other karst features;
6. Easements for drainage, access, and underground utility lines; and
7. Landscaped areas around stormwater management facilities and community wastewater disposal systems, provided that landscaping complies with the requirements in Section 5.4.4.

5.4.3 Conservation subdivision standards

A. Purpose

1. The intent of the conservation subdivision is to establish design standards for residential development within the [insert springs protection district name] in order to protect springs and the springshed within [city/county].
2. The implementation of conservation subdivision design standards is intended to protect springs, karst features, and land within the springshed, while also providing for open space and open space connectivity.
3. Conservation subdivision standards are intended to ensure that houses and structures are clustered on the least vulnerable lands on the development site, while also reducing the extent of disturbance to install infrastructure, including paved surfaces and utility easements, to support the residential development.
4. Conservation subdivision standards are further intended to minimize land disturbance and removal of vegetation, especially native vegetation, throughout the springshed.

C. Generally

1. The number of residential dwelling units shall not exceed the number of such units permissible by the district in which the conservation subdivision is located.
2. No permits and no public improvements or services shall be authorized or installed for any conservation subdivision until approval has been granted for the subdivision plat.

Commentary: Some local governments may have procedures that allow permits for installation of improvements or common area features before the final approval has been granted for the

subdivision plat. In the case of conservation subdivisions, it is important that no site work, grading, land clearing, or other activity commences until the final approval is granted. This may require a modification in the procedure for authorizing subdivision plats when a conservation subdivision is being considered. Delaying commencement of any site work, grading, clearing, or other activity ensures that all such activities are carried out in a manner that provides for protection of springs, karst features, and land within the protection areas.

3. Procedures for application, review, and approval of preliminary and final plats, and acceptance of public improvements, are set forth in [insert cross reference to the procedures]. In addition to other application requirements, an application for approval of a conservation subdivision shall include:
 - a. A site analysis map depicting natural resources on the site, consistent with the requirements of the comprehensive plan for the protection of springs, karst features, and land within the springshed.
 - b. A plan for management of open space and common facilities. An open space management plan should describe the management activities that will ensure the continuation of the open space; the maintenance of native, naturalized, and other vegetation; protection of habitats within the designated open space; restoration in the event of fire or other destructive forces; and maintenance of any uses, such as trails, that are located within the open space.
 - c. Legal instrument for permanent protection of designated open space.
4. The tract of land to be subdivided may be held in single or multiple ownership. If held in multiple ownership, however, the site shall be developed according to a single development plan. A legal instrument shall be required to designate the authority and responsibility for development, as well as the management and maintenance of open space and other common areas.

D. Central water shall be provided to all development within the conservation subdivision. Onsite wells are prohibited.

E. Central wastewater treatment facilities shall be provided to all development within the conservation subdivision. The use of onsite wastewater disposal systems and facilities is prohibited.

5.4.4 Landscaping standards

- A. A site survey shall be provided to identify and map the plant communities present on a proposed development site. These plant communities shall be protected to the maximum extent possible and shall be depicted on any site plan, subdivision plat, or development plan.

Commentary: Most local governments have standards regarding landscaping. The standards recommended here may be used to modify existing regulations. If separate landscaping standards are provided to apply within springs protection areas, a cross

reference to the existing standards should be provided to ensure that plant and planting specifications are implemented.

- B. All landscaping shall conform to the best management practices as stated in the *Guidelines for Model Ordinance Language for Protection of Water Quality and Quantity Using Florida Friendly Lawns and Landscapes*. (Florida Department of Environmental Protection, September 2, 2003).
- C. Native or naturalized species shall be used in all landscaped areas in order to avoid or minimize the use of irrigation and fertilizers.
 - 1. Within a primary springs protection area, 100 percent of the vegetation planted shall be native or naturalized species.
 - 2. Within the secondary springs protection area, a minimum of fifty (50) percent of installed vegetation shall be native or naturalized species.

Commentary: Most local governments have requirements regarding the use of native or naturalized plant materials. The local government should review existing landscaping requirements to determine if the recommended policies are already met. However, the requirements for retention or installation of native or naturalized plant materials may be higher within the Springs Protection Area to minimize the use of irrigation and fertilizers.

D. Landscaping practices

- 1. Mulch, three (3) inches deep, shall be used in planting beds and around individual trees in turf grass areas. Mulch rings should extend at least three (3) feet around freestanding trees and shrubs.
- 2. All invasive exotic plants shall be removed.
- 3. Plants that are installed on the site should be grouped according to their water and maintenance needs. This allows the establishment of water use zones where irrigation is needed.
- 4. Planted turf grass and landscaping on residential lots shall be limited to a maximum of fifty (50) percent of the landscaped area on the parcel.
- 5. All vegetation that is designated for protection shall be protected from all on-site construction activity. Protection shall include the use of barriers to prevent machinery from damaging the vegetation or compacting the soil over the roots. There shall be no dumping or storing of soil, liquids, or construction debris in the protection area. All vegetation that is damaged during construction shall be replaced with similar plant species.

Commentary: Many local governments have tree or vegetation protection requirements in the land development regulations that include specific protection during construction. When such protection requirements are already in place, the above requirement is not needed. A cross-reference may be helpful, however.

E. Irrigation practices

1. Irrigated turf grass areas shall be consolidated and located in areas that receive pedestrian traffic, provide for recreation use, or provide soil erosion control.
2. Moisture sensing and/or rain shut-off switch equipment shall be required on automatic irrigation systems to avoid irrigation during periods of sufficient soil moisture.

F. Yard wastes

1. Yard wastes shall not be disposed of or stored adjacent to shorelines, in swales, or near storm drains.
2. Shredded yard clippings and leaves should be used for mulch or composted.

G. Management of fertilizer and pesticides

An application for development approval shall include a management plan for the use of fertilizers and pesticides in accordance with the most current version of *The Florida Green Industries Best Management Practices for Protection of Water Resources in Florida*.

5.4.5 Sinkhole protection

A. Known sinkholes identified by the [city/county] shall be protected as set forth in this section. The sinkhole shall be fully protected or restored as a natural area as required below.

B. Restoration plan

An application for development shall include a plan that demonstrates the elimination of access to the sinkhole and the restoration of the land to a natural condition, including stabilization of erosion channels. The following are elements of restoration that shall be included in the plan:

1. Exclusion of direct access to the sinkhole by livestock.

2. Any erosion channels that relate to current or past access to the sinkhole or drainage from roads or developments that flow to the sinkhole shall be repaired and restored to ensure that continuing erosion is minimized.
3. Drainage from outside the sinkhole shall be prohibited.
4. Where areas are being revegetated and erosion is likely to consist of organic or biodegradable materials, mats shall be required to hold the surface soils until the vegetation can become established.

C. Access

If there are (or were) points of access to the sinkhole's bottom or if access is proposed, all the requirements for restoration shall be met. In addition, the application for approval of a development shall demonstrate that:

1. There is a recreational or scientific benefit to the public from the retention or creation of access. If access exists, show that use of the area is such that closing the access would not be practical;
2. All sources of erosion or pollution within the sinkhole setback and the sinkhole itself are mitigated; the restoration plan shall demonstrate that erosion and pollution are either fully eliminated or reduced to the lowest possible level;
3. Access is the minimum needed. The route chosen shall be the least damaging and least vulnerable to erosion; and
4. A plan for the maintenance of the access, refuse collection, and landscaping has been submitted, approved by the [city/county], and funded by the property owner.

D. Trails within sinkholes and sinkhole setback areas

1. There shall be a finding that there is a valid environmental education reason for the trail.
2. Trails shall not traverse any sinkhole where erosion or subsidence is likely to occur as a result of trail use.
3. Trails shall be designed and routed to ensure that the trail does not direct run-off into the sinkhole.
4. Only trails that provide immediate access to a spring or spring run for entering the water or boating shall be permissible. Access points shall be

kept to a minimum. Viewing platforms may be provided where such platforms receive appropriate agency permits.

E. Sinkhole drainage areas

The drainage area is the surface drainage shed of the sinkhole. The management objective is to limit impervious surfaces and design drainage to ensure that sediments or contaminated water does not reach the feature. The following should govern the design of development within the drainage area:

1. The stormwater management facilities for any development should be located as far from the feature as possible, including outside the drainage area so that stormwater flows towards the sinkhole are reduced.
2. A professional geotechnical study shall be required for any proposed development within the drainage area.

5.4.6 Specific standards for protection of springs

The desired condition is for springs to be left in a natural state. The only permissible activities should be pedestrian access and maintenance of erosion. The following standards shall be met for all permissible development:

- A. All proposed uses or development shall require demonstration that they are needed or are intended to enhance the protection of the spring from anticipated activities.
- B. All improvements shall be designed to minimize or eliminate excessive nutrients or pollutants entering the spring via run-off, local recharge, or direct introduction.
- C. Expansion of existing development shall not be permitted except where such expansion will not increase negative impact to the springs. If the development site extends beyond the spring buffer, a condition of approval may include extending protection beyond the spring buffer area.
- D. In addition to a local conditional use permit, the management plans for springs shall be reviewed by State and regional agencies with jurisdiction to ensure that the management plan will enhance or improve protection of the spring.
- E. First and second magnitude springs
Currently, the majority of these springs are used for recreation by the landowner or are incidentally used in this fashion. Where preservation is possible, it should be a top priority. The overall development and management plan for a spring shall demonstrate that the project as a whole improves protection beyond that

required by the standards of this article. The following provisions shall apply to any approvals:

1. The applicant shall demonstrate that the plan can maintain or enhance water quality and recharge through management of the total property by extending protection to areas of lower protection, while making improvements at the spring and in the spring buffer.
2. A wildlife management plan addressing natural flora and fauna for the entire property shall be required. Conservation agreements with other landowners may be required.

F. Third magnitude and smaller springs

Preservation of these springs and their buffers as natural areas is the desired result. However, some springs are attractions for their beauty, but are generally too small for any active recreation. The management plan should focus on providing viewing areas that provide highly controlled access for visual enjoyment, natural resource education, and scientific studies. In addition, wildlife habitats are likely in these areas. There should be requirements for buffers to ensure protection of both the springs and the habitat.

5.4.7 Specific standards for water bodies

Water bodies include the spring itself, spring-fed lakes, spring runs, and water-filled sinkholes. A hydrogeological study shall be required to determine the degree to which the water basin is connected to the aquifer providing flow to nearby springs. Hydraulically connected water bodies shall be treated as open sinkholes.

- A. Buffers shall be established within setback areas established pursuant to Section 5.4.1.E.
- B. Where the development is proposed to include docks, beaches, or other access to the water, the following shall apply:
 1. To the maximum extent possible, docks and launching ramps shall be designed as common facilities, rather than allowing individual access from each lot or parcel adjacent to the water body.
 2. Individual docks shall not be more than five (5) feet wide or more than twenty (20) feet long and shall be located in the beach area.

5.4.8 Specific standards for subsurface channels

A geotechnical study shall be conducted to determine locations that are likely to drain to subsurface channels or conduits.

- F. Stormwater facilities shall be located outside the subsurface channel area. When such a location is not possible, stormwater facilities shall be located to

minimize to the maximum extent possible any threat that the increased level of recharge will open or enlarge sinkholes or weaken areas so that new channels are opened.

G. Maximize the disconnection of impervious surfaces with green roofs, rain barrels, vegetated swales, or retention with vegetative uptake.

H. No septic systems shall be permitted in the subsurface channel area.

5.4.9 Specific standards for closed depressions

Closed depressions are areas where there is a significant probability that there are sand-filled sinkholes that have no surface indication. A geotechnical study shall be required for land where closed depressions are located.

5.4.10 Design standards for specific uses

A. Golf courses within the Springs Protection Area

1. Golf courses shall be sited, designed, constructed, and managed in compliance with the golf course certification program known as the Audubon International Signature Program – Gold level.
2. Approval of a golf course shall require submission of a Natural Resource Management Plan and participation in an Audubon International certification program.
3. All nutrients shall be applied only through irrigation.
4. The management plan shall provide that irrigation shall not exceed one-half ($\frac{1}{2}$) inch of water per day and shall be limited to two (2) days per week.
5. The management plan shall demonstrate that pesticides and herbicides will be managed to limit the potential for such materials reaching the ground water. Nutrients shall comply with the recommendations from the University of Florida, Institute of Food and Agricultural Sciences, in Bulletin SL 191, *Recommendations for N, P, K, and Mg for Golf Course and Athletic Field Fertilization*.
6. Roughs shall not be irrigated except with reuse or reclaimed water.
7. Golf course design may include special under-draining of tees and greens to lead nutrient-laden water to a treatment area where excessive nutrients can be removed or to other construction features to reduce infiltration of these chemicals.

- B. Uses with vehicle or equipment washing facilities
Vehicle and equipment washing facilities shall use a closed-loop recycling system to prevent discharge into water bodies or the groundwater.
- C. Uses that handle, store, sell, or dispose of petroleum products, pollutants, and other hazardous substances
1. Where petroleum products, pollutants, or other hazardous substances will be stored, handled, disposed, or sold, such substances shall not be located within the setbacks established in Section 5.4.1.E.
 2. Where petroleum products, pollutants, or other hazardous substances will be stored, handled, disposed, or sold, facilities and procedures shall be provided for the prevention, containment, recovery, and mitigation of spilled substances.
 3. Facilities and procedures shall be designed to prevent substances from entering the water or soil, and shall include adequate means for prompt and effective cleanup of any spills that occur.
 4. Applications for development of establishments providing oil and fluid change facilities and services shall include proof of compliance with State and federal regulations regarding handling and disposal of oil and automotive fluids.

5.5 Stormwater Management Standards

5.5.1 Generally

- A. Stormwater within the Springs Protection Area shall not be directly discharged into a wetland, river, spring, spring run, sinkhole, swallet, stream-to-sink, other karst feature, or other body of water. Any permissible discharge of stormwater shall meet applicable State water quality standards and permitting requirements.

Commentary: Local governments typically have stormwater management standards. This section should be coordinated with the existing regulations to ensure springs protection.

- B. All components of the stormwater treatment and management system within the Springs Protection Area shall be in common ownership and shall be maintained by the responsible legal entity identified in the stormwater permit. The entity may be a person, corporation, homeowners' association, or property owners' association.

5.5.2 Street drainage

- A. Vegetated swales shall be used to convey stormwater on all local and residential roads.
- B. Curb and gutter systems are prohibited except as stated in this section. Curb and gutter may be used only when swales cannot safely convey the volume and peak discharge rate of stormwater without erosion.
- C. All residential development shall use swales with swale blocks or raised driveway culverts whenever possible. An exception to this requirement may be granted when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.

5.5.3 Drainage design standards

- A. Best management practices shall be used to design stormwater management facilities and systems in order to reduce nitrate loading. These practices shall include the standards set forth in this section, as determined applicable by a professional engineer licensed in the State of Florida, based on existing soils, depth to the water table, and other relevant site conditions.
- B. All depressions within a proposed development area will be investigated by a licensed professional using a professionally acceptable methodology for suitability of water retention using generally accepted geotechnical practices. If connections are determined to exist, the depression shall not be used for stormwater retention and the area draining to this feature under pre-development conditions shall be preserved through a conservation easement.
- C. Vegetated infiltration areas shall be used to provide stormwater treatment and management on all sites except when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida. Whenever infiltration systems are not feasible, wet detention systems may be used for stormwater treatment and management.
- D. Design of the stormwater systems for all development shall use bio-retention areas (below grade vegetated areas) to increase stormwater treatment and reduce stormwater volume.
- E. Vegetated areas or swales shall be used to direct stormwater to yard areas prior to discharge to the stormwater conveyance system.

- F. All facilities shall be designed to hold runoff from a three (3) inch storm, unless an engineering analysis demonstrates that the pre-development stormwater retention can be provided by a smaller facility.
- G. Implementation of the St. Johns River Water Management District karst sensitive criteria found in SJRWMD Rule 40C-41.063 (7)(a) *ERPs – Surface Water Management Basin Criteria* and SJRWMD Rule 40C-42, Part II *Criteria for Evaluation, Section 9.11 Sensitive Karst Area Basin Design Criteria*.

Commentary: Implementation of the criteria found in this rule is not limited to those local governments located within the St. Johns River Water Management District. This rule provides appropriate criteria for water management in karst areas and should be applied throughout the springs protection areas.

5.5.4 Recharge standards

All developments shall meet the following standards for the recharge of water to assure that spring flows are not adversely affected by new development. A water budget (see Appendix A.3) shall be prepared to demonstrate that the recharge standards are met.

A. Water quantity

All development shall be designed so that the post-development recharge volume is equal to the pre-development recharge volume on an annual basis. To demonstrate that this performance standard has been met a water budget analysis shall be prepared using the methodology set forth in Appendix A.3. Example stormwater designs and water budgets to assure that post-development recharge equals pre-development recharge for conventional land use, cluster development, and commercial development are shown in Appendix A.3.

B. Water budget

The water budget analysis shall be done on an annual basis and shall include, as a minimum:

1. The watershed area, rainfall, evaporation, evapotranspiration, irrigation and ground water infiltration; and
2. Directly connected impervious area, irrigation area, natural lake area; and
3. Data to support the infiltration capacities, ground water pressure, and water table locations.
4. The water budget must be submitted to the reviewing agencies as part of an Environmental Resource Permit (ERP) application.

C. Water quality

All developments shall assure that stormwater retention systems are designed to assure that nitrate will be assimilated by the upper layers of the soil and plants and not migrate into the ground water. The plans must be acceptable to the water management districts and comply with all ERP rules and regulations.

D. Nutrient Budget

A nutrient budget shall be provided for each proposed amendment to the Future Land Use Map to document pre- and post-development conditions. The budget must demonstrate that post-development nutrient loadings to ground and surface waters will be less than or equal to pre-development nutrient loadings.

5.5.5 Sediment sumps

Sediment sumps shall be provided at inlets to retention areas and detention ponds to settle out the coarser sediment particles. A planted littoral shelf shall be placed between the sediment sump and the wet detention pond.

5.5.6 Exfiltration systems

Underground exfiltration systems may be used where soil, geologic, and water table conditions are appropriate. Pretreatment shall be provided by sediment sumps, catch basin inlets, or other means to limit sediments and other materials from entering the exfiltration trench. All exfiltration systems shall meet the requirements in Section 5.5.4. If appropriate, media that enhance removal of nitrogen shall be used in the exfiltration trench to minimize migration of nitrogen into the ground water. An observation well shall be required to monitor if the trench is clogging and needs maintenance.

5.5.7 Karst sensitive area systems

Retention areas constructed in karst sensitive areas, which are areas where limerock is within ten (10) feet of the land surface, shall be designed and constructed to minimize the potential to allow pollutants to migrate into the ground water. Within karst sensitive areas, the following criteria are established:

- A. Stormwater management systems should be designed to assure adequate treatment of the stormwater (pursuant to Section 62-28.700, *F.A.C.*) before it enters the Floridan aquifer and to preclude the formation of solution pipe sinkholes in the stormwater system. Such stormwater management systems also shall be designed and constructed in a manner that avoids breaching an aquitard. Many different stormwater management system designs will achieve these goals. However, they must comply with all ERP requirements for karst sensitive areas. To assure protection of the Floridan aquifer, certain design features are required depending upon the individual site characteristics. However, for all projects in karst sensitive areas, the following minimum design features are required:

1. A minimum of three (3) feet of unconsolidated soil material between the surface of the limestone bedrock and the bottom and sides of the stormwater basin. The soil material must be able to retain nutrients within the soil profile. Excavation and backfill of suitable material may be made to meet this criteria;
 2. Stormwater basin depth should be as shallow as possible with a horizontal bottom (no deep spots);
 3. Maximum stormwater basin depth of ten (10) feet, unless the basin is part of a stormwater reuse system;
 4. Fully vegetated basin side slopes and bottoms. It is recommended that Saint Augustine, Bahia, or Bermuda grass be used for this purpose; and
 5. The basin shall be engineered to retard unclogging of buried solution pipes or channels.
- B. The above requirements represent the minimum requirements for stormwater management system design in karst sensitive areas (unless the stormwater runoff is part of a reuse system). However, depending on the potential for contamination to the Floridan aquifer, more stringent requirements may apply for certain projects (e.g., industrial and some commercial sites). Examples for more stringent design features include:
1. Retaining more than three (3) feet of material between the limestone bedrock surface and the bottom and sides of the stormwater basin;
 2. Requiring soil amendments that reduce infiltration rates, increase uptake and absorption of nutrients, and minimize the migration of nutrients into the ground water. One example of such a soil amendment is the Black and Gold mixture developed by the University of Central Florida Stormwater Management Academy;
 3. Basin liners - clay or geotextile;
 4. Sediment sumps;
 5. Special stormwater system design;
 6. Ground water monitoring; and
 7. Paint/solvent and water separators.

- C. If limestone bedrock is encountered during construction of the retention basins or a sinkhole or solution cavity forms during construction, construction of the basin must be halted immediately and the applicable water management district must be notified. Remedial action will be required.
- D. Within karst sensitive areas, special geologic investigation is required as part of the basin design. Use of avoidance or minimization strategies is encouraged to reduce the loading of the basin. An inspection fee shall be paid annually to have the basin inspected for signs of sinkhole creation. The legal operation and maintenance entity specified in the project's ERP permit shall be responsible for having inspections conducted and for completing all maintenance in a timely manner. If any signs of sinkhole creation are noted, the applicable water management district shall be notified within twenty-four (24) hours of its discovery and complete sinkhole repair shall be completed within ten (10) days of such discovery using a water management district approved methodology.

5.6 Design Standards for All Wastewater Treatment Facilities

5.6.1 Design standards for central wastewater treatment facilities

Central wastewater treatment facilities shall be Type I or Type II. The facility shall provide advanced wastewater treatment levels of not more than 3 mg/l of nitrogen. All other design and construction requirements of the State and local government shall be met.

5.6.2 Design standards for on-site wastewater treatment facilities

A. New development

All development is required to connect to a central wastewater treatment system when such system is available within 1,320 feet from the proposed development. The distance shall be measured along existing or proposed rights-of-way from the property line of the proposed development to the nearest sewer line. When a central wastewater treatment system is not available, a septic system may be allowed, subject to the standards in this section.

B. Existing development

Development on septic tanks shall connect to a central wastewater treatment system when such a system becomes available within 1,320 feet from the proposed development. The distance shall be measured along existing or proposed rights-of-way from the property line of the proposed development to the nearest sewer line.

C. Existing septic systems

1. An existing septic system is a system in place and operating at the time of adoption of this ordinance.

Commentary: Local governments should consider inserting the ordinance number and effective date for clarity as to “existing septic systems”.

2. Inspection of existing septic systems is required every five (5) years and upon sale of the property served by an existing septic system. Inspection shall be conducted by a licensed septic system contractor.
3. When an existing septic system fails or otherwise requires replacement, the new septic system shall comply with the standards in this section.

D. Performance based systems required

A performance based septic system is required in the springs protection [zone/district] and for development sites within 300 feet of a sinkhole.

1. Effluent disposal shall be by drip irrigation.
2. System design shall comply with the Chapter 64E-6, Part IV, of the *Florida Administrative Code*.
3. The system shall be designed to provide a recovered water product that contains not more than 10 mg/l of Total Nitrogen, expressed as N. Such determination shall be based on an annual average basis.
4. The system shall not be approved until a binding agreement is provided to demonstrate ongoing monitoring and maintenance as required by Chapter 64E-6, Part IV, of the *Florida Administrative Code*.

5.7 Geotechnical Study Requirements

- A. When a professional geologic or geotechnical study is required, the study shall identify, characterize, and assess the natural geological and water resource features within and near the proposed development site.
- B. Prior to undertaking the professional geotechnical study, a proposed site investigation plan should be submitted to the [city/county] for review and comment. The investigation plan review will help focus data gathering activities based on the availability and quality of published site and vicinity information and the particular characteristics of the development site. Study investigations should be conducted by qualified professional geology and geotechnical engineering firms certified to practice in the State of Florida

C. Study requirements

1. Hydrogeologic aspects of the site and vicinity related to the occurrence, movement, and quality of surface waters and ground waters; and
2. Geotechnical aspects of the project site related to surface and subsurface soils, sinkhole formation potential, and foundation suitability.

D. Hydrogeological and geotechnical investigations

1. The hydrogeological element of the study is intended to provide a comparative analysis of actual hydrologic and geologic conditions within and near the site with respect to evaluations of the [zone/district] as a whole. Analyses should be primarily concerned with defining actual groundwater recharge functions within the project site boundaries and protection of nearby natural springs. Published technical literature available from agencies such as the U.S. Geological Survey, the Florida Geological Survey, the U.S. Natural Resources Conservation Service, the water management district, and the Florida DEP may be used in addition to site-specific investigations.
2. The geotechnical element of the study should address site-specific aspects such as near-surface soil characteristics, water table depths, depth to rock, subsurface formation hydrogeologic assessment, sinkhole formation potential, and identification of large- and small-scale karst features. Geotechnical site data collected for preliminary site design and local and state permitting activities should be incorporated into the study.

6.0 BIBLIOGRAPHY

TECHNICAL LITERATURE ON SPRINGS OF FLORIDA¹

This compilation includes published papers, reports, maps, studies and links to web sites that include information and data on springs of Florida. It also includes papers related to geology, springs and/or streams in other areas that are considered relevant to an understanding of the geology, hydrology, chemistry and/or ecology of Florida springs and spring-run streams. The reports are broken into major categories, and where relevant, a citation may be listed in more than one category.

This bibliography was compiled from searches of the holdings of the University of Florida and St. Johns River Water Management District, from searches of the publications lists of the U.S. Geological Survey and Florida Geological Survey, from searches of the literature cited sections of many of the listed publications, from a monograph produced by the Entomological Society of Canada entitled “Spring Habitats and Their Faunas: An Introductory Bibliography”, and from citations sent to me by a number of folks doing work on Florida springs.

6.1 General Overviews

Allan, J. D. 2004. Landscapes and riverscapes: the influence of land use on stream ecosystems. *Annual Review of Ecology, Evolution, and Systematics* 35: 257-284.

Anonymous. 1884. Map of the Wacissa River. Map and report transmitted to the Chief of Engineers, U. S. Army. http://image11.fcla.edu/cgi/i/image/image-idx?sid=6cff13071c2cfd5d68e2a7c545a17135;q1=UF00005245;rgn1=map_all;c=map;a=64;quality=2;view=entry;subview=detail;lasttype=boolean;cc=map;entryid=x-uf00005245;viewid=UF00005245;start=1;resnum=1

Anonymous. 1969. Homosassa Springs Florida, U.S.A. *Fla. Naturalist* 42: 35.

Beck, W. M. 1965. The streams of Florida. *Bull. Florida State Museum* 10(3): 91-126.

Berndt, M. P., E. T. Oaksford, M. R. Darst, and R. L. Marella. 1996. Environmental Setting and Factors that Affect Water Quality in the Georgia-Florida Coastal Plain Study Unit. U. S. Geological Survey Water-Resources Investigations Report 95-4268. 46 pp.

Botosaneanu, L. (ed.). 1998. *Studies in Crenobiology. The Biology of Springs and Springbrooks*. Backhuys Publishers, Leiden, The Netherlands. 261 pp.

¹ Bibliography provided by: Robert A. Mattson, St. Johns River Water Management District, Palatka, Florida, January 2007.

- Brooks, H. K. 1961. The submarine spring off Crescent Beach, Florida. *Quart. J. Florida Academy of Sciences* 24(2): 122-134
- Brown, M. T., J. M. Schaefer, K. H. Brandt, S. J. Doherty, et al. 1987. Buffer Zones for Water, Wetlands, and Wildlife. Report by the Center for Wetlands, University of Florida, Gainesville, FL. 163 pp, Appendix.
- Cooke, C. W. 1939. Scenery of Florida. *Bull. Florida State Geol. Survey* 17: 1-118.
- Copeland, R. 2003. Florida Spring Classification System and Spring Glossary. Florida Geological Survey Special Publication No. 52. 18 pp.
- Dolan, E. M. and G. T. Allan, Jr.. 1961. An Investigation of the Darby and Hornsby Springs Sites, Alachua County, Florida. Florida Geological Survey Special Publication No. 7. 124 pp.
- FDEP. 2001a. Basin Status Report. Suwannee (Including Aucilla, Coastal, Suwannee and Waccasassa Basins in Florida). Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 193 pp.
- FDEP. 2001b. Basin Status Report. Ochlockonee and St. Marks. Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 174 pp.
- FDEP. 2001c. Basin Status Report. Ocklawaha. Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 315 pp.
- FDEP. 2003a. Basin Status Report. Middle St. Johns. Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 345 pp.
- FDEP. 2003b. Basin Status Report. Choctawhatchee-St. Andrew. Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 211 pp.
- FDEP. 2005. Water Quality Status Report. Withlacoochee River. Report prepared by the Florida Department of Environmental Protection, Tallahassee, FL. 230 pp.
- FDNR. 1989. Florida Rivers Assessment. Report produced by the Florida Resources and Environmental Analysis Center for the Florida Department of Natural Resources, Tallahassee, FL. 452 pp.
- Fernald, E. A. and E. D. Purdum. 1998. Water Resources Atlas of Florida. Institute of Science and Public Affairs, Florida State University, Tallahassee, FL. 312 pp.

Florida Geological Survey. 2004. Wakulla Springs Scientific Symposium. May 13, 2004. Florida Geological Survey Special Publication No. 56. CD version.

Florida Springs Task Force. 2000. Florida's Springs. Strategies for Protection and Restoration. Report by the Florida Springs Task Force. Florida Department of Environmental Protection, Tallahassee, FL. CD version.

Florida Springs Task Force. 2006. Florida's Springs. Strategies for Protection and Restoration. Report by the Florida Springs Task Force. Florida Department of Environmental Protection, Tallahassee, FL. CD version.

Friends of the Wekiva River, Inc. (FOWR). 1985. The Wekiva River Basin: A Resource Endangered. A Position paper. Prepared by the Technical Committee.

Hobbs, H. H., III. 1992. Caves and Springs. Pp. 59-131 IN: C. T. Hackney, S. M. Adams, and W. H. Martin (eds.), Biodiversity of the Southeastern United States. John Wiley and Sons, New York, NY.

Lane, E. 2001. The Spring Creek Submarine Springs Group, Wakulla County, Florida. Florida Geological Survey Special Publication 47. 34 pp.

Mann, J. A. and R. N. Cherry. 1969. Large Springs of Florida's "Sun Coast": Citrus and Hernando Counties. Florida Geological Survey Leaflet Series No. 9. 23 pp.

Mohlenbrock, R. H. 1992. Alexander Springs, Florida. Natural History 101(11): 66-68.

Nordlie, F. G. 1990. Rivers and Springs. Pp. 392-425 IN: R. L. Myers and J. J. Ewel (eds.), Ecosystems of Florida. University of Central Florida Press, Orlando, FL.

Randazzo, A. F. and D. S. Jones (eds.). 1997. The Geology of Florida. University Press of Florida, Gainesville, FL. xviii, 327 pp.

Rosenau, J. C. An Index to the Springs of Florida. Florida Bureau of Geology Map Series 63.

Spechler, R. M. and D. M. Schiffer. 1995. Springs in Florida. U. S. Geological Survey Fact Sheet FS-151-95.

SJRWMD. 2002. Middle St. Johns River Basin. Surface Water Improvement and Management Plan. Report by the St. Johns River Water Management District, Palatka, FL. iv, 87 pp.

Stamm, D. 1994. Springs of Florida. Pineapple Press, Sarasota, FL. 112 pp.

SWFWMD. 2000. Crystal River/Kings Bay Surface Water Improvement and Management Plan. Southwest Florida Water Management District, Brooksville, FL. http://darla.swfwmd.state.fl.us/ppr/plans/crystal_river-kings_bay_2000.pdf.

SWFWMD. 2004. Crystal River/Kings Bay Technical Summary. Southwest Florida Water Management District Surface Water Improvement and Management Program, Brooksville, FL.
http://www.bocc.citrus.fl.us/commdev/scc/cr_kingsbay_summary.pdf

SWFWMD. 1989. Surface Water Improvement and Management Plan for the Rainbow River. Southwest Florida Water Management District, Brooksville, FL.

URS. 2001. Middle St. Johns River Basin. Final Reconnaissance Report. Report prepared by URS Corp. for the St. Johns River Water Management District, Palatka, FL. 54 pp., Exhibits.

Wakulla Springs Woodville Karst Plain Symposium: Transactions (1998)

Water and Air Research. 1991. Diagnostic Studies of the Rainbow River. Report prepared for Southwest Florida Water Management District, Brooksville, FL. Pp. variously numbered.

Wetland Solutions, Inc. 2003. Human Use and Ecological Evaluation of the Recommended Minimum Flow Regime for Blue Spring and Blue Spring Run, Volusia County. Report prepared for the St. Johns River Water Management District, Palatka, FL. Pp. variously numbered,

Wetland Solutions, Inc. 2004. Work Plan. Pollutant Load Reduction Goal (PLRG) Analysis for the Wekiva River and Rock Springs Run, Florida. Report prepared for the St. Johns River Water Management District, Palatka, FL. Pp. variously numbered.

Wetterhall, W. S. 1965. Reconnaissance of Springs and Sinks in West Central Florida. Florida Geological Survey Report of Investigations 39. 42 pp.

Williams, D. D. and I. M. Smith. 1990. Spring Habitats and their Faunas: An Introductory Bibliography. Biological Survey of Canada Document Series No. 4.

Wolfe, S. (ed.). 1990. An Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. U. S. Fish and Wildlife Service Biological Report 90(21). 323 pp.

6.2 Geology/Hydrogeology

Bahtijarevic, A. 1989. Sinkhole density of the Forest City Quadrangle. Pp. 75-82 IN: B. F. Beck (ed.), Proceedings of the Third Multidisciplinary Conference on Sinkholes,

Beatty, G. F. 1977. The Study of Lineaments and Fracture Traces and Correlation to Springs along the Suwannee River from Mayo, Florida to Branford, Florida. M. S. Thesis. University of Florida, Gainesville, FL. 90 pp.

Butt, P. L. and G. J. Murphy. 2003. Dyal and Black Sinks Dye Trace Study. Columbia County, Florida. May-September 2003. Report submitted by Karst Environmental Services to the Florida Department of Environmental Protection, Tallahassee, FL. iii, 47 pp., 4 Apps (1 as CD).

Cichon, J. R., A. E. Baker, A. R. Wood, and J. D. Arthur. 2005. Wekiva Aquifer Vulnerability Assessment. Florida Geological Survey Report of Investigations No. 104. 36 pp.

Champion, K. M. and S. B. Upchurch. 2003. Delineation of Spring-Water Source Areas in the Ichetucknee Springshed. Report submitted by SDII Global Corp. to the Florida Dept. of Environmental Protection, Tallahassee, FL. 40 pp., 1 Appendix.

Ferguson, G. E., C. W. Lingham, S. K. Love, and R. O. Vernon. 1947. Springs of Florida. Florida Geological Survey Bulletin No. 31. 196 pp.

GeoTrans, Inc. 1991a. Wekiva River Basin Groundwater Flow and Solute Transport Modeling Study. Phase II: Cross-Sectional Groundwater Flow and Solute Transport Model Development. St. Johns River Water Management District. Special Publication SJ92-SP20. Palatka, Florida.

GeoTrans, Inc. 1991b. Wekiva River Basin Groundwater Flow and Solute Transport Modeling Study. Phase III: Three-Dimensional Density Dependent Groundwater Flow and Solute Transport Model Development. St. Johns River Water Management District. Special Publication SJ92-SP21. Palatka, Florida.

GeoTrans, Inc. 1992. Wekiva River Basin Groundwater Flow and Solute Transport Modeling Study. Phase I: Regional Groundwater Flow Model Development. St. Johns River Water Management District. Special Publication SJ92-SP19. Palatka, Florida.

Gerami, A. 1984. Hydrogeology of the St. Marks River Basin, Northwest Florida. M. S. Thesis. Florida State University, Tallahassee, FL. viii, 165 pp.

Gordon, S. L. 1998. Surface and Ground Water Mixing in an Unconfined Karst Aquifer, Ichetucknee River Ground Water Basin, Florida. M.S. Thesis. University of Florida, Gainesville, FL. x, 122 pp.

Hirth, D. K. 1995. Hydrogeochemical Characterization of the Ichetucknee River Groundwater Basin using Multiple Tracers and Computer Modeling near Lake City, Florida. M. S. Thesis. University of Florida, Gainesville, FL. viii, 117 pp.

Hoerstine, R. W. and S. Weissinger 1982. A Geologic Guide to Suwannee River, Ichetucknee Springs, O'Leno and Manatee Springs State Parks. Florida Geological Survey Leaflet Series No. 12. 28 pp.

Huang, C-t. 1994. Revised Spring Conductance Coefficients. Wekiva River Basin Groundwater Flow Model. St. Johns River Water Management District Professional Paper SJ94-PP3. 16 pp.

HydroGeoLogic, Inc. 2005. Development of an Integrated Surface Water/Ground Water Model (ISGM) in Western Orange and Seminole Counties, Florida. Final Report. St. Johns River Water Management District Special Publication SJ2005-SP15. Pp. variously numbered, Tables, Figures.

Karst Environmental Services. 1997. Cooperative Dye Trace: Rose Creek Swallet-Ichetucknee Springs Group. Report produced for the Ichetucknee Springs Water Quality Working Group. Florida Dept. of Environmental Protection, Tallahassee, FL. Pp. variously numbered.

Kincaid, T. R. 1994. Ground Water and Surface Water Interactions in the Western Santa Fe River Basin near High Springs, Florida. M. S. Thesis. University of Florida, Gainesville, FL. xiii, 186 pp.

Knowles, L., Jr., A. M. O'Reilly, and J. C. Adamski. 2002. Hydrogeology and Simulated Effects of Ground-Water Withdrawals from the Floridan Aquifer System in Lake County and in the Ocala National Forest and Vicinity: North-Central Florida. U. S. Geological Survey Water-Resources Investigations Report 02-4207. 140 pp.

Maddox, G. L., J. M. Lloyd, T. M. Scott, S. B. Upchurch, and R. Copeland (eds.). 1992. Florida's Groundwater Quality Monitoring Program. Background Geochemistry. Florida Geological Survey Special Publication 34. 364 pp.

Martin, J. B. and R. W. Dean. 1999. Temperature as a natural tracer of short residence times for ground water in karst aquifers. Pp. 236-242 IN: A. N. Palmer, M. V. Palmer, and I. D. Sasowsky (eds.), Karst Modeling. Karst Waters Institute Special Publication #5. Charles Town, WV.

Martin, J. B. and R. W. Dean. 2001. Exchange of water between conduits and matrix in the Floridan Aquifer. *Chemical Geology* 179: 145-165.

Martin, J. B. and E. J. Sreaton. 2001. Exchange of matrix and conduit water with examples from the Floridan aquifer. Pp. 38-44 IN: E. L. Kuniatsky (ed.), *Proceedings. USGS Karst Interest Group. U. S. Geological Survey Water-Resources Investigations Report 01-4011.*

McGurk, B. and P. F. Presley. 2002. *Simulation of the Effects of Groundwater Withdrawals on the Floridan Aquifer System: Model Expansion and Revision.* St. Johns River Water Management District Technical Publication SJ2002-03. xix, 196 pp, Appendices.

Miller, J. A. 1986. *Hydrogeologic Framework of the Floridan Aquifer System in Florida and Parts of Georgia, Alabama, and South Carolina.* U. S. Geological Survey Professional Paper 1403-B. 91 pp.

Osburn, W., D. Toth, and D. Boniol. 2002. *Springs of the St. Johns River Water Management District.* SJRWMD Technical Report SJ2002-5. CD version.

Phelps, G. G. 1994. *Hydrogeology, Water Quality, and Potential for Contamination of the Upper Floridan Aquifer in the Silver Springs Groundwater Basin, Central Marion County, Florida.* U. S. Geological Survey Water-Resources Investigations Report 92-4159. 69 pp, 5 maps.

Phelps, G. G. 2004. *Chemistry of Ground Water in the Silver Springs Basin, Florida with an Emphasis on Nitrate.* U. S. Geological Survey Scientific Investigations Report 2004-5144. 54 pp.

Rosenau, J. C., G. L. Faulkner, C. W. Hendry, Jr., and R. W. Hull. 1977. *Springs of Florida.* Florida Department of Natural Resources Bureau of Geology Bulletin No. 31 (Revised). 461 pp.

Rupert, F. R. 1988. *The Geology of Wakulla Springs.* Florida Geological Survey Open File Report No. 22. 18 pp.

Ryder, P. D. 1985. *Hydrology of the Floridan Aquifer System in West-Central Florida.* U. S. Geological Survey Professional Paper 1403-F. 63 pp, 1 map.

Scott, T. M., G. H. Means, R. C. Means, and R. P. Meegan. 2002. *First Magnitude Springs of Florida.* Florida Geological Survey Open File Report No. 85. 138 pp.

Scott, T. M., G. H. Means, R. P. Meegan, R. C. Means, S. B. Upchurch, R. E. Copeland, et al. 2004. *Springs of Florida.* Florida Geological Survey Bulletin No. 66. 377 pp, CD.

Screaton, E., J. B. Martin, B. Ginn, and L. Smith. 2004. Conduit properties and karstification in the Santa Fe River Sink-Rise System of the Floridan Aquifer. *Ground Water* 42: 338-346.

Sepulveda, N. 2002. Simulation of Ground-Water Flow in the Intermediate and Floridan Aquifer Systems in Peninsular Florida. U. S. Geological Survey Water-Resources Investigations Report 02-4009. 130 pp.

Shoemaker, W. B. A. M. O'Reilly, N. Sepulveda, S. A. Williams, L. H. Motz, and S. Quing. 2004. Comparison of Estimated Areas Contributing Recharge to Selected Springs in North-Central Florida by using Multiple Ground-water Flow Models. U. S. Geological Survey Open-File Report 03-448. 31 pp.

Smith, L. A., J. B. Martin, and E. J. Screaton. 2002. Surface water control of gradients in the Floridan aquifer: Observations for the Santa Fe River sink-rise system. Pp. 44-49 IN: J. B. Martin, C. M. Wicks, and I. Sasowski (eds.), *Hydrogeology and Biology of Post-Paleozoic Carbonate Aquifers*. Karst Waters Institute. Special Publication #7. Charles Town, WV.

Stewart, J. W. and L. R. Mills. 1984. Hydrogeology of the Sulphur Springs Area, Tampa, Florida. U. S. Geological Survey Water-Resources Investigations Report 83-4085. Map w/ text.

Stringfield, V. T. and H. H. Cooper, Jr. 1951. Geology and Hydrologic Features of an Artesian Submarine Spring East of Florida. Florida Geological Survey Report of Investigations No. 7(2). 16 pp.

Stubbs, S. A. 1940. Solution a dominant factor in the geomorphology of peninsular Florida. *Quart. J. Fla. Academy of Sciences* 5: 148-167.

Swarzenski, P. W. C. D. Reich, R. M. Spechler, J. L. Kindinger, and W. S. Moore. 2001. Using multiple geochemical tracers to characterize the hydrogeology of the submarine spring off Crescent Beach, Florida. *Chemical Geology* 179: 187-202.

Tibbals, C. H. 1977. Availability of Ground Water in Seminole County and Vicinity, Florida. U.S. Geological Survey Water Resources Investigation 76-97. 15 pp; Open File Map.

Tibbals, C. H. 1990. Hydrology of the Floridan Aquifer System in East-Central Florida. U. S. Geological Survey Professional Paper 1403-E. 98 pp.

Toth, D. J. and C. Fortich. 2002. Nitrate Concentrations in the Wekiva Groundwater Basin, With Emphasis on Wekiva Springs. St. Johns River Water Management District Technical Publication SJ2002-2. 84 pp.

Toth, D. J., K. P. Rohrer, and D. A. Munch. 1989. Water Quality Assessment of the Floridan Aquifer in the Wekiva River Basin of Orange, Lake, and Seminole Counties. St. Johns River Water Management District. Technical Publication SJ 89-5. ix, 46 pp.

Upchurch, S. B. and K. M. Champion. 2004. Delineation of Spring Protection Areas at Five First-Magnitude Springs in North-Central Florida. Report produced for the Suwannee River Water Management District, Live Oak, FL. 24 pp.

van der Kamp, G. 1995. The hydrogeology of springs in relation to the biodiversity of spring fauna: a review. J. Kansas Entomological Soc. 68(2) Supplement: 4-17.

6.3 Hydrology

Barrios, K. 2005. Choctawhatchee River Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 05-02. Havana, FL. v, 15 pp.

Barrios, K. 2006. St. Marks River and Wakulla River Springs Inventory. Leon and Wakulla Counties, FL. Northwest Florida Water Management District Water Resources Special Report 06-03. Havana, FL. v, 24 pp.

Barrios, K. and A. Chelette. 2004a. Chipola River Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 04-01. Havana, FL. v, 49 pp.

Barrios, K. and A. Chelette. 2004b. Econfina Creek Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 04-02. Havana, FL. v, 38 pp.

Ceryak, R. and T. Mirti. 1999. Springflow Characteristics of White Sulphur Springs. Suwannee River Water Management District Technical Report No. WR99-05. 3 pp. plus Tables and Figures.

Champion, K. M. and R. Starks. 2001. The Hydrology and Water Quality of Springs in West-Central Florida. Technical Report. Southwest Florida Water Management District, Brooksville, Fl. xii, 149 pp.

CH2M HILL. 1999. Water Supply Needs and Sources Assessment: Alternative Water Supply Investigation: Review of Established Minimum Flows and levels for the Wekiva River System. St. Johns River Water Management District. Special Publication SJ99-SP1. Palatka, Florida. x, 33 pp, Appendices.

- Ferguson, G. E., C. W. Lingham, S. K. Love, and R. O. Vernon. 1947. Springs of Florida. Florida Geological Survey Bulletin No. 31. 196 pp.
- German, E. R. 2003. Summary and Analysis of Measurements of Discharge from Blue Spring, near Orange City, Florida 1932-2002. St. Johns River Water Management District Special Publication SJ2006-SP10. 7 pp.
- German, E. R. 2004. Assessment of Spring Discharge Measurement Data for Priority Springs in the St. Johns River Water Management District. St. Johns River Water Management District Special Publication SJ2006-SP9. 36 pp.
- Hammett, K. M., C. R. Goodwin, and G. L. Sanders. 1996. Tidal Flow, Circulation, and Flushing Characteristics of Kings Bay, Citrus County, Florida. U. S. Geological Survey Open-File Report 96-230. 63 pp.
- Hornsby, D. and R. Ceryak. 1999. Springs of the Suwannee River Basin in Florida. Suwannee River Water Management District Technical Report WR99-02. 178 pp.
- Hornsby, D. and R. Ceryak. 2000. Springs of the Aucilla, Coastal, and Waccasassa Basins in Florida. Suwannee River Water Management District Technical Report WR00-03. 66 pp.
- Hunn, J. D. and L. J. Slack. 1983. Water Resources of the Santa Fe River Basin, Florida. U. S. Geological Survey Water-Resources Investigations Report 83-4075. 105 pp.
- Hupalo, R. B., C. P. Neubauer, L. W. Keenan, D. A. Clapp, and E. F. Lowe. 1994. Establishment of Minimum Flows and Levels for the Wekiva River System. St. Johns River Water Management District Technical Publication SJ94-1. 86 pp.
- Knochenmus, L. A. and D. K. Yobbi. 2001. Hydrology of the Coastal Springs Ground-Water Basin and Adjacent Parts of Pasco, Hernando, and Citrus Counties, Florida.
- U. S. Geological Survey Water-Resources Investigations Report 01-4230. 88 pp.
- Knowles, L., Jr. 1996. Estimation of Evapotranspiration in the Rainbow Springs and Silver Springs Basins in North-Central Florida. U. S. Geological Survey Water-Resources Investigations Report 96-4024. 37 pp.
- Meinzer, O. E. 1927. Large Springs of the United States. U.S. Geological Survey Water Supply Paper 557. 94 pp.
- Osburn, W. L. 2001. Relationship Between Discharge at Blue Spring, Volusia County, and Nearby Springs. St. Johns River Water Management District. Palatka, Florida.

Osburn, W., D. Toth, and D. Boniol. 2002. Springs of the St. Johns River Water Management District. SJRWMD Technical Report SJ2002-5. CD version.

Prugh, B. J. 1969. A Hydrographic Survey of the Ichetucknee River. M.S. Thesis. University of Florida, Gainesville, FL. xii, 128 pp.

Rao, D. V. and D. A. Clapp. 1996. Preliminary Evaluation of the Impacts of Spring Discharge Reductions on the Flows of Receiving Water Bodies and Natural Systems, Central Florida. St. Johns River Water Management District. Special Publication SJ96-SP3. xiv, 60 pp., Appendices.

Rosenau, J. C., G. L. Faulkner, C. W. Hendry, Jr., and R. W. Hull. 1977. Springs of Florida. Florida Department of Natural Resources Bureau of Geology Bulletin No. 31 (Revised). 461 pp.

Scott, T. M., G. H. Means, R. C. Means, and R. P. Meegan. 2002. First Magnitude Springs of Florida. Florida Geological Survey Open File Report No. 85. 138 pp.

Scott, T. M., G. H. Means, R. P. Meegan, R. C. Means, S. B. Upchurch, R. E. Copeland, et al. 2004. Springs of Florida. Florida Geological Survey Bulletin No. 66. 377 pp, 1 CD.

Sinclair, W. C. 1978. Preliminary Evaluation of the Water-Supply Potential of the Spring-River System in the Weeki Wachee Area and the Lower Withlacoochee River, West-Central Florida. U. S. Geological Survey Water-Resources Investigations Report 78-74. 40 pp.

Wanielista, M., E. Hulstein, Y. Li, and G. Yeh. 2004. Wekiva Area Water Budget. Draft. University of Central Florida Stormwater Management Academy. January 2004.

Water Resource Associates. 2004. Development of Madison Blue Spring-based MFL. Technical Report. Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered, Appendices.

Wilson, W. L. and W. C. Skiles. 1989. Partial reclassification of first-magnitude springs in Florida. Pp. 65-72 IN: B. F. Beck (ed.), Proceedings of the Third Multidisciplinary Conference on Sinkholes.

Yobbi, D. K. 1992. Effects of Tidal Stage and Groundwater Levels on the Discharge and Water Quality of Springs in Coastal Citrus and Hernando Counties, Florida. U. S. Geological Survey Water-Resources Investigations Report 92-4069. 44 pp.

6.4 Water Quality/Chemistry

Barrios, K. 2005. Choctawhatchee River Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 05-02. Havana, FL. v, 15 pp.

Barrios, K. 2006. St. Marks River and Wakulla River Springs Inventory. Leon and Wakulla Counties, FL. Northwest Florida Water Management District Water Resources Special Report 06-03. Havana, FL. v, 24 pp.

Barrios, K. and A. Chelette. 2004a. Chipola River Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 04-01. Havana, FL. v, 49 pp.

Barrios, K. and A. Chelette. 2004b. Econfina Creek Springs Inventory. Northwest Florida Water Management District Water Resources Special Report 04-02. Havana, FL. v, 38 pp.

Binkley, D, G. G. Ice, J. Kaye, and C. A. Williams. 2004. Nitrogen and phosphorus concentrations in forest streams of the United States. *J. American Water Resources Association* 40(5): 1277-1291.

Bishop, J. H. 1995. Evaluation of the Removal of Treated Municipal Effluent on Water Chemistry and the Abundance of Submersed Vegetation in Kings Bay – Crystal River, Florida. M.S. Thesis. University of Florida, Gainesville, FL.

Canfield, D. E. and M. V. Hoyer. 1988. The Nutrient Assimilation Capacity of the Little Wekiva River. Final Report submitted to City of Altamonte Springs. Center for Aquatic Plants, University of Florida, Gainesville, FL. 288 pp.

Champion, K. M. and D. J. DeWitt. 2000. Origin of Nitrate in Ground Water Discharging from Crystal Springs; Pasco County, Florida. Technical Report. Southwest Florida Water Management District, Brooksville, FL. 191 pp.

Champion, K. M. and R. Starks. 2001. The Hydrology and Water Quality of Springs in West-Central Florida. Technical Report. Southwest Florida Water Management District, Brooksville, Fl. xii, 149 pp.

Chelette, A., T. R. Pratt, and B. G. Katz. 2002. Nitrate Loading as an Indicator of Nonpoint Source Pollution in the Lower St. Marks-Wakulla River Watershed. Northwest Florida Water Management District Water Resources Special Report 02-1.

Clark, G. M., D. K. Mueller, and M. A. Mast. 2000. Nutrient concentrations and yields in undeveloped stream basins of the United States. *J. American Water Resources Assoc.* 36(4): 849-860.

Collins, W. D. and C. S. Howard. 1928. *Chemical Character of Waters of Florida*. U. S. Geological Survey Water-Supply Paper 596-G: Pp. 177-233.

Dodds, W. K. 2006. Eutrophication and trophic state in rivers and streams. *Limnology and Oceanography* 51(1, part 2): 671-680.

Dodds, W. K. and E. B. Welch. 2000. Establishing nutrient criteria in streams. *J. North American Benthological Soc.* 19(1): 186-196.

Duarte, C. M. and D. E. Canfield, Jr. 1990. Light absorption in Florida springs. *Florida Scientist* 53(2): 118-121

Ferguson, G. E., C. W. Lingham, S. K. Love, and R. O. Vernon. 1947. *Springs of Florida*. Florida Geological Survey Bulletin No. 31. 196 pp.

Grice, G. D. and C. S. Yentsch. 1956. Light transparency of Wakulla Springs. *Papers Oceanogr. Inst.* 2: 1-5.

Hornsby, D. and R. Ceryak. 1999. *Springs of the Suwannee River Basin in Florida*. Suwannee River Water Management District Technical Report WR99-02. 178 pp.

Hornsby, D. and R. Ceryak. 2000. *Springs of the Aucilla, Coastal, and Waccasassa Basins in Florida*. Suwannee River Water Management District Technical Report WR00-03. 66 pp.

Hoyer, M. V., L. K. Mataraza, A. B. Munson, and D. E. Canfield, Jr. 1997. *Water Clarity in Kings Bay/Crystal River*. Final Project Report. Report submitted to the Southwest Florida Water Management District, Brooksville, FL.

Hunn, J. D. and L. J. Slack. 1983. *Water Resources of the Santa Fe River Basin, Florida*. U. S. Geological Survey Water-Resources Investigations Report 83-4075. 105 pp.

Jones, G. W. and S. B. Upchurch. 1993. *Origin of Nutrients in Ground Water Discharging from Lithia and Buckhorn Springs, Hillsborough County, Florida*. Technical Report. Southwest Florida Water Management District, Brooksville, FL. xiii, 118 pp, Appendices.

Jones, G. W., S. B. Upchurch, and K. M. Champion. 1996. *Origin of Nitrate in Ground Water Discharging from Rainbow Springs, Marion County, Florida*.

Technical Report. Southwest Florida Water Management District, Brooksville, FL. 155 pp.

Jones, G. W., S. B. Upchurch, K. M. Champion, and D. J. Dewitt. 1997. Water-Quality and Hydrology of the Homosassa, Chassahowitzka, Weeki Wachee and Aripeka Spring Complexes, Citrus and Hernando Counties, Florida. Technical Report. Southwest Florida Water Management District, Brooksville, FL. 167 pp.

Jones, G. W., S. B. Upchurch, and K. M. Champion. 1998. Origin of Nutrients in Ground Water Discharging from the King's Bay Springs. Technical Report. Southwest Florida Water Management District, Brooksville, FL. 158 pp.

Katz, B. G., R. S. DeHan, J. J. Hirten, and J. S. Catches. 1997. Interactions between ground water and surface water in the Suwannee River Basin, Florida. J. American Water Resources Assoc. 33(6): 1237-1254

Katz, B. G., H. D. Hornsby, J. F. Bohlke, and M. F. Mokray. 1999. Sources and Chronology of Nitrate Contamination in Spring Waters, Suwannee River Basin, Florida. U. S. Geological Survey Water-Resources Investigation Report 99-4252. 54 pp.

Katz, B. G., J. K. Bohlke, and H. D. Hornsby. 2001. Timescales for nitrate contamination of spring waters. Chemical Geology 179: 167-186.

Lehmensiek, M. 2005. Verification of Impairment and Proposed Reductions for Coliform Bacteria in the Wekiva River and Rock Springs Run. SJRWMD Staff Report. November, 2005. 16 pp.

Martin, J. B. and S. L. Gordon. 2000. Surface and ground water mixing, flow paths, and temporal variations in chemical compositions of karst springs. Pp. 65-92 IN: I. D. Sasowsky and C. Wicks (eds.), Groundwater Flow and Contaminant Transport in Carbonate Aquifers. Rotterdam, A.A. Balkema.

Mattson, R. A., E. F. Lowe, and C. L. Lippincott. 2005. Potential Nitrate Toxicity to Aquatic Animals in the Wekiva River and Rock Springs Run and Associated Nitrate Concentration Targets. SJRWMD Staff Report. September, 2005. 17 pp.

Munson, A. B. 1999. Water Clarity in Kings Bay/Crystal River, Florida. M.S. Thesis. University of Florida, Gainesville, FL.

Odum, H. T. 1953. Dissolved Phosphorus in Florida Waters. Florida Geological Survey Report of Investigations No. 9. Miscellaneous Studies. Pp. 1-40.

Osburn, W., D. Toth, and D. Boniol. 2002. Springs of the St. Johns River Water Management District. SJRWMD Technical Report SJ2002-5. CD version.

Phelps, G. G., S. J. Walsh, R. M Gerwig, and W. B. Tate. 2006. Characterization of the Hydrology, Water Chemistry, and Aquatic Communities of Selected Springs in the St. Johns River Water Management District, 2004. U. S. Geological Survey Open-File Report 2006-1107. vi, 51 pp.

Pittman, J. R., H. H. Hatzell, and E. T. Oaksford. 1997. Spring Contributions to Water Quantity and Nitrate Loads in the Suwannee River During Base Flow in July 1995. U. S. Geological Survey Water-Resources Investigations Report 97-4152. 11 pp.

Rosenau, J. C., G. L. Faulkner, C. W. Hendry, Jr., and R. W. Hull. 1977. Springs of Florida. Florida Department of Natural Resources Bureau of Geology Bulletin No. 31 (Revised). 461 pp.

Scott, T. M., G. H. Means, R. C. Means, and R. P. Meegan. 2002. First Magnitude Springs of Florida. Florida Geological Survey Open File Report No. 85. 138 pp.

Scott, T. M., G. H. Means, R. P. Meegan, R. C. Means, S. B. Upchurch, R. E. Copeland, et al. 2004. Springs of Florida. Florida Geological Survey Bulletin No. 66. 377 pp, 1 CD.

Slack, L. J. and J. C. Rosenau. 1979. Water Quality of Florida Springs. Florida Geological Survey Map Series MS 96. Florida Dept. of Environmental Protection, Tallahassee, FL.

Strong, W. R. 2004. Temporal Water Chemistry Trends within Individual Springs and within a population of Florida Springs. M.S. Thesis. University of Florida, Gainesville, FL. 54 pp.

Toth, D. J. 1999. Water Quality and Isotope Concentrations from Selected Springs in the St. Johns River Water Management District. St. Johns River Water Management District. Technical Publication SJ99-2. xii, 67 pp.

Toth, D. J. 2003. Water Quality and Isotope Concentrations from Selected Springs in the St. Johns River Water Management District, Part 2. St. Johns River Water Management District. Technical Publication SJ2003-1. xii, 70 pp.

Upchurch, S. B. and K. M. Champion. 2003. Geostatistical Analysis of Water-Level and Water-Quality Data for the Ichetucknee Springshed. Technical Report prepared for Suwannee River Water Management District, Live Oak, FL. 15 pp.

Woodruff, A. 1993. Florida Springs Chemical Classification and Aquatic Biological Communities. M.S. Thesis. University of Florida, Gainesville, FL. 117 pp.

6.5 Plant Communities (algae and macrophytes)

Bartodziej, W. M. and A. Leslie. 1997. The Aquatic Ecology and Water Quality of the St. Marks River, Wakulla County, Florida, with Special Emphasis on the Role of Waterhyacinth: 1989-1995 Studies. Florida Dept. of Environmental Protection, Bureau of Aquatic Plant Management, Tallahassee, FL. Report TSS-97-200. 109 pp.

Bishop, J. H. 1995. Evaluation of the Removal of Treated Municipal Effluent on Water Chemistry and the Abundance of Submersed Vegetation in Kings Bay – Crystal River, Florida. M.S. Thesis. University of Florida, Gainesville, FL.

Bishop, J. H. and D. E. Canfield, Jr. 1994 (presentation abstract). Water quality and aquatic macrophyte responses to natural and anthropogenic changes in the environment in Kings Bay, Crystal River, Florida. Lake and Reservoir Management 9(2): 57.

Canfield, D. E. and M. V. Hoyer. 1988. The Nutrient Assimilation Capacity of the Little Wekiva River. Final Report submitted to City of Altamonte Springs. Center for Aquatic Plants, University of Florida, Gainesville, FL. 288 pp.

Childs, D. L. 1999. Spatial Evaluation of Factors Influencing *Hydrilla* on the Rainbow River. M.S. Project Report. Center for Wetlands, University of Florida, Gainesville, FL.

Cowell, B. C. and P. S. Botts. 1994. Factors influencing the distribution, abundance and growth of *Lyngbya wollei* in central Florida. Aquatic Botany 49: 1-17.

Cowell, B. C. and C. J. Dawes. 2004. Growth and nitrate-nitrogen uptake by the cyanobacterium *Lyngbya wollei*. J. Aquatic Plant Management 42: 69-71.

Davis, A. and B. Herring. 2005. Inventory of Rare and Endemic Plant and Animal Species of Ponce DeLeon, Gemini, and Green Springs. Final Report. Report prepared by the Florida Natural Areas Inventory. St. Johns River Water Management District Special Publication SJ2006-SP8. vi, 27 pp.

Davis, J. S. and W. F. Gworek. 1972. *Dichotomosiphon* in Florida springs. J. Phycol. 8: 130-131.

Dawes, C. J. and J. M. Lawrence. 1989. Allocation of energy resources in the angiosperms *Vallisneria americana* Michx. and *Potamogeton pectinatus* L. in Florida. Florida Scientist 52(1): 58-63

- Doyle, R.D. and R.M. Smart. 1998. Competitive reduction of noxious *Lyngbya wollei* mats by rooted aquatic plants. *Aquatic Botany* 61: 17-32.
- Duarte, C. M. and D. E. Canfield. 1990. Macrophyte standing crop and primary productivity in some Florida spring runs. *Water Resources Bull.* 26(6): 927-934.
- Dutoit, C. H. 1979. The Carrying Capacity of the Ichetucknee Springs and River. M.S. Thesis. University of Florida, Gainesville, FL. 173 pp.
- FDNR. 1987. Wekiva River Aquatic Preserve Management Plan. Report by the Florida Department of Natural Resources, Bureau of Land and Aquatic Resource Management, Tallahassee, FL. 134 pp.
- Fisher, K. E. 1994. An Investigation of the Effects of Nutrient Input on Water Quality, Submersed Aquatic Macrophytes, and Attached Algae in a Central Florida Spring Stream. M.S. Thesis. University of Central Florida, Orlando, FL. vii, 62 pp.
- FNAI. 2004. Report on the Rare Plant and Animal Species and Rare Wetland Communities Occurring Adjacent to Priority Springs and Spring-Runs in St. Johns River Water Management District. St. Johns River Water Management District Special Publication SJ2004-SP39. 49 pp.
- FNAI and FDNR. 1990. Guide to the Natural Communities of Florida. Report by the Florida Natural Areas Inventory and Florida Department of Natural Resources, Tallahassee, FL. 111 pp.
- Frazer, T. K. and J. A. Hale. 2001. An Atlas of Submersed Aquatic Vegetation in Kings Bay (Citrus County, Florida). Final Report. Southwest Florida Water Management District, Brooksville, Florida.
- Frazer, T. K., S. K. Notestein, C. A. Jacoby, C. J. Littles, S. R. Keller, and R. A. Swett. 2006. Effects of storm-induced salinity changes on submersed aquatic vegetation in Kings Bay, Florida. *Estuaries and Coasts* 29(6A): 943-953.
- GreenWater Labs Inc. 2005. Final Report. Attached Algal Assessment for the Wekiva River and Rock Springs Run. Report submitted to the St. Johns River Water Management District, Palatka, FL. 45 pp.
- Herring, B. and A. Davis. 2004. Inventory of Rare and Endemic Plants and Rare Land and Riverine Vertebrates of Silver River and Silver Springs. St. Johns River Water Management District Special Publication SJ2004-SP36. 69 pp.
- Hoyer, M. V., T. K. Frazer, D. E. Canfield, Jr., and J. M. Lamb. 2001. Vegetation Evaluation in Kings Bay/Crystal River. Final Report. Southwest Florida Water Management District, Brooksville, FL.

Koburger, J. A. and C. R. Lazarus. 1974. Isolation of *Vibrio parahaemolyticus* from salt springs in Florida. *Appl. Microbiol.* 27: 435-436.

Lytle, S. T. 2003. Adaptation and Acclimation of Populations of *Ludwigia repens* to Growth in High and Lower-CO₂ Springs. Ph.D. Dissertation. University of Florida, Gainesville, FL.

Mattson, R. A., J. H. Epler, and M. K. Hein. 1995. Description of benthic communities in karst, spring-fed streams of north central Florida. *J. Kansas Entomological Soc.* 68(2) Supplement: 18-41.

Mumma, M. T. 1996. Effects of Recreation on the Water Quality and Submersed Plant Community of Rainbow River, Florida. M.S. Thesis. University of Florida, Gainesville, FL. xi, 73 pp.

Natelson, D. 1955. Standing crops and community survey of submerged vegetation in seven springs. IN: H. T. Odum and J. L. Yount (eds.), Annual Report to the Office of Naval Research 2 (1954).

National Park Service. 1999. Wekiva River, Rock Springs Run, and Seminole Creek. Wild and Scenic River Study. Report produced by the Southeast Support Office, National Park Service, Atlanta, GA. 49 pp., 8 Appendices.

Notestein, S. K. 2001. Physical, Chemical, and Vegetative Characteristics of the Chassahowitzka River. M.S. Thesis. University of Florida, Gainesville, FL. 86 pp.

Notestein, S. K., T. K. Frazer, M. V. Hoyer, and D. E. Canfield, Jr. 2003. Nutrient limitation of periphyton in a spring-fed, coastal stream in Florida, U.S.A. *J. Aquatic. Plant Management* 41: 57-60.

Pandion Systems, Inc. 2003. Carrying Capacity Study of Silver Glen Spring and Run. Prepared for the Florida Department of Environmental Protection, Tallahassee, Florida. FDEP Contract No. SL 982. 86 pp., 1 Appendix.

PBS&J. 2000. Rainbow Springs Aquatic Preserve 2000 Vegetation Mapping and Change Analysis Report. Report to the Florida Department of Environmental Protection Bureau of Coastal and Aquatic Managed Areas, Dunnellon, FL.

PBS&J. 2003. Mapping and Monitoring Submerged Aquatic Vegetation in Ichetucknee and Manatee Springs. Final Report by Post, Buckley, Schue and Jernigan submitted to the Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered, 7 Appendices.

PBS&J. 2004. Mapping and Monitoring Submerged Aquatic Vegetation in Ichetucknee Springs – 2004. Final Report by Post, Buckley, Schue and Jernigan submitted to the Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered, 6 Appendices.

Phlips, E. J. and E. Bledsoe. 2002. The Consequences of Suwannee River Eutrophication for the Dynamics of Algae in the River and Associated Estuary. Final Report submitted to Suwannee River Water Management District, Live Oak, FL. 322 pp.

Phlips, E. J., J. Inhat, and M. Conroy. 1992. Nitrogen-fixation by the benthic freshwater cyanobacterium *Lyngbya wollei*. *Hydrobiologia* 234: 59-64.

Romie, K. F. 1990. An Evaluation of Factors Contributing to the Growth of *Lyngbya* sp. in Kings Bay/Crystal River, Florida. Technical Report. Southwest Florida Water Management District, Brooksville, FL. xi, 70 pp., 3 Attachments.

Simons, R. W. 1990. Terrestrial and Freshwater Habitats. Pp. 99-157 IN: S. Wolfe (ed.), An Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. U. S. Fish and Wildlife Service Biological Report 90(21). 323 pp.

Shannon, K., E. D. Gross, and D. F. Martin. 1992. Variation of growth of *Lyngbya majascula* as a function of salinity. *Biomedical Letters* 47: 29-33.

Stevenson, R. J. 1997. Resource thresholds and stream ecosystem sustainability. *J. North American Benthological Soc.* 16(2): 410-424.

Stevenson, R. J., A. Pinowska, and Y-K Wang. 2004. Ecological Condition of Algae and Nutrients in Florida Springs. Final Report to the Florida Department of Environmental Protection, Tallahassee, FL. 101 pp.

Terrell, J. B. and D. E. Canfield, Jr. 1996. Evaluation of the effects of nutrient removal and the “Storm of the Century” on submersed vegetation in Kings Bay-Crystal River, Florida. *Lake and Reservoir Management* 12(3): 394-403.

Thompson, S. M. 1977. Vascular Plant Communities and Environmental Parameters under Tidal Influence on the Wakulla and St. Marks Rivers, Florida. M.S. Thesis. Florida State University, Tallahassee, FL. 44 pp.

Welch, E. B., J. M. Jacoby, R. R. Horner, and M. R. Seeley. 1988. Nuisance biomass levels of periphytic algae in streams. *Hydrobiologia* 157: 161-168.

Whitford, L. A. 1956. The communities of algae in the springs and spring streams of Florida. *Ecology* 37(3): 433-442.

Yount, J. L. 1956. Factors that control species numbers in Silver Springs, Florida. *Limnology and Oceanography* 1(4): 286-295.

6.6 Substrata And Benthic Macroinvertebrates

Benke, A. C., T. C. Van Arsdall, Jr., and D. M. Gillespie. 1984. Invertebrate productivity in a subtropical blackwater river: the importance of habitat and life history. *Ecol. Monographs* 54(1): 25-63.

Benke, A. C., R. L. Henry, III, D. M. Gillespie, and R. J. Hunter. 1985. Importance of snag habitat for animal production in southeastern streams. *Fisheries* 10(5): 8-13.

Berner, L. and M. L. Pescador. 1988. *The Mayflies of Florida*. Revised Edition. University Presses of Florida, Gainesville, FL. 415 pp.

Black and Veatch Corp. 2004. Environmental Monitoring Plan. Annual Report. January 2004. Madison Blue Spring. WUP No. 2-98-00025M. Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered.

Black and Veatch Corp. 2005. . Environmental Monitoring Plan. Annual Report. February 2005. Madison Blue Spring. WUP No. 2-98-00025M. Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered.

Davis, J. S. and W. F. Gworek. 1972. A rotifer parasitizing *Vaucheria* in a Florida spring. *J. Phycol.* 8: 18.

Ferrington, L. C. (ed.). 1995. Biodiversity of aquatic insects and other invertebrates in springs. *J. Kansas Entomological Soc.* 68(2) Supplement, Special Publication No. 1.

FDEP. 1997. Biological Assessment of the Ichetucknee River, Columbia County, Florida. Biology Section, Florida Dept. of Environmental Protection, Tallahassee, FL. 15 pp.

FDEP. 2000. Ecological Assessment of the Wekiva River; Seminole, Lake and Orange Counties. Florida Department of Environmental Protection, Bureau of Laboratories, Division of Resource Assessment and Management, Tallahassee, FL. 8 pp.

Franz, R. 2002. Crustacean Surveys in Spring Habitats of 17 Florida State Parks. Report submitted to the Florida Park Service by the Florida Museum of Natural History, Gainesville, Fl. 13 pp.

Franz, R. and H. H. Hobbs, Jr. 1983. *Procambarus (Ortmannicus) leitheuseri*, new species, another troglobitic crayfish (Decapoda : Cambaridae) from peninsular Florida. Proceedings of the Biological Society of Washington 96: 323-332.

Franz, R. and D. S. Lee. 1982. Distribution and evolution of Florida's troglobitic crayfishes. Bulletin of the Florida State Museum, Biological Sciences 28: 53-78.

Franz, R., J. Bauer, and T. Morris. 1994. Review of biologically significant caves and their faunas in Florida and south Georgia. Brimleyana 20: 1-109.

Genevieve, R. S. and M. L. Cipollini. 2006. Relationship between physicochemical factors and distribution of stygobiotic crayfishes in southeastern caves. Southeastern Naturalist 5(1): 17-26.

Gottfried, P. K. and J. A. Osborne. 1992. Distribution, abundance and size of *Corbicula manilensis* (Phillipi) in a spring-fed central Florida stream. Fla. Scientist 45(3): 178-188.

Hobbs, H. H., Jr. and R. Franz. 1986. New troglobitic crayfish with comments on its relationship to epigean and other hypogean crayfishes of Florida. J. Crustacean Biology 6(3): 509-519.

Hobbs, H. H., Jr. and D. S. Lee. 1976. A new troglobitic crayfish (Decapoda : Cambaridae) from peninsular Florida. Proceedings of the Biological Society of Washington 89: 383-391.

Hobbs, H. H., Jr. and D. B. Means. 1972. Two new troglobitic crayfishes (Decapoda : Astacidae) from Florida. Proceedings of the Biological Society of Washington 84: 393-409.

Hobbs, H. H., Jr., H. H. Hobbs, III, and M. A. Daniel. 1977. A Review of the Troglobitic Decapod Crustaceans of the Americas. Smithsonian Contributions to Zoology 244: 1-183.

Lobinske, R. J. 1995. Qualitative and Quantitative Population and Productivity Estimates of Chironomidae (Diptera) and Selected Physico-chemical Parameters in Two Tributaries of the Wekiva River, Central Florida. M.S. Thesis. University of Central Florida, Orlando, FL. 56 pp.

Mattson, R. A., J. H. Epler, and M. K. Hein. 1995. Description of benthic communities in karst, spring-fed streams of north central Florida. J. Kansas Entomological Soc. 68 (2) Supplement: 18-41.

- Morris, T. 2003. A Biological Inventory of Spring Caves Associated with the Oklawaha River, Holmes Creek, Choctawhatchee River, Econfina River, Suwannee River, Withlacoochee River, Apalachicola River and St. Johns River, with Special Emphasis on Troglobitic Invertebrates. Report submitted to the Florida Dept. of Environmental Protection Springs Initiative Program. FDEP Grant Agreement S0057. 41 pp.
- PBS&J. 2003. Mapping and Monitoring Submerged Aquatic Vegetation in Ichetucknee and Manatee Springs. Final Report by Post, Buckley, Schue and Jernigan submitted to the Suwannee River Water Management District, Live Oak, FL. Pp. variously numbered, 7 Appendices.
- Phelps, G. G., S. J. Walsh, R. M Gerwig, and W. B. Tate. 2006. Characterization of the Hydrology, Water Chemistry, and Aquatic Communities of Selected Springs in the St. Johns River Water Management District, 2004. U. S. Geological Survey Open-File Report 2006-1107. vi, 51 pp.
- Relyea, K. and B. Sutton. 1975. A new troglobitic crayfish of the genus *Procambarus* from Florida (Decapoda : Astacidae). *Tulane Studies in Zoology and Botany* 19: 8-16.
- Relyea, K., D. Blody, and K. Bankowski. 1976. A Florida troglobitic crayfish: biogeographic implications. *Florida Scientist* 39: 71-72.
- Shelton, D. N. 2005. The Rare and Endemic Snails of Selected Springs within the St. Johns River Water Management District. Report by the Alabama Malacological Research Center submitted to St. Johns River Water Management District, Palatka, FL. iv, 25 pp.
- Sloan, W. C. 1954. The Distribution of Aquatic Insects in Two Florida Springs. M.S. Thesis, University of Florida, Gainesville, FL. 93 pp.
- Sloan, W. C. 1956. The distribution of aquatic insects in two Florida springs. *Ecology* 37(1): 81-98.
- Steigerwalt, N. M. 2005. Environmental Factors Affecting Aquatic Invertebrate Community Structure on Snags in the Ichetucknee River, Florida. M.S. Thesis, University of Florida, Gainesville, FL. 85 pp.
- Streever, W. 1992. First record of *Corbicula* clams in flooded cave systems in Florida. *Fla. Scientist* 55(1): 35-37.
- Streever, W. J. 1992. First record of the colonial Cnidarian *Cordylophora lacustris* within a flooded cave system. *The NSS Bulletin* 54: 77-78.

Streever, W. J., J. F. Gottgens, and T. L. Crisman. 1993. Patterns of sediment flux in a subtropical permanently flooded cave. *Verh. Internat. Verein. Limnol.* 25: 257-260.

Thompson, F. G. 1968. *The Aquatic Snails of the Family Hydrobiidae of Peninsular Florida*. University of Florida Press, Gainesville, FL. 268 pp.

Walsh, S. J. 2001. Freshwater macrofauna of Florida karst habitats. Pp. 78-88 IN: E. L. Kuniatsky (ed.), *Proceedings*. USGS Karst Interest Group. U. S. Geological Survey Water-Resources Investigations Report 01-4011.

Walsh, S. J. and J. D. Williams. 2003. *Inventory of Fishes and Mussels in Springs and Spring Effluents of North-Central Florida State Parks*. Report to the Florida Park Service. U. S. Geological Survey, Center for Aquatic Resources, Gainesville, FL. iii, 94 pp.

Warren, G. L., D. A. Hohlt, C. E. Cichra, and D. VanGenechten. 2000. *Fish and Aquatic Invertebrate Communities of the Wekiva and Little Wekiva Rivers: A Baseline Evaluation in the Context of Florida's Minimum Flows and Levels Statutes*. St. Johns River Water Management District Special Publication SJ2000-SP4. Pp. variously numbered.

Woodruff, A. 1993. *Florida Springs Chemical Classification and Aquatic Biological Communities*. M.S. Thesis. University of Florida, Gainesville, FL. 117 pp.

6.7 Fishes

Allen, E. R. 1946. *Fishes of Silver Springs, FL*. Privately printed report. 36 pp. <http://fulltext10.fcla.edu/cgi/t/text/text-idx?c=feol&idno=UF00000192&format=pdf>

Caldwell, D. K., F. H. Berry, and H. T. Odum. 1955. *Fishery Biology Studies in Silver Springs, Productivity of Florida Springs: Second Annual Report to Biology Branch Office of Naval Research*. Dept. of Biology: University of Florida, Gainesville, Florida.

Caldwell, D. K., H. T. Odum, T. R. Hellier, Jr., and F. H. Berry. 1957. Populations of spotted sunfish and Florida largemouth bass in a constant temperature spring. *Trans. American Fisheries Soc.* 85: 120-134.

Canfield, D. E. and M. V. Hoyer. 1988. *The Nutrient Assimilation Capacity of the Little Wekiva River*. Final Report submitted to City of Altamonte Springs. Center for Aquatic Plants, University of Florida, Gainesville, FL. 288 pp.

Edwards, T. M. 2005. Environmental Influences on Mosquitofish Reproduction. Ph.D Dissertation. University of Florida, Gainesville, FL. 187 pp.

Hellier, T. R., Jr. 1967. The fishes of the Santa Fe River System. Bulletin of the Florida State Museum 11(1): 1-37.

Herald, E. S. and R. R. Strickland. 1949. An annotated list of the fishes of Homosassa Springs, Florida. Quart. Jour. Florida Academy of Sciences 11(4): 99-109.

Hubbs, C. L. and E. R. Allen. 1943. Fishes of Silver Springs, Florida. Proc. Florida Academy of Sciences 6: 110-130.

National Park Service. 1999. Wekiva River, Rock Springs Run, and Seminole Creek. Wild and Scenic River Study. Report produced by the Southeast Support Office, National Park Service, Atlanta, GA. 49 pp., 8 Appendices.

Odum, H. T. and D. K. Caldwell. 1955. Fish respiration in the natural oxygen gradient of an anaerobic spring in Florida. Copeia: 104-106.

Phelps, G. G., S. J. Walsh, R. M Gerwig, and W. B. Tate. 2006. Characterization of the Hydrology, Water Chemistry, and Aquatic Communities of Selected Springs in the St. Johns River Water Management District, 2004. U. S. Geological Survey Open-File Report 2006-1107. vi, 51 pp.

Relyea, K. and B. Sutton. 1973. Cave dwelling yellow bullheads in Florida. Fla. Scientist 36(1): 31-34.

VanGenechten, D. T. 1999. Effects of Habitat and Season on Fish Communities of the Wekiva River System. M. S. Thesis. University of Florida, Gainesville, FL. 93 pp.

Walsh, S. J. and J. D. Williams. 2003. Inventory of Fishes and Mussels in Springs and Spring Effluents of North-Central Florida State Parks. Report to the Florida Park Service. U. S. Geological Survey, Center for Aquatic Resources, Gainesville, FL. iii, 94 pp.

Warren, G. L., D. A. Hohlt, C. E. Cichra, and D. VanGenechten. 2000. Fish and Aquatic Invertebrate Communities of the Wekiva and Little Wekiva Rivers: A Baseline Evaluation in the Context of Florida's Minimum Flows and Levels Statutes. St. Johns River Water Management District Special Publication SJ2000-SP4. Pp. variously numbered.

6.8 Other Vertebrates

Adler, E. T. 1977. Wakulla Springs: Its History, Legend, Birds and Wildlife. Wakulla Silver Springs Company. 39 pp.

Campbell, H. W. and A. B. Irvine. 1977. Feeding ecology of the West Indian manatee *Trichechus manatus* Linnaeus. *Aquaculture* 12(3): 249-251.

Cox, W. A. and K. R. Marion. 1976. Observations on the female reproductive cycle of the loggerhead musk turtle *Stenotherus minor* in a north Florida spring. *J. Ala. Acad. Science* 47: 136.

Cox, W. A. and K. R. Marion. 1978. Observations on the female reproductive cycle and associated phenomena in spring-dwelling populations of *Stenotherus minor* in north Florida (Reptilia : Testudines). *Herpetologica* 34: 20-33.

Davis, A. and B. Herring. 2005. Inventory of Rare and Endemic Plant and Animal Species of Ponce DeLeon, Gemini, and Green Springs. Final Report. Report prepared by the Florida Natural Areas Inventory. St. Johns River Water Management District Special Publication SJ2006-SP8. vi, 27 pp.

Edwards, T. M., L. J. Guillette, Jr., K. McCoy, and T. Barbeau. 2004. Final Report. Effects of Nitrate/Nitrite on Two Sentinel Species Associated with Florida's Springs. Technical Report to the Florida Department of Environmental Protection, Tallahassee, FL. 89 pp, appendix.

Facemire, C. F. 1991. Copper and Other Contaminants in Kings Bay and Crystal River, Florida Sediments: Implications for Impact on the West Indian Manatee. United States Fish and Wildlife Service, Division of Environmental Contaminants. Arlington, Virginia. Publication Number VB-89-4-109A.

FDNR. 1987. Wekiva River Aquatic Preserve Management Plan. Report by the Florida Department of Natural Resources, Bureau of Land and Aquatic Resource Management, Tallahassee, FL. 134 pp.

FGFWFC. 1992. Aquatic and Terrestrial Wildlife Surveys for the Rainbow River Watershed. Final Report. Report prepared by the Nongame Wildlife Program, Florida Game and Fresh Water Fish Commission for Southwest Florida Water Management District, Brooksville, FL. 29 pp.

FNAI. 2004. Report on the Rare Plant and Animal Species and Rare Wetland Communities Occurring Adjacent to Priority Springs and Spring-Runs in St. Johns River Water Management District. St. Johns River Water Management District Special Publication SJ2004-SP39. 49 pp.

FNAI and FDNR. 1990. Guide to the Natural Communities of Florida. Report by the Florida Natural Areas Inventory and Florida Department of Natural Resources, Tallahassee, FL. 111 pp.

Giovanetto, L. A. 1992. Population Ecology and Relative Abundance of Sympatric Freshwater Turtles in the Headwaters of Two Spring-Fed Rivers in Western Peninsular Florida. Ph.D. Dissertation. Florida Institute of Technology, Melbourne, FL.

Herring, B. and A. Davis. 2004. Inventory of Rare and Endemic Plants and Rare Land and Riverine Vertebrates of Silver River and Silver Springs. St. Johns River Water Management District Special Publication SJ2004-sp36. 69 pp.

Huestis, D. L. and P. A. Meylan. 2004. The turtles of Rainbow Run (Marion County, Florida): observations on the genus *Pseudemys*. Southeastern Naturalist 3(4): 595-612.

Jackson, J. A. 1996. Ivory-billed Woodpecker. Pp. 103-112 IN: J. A. Rodgers, Jr., H. W. Kale, III, and H. T. Smith (eds.), Rare and Endangered Biota of Florida. Volume V. Birds. University Press of Florida, Gainesville, FL.

Kramer, M. 1995. Home range of the Florida Red-bellied turtle (*Pseudemys nelsoni*) in a Florida spring run. Copeia 1995: 883-890.

Langtimm, C. A., G. L. Mahon, H. I. Kochman, and S. Butler. 2003. Manatee Habitat Suitability at Manatee Spring, Levy County, Florida. Report by the U. S. Geological Survey, Center for Aquatic Resource Studies, Gainesville, FL. 41 pp.

Lomolino, M. V. 1977. The Ecological Role of the Florida Manatee (*Trichecus manatus latirostris*) in Water Hyacinth-Dominated Ecosystems. M.S. Thesis. University of Florida, Gainesville, FL.

Lomolino, M. V. and K. C. Ewel. 1984. Digestive efficiencies of the West Indian manatee (*Trichecus manatus*). Florida Scientist 47(3): 176-179.

Marchand, L. J. 1942. A Contribution to the Knowledge of the Natural History of Certain Freshwater Turtles. M.S. Thesis. University of Florida, Gainesville, FL.

Meylan, P. A., C. A. Stevens, M. E. Barnwell, and E. D. Dohm. 1992. Observations on the turtle community of Rainbow Run, Marion County, Florida. Florida Scientist 55(4): 219-227.

National Park Service. 1999. Wekiva River, Rock Springs Run, and Seminole Creek. Wild and Scenic River Study. Report produced by the Southeast Support Office, National Park Service, Atlanta, GA. 49 pp., 8 Appendices.

O'Shea, T. J., J. F. Moore, and H. I. Kochman. 1984. Contaminant concentrations in manatees in Florida. *Journal of Wildlife Management* 48: 741-748.

Silverberg, D. J. and J. G. Morris. 1987 (presentation abstract). The role of nutrients and energy in the diet selection of the West Indian manatee (*Trichechus manatus*) in the winter refuge at Homosassa Springs, Citrus County, FL. *American Zoologist* 27(4): 44A.

Simons, R. W. 1990. Terrestrial and Freshwater Habitats. Pp. 99-157 IN: S. Wolfe (ed.), *An Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers*. U. S. Fish and Wildlife Service Biological Report 90(21). 323 pp.

Sucsy, P., R. Hupalo, and B. Freeman. 1998. Minimum Flow Determination for Blue Spring, Volusia County: The Relationship between Ground Water Discharge and Winter Refuge for Manatees. Technical Report. Department of Water Resources. St. Johns River Water Management District, Palatka, FL. 73 pp.

Warm Water Task Force. 2004. Draft Recommendations for Future Manatee Warm-Water Habitat. Report by the Florida Manatee Warm Water Task Force, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL. 26 pp.

6.9 Whole Ecosystem Studies

Caldwell, D. E., S. J. Caldwell, and J. M. Tiedje. 1975. An ecological study of the sulfur oxidizing bacteria from the littoral zone of a Michigan lake and a sulfur spring in Florida. *Pl. Soil* 43: 101-114.

Duarte, C. M. and D. E. Canfield. 1990. Macrophyte standing crop and primary productivity in some Florida spring runs. *Water Resources Bull.* 26(6): 927-934.

Kemp, W. M. and W. R. Boynton. 2004. Productivity, trophic structure, and energy flow in the steady-state ecosystems of Silver Springs, Florida. *Ecological Modeling* 178: 43-49.

Knight, R. L. 1983. Energy Basis of Ecosystem Control at Silver Springs, Florida, pp. 161-179 In T. D. Fontaine and S. M. Bartell [eds.], *Dynamics of Lotic Ecosystems*. Ann Arbor Science, Ann Arbor, MI.

Knight, R. L. 1980. Energy Basis of Control in Aquatic Ecosystems. Ph.D. Dissertation. University of Florida, Gainesville, FL. 200 pp.

Odum, H. T. 1956. Primary Production in Flowing Waters. *Limnology and Oceanography* 1:102-117.

Odum, H. T. 1957a. Primary Production Measurements in Eleven Florida Springs and a Marine Turtle-Grass Community. *Limnology and Oceanography* 2:85-97.

Odum, H. T. 1957b. Trophic structure and productivity of Silver Springs, Florida. *Ecological Monographs* 27: 55-112.

Wetland Solutions, Inc. 2005. Pollutant Load Reduction Goal (PLRG) Analysis for the Wekiva River and Rock Springs Run, Florida. Final Report. Report Prepared for the St. Johns River Water Management District, Palatka, FL. Pp. variously numbered.

Wetland Solutions, Inc. 2006. Pollutant Load Reduction Goal (PLRG) Analysis for the Wekiva River and Rock Springs Run, Florida. Phase 2 Final Report. Report Prepared for the St. Johns River Water Management District, Palatka, FL. Pp. variously numbered.

6.10 Management And Economics

Billington, H. E. 1995. Use Levels, Encounters, Satisfaction and Perceived Crowding among Recreation Visitors to the Rainbow River. M.S. Thesis. University of Florida, Gainesville, FL. vi, 90 pp.

Bonn, M. A. 2004. Visitor Profiles, Economic Impacts and Recreational Aesthetic Values Associated with Eight Priority Florida Springs Located in the St. Johns River Water Management District. St. Johns River Water Management District Special Publication SJ2004-SP35. xv, 136 pp.

Bonn, M. A. and F. W. Bell. 2003. Economic Impact of Selected Florida Springs on Surrounding Local Areas. Report prepared by Florida State University for the Florida Department of Environmental Protection. Tallahassee, Florida. xvi, 95 pp., 6 Apps.

Brown, M. T., J. M. Schaefer, K. H. Brandt, S. J. Doherty, et al. 1987. Buffer Zones for Water, Wetlands, and Wildlife. Report by the Center for Wetlands, University of Florida, Gainesville, FL. 163 pp, Appendix.

Dutoit, C. H. 1979. The Carrying Capacity of the Ichetucknee Springs and River. M.S. Thesis. University of Florida, Gainesville, FL. 173 pp.

FDCA. 2002. Protecting Florida's Springs. Land Use Planning Strategies and Best Management Practices. Report prepared by the Florida Dept. of Community Affairs, Tallahassee, FL. 124 pp.

FDEP. 1995. Wekiva River Basin. Interagency Strategic Plan. Report prepared by the Wekiva River Basin Management Plan Advisory Group and Florida Department of Environmental Protection. 123 pp.

FDEP. 2004. A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area. Report by the Florida Department of Environmental Protection, Orlando, FL. 77 pp.

Florida Springs Task Force. 2000. Florida's Springs. Strategies for Protection and Restoration. Report by the Florida Springs Task Force. Florida Department of Environmental Protection, Tallahassee, FL. CD version.

Florida Springs Task Force. 2006. Florida's Springs. Strategies for Protection and Restoration. Report by the Florida Springs Task Force. Florida Department of Environmental Protection, Tallahassee, FL. CD version.

Friends of the Wekiva River, Inc. (FOWR). 1985. The Wekiva River Basin: A Resource Endangered. A Position paper. Prepared by the Technical Committee.

Goggin, S. E. 1992. A Comparison Analysis of Property Arrangements and Resource Management of Florida Springs. M.S. Thesis. Florida State University, Tallahassee, FL. vi, 157 pp.

Haller, W. T., J. V. Shireman, and D. E. Canfield. 1983. Vegetative and Herbicide Monitoring Study in King's Bay, Crystal River, Florida. Project Report. United States Army Corps of Engineers, Jacksonville, Florida. Contract No. DACW17-80-C-0062.

Hauxwell, J., C. W. Osenberg, and T. K. Frazer. 2004. Conflicting management goals: manatees and invasive competitors inhibit restoration of a native macrophyte. *Ecological Applications* 14(2): 571-586.

Mattson, R. A., E. F. Lowe, C. L. Lippincott, J. Di, and L. Battoe. 2006. Wekiva River and Rock Springs Run Pollutant Load Reduction Goals. Report to the Florida Department of Environmental Protection. St. Johns River Water Management District, Palatka, FL. xvi, 70 pp.

Mumma, M. T. 1996. Effects of Recreation on the Water Quality and Submersed Plant Community of Rainbow River, Florida. M.S. Thesis. University of Florida, Gainesville, FL. xi, 73 pp.

Pandion Systems, Inc. 2003. Carrying Capacity Study of Silver Glen Spring and Run. Prepared for the Florida Department of Environmental Protection, Tallahassee, Florida. FDEP Contract No. SL 982. 86 pp., 1 Appendix.

Paulauskas, G. 2001. Factors Associated with Satisfaction of Recreational Users on the Ichetucknee River. M.S.R.S. Thesis. University of Florida, Gainesville, FL. ix, 83 pp.

USEPA. 2005 . Total Maximum Daily Load (TMDL) for Nutrients in Wekiwa Spring (WBID 2956C), Rock Springs Run (WBID 2967), and Volusia Blue Spring (WBID 28933), Middle St. Johns River Basin, Florida. Report by U.S. Environmental Protection Agency Region 4, Atlanta, GA. vi, 17 pp., 1 Appendix.

Water Resource Associates. 2005. Marion County Springs Protection Program. Strategies and Recommendations for Protecting Silver and Rainbow Springs. Report submitted to Marion County, Ocala, FL. Pp. variously numbered, 6 Apps. plus Exhibits.

WRBCC. 2004. Wekiva River Basin Coordinating Committee. Final Report. Florida Department of Community Affairs, Tallahassee, FL. 54 pp.

WRTF. 1988. Wekiva River Task Force. Report to Governor Bob Martinez. Report by the Wekiva River Task Force dated May 20, 1988. 96 pp.

6.11 Online Resources

Selected USGS Publications are available online at:
http://fl.water.usgs.gov/Pubs_products/online.html

Selected Florida Geological Survey reports, maps and special publications are online at: <http://www.dep.state.fl.us/geology/publications/listofpubs.htm>

Many St. Johns River Water Management District reports are available digitally on their website at: <http://www.sjrwmd.com/programs/outreach/pubs/index.html>

A limited number of University of Florida M.S. Theses and Ph.D. Dissertations are available online at: <http://www.uflib.ufl.edu/etd.html>

Some of the references cited above are available online at a State University System of Florida website which maintains an archive of Florida-related publications:
<http://fulltext10.fcla.edu/cgi/t/text/text-idx?sid=998ed0b4b65319b81fd6df61789d5a3e;xg=1;page=simpleext:g=floridagrpa=3>

A number of “Ecosummaries” of springs assessed by biologists from the Florida Department of Environmental Protection using the SCI methodology can be found at: http://water.dep.state.fl.us/eswizard/eco_query.asp

Web links:

<http://www.floridasprings.org/> - Florida springs website developed and sponsored by the Florida Dept. of Environmental Protection.

<http://tfn.net/springs/> - website on Florida springs developed by Joe Follman and Richard Buchanan.

<http://susdl.fcla.edu/lfnh/related/springs.html> - abstracts and presentations from the first Florida Springs Conference in February 2000.

<http://snre.ufl.edu/programs/springs/research.htm> - University of Florida website on Florida springs and contacts to faculty at UF doing research in springs.

<http://www.floridasprings.com/> - Karst Environmental Service (Wes Skiles’) website on Florida springs.

<http://www.floridasprings.net/> - guide to major Florida springs; lists amenities, activities, and other general information.

<http://www.pbs.org/wnet/nature/springs/> - Public Broadcasting System web page on Florida springs, based on a documentary.

<http://www.mysuwanneeriver.com/water+data/springs/default.htm> - Suwannee River Water Management District springs page.

http://www.sjrwm.com/programs/plan_monitor/gw_assess/springs/ - St. Johns River Water Management District springs page.

APPENDIX

A.1

TRANSFER OF DEVELOPMENT RIGHTS

The use of a transfer of development rights (TDR) program is a strategy intended to allow designated springs protection areas to remain undeveloped by transferring the development rights to land outside the protection zone. The system must be designed so that a landowner with land in a protection zone is able to receive monetary value for the development rights that exist on his land. The value is based on developing those rights.

A TDR system requires three things:

- A sending area, land that is identified for protection where development rights will be removed.
- A receiving area, land that is identified as appropriate for development where additional development rights will be added.
- A procedure for approving, tracking, and – if desired, banking the development rights for sale at a later time.

In a TDR program the rights to develop a parcel of land are severed and reassigned or transferred to another property. Both the severance and the transfer are recorded and made a part of the permanent records of the jurisdiction within which the transfer takes place. This process allows owners of land designated for protection to benefit from the development potential assigned by the land use category. It also enables owners of receiving parcels to develop at higher densities than would otherwise be permissible. Some jurisdictions maintain a “bank” where severed development rights may be collected and sold at a later date rather than immediately transferred.

The TDR system should be established in the local comprehensive plan. Inherent in the implementation of a TDR system is the increase in development rights on a receiving parcel. Since the comprehensive plan establishes maximum density and intensity of development, it is not possible to increase development above those maximums unless the possibility of such an increase is established by policy in the comprehensive plan.

Several local governments in Florida have established TDR programs. The Rural Land Stewardship Program is a specialized TDR program. Two have been adopted in Florida – in Collier County (a forerunner of the formal program) and St. Lucie County.

Other local governments have established TDR programs to protect barrier islands, coastal islands, agricultural areas, wetlands, and rare vegetative communities.

However, several local governments contacted about their TDR programs reported that the program was never used or seldom used – often only once. Only Palm Beach County reported that it considered its program moderately successful and would recommend it as a model for other local governments. The TDR program is well described in the Palm Beach County Comprehensive Plan.

Other local governments with TDR programs include Orange County, which has prepared a white paper on the program; Lee County which established the program to protect Pine Island; the City of Key West; the City of Cedar Key, which will repeal the program in an upcoming plan amendment; Sarasota County; and Monroe County.

The TDR program is addressed in some detail in the legal analysis contained in Appendix A.2.

Readers who are considering the establishment of a transfer of development rights program for springs protection are strongly encouraged to contact one of the above local governments for further information.

**APPENDIX
A.2
LEGAL FOUNDATION FOR IMPLEMENTATION OF
SPRINGS PROTECTION**

Prepared by

**Richard Hamann, Associate in Law
Thomas Ruppert, Assistant in Environmental Law
Center for Governmental Responsibility
Fredric G. Levin College of Law
University of Florida
Gainesville, FL**

May 2007

ACKNOWLEDGEMENTS

This document was created under a contract with the Gail Easley Company, which drafted the Model Land Development Code for Florida Springs Protection for the Florida Department of Community Affairs. This version updates one dated April 7, 2004, developed for Lane Kendig and Associates, who had an earlier contract.

Students who were in the Conservation Clinic in 2003-2004 contributed substantially to the draft. They included Matthew Brewer (JD, 2004), Matthew Clark, (JD, 2004), Jason Evans, Ph.D. Candidate, and Christine Francescani, (JD, 2005). The Clinic's director, Thomas T. Ankersen and the Director of the Environmental Division at the Center for Governmental Responsibility, Jeff Wade, also contributed.

The contributions of CGR's administrative and clerical staff were substantial: Laura Coates, Barbara Sieger, and Lenny Kennedy.

TABLE OF CONTENTS

| | | |
|-------------|---|-----------|
| I. | Summary of Legal Issues Regarding Springs Protection | 1 |
| A. | Introduction..... | 1 |
| B. | Local Government Authority..... | 1 |
| C. | Florida Growth Management..... | 2 |
| D. | State Preemption..... | 3 |
| E. | Constitutional Limitations on Land Use Regulations..... | 4 |
| F. | Bert J. Harris, Jr. Private Property Rights Protection Act..... | 5 |
| G. | Transfer of Development Rights..... | 6 |
| II. | Local Government Authority | 7 |
| A. | General Authority..... | 7 |
| B. | Preemption by the State..... | 8 |
| II. | Florida Growth Management Growth Management Framework | 8 |
| 1. | Areas of Critical State Concern..... | 9 |
| A. | Local Government Comprehensive Planning and Land Development Regulation Act | 13 |
| B. | The Content of Local Government Comprehensive Plans..... | 14 |
| C. | Adoption, Amendment and Update of Plans..... | 18 |
| D. | Adoption of Land Development Regulations..... | 20 |
| E. | Consistency of Development Orders..... | 20 |
| F. | Joint Planning and Intergovernmental Coordination..... | 21 |
| III. | State Preemption | 22 |
| A. | Agriculture..... | 22 |
| B. | Pollution Control Programs..... | 24 |
| C. | Consumptive Use of Water..... | 26 |
| 1. | Overview of Water Management District Authority..... | 26 |
| a) | Planning..... | 27 |
| b) | Regulation of Consumptive Use..... | 29 |
| c) | Minimum Flows and Levels and Reservations..... | 30 |
| 2. | Preemption of Local Government Authority..... | 32 |
| 3. | Coordination of local and regional planning..... | 33 |
| D. | Environmental Resource Permitting..... | 34 |
| 1. | Overview of ERP Program..... | 34 |
| 2. | Preemption of Local Government Authority..... | 37 |
| 3. | Onsite Treatment and Disposal Systems (Septic Tanks)..... | 38 |
| IV. | Constitutional Limits on Land Use Regulation | 40 |
| A. | Due Process..... | 40 |
| B. | Substantive Due Process..... | 41 |
| C. | Equal Protection..... | 42 |
| D. | Expropriation..... | 42 |
| V. | Bert J. Harris, Jr. Private Property Rights Protection Act | 46 |
| A. | Overview..... | 46 |
| B. | Settlement Procedure..... | 48 |
| C. | Inordinate Burden..... | 50 |
| D. | Existing Use..... | 52 |
| E. | Vested Rights..... | 53 |
| F. | Recent Cases Under the Act..... | 54 |

| | | |
|------------|---|-----------|
| G. | Conclusion | 55 |
| VI. | Transfer of Development Rights | 56 |
| A. | Overview | 56 |
| B. | Use of TDRs in Florida | 56 |
| 1. | Florida Statute References to TDRs | 56 |
| 2. | Case law | 57 |
| 3. | Transferable Rural Land Use Credits (TRLUCs)..... | 58 |
| C. | Types of TDR Programs | 59 |
| 1. | Mandatory TDRs | 59 |
| 2. | Voluntary TDRs..... | 60 |
| 3. | Universal TDR System | 61 |
| D. | Recommendations | 61 |

I. Summary of Legal Issues Regarding Springs Protection

A. Introduction

This section contains a summary of legal issues pertinent to springs protection. Refer to additional sections of this appendix for more detailed analysis and information regarding springs protection in the *Florida Statutes* and in case law.

Florida's Growth Management Act¹ not only authorizes but also requires local governments to develop and implement comprehensive plans that address the protection of springs and springsheds. The Future Land Use Element must include objectives that discourage sprawl, allow only appropriate activities within wellhead protection areas and environmentally sensitive lands, and ensure the protection of natural resources. Springs and related features are important natural resources. The Sanitary Sewer, Solid Waste, Drainage, Potable Water and Natural Groundwater Aquifer Recharge Element must identify recharge areas and contain policies addressing protection of the functions of natural groundwater recharge areas. Finally, the Conservation Element must contain policies addressing groundwater protection by restricting activities and land uses known to adversely affect the quality and quantity of identified water sources, including natural groundwater recharge areas. Therefore, it is clear that the protection of the aquifer, springs, and related features must be included in a local government comprehensive plan. Furthermore, local governments are required to adopt land development regulations that are consistent with and implement the goals, objectives, and policies of the comprehensive plan. Thus, once a local government has amended its plan to include springs protection provisions, it should then implement those provisions with land development regulations.

B. Local Government Authority

The Florida Constitution creates three kinds of local governments: charter and non-charter counties and municipalities. Each type of local government has similar authority to exercise the powers of self-government. These include the authority to adopt plans and regulations to protect the quality and quantity of water in springs. Additional authority may also be delegated to local governments by the Legislature.

The powers of local governments may also be limited by the Legislature through either express preemption or implied preemption. Express preemption occurs when the Legislature clearly states that laws passed by it override the laws of local governments. Implied preemption, while not favored by the courts, may occur if state law implicitly demonstrates intent by the legislature to preempt a specific area of law.

¹Local Government Comprehensive Planning and Land Development Regulation Act, codified at FLA. STAT. Ch 163, Pt II (2006).

In the absence of any preemption, local governments may regulate concurrently with the state legislature but may not conflict with state law. Local government regulation must also be consistent with the state and federal constitutions.

C. Florida Growth Management

Florida's growth management framework consists of a State Comprehensive Plan, eleven regional planning councils and their strategic regional policy plans, and local comprehensive plans. The state has greatest authority in dealing with Developments of Regional Impact (DRIs) and Areas of Critical State Concern (ACSC). Outside of these areas, however, most of responsibility for growth management resides with local governments.

Florida's Local Government Comprehensive Planning and Land Development Regulation Act (hereinafter "Growth Management Act") establishes an integrated planning process to promote orderly development and regulate impacts to environmental resources. The Growth Management Act requires that local governments adopt comprehensive plans that are "consistent" with the goals, objectives, and policies of the State Comprehensive Plan and the Strategic Regional Policy Plan of the relevant Regional Planning Council. The Act requires that local land development regulations be consistent with and implement the goals, objectives, and policies of the adopted comprehensive plan. It also requires that land development be consistent with the adopted plan.

A local government's comprehensive plan must incorporate various elements potentially relevant to protecting springs and springsheds. Four of the most pertinent elements are: a Future Land Use Element; a Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Recharge Element; a Conservation Element; and an Intergovernmental Coordination Element.

The Future Land Use element must include protections for potable water wellfields and protection of environmentally sensitive lands. The Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Recharge Element requires identification of natural drainage features/groundwater recharge areas, assessment of current land use regulations related to these issues, and objectives and policies for implementation of land use regulation to protect drainage and recharge functions. The Conservation Element must identify natural resources, including groundwater, and incorporate objectives and policies to conserve such resources. Finally, the Intergovernmental Coordination Element requires analysis of current intergovernmental coordination, specific objectives for future coordination, and policies addressing each objective. Coordination also must exist to adequately account for springs protection during water supply planning and under water management district regulatory programs. Sources of water supply adequate to provide for planned growth must be identified.

Local governments must evaluate and update their comprehensive plans every seven years. This evaluation includes consideration of water management district regional water supply plans and major groundwater issues. Water management districts, the Department of Environmental Protection (DEP), and DCA all have an opportunity to comment on draft evaluations of local government comprehensive plans, thus giving them a chance for input to help protect springs.

In addition to comprehensive planning, the Florida Legislature has adopted laws permitting the designation of certain areas as “areas of critical state concern” in order to promote protection of and reverse deterioration of water resources in those areas. The statute authorizing areas of critical state concern specifically refers to environmental resources and aquifer recharge areas. While designation as an area of critical state concern could help preserve springs, only five percent of the state can be so designated, thus limiting the usefulness of this tool in its current form.

D. State Preemption

State statutes expressly preempt local government authority to regulate in several areas. For example, agricultural activities do not fall within the scope of “development” for the purposes of comprehensive plans. Local governments may not enforce new regulations for agricultural activities already regulated by or subject to best management practices promulgated by DEP, the Department of Agriculture and Consumer Services (DACS), a water management district, or a federal entity. Thus, while agriculture poses serious threats to springs and springsheds in many areas of the state, counties and municipalities have limited authority to improve their regulation of agricultural practices.

One potential area of preemption relates to the establishment of local pollution control programs, which must be approved by DEP. Current law is unclear as to which local government laws constitute a “local pollution control program” and thus require DEP approval. DEP asserts that it need not approve local government regulations that may affect pollution if the regulation does not form part of a local pollution control program, the local government has not requested a delegation of authority from DEP, and DEP and the local government have no current delegation agreement. It remains unclear whether the courts will follow this same approach and allow local governments to regulate sources of pollution even if DEP does not consider the regulation part of a delegation or a local pollution control program.

Another area in which local governments cannot regulate due to preemption by the state is the consumptive use of water. That authority is vested exclusively in DEP and the water management districts. Consumptive use permits may only be granted if the proposed use does not interfere with existing legal uses of water, is a reasonable-beneficial use, and is consistent with the public interest. The criteria for these conditions are located in the districts’ rules and include criteria enabling the districts to protect the quantity of water discharged by springs by denying or

imposing conditions on consumptive use permits. The districts also have authority to impose additional restrictions on current consumptive use permits if a water shortage threatens serious harm to water resources. Additional tools the districts have at their disposal for springs protection include minimum flows and levels (MFLs) and reservations of water. MFLs could play a significant role in protecting the flow of springs by providing the basis for denying consumptive use permits that would diminish spring flow below the MFL, which is designed to protect water resources from significant harm. Finally, the districts can “reserve” water for the protection of fish and wildlife or the public health and safety. The reserved water cannot be granted to users by a consumptive use permit. Use of reservations could serve as a better tool for springs protection than MFLs since a reservation does not require a determination of what constitutes “significant harm” to the water resources. MFLs and reservations must be considered in developing regional water supply plans. Local government water supply plans must be consistent with regional water supply plans and must include specific plans for water supply projects.

The water management districts also have authority to regulate the placement and design of buildings, roads, parking lots, ditches, and other activities affecting surface waters through the issuance of Environmental Resource Permits (ERP). Mitigation is often required to offset the unavoidable impacts of development pursuant to ERP permits. While local government authority over mitigation is preempted in several ways, local governments may still exercise many concurrent powers with the districts to improve water quality and protect springs. For example, local governments may usually require greater stormwater retention than the water management district in order to improve the quality of discharged water.

A final preemption issue emerges with regard to septic tanks. The Department of Health has exclusive authority to approve and permit septic systems. This authority, however, does not prevent local governments from imposing more stringent performance standards to protect the environment and groundwater from excessive nitrates discharged by septic systems.

E. Constitutional Limitations on Land Use Regulation

The United States Constitution, in amendments V and XIV, forbids the taking of private property for a public use without just compensation or without due process of law. U.S. Supreme Court precedent has expanded the idea of a taking from physical appropriation of land to include regulation of land use in some instances. A taking that results from regulation is called inverse condemnation. Takings law in general seeks to find a balance between honoring private property rights and protecting the common good by regulation of what property owners may do with their land or on their land. Only two types of actions clearly lead to a finding of inverse condemnation. The first occurs when the government itself physically invades the property without permission or permits another to do so. The second

occurs when government regulation eliminates all economically viable use of the property. Regulation, however, seldom removes all economically viable use of land. Furthermore, there are exceptions. All economically viable use of land may be prohibited if that use would constitute a nuisance or is prohibited by underlying principles of property law.

Most cases, however, fall outside of these two categories of inverse condemnation. Thus, in the majority of cases, the test is whether the regulation goes “too far”. This “test” is an ad hoc factual inquiry by the reviewing court. While no hard and fast rules exist for this test the U.S. Supreme Court has identified various factors to consider in determining if a questioned regulation has gone “too far”. These include the character of the government action, the economic impact of the regulation, and the extent to which the action interferes with the reasonable investment-backed expectations of the property owner.

Character of the government regulation refers to how the government is regulating. As noted above, if the government physically invades the land or allows a member of the public to do so, a taking occurs. Courts appear more likely to find a taking as well if the regulation eliminates a substantial property right such as the right to use or possess or dispose of the property.

The economic impact of the regulation relates to how much the regulation diminishes the value of the land. Courts determine this by looking to the land’s value before and after imposition of the challenged regulation. As noted, in the unusual case that all economically viable use of the land is destroyed, a taking will be found.

Finally, the consideration of reasonable investment-backed expectations involves an inquiry into whether the owner retains uses that were reasonably expected to be available for the property and for which the owner paid when purchasing the land. This factor usually makes it difficult for a landowner to challenge regulations that affected the value of uses of the property before the landowner took possession of the property.

F. Bert J. Harris, Jr. Private Property Rights Protection Act

The Bert J. Harris, Jr. Private Property Rights Protection Act (Act) reflects the judgment of the Florida Legislature that takings jurisprudence under the U.S. and Florida constitutions did too little to protect private property and placed too much of the burden of regulation for the common good on private property owners. The Act thus specifically seeks to create a separate and distinct cause of action from takings law.

Local government regulations intended to control the negative environmental impacts of development in sensitive ecological areas could give rise to claims under

the Act, since the Act applies to any law, regulation, or rule noticed for adoption or adopted after May 11, 1995. The Act requires compensation to landowners for regulations that “inordinately burden” property. The remedy for the landowner may include compensation for the actual loss to the fair market value of the land resulting from the government regulation.

The Act contains a settlement procedure before a property owner can bring suit for the government action in question. The procedure requires that the property owner give notice to the government entity imposing the regulation along with a property appraisal to support the claim of “inordinate burden”. The government entity then must make a settlement offer, after which an unsatisfied property owner may file suit in circuit court.

Judicial interpretation of key terms in the Act has so far been minimal. Thus, at this time, it remains difficult to predict what facts or economic impacts might lead to a government action losing in a claim under the Act. While few claims have made it to circuit court, many claims under the Act have been filed and settled before going to court. Thus, the Act presents a possible cost in legal and settlement expenses for local governments even for those cases that never reach the courtroom.

Open space requirements, prohibitions on development in some sensitive areas, and mandatory transfer of development right programs represent some of the regulations most likely to provoke Bert Harris and constitutional taking claims. Constitutional takings claims can usually be avoided in most of these areas by ensuring that landowners retain some development right on the property or the property as a whole retains some significant value. It is, however, much more difficult to predict whether claims under the Bert Harris Act will result in substantial costs to local governments. In any case, the Act specifically allows that settlement offers to aggrieved landowners may include, among others, such things as modifications to permits or development densities, land swaps, transfer of development rights, and variances or special exceptions.

G. Transfer of Development Rights

One planning tool is the transfer of development rights (TDR). Some local governments in Florida have implemented this technique to protect coastal islands, rural lands, wetlands, and other important lands. This section provides an overview of the legal basis for the TDR. A more detailed legal analysis is provided in the Transfer of Development Rights section of this appendix. Additional discussion of TDRs in Florida is provided in Appendix A.1.

Transfer of development rights programs developed in response to a desire to give landowners the value of potential development on their land while not permitting the development. TDR programs accomplish this by separating the development rights of property from the physical location of the property and allowing the

property owner to transfer those development rights to another parcel. Florida law encourages the use of TDRs as a growth management tool. TDR programs can serve a crucial role both in preventing takings claims and eliminating, settling, or ameliorating claims under the Bert Harris Act.

In the past many TDR programs have failed to live up to their great theoretical potential. If there is insufficient demand for the TDR credits granted to property owners in lieu of development of their own property, then those credits will lack value. If a landowner has no right or an extremely limited right to develop the landowner's property and the TDR credits granted in place of such development rights have little or no value, a takings claim or Bert Harris claim will likely arise, and those claims are more likely to be successful.

Local government should emphasize a cautious market approach to TDR program design in order to ensure that TDR credits have value and that the credits to a particular landowner appropriately reflect the value and environmental sensitivity of the land protected by the TDR program.

II. Local Government Authority

A. General Authority

The Florida Constitution provides for three kinds of general local governments: charter and non-charter counties and municipalities. Non-charter counties have the most limited constitutional authority; they can act within the scope of whatever authority is delegated by the Legislature.² Counties with an approved charter³ and municipalities⁴ have home-rule authority. Although the constitutional wording differs for each, they generally have all the powers of the state needed for self-government except as limited by statutes. The Florida Legislature has essentially extended similar powers of home-rule to municipalities and both classes of counties.⁵ Local governments generally have the same regulatory power to protect springs as the state does. A local government can regulate in areas not addressed by state legislation, or may regulate concurrently with the state, adopting stricter standards it deems locally warranted. Local regulation cannot, however, conflict with state statutes. The superior authority of the state legislature will preempt conflicting local regulations.

² FLA. CONST. art. VIII, §(1)(f).

³ FLA. CONST. art. VIII, §(1)(g). State *ex rel.* Dickinson v. Volusia Cty, 269 So.2d 41 (Fla. 1972).

⁴ FLA. CONST. art. VIII, §(2)(b).

⁵ FLA. STAT. §§ 125.01(1)(j), 166.021 (2006).

B. Preemption by the State

The authority of local governments is subject to limitation by the Legislature in one of two ways. The Legislature may expressly preempt local governments from regulating in a particular area, or preemption may be implied “where the legislative scheme is so pervasive as to evidence an intent to preempt the particular area, and where strong public policy reasons exist for finding such an area to be preempted by the Legislature.”⁶ Preemption is not favored. The First District Court of Appeal has stated that, “[t]he courts should be careful in imputing an intent on behalf of the Legislature to preclude a local elected governing body from exercising its home rule powers.”⁷ Preemption is limited to the “the specific area where the Legislature has expressed their will to be the sole regulator.”⁸ Local governments can legislate concurrently with the state, but cannot conflict with state law.⁹ A conflict arises where the local government prohibits what the Legislature has “expressly licensed, authorized or required” or authorizes “what the legislature has forbidden.”¹⁰ The courts will give deference to the interpretation of the state agency charged with implementing a law regarding whether it preempts local authorities.¹¹

In summary, this means that local governments may not regulate a subject area at all if the state has expressly preempted the area. A local government may, however, impose stricter regulations if the state has neither expressly nor implicitly preempted the area and the local government’s regulation does not conflict with state regulation.

III. Florida Growth Management Growth Management Framework

Florida has a system of growth management that relies primarily on the development and implementation of local comprehensive plans, with limited state oversight. Florida has an adopted State Comprehensive Plan¹² and requires the state’s eleven regional planning councils¹³ to adopt Strategic Regional Policy Plans.¹⁴ For land use regulation in a few areas, primarily in designated Areas of

⁶ Tallahassee Mem’l Reg’l Med. Ctr. v Tallahassee Med. Ctr., 681 So. 2d 826, 831 (Fla. 1st DCA 1996).

⁷ *Id.*

⁸ *Id.*

⁹ Thomas v. State, 614 So. 2d 468, 470 (Fla. 1993).

¹⁰ *Id.* at 470, quoting Rinzler v. Carson, 262 So.2d 661, 668 (Fla. 1972).

¹¹ GLA and Assoc. v. Boca Raton, 855 So. 2d 278 (Fla. 4th DCA 2003).

¹² FLA. STAT. ch. 187 (2006).

¹³ FLA. STAT. § 186.50 (2006).

¹⁴ FLA. STAT. §§ 186.507-186.511(2006).

Critical State Concern,¹⁵ the state plays a significantly stronger role. The state and regional agencies have also historically played a significant role in regulating certain large developments known as Developments of Regional Impact (DRI).¹⁶ For most purposes, however, the duty of growth management falls on local governments.

Florida's State Comprehensive Plan¹⁷ establishes broad goals and policies to provide guidance for state agencies,¹⁸ Strategic Regional Policy Plans,¹⁹ and local government comprehensive plans.²⁰ The State Comprehensive Plan includes several goals and policies that support the protection of groundwater and springs. The following sections are particularly relevant: Water Resources,²¹ Natural Systems and Recreational Lands,²² and Land Use.²³

1. Areas of Critical State Concern

One option for increasing the level of state involvement in land use decisions affecting springs would be to designate certain springs and their springsheds as Areas of Critical State Concern (ACSC). Under the Florida Environmental Land and Water Management Act (FELWMA),²⁴ the Department of Community Affairs (DCA), serving as the state land planning agency,²⁵ may from time to time

¹⁵ FLA. STAT. § 380.05 (2006).

¹⁶ Fla. Stat. § 380.06 (2006).

¹⁷ Fla. Stat. ch. 187 (2006).

¹⁸ FLA. STAT. § 186.008(4)(5)(2006). Interpretation of the plan is limited by the terms of the adopting statute. FLA. STAT. § 187.101 (2006). The State Comprehensive Plan does not create new regulatory authority and may be implemented only to the extent resources are allocated. The plan must be construed and applied as a whole, only if it is reasonable, economically and environmentally feasible, not contrary to the public interest, and consistent with the protection of private property rights. *Id.*

¹⁹ Fla. Stat. § 186.508(1) (2006).

²⁰ Local governments are required to “address” relevant plans and policies of the state comprehensive plan but have sole discretion to determine the extent of implementation through expenditures in any given year. FLA. STAT. § 163.3177(10)(b) (2006).

²¹ FLA. STAT. § 187.201(7) (2006). The goal states “Florida . . . shall maintain the functions of natural systems and the overall present level of surface and ground water quality. Florida shall improve and restore the quality of waters not presently meeting water quality standards.”

²² FLA. STAT. § 187.201(9) (2006). “Florida shall protect . . . unique natural habitats and natural systems.”

²³ FLA. STAT. § 187.201(15) (2006).

²⁴ FLA. STAT. § 380.05 (2006).

²⁵ FLA. STAT. § 380.03(18) (2006).

recommend to the Administration Commission²⁶ that specific geographic areas be designated areas of critical state concern.²⁷ The purpose of the program is to:

protect the natural resources and environment of this state as provided in s. 7, Art. II of the State Constitution, ensure a water management system that will reverse the deterioration of water quality and provide optimum utilization of our limited water resources, facilitate orderly and well-planned development, and protect the health, welfare, safety, and quality of life of the residents of this state.²⁸

Before an Areas of Critical State Concern can be designated, a Resource Planning and Management Committee must be designated²⁹. The committee must include local elected officials and planners from each affected jurisdiction, as well as appropriate state and regional agencies. The purpose of the committee is to develop "a voluntary, cooperative resource planning and management program to resolve existing, and prevent future, problems. . .³⁰" The committee has no more than 12 months to develop recommendations for a program³¹.

Once designated, ACSCs are subject to stringent state oversight of development. To guide this regulation, the DCA must include in its recommendation to the Administration Commission a report of "the dangers that would result from uncontrolled or inadequate development of the area and the advantages that would be achieved from the development of the area in a coordinated manner . . . and specific principles for guiding development within the area."³² In addition, the DCA is required to recommend actions that the local government and state and regional agencies must take to implement the principles for guiding development.³³ These

²⁶ FLA. STAT. § 380.031(1)(2006). The Administration Commission is composed of the Governor and independently elected cabinet officers, with the Governor as chairperson. FLA. STAT. §14.202 (2006). They also sit as the Florida Land and Water Adjudicatory Commission (FLWAC). FLA. STAT. §380.07(2006) The FLWAC acts as a quasi-judicial body to review appeals from orders of proposed regional development in areas of critical state concern and issue a decision granting or denying permission to develop. *Id.*

²⁷ FLA. STAT. § 380.05(1)(a) (2006). In addition, under Chapter 380.05(3), regional planning agencies designated by the state land planning agency and local governments in an area without a regional planning agency may make suggestions to the Administration Commission as to areas to be recommended.

²⁸ Fla. Stat. § 380.021 (2006).

²⁹ FLA. STAT. §380.045 (2006).

³⁰ FLA. STAT. §380.045(1) (2006).

³¹ FLA. STAT. §380.045 (3) (2006).

³² FLA. STAT. § 380.05(1)(a) (2006).

³³ *Id.*

actions may include revisions of the local comprehensive plan and adoption of land development regulations, density requirements, and special permitting requirements.³⁴ Each of these recommended actions could be employed locally to bring about springs protection. For example, if excessive development in an area threatens springs with nutrient pollution, DCA could recommend that a local government adopt measures restricting the density of development in a particularly vulnerable area or impose stricter standards for the control of stormwater runoff.

Upon receiving the DCA's recommendation, the Administration Commission must, within forty-five days, either reject the recommendation as proposed or adopt the recommendation with or without modification and, by rule, designate the area of critical state concern.³⁵ As in the DCA's recommendation, any rule promulgated by the Administration Commission to designate an area of critical state concern must contain statutorily specified information, including principles for guiding development,³⁶ and a precise checklist of actions which, when implemented, will result in repeal of the designation by the Administration Commission.³⁷ The ultimate goal is implementation of principles sufficient to eventually allow the removal the designation.³⁸

As a final level of state oversight, a rule adopted by the Administration Commission designating an area of critical state concern and principles for guiding development must be submitted to the President of the Senate and the Speaker of the House of Representatives for review no later than 30 days prior to the next regular session of the Legislature.³⁹ The Legislature may then reject, modify, or take no action relative to the adopted rule.⁴⁰ Because the Legislature, independent of the Administration Commission, has final decision-making authority, designating areas of critical state concern requires the combined political will of both the executive and legislative branches of government.

Only statutorily enumerated types of land may be designated an ACSC. Included, *inter alia*, are areas:

³⁴ Id.

³⁵ FLA. STAT. § 380.05(1)(b) (2006).

³⁶ FLA. STAT. § 380.05(1)(b)2 (2006).

³⁷ FLA. STAT. § 380.05(1)(b)4 (2006).

³⁸ However, if, after repeal of such designation, DCA determines that the administration of the local land development regulations or comprehensive plan within a formerly designated area is inadequate to protect that area, DCA may recommend to the commission that the area be re-designated. FLA. STAT. § 380.05(1)(d) (2006).

³⁹ FLA. STAT. § 380.05(1)(c) (2006).

⁴⁰ Id.

containing, or having a significant impact upon, environmental or natural resources of regional or statewide importance, including, but not limited to, state or federal parks, forests, wildlife refuges, wilderness areas, aquatic preserves, major rivers and estuaries, state environmentally endangered lands, Outstanding Florida Waters, and aquifer recharge areas, the uncontrolled private or public development of which would cause substantial deterioration of such resources.⁴¹

While these land classifications could be interpreted to include springs and springsheds, making them eligible for protection, the combined size of Florida's springs and springsheds may create an obstacle under current law. Under FELWMA, at no time may a new area of critical state concern be designated if that designation results in more than five percent of the state being so designated.⁴² There are currently five designated areas of critical state concern: Big Cypress, Green Swamp, Florida Keys, City of Apalachicola, and Key West.⁴³ In addition to the extent of existing areas of critical state concern, the combined area of just first magnitude springsheds exceeds 4.6 million acres,⁴⁴ over eight percent of Florida. Thus, in its current form, FELWMA only offers the possibility of protecting a few springs, necessitating a careful prioritization of springs and springsheds to utilize this approach.

Florida case law addressing areas of critical state concern is limited and does not appear to preclude use of FELWMA to protect springs. Though FELWMA was originally ruled an unconstitutional delegation of legislative authority,⁴⁵ subsequent

⁴¹ FLA. STAT. § 380.05(2)(a) (2006).

⁴² FLA. STAT. § 380.05(20) (2006).

⁴³ <http://www.dca.state.fl.us/fdcp/dcp/acsc/index.cfm> (visited 2-13-07). The total area of Florida is 58,560 square miles or 37,478,400 acres. Five percent of that is about 1,873,920 acres. Florida Division of Historical Resources, at <http://www.flheritage.com/facts/stats/quick/> (visited 2-13-07).

⁴⁴ Communication with Harley Means, Geologist II, Geological Investigations Section, Florida Geological Survey (Feb. 16, 2004).

⁴⁵ *Askew v. Cross Key Waterways*, 372 So.2d 913 (Fla. 1978). In *Askew*, the Florida Supreme Court invalidated the Administration Commission's designation of the Green Swamp and Florida Keys as ACSCs. At the time of the decision, section 380.05(2)(a), Florida Statutes, merely required that "[a]n area of critical state concern may be designated ... for ... An area containing, or having a significant impact upon, environmental or natural resources of regional or statewide importance." The court ruled that by failing to establish priorities to aid the Commission in deciding which areas were of critical concern, the legislature had "unconditionally delegated to an agency of the executive branch the policy function of designating the geographic area" to be subjected to that agency's development regulations. *Id.* at 920.

amendments have repaired this constitutional defect.⁴⁶ In addition, FELWMA has recently withstood a claim that its provisions constitute an unconstitutional special law.⁴⁷ Most recently, the Third District Court of Appeal ruled that FELWMA is subject to the common law standard for the vesting of development rights: namely that vested rights to develop in an area of critical state concern are only established if the land was platted prior to its designation, and if property owner has, in good faith reliance upon section 380.05(18), F.S.,⁴⁸ made such a substantial change in position that it would make it highly inequitable to interfere with the acquired right.⁴⁹ Thus, subject to the limitations of already-vested development rights, there is no case law suggesting that FELWMA could not be used to protect Florida's springs.

A. Local Government Comprehensive Planning and Land Development Regulation Act

Florida's Local Government Comprehensive Planning and Land Development Regulation Act⁵⁰ (hereinafter "Growth Management Act") establishes an integrated planning process to promote orderly development and regulates impacts to environmental resources. The Growth Management Act requires that local governments adopt comprehensive plans that are "consistent"⁵¹ with the goals, objectives and policies of the State Comprehensive Plan⁵² and the Strategic Regional Policy Plan of the relevant Regional Planning Council. Criteria for the

⁴⁶ In 1979, the legislature responded to *Askew* by amending section 380.05(2) to provide more detailed criteria for the designation of areas of critical state concern, and to require legislative approval of the designation. FLA. STAT. § 380.05(1)(c) (1979). *See also* Rathcamp v. Dep't of Cmty. Affairs, 740 So. 2d 1209, 1209 (Fla. 3rd DCA, 1999)(holding that section 380.0552(7), F.S., giving DCA the power to restrict rental periods in an area of critical state concern, was not an unconstitutional delegation of legislative authority to an administrative agency).

⁴⁷ *Schrader v. Florida Keys Aqueduct Authority*, 840 So.2d 1050 (Fla. 2003). In *Schrader*, the issue was whether a state law (i.e. FELWMA) authorizing local governments in Monroe County, and only Monroe County, to pass wastewater laws more restrictive than those provided for under general law is a special law. *Id.* at 1055.

⁴⁸ Section 380.05(18) states "[n]either the designation of an area of critical state concern nor the adoption of any regulations for such an area shall in any way limit or modify the rights of any person to complete any development that has been authorized."

⁴⁹ *Monroe County v. Ambrose*, 2003 WL 22900537 (Fla. 3rd DCA 2003).

⁵⁰ FLA. STAT. ch. 163, Pt. II (2006).

⁵¹ Consistency of the local comprehensive plan with the state comprehensive and the strategic regional policy plan exists if the local plan is compatible with and furthers those plans. It is "compatible" if it does not conflict and it "furthers" a plan if it takes "action in the direction of realizing" the goal or policies of the plan. FLA. STAT. § 163.3177(10)(b) (2006). Consistency with regional water supply plans is also effectively required. FLA. STAT. §3177(6)(2006).

⁵² FLA. STAT. ch. 187 (2006).

review of comprehensive plans and plan amendments have been adopted by the Florida Department of Community Affairs.⁵³ The Act requires the adoption of local land development regulations that are consistent with and help implement the goals, objectives and policies of the adopted comprehensive plan.⁵⁴ It also requires that land development be consistent with the adopted plan.⁵⁵ Equally or more importantly, capital facilities must be provided concurrently with development⁵⁶.

B. The Content of Local Government Comprehensive Plans

The Growth Management Act requires local governments to prepare or amend comprehensive plans, which include a number of required and optional elements related to the orderly growth of the local jurisdiction.⁵⁷ The elements of the comprehensive plan must be consistent with each other and the plan must be financially feasible. Rule 9J-5 of the Florida Administrative Code has been adopted by DCA to implement the Act. In addition to the comprehensive plan, each county and municipality must adopt or amend land development regulations⁵⁸ that include provision for protection of potable water wellfields⁵⁹ and for protection of environmentally sensitive lands.⁶⁰

One very important set of requirements relates to the sufficiency of the data and analysis supporting the plan. The Growth Management Act and Rule 9J-5 require the elements to be based on “relevant and appropriate data” and analyses.⁶¹ Data must be “the best available existing data” from “professionally accepted existing sources.” All analyses must meet “professionally accepted standards.”⁶² DCA cannot determine that one methodology is better than another and cannot require original data collection.⁶³ To the extent that DEP, USGS or the water management districts have identified springsheds, conduits, areas of aquifer vulnerability, water quality degradation, etc., local governments may be required to base their comprehensive plans on that data if they are the best available.

⁵³ Fla. Admin. Code r. 9J-5.

⁵⁴ Fla. Stat. § 163.3202 (2006).

⁵⁵ FLA. STAT. §§ 163.3161, 163.3194(1)(a), 3 (2006).

⁵⁶ FLA. STAT. §§ 163.3180, 3202(2)(g) (2006); FLA. ADMIN. CODE r. 9J-5.0055.

⁵⁷ Fla. Stat. § 163.3177 (2006).

⁵⁸ Fla. Stat. § 163.3202(1) (2006).

⁵⁹ Fla. Stat. § 163.3202(2)(c) (2006).

⁶⁰ Fla. Stat. § 163.3202(2)(e) (2006).

⁶¹ FLA. STAT. §§ 163.3177(8), 163.3177(10)(e) (2006); FLA. ADMIN. CODE r. 9J5-.005(2).

⁶² *Id.*

⁶³ FLA. STAT. § 163.3177(10)(e) (2006).

The DCA may not require a local government's comprehensive plan to duplicate or exceed a permitting program that a federal, state or regional agency has implemented, nor may the DCA require implementation of such a permitting program in the local government's land development regulations.⁶⁴ When the DCA provides assistance to local governments regarding their comprehensive plans, it must consider several factors, including the existence of natural resource features such as groundwater recharge areas and water wells.⁶⁵

The required elements of a local comprehensive plan⁶⁶ most relevant to groundwater and springs protection are:

- Future Land Use Element;
- Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge Element;
- Conservation Element;
- Intergovernmental Coordination Element
- Future Land Use Element⁶⁷

The future land use element must generally designate future land use patterns.⁶⁸ The existing land use map must show existing and planned public potable water wells and wellhead protection areas.⁶⁹ The element must also, for each objective, contain policies that address implementation activities for protection of potable water wellfields by designation of appropriate activities and land uses within wellhead protection areas and environmentally sensitive land.⁷⁰ The future land use element must contain objectives that ensure the protection of natural resources.⁷¹ In addition, the land use plan should discourage urban sprawl. An indicator of a plan's failure to discourage such sprawl is that natural resources, including natural groundwater aquifer recharge areas and environmentally sensitive areas, are not adequately protected.⁷²

⁶⁴ FLA. ADMIN. CODE r. 9J-5.001(5).

⁶⁵ FLA. ADMIN. CODE r. 9J-5.002(2)(c).

⁶⁶ FLA. STAT. § 163.3177 (2006).

⁶⁷ FLA. STAT. § 163.3177(6)(a) (2006). FLA. ADMIN. CODE r. 9J-5.006.

⁶⁸ FLA. ADMIN. CODE r. 9J-5.006.

⁶⁹ FLA. ADMIN. CODE r. 9J-5.006(1)(b)1.

⁷⁰ FLA. ADMIN. CODE r. 9J-5.006(3)(c)6.

⁷¹ FLA. ADMIN. CODE r. 9J-5.006(3)(b)4.

⁷² FLA. ADMIN. CODE r. 9J-5.006(5)(g)4.

- Sanitary Sewer, Solid Waste, Drainage, Potable Water and Natural Groundwater Aquifer Recharge Element⁷³

This plan element must contain objectives addressing conservation of potable water resources⁷⁴ and protection of functions of natural groundwater recharge areas and natural drainage features, with high recharge and prime recharge areas receiving a level of protection commensurate with their significance to natural systems or status as current or future sources of potable water.⁷⁵ The element must also contain policies for each objective addressing implementation activities for regulating land use and development to protect the functions of natural drainage and natural groundwater aquifer recharge areas.⁷⁶

This element is also intended to provide for necessary public facilities and services correlated to future land use projections.⁷⁷ The data and analysis requirements most relevant to springs protection include:

- Identification of major natural drainage features and natural groundwater aquifer recharge areas⁷⁸
- Identification and assessment of existing regulations and programs that govern land use and development of natural drainage features and groundwater recharge areas⁷⁹
- Identification of potable water facilities,⁸⁰ including the operational entity responsible, the service area, the design capacity, current demand on capacity, and level of service currently provided by the facility.⁸¹

Recent amendments strengthened the requirements to plan for potable water supply. Local plans must be consistent with regional water supply plans adopted by water management districts and include in this element a ten-year work plan for the facilities needed to meet the water supply needs of both existing and new

⁷³ FLA. STAT. § 163.3177(6)(c) (2006). FLA. ADMIN. CODE r. 9J-5.011.

⁷⁴ FLA. ADMIN. CODE r. 9J-5.011(2)(b)4.

⁷⁵ FLA. ADMIN. CODE r. 9J-5.011(2)(b)5.

⁷⁶ FLA. ADMIN. CODE r. 9J-5.011(2)(c)4.

⁷⁷ *Id.*

⁷⁸ FLA. ADMIN. CODE r. 9J-5.011(1)(g).

⁷⁹ FLA. ADMIN. CODE r. 9J-5.011(1)(h).

⁸⁰ FLA. ADMIN. CODE r. 9J-5.011(1)(d).

⁸¹ FLA. ADMIN. CODE r. 9J-5.011(1)(e)1-5.

development.⁸² Maps showing existing and planned waterwells and cones of influence from such wells must also be included.⁸³

- Conservation Element⁸⁴

This element seeks to promote conservation, use and protection of natural resources.⁸⁵ The local government must identify and analyze natural resources including groundwater.⁸⁶ The local government must also identify current and projected water needs and sources (for the next 10-year period), taking into consideration existing levels of water conservation, use and protection.⁸⁷ The element must contain objectives that address conservation, appropriate use and protection of the quality and quantity of current and projected water sources.⁸⁸ The element needs to contain policies for each objective addressing implementation activities for protection of water quality by restricting activities and land uses known to adversely affect the quality and quantity of identified water sources (including natural groundwater recharge areas, wellhead protection areas and surface waters used as a source of public water supply).⁸⁹

- Intergovernmental Coordination Element⁹⁰

This element is intended to identify and resolve incompatible goals, objectives, policies and development proposed in local government comprehensive plans and to deal with the need for coordination processes and procedures.⁹¹ Intergovernmental coordination can involve areas of concern for municipalities and their adjacent municipalities, the county and counties surrounding the municipality, and areas of concern for counties, their included municipalities, and their adjacent counties and municipalities.⁹² The element must have an analysis of existing coordination mechanisms, including intergovernmental agreements,⁹³ and proposed growth and

⁸² FLA. STAT. §§163.3177(6)(c),(d) .3191(2)(1) (2006). Reporting to the district is also required.

⁸³ FLA. STAT. § 163.3177(6)(d)1 (2006).

⁸⁴ FLA. STAT. § 163.3177(6)(d) (2006). FLA. ADMIN. CODE r. 9J-5.013.

⁸⁵ Fla. Admin. Code r. 9J-5.013.

⁸⁶ FLA. ADMIN. CODE r. 9J-5.013(1)(a)1.

⁸⁷ FLA. ADMIN. CODE r. 9J-5.013(1)(c).

⁸⁸ FLA. ADMIN. CODE r. 9J-5.013(2)(b)2.

⁸⁹ FLA. ADMIN. CODE r. 9J-5.013(2)(c)1.

⁹⁰ FLA. STAT. § 163.3177(6)(h) (2006). FLA. ADMIN. CODE r. 9J-5.015.

⁹¹ Fla. Admin. Code r. 9J-5.015.

⁹² FLA. ADMIN. CODE r. 9J-5.015(1).

⁹³ FLA. ADMIN. CODE r. 9J-5.015(2)(a).

development in the area of concern.⁹⁴ The element must also have a goal statement establishing one or more specific objectives⁹⁵ of the intergovernmental coordination activities.⁹⁶ The specific objectives can ensure that local governments coordinate to address the impacts of development, proposed in the comprehensive plan, upon adjacent municipalities, the county, adjacent counties, the region, and in the state.⁹⁷ In addition, the element must contain one or more policies for each objective addressing 1) the coordination of planning activities with other local governments,⁹⁸ 2) review of the relationship of proposed development of the area to the existing comprehensive plans of adjacent local governments⁹⁹ and, 3) review of development proposed in the comprehensive plan.¹⁰⁰

C. Adoption, Amendment and Update of Plans

Because every local government in Florida has an approved local comprehensive plan, the focus of implementation is now on amendments and updates. Plans may be periodically amended, and future land use maps (FLUMs) often are amended to accommodate proposed development. Amendments must be consistent with the local plan and otherwise meet all of the compliance criteria identified in Section 163.3184(1)(b), Florida Statutes.

Every local government is required to prepare an evaluation and appraisal report (EAR) at least once every seven years and revise the comprehensive plan based on that analysis.¹⁰¹ The EAR must include consideration of “major issues” as determined by the local government with input from state and regional agencies as well as adjacent local governments and the public.¹⁰² This gives DCA, DEP, the water management districts and other state agencies the opportunity to provide data and analysis regarding issues of groundwater depletion or contamination, spring flows, quality of recharge water and spring discharge water for local government consideration in determining whether they are “major issues” and thus need to be addressed by the EAR. The EAR must consider the appropriate water management district’s water supply plan as well as evaluate the potable water

⁹⁴ FLA. ADMIN. CODE r. 9J-5.015(2)(c).

⁹⁵ FLA. ADMIN. CODE r. 9J-5.015(3)(b).

⁹⁶ FLA. ADMIN. CODE r. 9J-5.015(3)(a).

⁹⁷ FLA. ADMIN. CODE r. 9J-5.015(3)(b)2.

⁹⁸ FLA. ADMIN. CODE r. 9J-5.015(3)(c)1.

⁹⁹ FLA. ADMIN. CODE r. 9J-5.015(3)(c)5.

¹⁰⁰ FLA. ADMIN. CODE r. 9J-5.015(3)(c)7.

¹⁰¹ FLA. STAT. § 163.3191 (2006).

¹⁰² FLA. STAT. § 163.3191(1)(c) (2006).

element's ten year work plan for providing necessary potable water facilities.¹⁰³ The EAR must be submitted to the Florida Department of Community Affairs (DCA) to review for sufficiency. If a local government fails to submit an EAR when required, the local government may not amend its comprehensive plan.¹⁰⁴ Plan amendments are also prohibited beginning one year after a determination by DCA that a submitted EAR is insufficient.¹⁰⁵ The plan must be revised within 18 months of submitting a sufficient EAR.

Local governments first submit plan amendments to the DCA for review.¹⁰⁶ DCA then sends to the local government an Objections, Recommendations and Comments (ORC) report, including comments from relevant agencies. The local government then adopts the plan or plan amendment by ordinance and sends it to DCA for a formal determination of whether it is in compliance with the Act. If DCA determines the plan is out of compliance. The plan amendment is sent to the Division of Administrative Hearings (DOAH) for a hearing. The state land planning agency and the local government may enter into a compliance agreement.¹⁰⁷ The local government's determination that the plan is in compliance is presumed to be correct. The determination will be sustained unless by a preponderance of evidence it is shown that the plan is not in compliance.¹⁰⁸

If DCA determines the amendments to be in compliance, a hearing may be demanded by citizens with legal standing. The local plan or amendment will be found in compliance if the local government's determination of compliance is fairly debatable.¹⁰⁹

The hearing results in a recommended order from the Administrative Law Judge (ALJ), which is transmitted to DCA if the initial finding was that the amendment is "in compliance." DCA can issue a final order determining the plan is in compliance but only the Governor and Cabinet can issue a final order determining the plan is out of compliance. If the initial finding was that the amendment is not "in compliance," the Recommended Order is transmitted to the Governor and Cabinet

¹⁰³ FLA. STAT. § 163.3191(1)(l) (2006).

¹⁰⁴ FLA. STAT. § 163.3187(6)(a) (2006). There are exceptions for Developments of Regional Impact and ports. *Id.*

¹⁰⁵ FLA. STAT. § 163.3187(6)(b) (2006).

¹⁰⁶ FLA. STAT. § 163.3184(15)(a)(2006). Small scale plan amendments are exempt from review by DCA, FLA. STAT. § 163.3187(1)(c)(2006), but may be challenged by affected persons. FLA. STAT. § 163.3187(3)(a)(2006).

¹⁰⁷ FLA. STAT. § 163.3184(16) (2006).

¹⁰⁸ FLA. STAT. § 163.3184(10)(a) (2006).

¹⁰⁹ FLA. STAT. § 163.3184(9)(a) (2006).

for a Final Order. A local government may refuse to bring the plan into compliance, but significant financial sanctions may be levied by the Governor and Cabinet.

D. Adoption of Land Development Regulations

The Growth Management Act requires that within one year of the date it submits its comprehensive plan for review by the DCA, a local government must adopt or amend and enforce land development regulations (LDR) that are consistent with and implement the goals, objectives and policies of the comprehensive plan.¹¹⁰ The Act encourages “the use of innovative LDRs which include provisions such as transfer of development rights and performance zoning.¹¹¹ Thus the provisions of the plan that relate to groundwater and springs protection may be further implemented by LDRs. The Act requires that any existing LDR that is not consistent with the plan must be amended so as to be consistent. Once LDRs are adopted, citizens who are “substantially affected persons” have twelve months to challenge LDRs as inconsistent with the comprehensive plan.¹¹²

DCA may require a local government to submit to DCA one or more land development regulations if DCA has reasonable grounds to believe that a local government has totally failed to adopt land development regulations required by statute.¹¹³ DCA and the local government then enter into a review and consultation process.¹¹⁴ If, after review and consultation, the DCA determines that a local government has not adopted or amended the required land development regulations, it may file suit in circuit court to require adoption of the regulations.¹¹⁵

E. Consistency of Development Orders

Development orders¹¹⁶ must also be consistent with the adopted plan. Citizens who

¹¹⁰ FLA. STAT. §163.3194, .3202 (2006).

¹¹¹ FLA. STAT. § 163.3202(3) (2006); FLA. ADMIN. CODE r. 9J-5.022 (1) and 9J-5.006(5)(1)(clustering and open space provisions encouraged to discourage urban sprawl).

¹¹² FLA. STAT. § 163.3213 (2006).

¹¹³ FLA. STAT. § 163.3202(4) (2006). Ordinarily such awareness on the part of DCA would only arise due to a citizen complaint since DCA does not typically review land development regulation adoption or lack thereof by local governments.

¹¹⁴ Id.

¹¹⁵ Id.

¹¹⁶ Development orders are action by local government granting, denying or granting with conditions a development permit, defined as any official action “having the effect of permitting the development of land.” FLA. STAT. § 163.3164(7) (2006). Development permits include building or zoning permits, rezonings, subdivision approvals, special exceptions, variances and certifications. FLA. STAT. § 163.3164(8) (2006).

are “aggrieved or adversely affected” can challenge development orders in circuit court as inconsistent with the adopted plan.¹¹⁷ Development orders themselves can only be issued through a quasi-judicial process that provides procedural due process.¹¹⁸ Courts strictly scrutinize development orders for consistency with the plan.¹¹⁹ To be consistent, the permitted development must be “compatible with and further the objectives, policies, land uses, and densities or intensities in the comprehensive plan.”¹²⁰

F. Joint Planning and Intergovernmental Coordination

Many springsheds encompass parts of more than one local jurisdiction. Effective protection of the quality and quantity of water discharged by springs thus requires a similar level of effort by all of the governments with jurisdiction over that area. The need for coordination is particularly acute where springs protection depends on the regional transfer of development rights from areas where aquifers are particularly vulnerable to areas better able to accommodate increased density or intensity of development.¹²¹ Because of the potential impacts of water supply development on spring flows, coordination with the water supply planning and consumptive use regulatory programs of the relevant water management district is also necessary.¹²²

These issues can be addressed in several ways. Local governments can enter into joint planning agreements, sometimes creating joint local planning agencies. Annexation, transfer of development rights and other issues can be addressed through such agreements. Urban service delivery agreements can be used to facilitate development of desired areas while discouraging the development of vulnerable areas or development that is not served by adequate water supply, stormwater and wastewater treatment facilities. The experience of local governments within the Wekiva springshed may be helpful. In the context of the

¹¹⁷ FLA. STAT. §163.3215 (2006).

¹¹⁸ *Snyder v. Brevard Cty.*, 627 So.2d 469 (Fla. 1993).

¹¹⁹ *Id.*

¹²⁰ FLA. STAT. § 163.3194(3)(a) (2006). *See also* *B.B.McCormick & Sons v. Jacksonville*, 559 So. 2d 252 (Fla. 1st DCA 1990); *Machado v. Musgrove*, 519 So.2d 629, 632 (Fla. 3rd DCA 1987).

¹²¹ Department of Community Affairs Recommendations to the Wekiva River Basin Coordinating Committee for Enhanced Comprehensive Planning and Land Development Regulations, 1-23, 7-10 (undated report attached to letter from Colleen M. Castille, Secretary, DCA to The Honorable Lee Constantine, Chair, Wekiva River Basin Coordinating Committee, December 8, 2003).

¹²² Mary Jane Angelo, *Integrating Water Management and Land Use Planning: Uncovering the Missing Link in the Protection of Florida’s Water Resources?*, 12 U. FLA. J.L. & PUB. POL’Y 223-249 (Spring 2001).

Wekiva Study Area, DCA has drafted model goals, objectives and policies for intergovernmental coordination on resource protection¹²³.

The authority to enter into such agreements is broad. The Florida Interlocal Cooperation Act authorizes local governments to enter into interlocal agreements with each other and with state and regional agencies regarding the joint exercise of their respective powers.¹²⁴ Municipalities and counties may jointly plan for development and growth,¹²⁵ adopt and amend comprehensive plans¹²⁶ and implement comprehensive plans.¹²⁷ Neighboring communities, particularly those sharing natural resources, are encouraged to create collective visions for greater-than-local areas.¹²⁸ Municipalities within a county or counties may also jointly exercise power.¹²⁹ In addition, the Department and a local government may enter into agreements with each other.¹³⁰

IV. State Preemption

A. Agriculture

The authority of local governments to regulate agricultural activities is expressly preempted by several statutes. The Local Government Comprehensive Planning and Land Development Regulation Act authorizes local governments to plan for and regulate “land use” and “development.” Development is defined to exclude “the use of any land for the purpose of growing plants, crops, trees, and other agricultural or forestry products; raising livestock; or for other agricultural purposes.”¹³¹ Thus, local governments may not regulate agriculture as development. Agriculture is still subject to planning regulation as a “land use,” which means that agricultural lands

¹²³ Florida Department of Community Affairs, Division of Community Planning, Model Goals, Objectives and Policies for the Wekiva Study Area, Goal 1, Objective 7, June 7, 2006. Available at <http://www.dca.state.fl.us/fdcp/DCP/wekiva/wekivaact/index.cfm> visited 2-14-07.

¹²⁴ FLA. STAT. § 163.01 (2006).

¹²⁵ FLA. STAT. § 163.3167(1)(a) (2006).

¹²⁶ FLA. STAT. § 163.3167(1)(b) (2006).

¹²⁷ FLA. STAT. § 163.3167(1)(c) (2006).

¹²⁸ FLA. STAT. § 163.3167(11) (2006).

¹²⁹ FLA. STAT. § 163.3171(3) (2006). The same authority extends to any combination of counties and municipalities.

¹³⁰ FLA. STAT. § 163.3171(4) (2006).

¹³¹ FLA. STAT. § 380.04 (2006), referred to by FLA. STAT. §163.3164(6) (2006).

are depicted on the FLUM.¹³² The protection of agriculture through planning is also a major objective of the Rural Land Stewardship Program.

The Agricultural Lands and Practices Act (ALPA)¹³³ prohibits counties from adopting regulations for regulating “an activity of a bona fide farm operation on land classified as agricultural land” for ad valorem tax purposes¹³⁴ if the activity is regulated through “implemented best management practices, interim measures or regulations” adopted by DEP, DACS or a WMD or USDA, USACOE or EPA. There are limited exceptions for emergencies,¹³⁵ wellfield protection,¹³⁶ land application of sewage sludge,¹³⁷ farm operations adjacent to homesteads or businesses established as of 1982,¹³⁸ and for certain counties.¹³⁹ The most important exception is that ALPA only prohibits the adoption of new rules; the enforcement of existing regulations is not preempted.¹⁴⁰ Most agricultural activities that might potentially impact the quality or quantity of groundwater are thus probably exempt from new regulation by counties, but are not protected against the enforcement of existing regulations. Regulation of agricultural activities by municipalities is similarly preempted by a duplicative section of the Florida Right to Farm Act.¹⁴¹

The preemption of local government authority over agricultural lands was further extended in 2006 to prohibit restrictions on their conversion to non-agricultural land uses under certain circumstances.¹⁴² Under this Act, comprehensive plan amendments for land defined as an "agricultural enclave" are presumed to be consistent with rule 9J-5.006(5) if they allow uses similar to those on adjacent

¹³² FLA. STAT. §163.3162(4)(a) (2006).

¹³³ Ch. 2003-162, Laws of Florida, codified as FLA. STAT. §163.3162 (2006). For a review of right-to-farm laws, see Terence J. Centner, Creating an "Undeveloped Lands Protection Act" for Farmlands, Forests and Natural Areas, 17 Duke Env't'l L. & Pol'y F 1 (2006).

¹³⁴ FLA. STAT. §163.3162(4) (2006). The statute fails to define a "bona fide farm operation". See David and December McSherry v. Alachua Cty. and Dept. of Community Affairs, Case No. 03-3665GM, Recommended Order, DOAH, Oct 18, 2004, ¶201.

¹³⁵ FLA. STAT. §163.3162(4)(a) (2006).

¹³⁶ Id.

¹³⁷ FLA. STAT. §163.3162 (4)(d) (2006).

¹³⁸ FLA. STAT. §163.3162 (4)(b) (2006).

¹³⁹ FLA. STAT. §163.3162 (4)(c) (2006).

¹⁴⁰ J-II Investments v. Leon Cty., 908 So. 2d 1140 (Fla. 1st DCA 2005).

¹⁴¹ FLA. STAT. § 823.14(6) (2009). Ironically, this section is entitled “Limitation on Duplication of Government Regulation.” The emphasis of the Florida Right to Farm Act is to limit the ability of neighboring landowners to seek relief for nuisances. FLA. STAT. § 823.14(2) (2006).

¹⁴² Ch. 2006-255, §2, Laws of Florida.

lands.¹⁴³ An "agricultural enclave" can be as large as 4,480 acres, provided that 75% of its perimeter is bordered by existing or proposed industrial, commercial or residential development, it is located in an unincorporated area and certain other conditions are met.¹⁴⁴ The ability of local governments in unincorporated areas to limit urban expansion into springsheds is thus compromised.

B. Pollution Control Programs

Under the Florida Air and Water Pollution Control Act (PCA),¹⁴⁵ the Department of Environmental Protection (DEP) is charged with "the power and the duty to control and prohibit pollution of air and water."¹⁴⁶ The definition of pollution includes the "alteration of the chemical, physical, [or] . . . biological integrity of water in quantities or at levels which are or may be potentially harmful or injurious . . . [to] animal or plant life . . . or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation."¹⁴⁷ Because of the potential effects, "pollution" can be interpreted to include the addition of excess nutrients to groundwater, and consequently to the water that recharges springs.

As part of its pollution control duties, the DEP is required to adopt rules to implement the provisions of the PCA,¹⁴⁸ and to "[e]xercise general supervision of the administration and enforcement of the laws, rules, and regulations pertaining to air and water pollution."¹⁴⁹ In addition, each county and municipality, or combination thereof, may establish and administer a local pollution control program if it complies with the state law.¹⁵⁰ All local pollution control programs must, among other things, provide for requirements compatible with, or stricter or more extensive than those imposed by the state¹⁵¹ and, more important to the question of preemption, be approved by the DEP as adequate to meet the requirements of the statute.¹⁵² Thus, local pollution control programs are subject to DEP approval.

¹⁴³ FLA. STAT. §163.3162(5)(2006).

¹⁴⁴ FLA. STAT. §163.3164(33)(2006).

¹⁴⁵ FLA. STAT. §§ 403.011 *et. seq.* (2006).

¹⁴⁶ FLA. STAT. § 403.061 (2006). The Pollution Control Act defines water as including "underground waters", which is in turn defined to comprise "all underground waters passing through pores of rock or soils or flowing through in channels, whether manmade or natural." FLA. STAT. Ch. 403.031(13) (2006).

¹⁴⁷ FLA. STAT. § 403.031(7) (2006).

¹⁴⁸ FLA. STAT. § 403.061(7) (2006).

¹⁴⁹ FLA. STAT. § 403.061(6) (2006).

¹⁵⁰ FLA. STAT. § 403.182 (2006).

¹⁵¹ FLA. STAT. § 403.182(1)(b) (2006).

¹⁵² FLA. STAT. § 403.182(1)(a) (2006).

While the DEP has exclusive authority under the PCA to require and issue permits, it may delegate this authority to local pollution control organizations if the DEP finds it necessary or desirable to do so.¹⁵³ In practice, the DEP does not review ordinances proposed by local governments unless (a) DEP considers the local ordinance(s) to be a local pollution control program, (b) those governments request the DEP for a delegation of authority or (c) there is a specific operating agreement entered into by the local government and DEP delegating to the local government all or part of a pollution control program, and the operating agreement requires approval.¹⁵⁴ As an example, in *Azurix North America Residuals Management, Inc. v. Desoto County*, the DEP did not consider Desoto County ordinances regulating the transportation and landspreading of sewage sludge to constitute a local pollution control program.¹⁵⁵ In the absence of either a delegation of authority from DEP to the County, or a specific operating agreement between DEP and the County, the DEP did not believe that the Desoto County ordinances required DEP approval. Thus, whether local land development regulations will require DEP approval will depend primarily on whether there is a delegation of DEP authority to the local government, an operating agreement between the local government and DEP, and whether the DEP determines the regulations constitute a local pollution control program.¹⁵⁶

Florida courts, however, may not hold the same view of Chapter 403.182 as DEP. The First District Court of Appeal appears to have interpreted Chapter 403.182 to require DEP approval for any local ordinance that regulates pollution, regardless of whether it is part of a DEP- recognized pollution control program.¹⁵⁷ In *Florida Rock*, Alachua County had proposed a Clean Air Ordinance that created requirements stricter than those required by state law.¹⁵⁸ Florida Rock, a local business whose construction of a facility would have been impacted by the ordinance, challenged the ordinance because it had not been approved by DEP.¹⁵⁹ The opinion does not indicate whether DEP had delegated authority to the local government, whether there existed an operating agreement between DEP and the

¹⁵³ FLA. STAT. § 403.182(2) (2006).

¹⁵⁴ Affidavit of Betsy Hewitt, Deputy General Counsel for, and authorized to testify on behalf of, DEP, given in *Azurix North America Residuals Management, Inc. v. Desoto County*, Case No. 2:01-cv-428-FTM-29DNF (M.D. Fla. 2001).

¹⁵⁵ *Id.*

¹⁵⁶ *Id.* There is, however, no published opinion in *Azurix*, so it is unknown whether the court upheld DEP's position that the ordinances did not require DEP approval.

¹⁵⁷ *See Florida Rock Industries v. Alachua County*, 721 So.2d 741, 743 (Fla. 1st DCA, 1998).

¹⁵⁸ *Id.* at 742.

¹⁵⁹ *Id.*

local government requiring DEP approval, or whether DEP considered the Clean Air Ordinance to be a local pollution control program.¹⁶⁰ The court merely states “[a] plain reading of section 403.182 establishes that this ordinance may not, either standing alone or as part of a local pollution program, be effective in the absence of approval from DEP.”¹⁶¹ Absent a discussion of the specifics of the relationship between DEP and Alachua County, this holding indicates that the court could consider any local ordinance that regulates pollution to require DEP approval.

This narrow interpretation by the court of the authority of local governments to regulate activities involving “pollution” contrasts markedly with DEP’s interpretation that local governments have very broad authority to regulate pollution without explicit DEP approval. If the interpretation in *Florida Rock* is applied broadly, then many land development regulations intended to prevent water quality degradation or other forms of “pollution” may be invalid and many of the provisions of the Local Government Comprehensive Planning and Land Development Regulation Act would seem meaningless. Such a result would not be consistent with legislative intent. A future court deciding the validity of local springs protection regulations should consider the views of DEP and the requirements of other statutes.

C. Consumptive Use of Water

1. Overview of Water Management District Authority

Consumptive use of water is managed under authority of the Florida Water Resources Act of 1972.¹⁶² Responsibility for implementing the Water Resources Act resides primarily with the Florida Department of Environmental Protection (DEP) and five regional water management districts (WMD). Most of the authority for managing the consumptive use of water has been delegated to the water management districts.¹⁶³ The districts and DEP share authority for regulating surface water management facilities and construction activities in wetlands through the Environmental Resource Permitting (ERP) program.¹⁶⁴ The water management districts were established to include entire surface water basins and

¹⁶⁰ *Id.*

¹⁶¹ *Id.* at 743.

¹⁶² Ch. 72-299, Laws of Florida, codified at FLA. STAT. ch. 373 (2006). The Water Resources Act was based largely on a proposal for water law reform developed at the University of Florida. *See* F. MALONEY, R. AUSNESS, J. MORRIS, A MODEL WATER CODE (1972).

¹⁶³ FLA. ADMIN. CODE r. 62-113.200(12); FLA. STAT. § 373.103 (2006). Delegation is statutorily encouraged. FLA. STAT. § 373.016(5) (2006) (“to the greatest extent practicable . . . power should be delegated to the governing board of a water management district”).

¹⁶⁴ FLA. ADMIN. CODE r. 62-113.200(12). *See e.g.* FLA. ADMIN. CODE r. 40C-4.

have comprehensive authority to gather information and develop plans; construct and operate works; acquire lands for water management; regulate well construction and license well drillers; regulate surface water management facilities and construction in wetlands; and regulate the consumptive use of water through permitting, water shortage plans, and water emergency orders.

Each district is governed by a board of gubernatorial appointees.¹⁶⁵ Governing boards members serve without pay for fixed terms and are subject to confirmation by the Senate. The governing boards hire an executive director, adopt rules, set budgets, issue permits, and otherwise govern the affairs of the districts. The districts are subject to the general supervisory authority of DEP, which can appeal district rules and orders to the Governor and Cabinet.¹⁶⁶ A Water Resources Implementation Rule (WRIR), adopted by DEP, establishes the policy framework for District programs.¹⁶⁷ District budgets are reviewed by the Executive Office of the Governor and, although the Districts can levy ad valorem taxes, there are constitutional and statutory mileage caps.¹⁶⁸

a) Planning

Planning was an integral part of the Florida Water Resources Act of 1972.¹⁶⁹ The Act envisioned that water resource planning would be the essential foundation for all water management decisions, including water allocation. Disputes over state vs. regional control, as well as conflict over substantive elements of proposed plans, led to delays in planning. A State Water Policy, adopted in 1981, gave uniform direction to the water management districts and required them to develop district water management plans. In 1988, the State Water Policy was amended to require the districts to assess water needs for a twenty-year planning horizon and develop a “course of remedial or preventive action . . . for each current and anticipated future critical problem.”¹⁷⁰ In 1996, Governor Chiles directed the Districts to develop

¹⁶⁵ Governing board members are subject to geographic restrictions and confirmation by the Senate.

¹⁶⁶ FLA. STAT. § 373.114 (2006).

¹⁶⁷ FLA. ADMIN. CODE r. 62-40. DEP has the exclusive authority to review rules for consistency with the WRIR. FLA. STAT. § 373.114(2) (2006).

¹⁶⁸ Fla. Const. art. 7, §9; FLA. STAT. §373.503 (2006).

¹⁶⁹ Unfortunately, the state and the water management districts were slow to implement the planning provisions of the Water Resources Act of 1972. *See* F. Maloney and R. Hamann, *Integrating Land and Water Management*, Publication No. 54, Water Resources Research Center, University of Florida (1981).

¹⁷⁰ FLA. ADMIN. CODE r. 17-40.090. Effective 12-5-88, 14 F.A.W. 46/4637.

regional water supply plans for each area with inadequate water supplies.¹⁷¹ In 1997, the Florida Legislature codified and significantly expanded the mandate for the Districts to develop regional water supply plans.¹⁷² These plans must include minimum flows and levels with associated prevention and recovery strategies and may provide for the reservation of water. The districts are directed to work “in coordination and cooperation with . . . affected and interested parties.”¹⁷³

The statute distinguishes between water supply and water resource development. Both must be addressed in the plan, but the water management districts have primary responsibility for planning and water resource development. The latter phrase is defined to mean “the formulation and implementation of regional water resource management strategies.”¹⁷⁴ It includes data collection and analysis, technical assistance and “structural and nonstructural programs to protect and manage water resources.”¹⁷⁵

Water supply development is more narrowly defined as “the planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use.”¹⁷⁶ Water supply development is generally the responsibility of local governments, regional water supply authorities and utilities.¹⁷⁷ The water supply development component of the regional water supply plan, however, must quantify the water supply needs for all existing and projected future uses for conditions up to a 1:10 year drought and identify options for meeting them. The estimated costs and potential sources of funding for water supply development must be included.

To the extent that water resource development projects are required to support water supply development, they must be listed, with estimates of the quantities that will be made available, timetables, costs, sources of funding and implementation plans.¹⁷⁸ The plan must contain a “funding strategy for water resource development projects, which shall be reasonable and sufficient to pay the

¹⁷¹ Executive Order 96-297, §3. Planning was to be initiated by October 1, 1998, completed within 18 months and updated every five years.

¹⁷² Ch. 97-160, Florida Statutes, sometimes referred to as HB 715. See FLA. STAT. §§ 373.036, .0361, .042, .0421 (2006).

¹⁷³ FLA. STAT. § 373.0361(1) (2006).

¹⁷⁴ FLA. STAT. § 373.019(19) (2006).

¹⁷⁵ *Id.*

¹⁷⁶ FLA. STAT. § 373.019(21) (2006).

¹⁷⁷ FLA. STAT. § 373.0831(2)(c) (2006).

¹⁷⁸ FLA. STAT. § 373.0361(2)(b) (2006).

cost of constructing or implementing all of the listed projects.”¹⁷⁹ Given the broad scope of this category, the Districts must include in the regional water supply plans a reasonable budget for many of its water management activities. Measures to protect and restore natural systems would certainly fit the definition of a water resource development project. In addition, the statute requires a plan to include any minimum flows and levels that have been established in the planning region¹⁸⁰ and the associated recovery and prevention strategy.¹⁸¹

b) Regulation of Consumptive Use

Water management district governing boards or the Florida Department of Environmental Protection (DEP) are authorized to require permits for consumptive use of water and to impose reasonable conditions to ensure the use is consistent with the overall objectives of the district and not harmful to the water resources of the area.¹⁸² In addition, permit applicants must demonstrate compliance with three conditions. The proposed use cannot interfere with any presently existing legal use of water; it must be “reasonable-beneficial”¹⁸³; and it must be consistent with the public interest.¹⁸⁴ Applicants have a right to twenty year permits “if there is sufficient data to provide reasonable assurance that the conditions for permit issuance will be met for the duration of the permit.”¹⁸⁵

DEP has adopted a Water Resource Implementation Rule interpreting these criteria.¹⁸⁶ This rule was formerly known as the State Water Policy.¹⁸⁷ The water management districts have adopted consumptive use permitting criteria¹⁸⁸ and a detailed “Basis of Review” for evaluating permit applications. These criteria clearly provide a basis for protecting the quantity of water discharged by springs by denying or conditioning consumptive use permits.

¹⁷⁹ FLA. STAT. § 373.0361(2)(d) (2006).

¹⁸⁰ FLA. STAT. § 373.0831(2)(g) (2006).

¹⁸¹ FLA. STAT. § 373.0831(2)(c) (2006).

¹⁸² FLA. STAT. § 373.219(1) (2006).

¹⁸³ FLA. STAT. § 373.019(4) (2006).

¹⁸⁴ FLA. STAT. § 373.223(1) (2006).

¹⁸⁵ FLA. STAT. §373.236(1) (2006).

¹⁸⁶ FLA. ADMIN. CODE r. 62-40.410.

¹⁸⁷ FLA. STAT. § 373.019 (20), .036 (2006).

¹⁸⁸ *See e.g.* FLA. ADMIN. CODE rr. 40C-2 and 40C-20. Most districts have an “Applicant’s Handbook” or “Basis of Review” that provides more detailed criteria.

Another set of restrictions applies during water shortages. Consumptive use permits are intended to allocate water up to 1:10 year drought conditions. Under more severe water shortages, additional restrictions may be imposed on permittees. The Districts are required to adopt water shortage plans by rule, based on classifying uses by source of supply, method of withdrawal and type of use.¹⁸⁹ When the District determines there will be insufficient water to meet the needs of users, or use must be reduced to prevent serious harm to water resources, it may order implementation of the plan for one or more classes of users. If implementation of the plan is not sufficient during an emergency water shortage condition to protect the public health, safety or welfare, the health of wildlife, or other reasonable uses, the District may issue emergency orders.¹⁹⁰

c) Minimum Flows and Levels and Reservations

District water supply plans must include the minimum flows and levels (MFL) established for the area.¹⁹¹ Under the 1972 Florida Water Resources Act, the Districts were required to establish minimum flows for all surface watercourses as “the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.”¹⁹² Minimum levels were to be established for aquifers and surface waters at a level that protects the “water resources of the area” from significant harm.¹⁹³ The protection of nonconsumptive uses must be considered and may be protected through the establishment of MFLs.¹⁹⁴ MFLs may reflect seasonal variations and must be based on the “best information available.”¹⁹⁵ Any substantially affected person may request independent scientific peer review of the data, methodologies, models and assumptions used to establish an MFL.¹⁹⁶

The establishment of minimum flows and levels has been delayed for many years due to technical difficulties and policy concerns. Beginning in 1993, the courts, the Governor and Cabinet and the Legislature all ordered the water management districts to implement the 1972 statute.¹⁹⁷ Because the Districts have been slow to

¹⁸⁹ FLA. STAT. § 373.246(1) (2006).

¹⁹⁰ FLA. STAT. §§ 373.175, .246 (2006).

¹⁹¹ FLA. STAT. § 373.0361(1)(g)(2006).

¹⁹² FLA. STAT. § 373.042(1)(a) (2006).

¹⁹³ FLA. STAT. § 373.042(1)(b) (2006).

¹⁹⁴ FLA. STAT. § 373.042(1)(b) (2006).

¹⁹⁵ *Id.*

¹⁹⁶ FLA. STAT. § 373.042(4) (2006).

¹⁹⁷ A citizen suit on behalf of lakefront property owners in Northeast Florida resulted in a court order to the St. Johns River Water Management District to begin establishing MFLs. *Concerned Citizens of Putnam County for Responsive Govt. v. St. Johns River Water Management District*,

adopt MFLs, in many areas, existing flows and levels of water may be below the levels that would otherwise be adopted. In other cases, projected withdrawals would violate MFLs. In 1997 the Legislature directed the Districts to adopt recovery and prevention strategies as part of regional water supply plans.¹⁹⁸ The Legislature also authorized the districts to establish MFLs below historic levels under certain circumstances.¹⁹⁹

Minimum flows and levels should be adopted for all springs. One important example of a minimum flow and level for springs protection is the MFL adopted by the St. Johns River Water Management District to protect Blue Springs as a thermal refuge for the endangered Florida manatee.²⁰⁰ The water management districts have been ordered to develop MFLs for all first magnitude springs and for all second magnitude springs on state and federal conservation lands.²⁰¹

Reservations under state law are another means of securing water for the environment. District governing boards are authorized to reserve water from use by permit applicants “in such locations and quantities, and for such seasons of the year, as . . . may be required for the protection of fish and wildlife or the public health and safety.”²⁰² “Existing legal uses of water” are protected from the reservation “so long as such use is not contrary to the public interest.”²⁰³ An existing

622 So. 2d 520 (Fla. 5th DCA 1993). The Florida Land and Water Adjudicatory Commission (FLWAC), comprised of the Governor and Cabinet, then ordered the St. Johns and Southwest Florida Water Management Districts to begin establishing MFLs. *Lake Brooklyn Civic Assoc. v. St. Johns River Water Management District* (Final Order, FLWAC, 9/30/93); *Pinellas County, Florida v. Southwest Florida Water Management District* (Final Order, FLWAC, 2/13/96). In 1996 the Legislature directed the Southwest Florida Water Management District to establish priority lists for establishing MFLs, subject to review and approval by DEP, s. 2, ch 96-339, Laws of Florida. In 1997 that mandate was extended to all of the districts, s. 5, ch. 97-160, Laws of Florida, effectively codifying an executive order by Governor Lawton Chiles. Executive Order 96-297.

¹⁹⁸ FLA. STAT. § 373.0421 (2006).

¹⁹⁹ FLA. STAT. § 373.0421(1) (2006). The statute allows the Districts to consider the constraints placed on the hydrology of a waterbody by hydrologic alterations, but not to the extent of allowing significant harm caused by withdrawals. FLA. STAT §373.0421(1)(a) (2006). The Districts are allowed to establish MFLs that are inconsistent with the recovery of historic conditions in areas other than the Everglades Protection Area. FLA. STAT §373.0421(1)(b) (2006).

²⁰⁰ FLA. ADMIN. CODE r. 40C-8.031, F.A.C.

²⁰¹ FLA. STAT. § 373.042(2) (2006). An exception is provided for all springs in the Suwannee River Water Management District and all second magnitude springs in other areas of the state provided the district submits a report demonstrating no current or expected adverse impacts to the spring from consumptive uses over a twenty year period.*Id.*

²⁰² FLA. STAT. § 373.223(4) (2006).

²⁰³ *Id.*

legal use of water is one that is permitted or exempt under the statute. Since all permits have limited duration, the protection would logically extend only for the duration of the permit. Uses that are significantly harming fish and wildlife or interfering with the restoration of important habitat are arguably contrary to the public interest.

Protecting water for the environment through a reservation avoids some of the potential objections to a minimum flow or level. It is not necessary to demonstrate that further withdrawals would cause “significant harm,” only that the water reserved is “required for the protection of fish and wildlife or the public health and safety.” The level of harm that is "significant" is thus not an issue. In the context of springs protection, the requirements for fish and wildlife must be established in order to implement a reservation.

The importance of minimum flows and levels and reservations is that they establish numeric criteria against which the cumulative effects of withdrawals for consumptive uses or other purposes can be evaluated. These criteria may be used in evaluating individual permit applications or in the context of broader water management planning.

2. Preemption of Local Government Authority

The Water Resources Act provides for regional management of water as a state resource.²⁰⁴ Although it implements a policy of “local sources first,” it does allow for the transfer of water outside of its basin of origin and across political boundaries.²⁰⁵ The Legislature clearly intended that local government authority to regulate the consumptive use of water should be preempted. It stated that Part II of the Act should “provide the exclusive authority for requiring permits for the consumptive use of water and for authorizing transportation thereof.”²⁰⁶ It declared that other laws, ordinances, rules and regulations “shall be deemed superseded for the purpose of regulating the consumptive use of water.”²⁰⁷ Making the same point yet again, it said that Part II “preempts the regulation of the consumptive use of water.”²⁰⁸

²⁰⁴ *Osceola Cty v. St. Johns River Water Management District*, 504 So. 2d 385 (Fla. 1987).

²⁰⁵ Fla. Stat. §§ 373.223(2), (3), .2295 (2006).

²⁰⁶ FLA. STAT. § 373.217(2) (2006).

²⁰⁷ FLA. STAT. § 373.217 (3) (2006).

²⁰⁸ FLA. STAT. § 373.217 (4) (2006).

3. Coordination of local and regional planning

The water management districts have been directed to provide a great deal of information to local governments that is relevant to springs protection. In 1982, the Legislature required the districts to produce “groundwater basin resource inventories” and submit them to each local government.²⁰⁹ These were intended to include hydro-geologic studies of groundwater basins and associated recharge areas.²¹⁰ In 1985, the districts were required to determine “prime groundwater recharge areas” for the Floridan and Biscayne aquifers.²¹¹ In 1989, the water management districts were directed to provide technical assistance to local governments in the development and revision of local comprehensive plans, including descriptions of groundwater characteristics, aquifer recharge areas, and water quality information.²¹²

Regional water supply plans, mandated in 1997, were clearly intended to assist local governments in planning for water supply development.²¹³ Until recently, however, there was no requirement for local governments to consider the availability of water resources for water supply.²¹⁴ This “missing link” has been addressed by the Legislature in 2002.²¹⁵ Local governments are now required to assess their water supply needs for at least a ten-year period and include in their comprehensive plans a workplan for building those water supply facilities necessary to serve existing and new development.²¹⁶ The local plan must be consistent with the regional water supply plan must be considered by the local government in developing the plan²¹⁷ and identify facilities sufficient to supply the needs identified by the water management district addressed in the intergovernmental coordination

²⁰⁹ FLA. STAT. § 373.0395 (2006).

²¹⁰ FLA. STAT. § 373.0395 (1) (2006).

²¹¹ FLA. STAT. § 373.0395 (2006).

²¹² FLA. STAT. § 373.0391 (2006).

²¹³ FLA. STAT. §§ 373.0361, .0831 (2006).

²¹⁴ Mary Jane Angelo, *Integrating Water Management and Land Use Planning: Uncovering the Missing Link in the Protection of Florida's Water Resources?*, 12 U. Fla. J. L & Pub. Pol'y 223-249 (2001). Local governments were only required to consider the capacity of withdrawal, treatment and distribution systems, not whether there was sufficient water to supply those facilities.

²¹⁵ Chs., 2002-296, 2004-381, 2005-290, 2005-291, Laws of Florida.

²¹⁶ FLA. STAT. § 163.3177(6)(c) (2006).

²¹⁷ *Id.*

element.²¹⁸ To the extent that a regional water supply plan incorporates minimum flows and levels or other measures to protect springs discharge, and does not delay compliance through the prevention and recovery plans, it would seem difficult for a local government to adopt a plan that relied on water supply sources that would result in violations of those criteria. It will also be difficult for a local government to avoid developing water supplies sufficient for the level of growth planned for the area, which may result in greater pressure to continue using or developing aquifers that supply springs. Given the likely prohibition on permitting such withdrawals, the amendments are most beneficial in forcing local governments to face the need to develop alternative water supplies.

D. Environmental Resource Permitting

1. Overview of ERP Program

The Environmental Resource Permitting (ERP) program provides for the regulation by the Florida Department of Environmental Protection (DEP) or one of the water management districts of most development activities affecting surface water.²¹⁹ The ERP program regulates the construction and operation of buildings, roads, parking lots, stormwater systems, ditches, borrow pits, mines and similar facilities. Development directly in wetlands or surface waters must meet additional criteria, but all development is subject to regulation. Although ERP jurisdiction comes from affecting surface waters, the purpose of regulation is to ensure that development does not adversely affect water resources; thus groundwater recharge and habitat of wildlife are relevant in ERP permit considerations.

ERP rules provide for two sets of criteria. There is a set of “conditions” applicable to all ERP permits and “additional conditions” applicable to activities located in wetlands or other surface waters.²²⁰ The conditions-for-issuance rules used by SJRWMD are typical of those rules used by the other WMDs and DEP, and therefore are laid out below as an example.

²¹⁸ *Id.*

²¹⁹ FLA. STAT. § 373.403 (2006). For many years the ERP program was not implemented in the Northwest Florida Water Management District due to refusal by the Legislature to fund the program. That is about to change. Ch. 2006-228, Laws of Florida. Each of the other water management districts has adopted consistent implementing regulations. *See generally* ENVTL. AND LAND USE SECTION OF THE FLORIDA BAR, TREATISE ON FLORIDA ENVIRONMENTAL AND LAND USE LAW, Vol. 1, 9.6--9.22 (Feb. 2004).

²²⁰ The distinction was created when the public interest review criteria of DEP’s wetland permitting program merged into the criteria of the Management and Storage of Surface Waters programs of the water management districts to create a single ERP permitting program. It was the Legislative intent not to change the criteria, but to merge the programs. FLA. STAT. § 373.414(9) (2006).

40C-4.301 Conditions for Issuance of Permits

(1) In order to obtain a . . . permit . . . an applicant must provide reasonable assurance that the construction, alteration, operation, maintenance, removal, or abandonment of a surface water management system:

. . .

- c. Will not cause adverse impacts to existing surface water storage and conveyance capabilities;
- d. Will not adversely impact the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters;
- e. Will not adversely affect the quality of receiving waters such that the water quality standards set forth in chapters 62-3, 62-4, 62-302, 62-520, 62-522, and 62-550, F.A.C., including any antidegradation provisions . . . and any special standards for Outstanding Florida Waters . . . will be violated;
- f. Will not cause adverse secondary impacts to the water resources;
- g. Will not adversely impact the maintenance of surface or ground water levels or surface water flows established in chapter 40C-8, F.A.C.;

. . .

- k. Will comply with any applicable special basin or geographic area criteria established in chapter 40C-41, F.A.C.²²¹

²²¹ FLA. ADMIN. CODE r. 40C-4.301 (2006); *see also* ENVTL. AND LAND USE SECTION OF THE FLORIDA BAR, TREATISE ON FLORIDA ENVIRONMENTAL AND LAND USE LAW, Vol. 1, 9.13-4 – 9.13-5 (Feb. 2004). Chapter 40C-41 of the Florida Administrative Code establishes additional criteria that are used in reviewing the ERP applications for projects that are located in one of the eight hydrologic regulatory basins adopted by the Governing Board. An example of such a basin is the Wekiva River Hydrologic Basin, for which the St. Johns River Water Management District has developed additional basin-specific standards to ensure that the basin’s resources will be adequately protected. These Wekiva Basin rules were adopted under the authority of Florida Statutes Section 373.415, which directs the District to adopt protection zones adjacent to the water courses in the Wekiva river system to prevent harm to the water quality, water quantity, hydrology, wetlands, and wildlife species caused by the systems regulated under Chapter 373, Part IV of the Florida Statutes. Those special basin criteria were recommended for application in the springshed of the Wekiva Springs because they are protective of groundwater quality. SJRWMD, *Preliminary Report to the Wekiva River Basin Coordinating Committee Pursuant to Executive Order No. 03-112*, page 6 of 27 (Wekiva River Basin Coordinating Committee Final Draft Report and Recommendations, January 29, 2004).

The additional conditions for issuance of a permit adopted by SJRWMD are also typical of those used by other WMDs and the DEP, and thus provide the following example.

40C-4.302 Additional Conditions for Issuance of Permit

(1) In addition to the conditions set forth in section 40C-4.031, F.A.C., in order to obtain a . . . permit . . . an applicant must provide reasonable assurance that the construction, alteration, operation, maintenance, removal, and abandonment of a system:

a. Located in, on, or over wetlands or other surface waters will not be contrary to the public interest, or if such an activity significantly degrades or is within an Outstanding Florida Water, that the activity will be clearly in the public interest, as determined by balancing the following criteria as set forth in subsections 12.2.3 through 12.2.3.7 of the Applicant's Handbook: Management and Storage of Surface Waters:

. . .

i. Whether the activity will adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats;

. . .

i.v. Whether the activity will adversely affect the fishing or recreational values or marine productivity in the vicinity of the activity;

. . .

v.ii. The current condition and relative value of functions being performed by areas affected by the proposed activity.

The Wekiva Parkway Protection Act required the district to protect predevelopment recharge volume. FLA. STAT. §369.318(4) (2006). Special criteria for the basin have been incorporated into section 11.3, Applicants Handbook: Management and Storage of Surface Waters (Dec. 3, 2006). The District is also prohibited from issuing ERP permits in the Wekiva River Protection Area before receiving notification from the local government that a development is consistent with the comprehensive plan and land development regulations. FLA. STAT. §373.415(2)(2006).

- b. Will not cause unacceptable cumulative impacts upon . . . surface waters as set forth in subsections 12.2.8 through 12.2.8.2 of the Applicant's Handbook: Management and Storage of Surface Waters . . .
- c. Located in, adjacent to or in close proximity to Class II waters . . . will comply with the additional criteria in subsection 12.2.5 of the Applicant's Handbook: Management and Storage of Surface Waters.²²²

Preventing adverse impacts to both water quality and ground water levels are primary objectives of the regulatory criteria contained in the ERP program. To the extent that ERP criteria are not sufficient to protect springs or to provide a greater level of local control in the decision-making process, local governments should consider adopting local criteria through land development regulations.

2. Preemption of Local Government Authority

There are several specific areas of local government preemption within the ERP program. The preemption of local government authority is mainly limited to the context of mitigation, and thus it does not appear that preemption should be a major concern for local governments.

First, local governments may not require permits or otherwise impose regulations governing the operation of mitigation banks.²²³ Second, local governments cannot deny the use of mitigation banks due to the location being outside of its jurisdiction.²²⁴

There are further areas of local government preemption within the ERP program for activities in surface waters and wetlands. If mitigation requirements imposed by a local government for surface water impacts of an activity also regulated under the ERP program cannot be reconciled with the mitigation requirements approved under an ERP permit for that same activity, then the mitigation requirements for surface water and wetland impacts are controlled by the ERP permit.²²⁵ Moreover, when activities for a single project regulated under this part of the ERP program occur in more than one local government jurisdiction, and where permit or

²²² FLA. ADMIN. CODE r. 40C-4.302(1); FLA. STAT. § 373.414 (2006); ENVTL. AND LAND USE SECTION OF THE FLORIDA BAR, TREATISE ON FLORIDA ENVIRONMENTAL AND LAND USE LAW, Vol. 1, 13-7 (Feb. 2004).

²²³ FLA. STAT. § 373.4136(8) (2006). They can, however, regulate construction activities associated with mitigation banks. *Id.*

²²⁴ FLA. STAT. § 373.4135(2) (2006).

²²⁵ FLA. STAT. § 373.414(1)(b)(4) (2006).

regulatory requirements imposed by a local government are different from the requirements of an ERP permit for those same activities, then the permit or regulatory requirements shall be controlled by the ERP permit.²²⁶ Finally, Uniform Mitigation Assessment Method (UMANM) for wetlands and other surface waters had been adopted as a rule that binds local governments.²²⁷

The areas of local government preemption under the ERP program seem quite extensive at first. Yet, local governments still have a broad range of authority within the areas of ERP permitting because the majority of the local government's preempted powers deal only with mitigation procedures and requirements. Therefore it appears that a local government would not be preempted from requiring, for example, greater levels of stormwater retention or detention unless the ERP permitted activity at issue is in a surface water or wetland and extends beyond the jurisdiction of that one local government.

3. Onsite Treatment and Disposal Systems (Septic Tanks)

a) Overview of Department of Health Authority

The Department of Health (DOH) has a duty to regulate septic tanks and other forms of onsite treatment and disposal.²²⁸ DOH performs application reviews and site evaluations, issues permits, and conducts inspections and investigations related to the construction, installation, maintenance, operation, use, and abandonment of onsite sewage treatment and disposal systems, more commonly known as septic tanks and drain field, for residences and other establishments with an estimated domestic sewage flow of 10,000 gallons or less per day, or an estimated commercial sewage flow of 5,000 gallons per day or less per day.²²⁹ The DOH also adopts rules for enforcement activities such as imposing fines or issuing citations to carry out their regulations for septic tank design and construction.²³⁰ Furthermore, DOH is charged with developing a comprehensive program to ensure that onsite sewage treatment and disposal systems are sized, designed, constructed, installed, repaired, used, operated, and abandoned in compliance with DOH rules to “prevent groundwater contamination and surface water contamination and to preserve the public health.”²³¹

²²⁶ FLA. STAT. § 373.414(1)(c) (2006).

²²⁷ FLA. STAT. § 373.414(18) (2006).

²²⁸ FLA. STAT. § 381.0065(3) (2006).

²²⁹ FLA. STAT. § 381.0065(3)(b) (2006). Larger systems may be regulated by DEP.

²³⁰ FLA. STAT. §§ 381.0065(3)(a, h) (2006).

²³¹ FLA. STAT. § 381.0065(3)(c) (2006).

Several provisions addressing septic tanks are directly related to the protections of water quality. DOH must not allow an onsite sewage treatment and disposal system to be placed closer than: ten feet from any storm sewer pipe whenever possible, but never closer than five feet; seventy-five feet from the mean high-water line of a tidally influenced surface water; seventy-five feet from the normal flood line of a permanent nontidal surface water; or fifteen feet from the high-water line of retention areas, detention areas, swales that are designed to contain water for less than seventy-two hours after a rainfall, normally dry drainage ditches, or normally dry individual lot storm water retention areas.²³²

One of the major intentions of the Legislature in enacting Florida Statute Section 381.0065 was to ensure that onsite sewage treatment and disposal systems did not significantly degrade groundwater or surface water.²³³ The regulatory emphasis, however, has been on protecting human health. Thus, while DOH might not allow contamination to the point that human health is at risk, the seepage of nitrates from septic tanks is slowly leaking into Florida's groundwater and harming springs.²³⁴

b) Preemption of Local Government Authority

Within DOH's regulation of the septic tank industry, there is only one area of express preemption: building permitting. A local government may not issue a building or plumbing permit for any building that requires the use of an onsite sewage treatment and disposal system, unless the owner or builder has already received a construction permit for such a system from DOH.²³⁵ Also, a building or structure may not be occupied, and no local government, state agency, or federal agency may authorize occupancy, until the DOH approves the final installation of the onsite septic system.²³⁶ Finally, no local government may approve any change in occupancy or tenancy of a building that uses an onsite sewage treatment and disposal system until the DOH has reviewed the use of the septic system with the proposed change, approved the change, and amended the operating permit.²³⁷

²³² FLA. STAT. § 381.0065(4)(e) (2006).

²³³ FLA. STAT. § 381.0065(4)(e) (2006).

²³⁴ See generally, Heather Darden, Wastewater in the Florida Keys: A Call For Stricter Regulation of Nonpoint Source Pollution, 16 J. Land Use & Env'tl. Law 200 (2001).

²³⁵ FLA. STAT. § 381.0065(4) (2006).

²³⁶ FLA. STAT. § 381.0065(4) (2006).

²³⁷ FLA. STAT. § 381.0065(4) (2006).

State regulations thus establish only minimum standards for septic systems. Local governments appear able to mandate stricter regulations of the use of septic tanks, such as larger lot sizes, additional setbacks or the use of more advanced systems, so long as they are approved by DOH. Thus, it does not appear that the DOH's regulation of onsite sewage treatment and disposal systems would generally preempt local governments from further restricting the type and uses of septic tanks within their jurisdictions to enhance the protection of Florida's springs. In one specific area, however, the Legislature may have expressly preempted local authority. Onsite sewage treatment and disposal systems for single family residences that are designed and certified by registered professional engineers can be approved by DOH despite the action of a county health department.²³⁸ Furthermore, DOH regulation of septic systems in no way, however, prejudices local government authority to regulate in ways that incidentally affect the amount of development permitted and thus, by default, the number of septic systems that will be constructed. For example, local government may reduce permitted density or increase minimum lot size.

V. Constitutional Limits on Land Use Regulation

A. Due Process

The U.S. Constitution forbids state action²³⁹ that deprives property owners of property "without due process of law."²⁴⁰ Such due process includes both substantive and procedural due process.

Procedural due process requires that state action affecting a landowner gives notice to a landowner before the application of an ordinance or regulation.²⁴¹ Similarly, due process requires that landowners who would be affected by a proposed state action have the opportunity to appear before a local decision making body in a public hearing.²⁴² The formality of the hearing procedures must be proportional to the severity of the possible deprivation of property interest.²⁴³

²³⁸ FLA. STAT. §381.0065(4)(j)3(2006).

²³⁹ Local government action is "state action." *Edmondson v. Jordon*, 415 U.S. 651, 667 n. 12 (1974).

²⁴⁰ U.S. Const. amends. V, XIV.

²⁴¹ The requirement for individualized due process notice is limited to situations in which the legislative action has a distinct and significant impact on a limited part of the population; generally applicable land use matters, such as the adoption of policies or ordinances that affect a large group of citizens, do not require individualized due process. *Bi-Metallic Inv. Co. v. Board of Equalization*, 239 U.S. 441 (1915); *Brown v. McGarr*, 774 F.2d 777, 784-85 (7th Cir. 1985).

²⁴² *Irvine v. Duval County Planning Comm'n*, 504 So. 2d 1265 (Fla. 1st DCA 1986).

²⁴³ *Little v. Streater*, 452 U.S. 1 (1981); *Brown v. McGarr*, 774 F.2d 777, 784-85 (7th Cir. 1985).

B. Substantive Due Process

Substantive due process examines the reasonableness of regulation. The three-part test enunciated by courts asks 1) if there is a valid public purpose for the regulation, 2) if the means intended to be used are reasonably related to achievement of the goals, and 3) if the regulations are unduly oppressive on individuals.²⁴⁴ The determination of whether a land use regulation unduly oppresses an individual generally occurs in the context of a takings analysis.

For many years the Supreme Court's jurisprudence had created confusion regarding the validity of regulation of land and takings law. In the case of *Agins v. Tiburon*²⁴⁵ the Court stated that regulation "effects a taking if [such regulation] does not substantially advance legitimate state interests"²⁴⁶ This language, however, mirrors the due process test for the validity of a regulation. Thus, the *Agins* decision confused questions of the legitimacy of a regulation as opposed to the effect of the regulation on private property. The U.S. Supreme Court finally eliminated this confusion in 2005 in the case of *Lingle v. Chevron*²⁴⁷ when it abrogated the rule in the *Agins* case and held that the proper inquiry in *Agins* as to the legitimacy of a regulation was a due process question and not a method for determining a taking.²⁴⁸ *Lingle* clarified that the questions of whether a land use regulation is valid and whether the regulation effects a taking are distinct questions.

In the context of land development regulations aimed as springs protection, the valid public purpose of regulation (i.e.—protection of springs) should not present an issue. However, the reasonable relation of proposed regulations to the valid public purpose of springs protection may give rise to disputes about the amount of data and pollutant modeling necessary to assure that the land development regulations "reasonably relate" to the goal of springs protection. Similarly, regulations viewed as unduly oppressive on individuals may be questioned; this inquiry, however, will typically take place in the context of a "takings" claim.

²⁴⁴ See *Lawton v. Steele*, 152 U.S. 133, 137 (1894); see also, *Kaiser Dev. Co. v. City and County of Honolulu*, 649 F. Supp. 926, 943 (D. Hawaii 1986) (citing *Williamson v. Lee Optical*, 348 U.S. 483, 487-88 (1955)).

²⁴⁵ 447 U.S. 255 (1980).

²⁴⁶ *Id.* at 260.

²⁴⁷ *Lingle v. Chevron U.S.A. Inc.* 544 U.S. 528 (2005).

²⁴⁸ *Id.* at 542-43.

C. Equal Protection

Both the U.S. Constitution and the Florida Constitution have similar requirements regarding equal protection under the laws for all citizens.²⁴⁹ An equal protection claim may be either “facial” or “as applied.” A facial challenge to a regulation or law requires that the law involve a fundamental right or race or some other suspect class. In such a challenge, a court will strictly scrutinize whether the law or regulation is needed to further a compelling state interest.²⁵⁰ The remedy for a facial challenge is an injunction on the enforcement of the regulation.²⁵¹

An “as applied” challenge may be pursued if no fundamental right nor race nor any other suspect class is implicated by the law or regulation. In such a case courts inquire whether there exists a rational relationship between the classification within the law or regulation and a legitimate state interest.²⁵²

D. Expropriation

The U.S. Constitution forbids the taking of private land for a public purpose without “just compensation.”²⁵³ The government may still “take” private property, but if it does, the government must pay compensation for what it has taken.²⁵⁴ For more than a century the understanding of the Fifth Amendment’s prohibition on takings without compensation did not extend beyond cases involving the government taking possession of property or effectively “ousting” the property owner.²⁵⁵ In 1922 this changed when the U.S. Supreme Court introduced the idea that *regulation* of private property could be so onerous as to effectively merit treatment as a physical occupation of the property or an ouster of the owner.²⁵⁶ Thus, today, the “taking” of private land for a public purpose includes not only the state exercising eminent domain powers to take title to land, but also “inverse

²⁴⁹ U.S. Const. amend. XIV; Fla. Const. art. I, §2, (“All natural persons are equal before the law.”).

²⁵⁰ *Eide v. Sarasota County*, 908 F. 2d 716, 722 (11th Cir. 1990).

²⁵¹ *Id.*

²⁵² *Id.*

²⁵³ U.S. Const. amend. V.

²⁵⁴ *Lingle v. Chevron U.S.A. Inc.* 544 U.S. 528, 536 (2005) (citing *First English Evangelical Lutheran Church of Glendale v. County of Los Angeles*, 482 U.S. 304, 314 (1987)).

²⁵⁵ See, e.g. *id.* at 537.

²⁵⁶ *Id.* at 537-38 (citing *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 415 (1922)).

condemnation” or “regulatory takings” when government regulations become too onerous.²⁵⁷

Since the 1922 recognition of regulatory takings, courts have confronted the persistent problem of determining when a regulatory taking has occurred. Regulatory takings jurisprudence has evolved to recognize two types of cases in which a taking will be found *per se*: 1) physical invasion of property and 2) elimination of all economically viable use of land.

When the government “physically invades” or requires that a member of the public be allowed to enter the property, a taking will almost always be found, “no matter how minute the intrusion, and no matter how weighty the public purpose behind it.”²⁵⁸ The second type of categorical taking is “where regulation denies all economically beneficial or productive use of land.”²⁵⁹ A loss of all economic viability cannot be supported by simply asserting important public interests, but can be justified only where the regulation is aimed at preventing a common law nuisance.²⁶⁰ The U.S. Supreme Court noted that most cases do not result in a loss of all economic viability.²⁶¹

Most regulatory takings cases, however, do not involve either of these rules resulting in a categorical taking. Rather, most cases involve regulations that affect a property owner’s exercise of certain sticks in the “bundle of rights” that comprise property ownership, thus impacting the value of the property. As Justice Holmes in *Pennsylvania Coal Co. v. Mahon* stated: “[W]hile property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking.”²⁶² The Supreme Court has not enunciated a clear, concise test for when regulations go “too far.” Instead, the Supreme Court has stated that it will engage in a case-by-case factual inquiry. This ad hoc factual inquiry first appeared in the case of *Penn Central Transportation Co. v. City of New York*.²⁶³

²⁵⁷ See, e.g., *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 426-28 (1982); *First English Evangelical Church v. County of Los Angeles*, 482 U.S. 304 (1987); *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1028-29 (1992).

²⁵⁸ *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1015 (1992); see also, *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982).

²⁵⁹ *Lucas*, 505 U.S. at 1015.

²⁶⁰ *Id.* at 1029-31.

²⁶¹ *Id.* at 1017.

²⁶² 260 U.S. 393, 415 (1922).

²⁶³ 438 U.S. 104, 124 (1978).

In making its “ad hoc” inquiry, the Supreme Court has identified three factors of particular importance in determining whether government action works a taking: (1) the character of the government action; (2) the economic impact of the regulation; and (3) the extent to which the action interferes with reasonable investment-backed expectations.²⁶⁴

If the government's action can be characterized as a physical invasion of the property, a court will be more likely to find a taking.²⁶⁵ If the action can be characterized as eliminating substantial rights held in property, such as the right to possess, use, and dispose of the property, and the right to exclude others, courts may also be more likely to find a taking.²⁶⁶

The U.S. Supreme Court determines the economic impact of a regulation by comparing the value of the property before and after the regulation's interference with the property.²⁶⁷ However, the fact that property value diminished as a result of government regulation does not necessarily amount to a compensable taking. The denial of a development permit may, however, create a taking if the effect of the denial is to prevent all economically viable use of the land in question.²⁶⁸

Finally, courts will consider the impact of the action on the property owner's reasonable investment-backed expectations.²⁶⁹ Reasonable investment-backed expectation analysis looks at what property rights, both economic and non-economic, the regulation takes away. In *Penn Central*²⁷⁰ the U.S. Supreme Court held that because a New York City landmark law did not interfere with current uses of the parcel and allowed a reasonable return on the original investment made in the property, the law did not interfere with plaintiff's investment-backed expectations.²⁷¹ The decision also noted that the regulation's stated rationale would benefit the owners of the parcel in that it “benefit[s] all New York citizens and all structures, both economically and by improving the quality of life in the city as a whole.”²⁷²

²⁶⁴ *Id.*

²⁶⁵ *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 426 (1982).

²⁶⁶ *Loveladies Harbor, Inc. v. United States*, 15 Cl.Ct. 381, 391 (1988).

²⁶⁷ *Keystone Bituminous Coal Ass'n v. DeBenedictis*, 480 U.S. 470, 497 (1987).

²⁶⁸ *See United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121 (1985); *Bowles v. United States*, Fed. Cl. 37, 48-51 (1994); *Florida Rock Indus. v. United States*, 18 F.3d 1560 (Fed. Cir. 1994).

²⁶⁹ *Penn Central Trans. Co. v. City of New York*, 438 U.S. 104, 124 (1978).

²⁷⁰ *Id.*

²⁷¹ *Id.* at 136.

²⁷² *Id.* at 134-35.

Furthermore, a taking does not necessarily occur simply because regulations do not permit a property holder the highest and best use of property if that use creates a public harm.²⁷³ A landowner does not have an absolute right to change the natural condition of the land when the purpose of the change is not appropriate to the natural state of the land and the change would injure others.²⁷⁴

This leaves the question as to how much loss of economic benefit of land must occur before a compensable taking may be found as the case law is inconsistent on this point.

Open space requirements (OSR) as an environmental protection measure will usually not run afoul of Fifth Amendment takings jurisprudence. One key factor is whether the OSR permits some sort of reasonable use for any given lot. If the OSR permits a house to be built on a lot, this will typically avoid the claim that all value has been taken from the land.²⁷⁵

OSR may interact with lot size to determine the possibility of allowing even one single-family dwelling on a lot. However, a requirement of 100% open space on a small lot may not leave any way to meaningfully utilize the property.²⁷⁶ In such a case, a grant to the landowner of transferable development credits may be sufficient to ward off a takings claim.²⁷⁷

Some landowners might argue that even if they have a large lot, an OSR requirement of 80% effects a complete taking of 80% of their property. Takings jurisprudence, however, clearly indicates that forcing a landowner to build on a portion of a lot and leave another part open does not automatically constitute a taking.²⁷⁸ Therefore, OSRs that both retain some economic value for the land and

²⁷³ *Graham v. Estuary Properties*, 399 So. 2d 1374 (Fla. 1981).

²⁷⁴ *Id.* at 1381-82.

²⁷⁵ *Palazzolo v. Rhode Island*, 533 U.S. 606, 621 (2001).

²⁷⁶ A clever, and arguably malevolent, approach to this by a developer might be to design individual parcels in a development anticipating that the parcels could not be built upon due to environmental regulations such as OSR, thus providing a takings claim. Such tactics could be easily countered by noting that the *Penn Central* test, *supra* notes 25-26, 31-34 and accompanying text, focuses on “reasonable investment-backed expectations.” A developer dividing an environmentally sensitive landscape in a springshed into small lots cannot reasonably expect to build on such lots, thus failing the “reasonable investment-backed expectations analysis in *Penn Central*.”

²⁷⁷ For more on this question, see note 358, *infra*.

²⁷⁸ *Keystone Bituminous Coal Ass’n v. DeBenedictis*, 480 U.S. 470, 497-98 (1987) (rejecting the notion that a “requirement that a building occupy no more than a specified percentage of the lot

some development potential, however small, should not qualify as a taking. At the opposite end of the spectrum, if an OSR applied to a specific property leaves neither development potential nor value in the form of viable TDR (transfer of development rights) credits, a taking might be found. The cases which one cannot safely predict are those falling in between these two extremes: the land retains no development potential and only minimal value as open area, or the land's only value resides in TDR credits. Such cases require case-by-case evaluation.

Similarly, if a landowner has a sinkhole on a property and regulations allow for no use of that portion of the property, the landowner could claim that the portion of the property around the sinkhole has been taken. Takings jurisprudence does not, however, look favorably on landowner attempts to separate property into various parcels in an attempt to claim a complete taking of a portion of the property.²⁷⁹ The denominator problem poses the question of what is the relevant property interest that has been burdened. A landowner will find that courts will not lend a sympathetic ear if the landowner breaks property into smaller parcels so that the relative burden on certain parcels increases.

VI. Bert J. Harris, Jr. Private Property Rights Protection Act

A. Overview

In 1995, the Florida legislature adopted the Bert J. Harris, Jr., Private Property Rights Protection Act (Act),²⁸⁰ which purports to create a new cause of action for landowners complaining of government interference with property rights. It provides that:

when a specific action of a governmental entity has inordinately burdened an existing use of real property or a vested right to a specific use of real property, the property owner of that real property is entitled to relief, which may include compensation for the actual loss to

on which it was located" is any more of a taking than the claim the court rejected in the decision).

²⁷⁹ *Villas of Lake Jackson, Ltd. v. Leon County*, 906 F. Supp. 1509, 1517 (N.D. Fla. 1995)(citing *Concrete Pipe and Products of California, Inc. v. Construction Laborers Pension Trust for Southern California*, 508 U.S. 602, 643-44 (1993)); *State Dept. of Env'tl. Reg. v. Schindler*, 604 So. 2d 565, 568 (2d DCA 1992) ("The focus is on the nature and extent of the interference with the landowner's rights in the parcel *as a whole* in determining whether a taking of private property has occurred. Prohibition on certain *portions* of the tract does not in itself effect an unconstitutional taking.") (quoting *Fox v. Treasure Coast Reg'l Planning Council*, 442 So. 2d 221, 226 (Fla. 1st DCA 1983)).

²⁸⁰ FLA. STAT. § 370.001 (2006).

the fair market value of the property caused by the action of government, as provided in this section.²⁸¹

As expressed in the statute, the intent of the legislature was to create “a separate and distinct cause of action from the law of takings”²⁸² and to provide “for relief, or payment of compensation, when a new law, rule, regulation, or ordinance . . . , as applied, unfairly affects real property.”²⁸³

The Act does not apply to any governmental action by the U.S. government nor any act by a Florida state governmental entity exercising powers of the U.S. or its agencies through delegation to the state.²⁸⁴ The Act also does not apply to any law, ordinance, rule or regulation adopted, or formally noticed for adoption before May 11, 1995.²⁸⁵ The amendment of an existing ordinance or comprehensive plan could fall within the scope of the Act “to the extent that the application of the amendatory language imposes an inordinate burden apart from the law, rule, regulation, or ordinance being amended.”²⁸⁶

If a court determines that an inordinate burden has been imposed on the landowner, the remedy “may include compensation for the actual loss to the fair market value of the real property” caused by the government’s action.²⁸⁷ The Act requires that a jury determine the amount of compensation due if an inordinate burden is found.²⁸⁸ The amount of compensation due is equal to the difference between the fair market value of the property prior to the governmental action, including the owner’s reasonable investment-backed expectations, and the current fair market value after the governmental action, including the government’s

²⁸¹ FLA. STAT. § 70.001(2) (2006). The Act does not allow for compensation for an incidental loss of market value to property that is not the subject of regulation but may have lost value due to regulations on other property. Op. Att’y Gen. Fla. 95-78 (1995).

²⁸² FLA. STAT. § 70.001(1) (2006).

²⁸³ *Id.*

²⁸⁴ FLA. STAT. § 70.001(2) and (3)(c), (2006). Despite wording in the Bert Harris Act noting that “[t]his section does not affect the sovereign immunity of the government,” Florida Statute Section 70.001(13) (2006), Florida’s Third District Court of Appeals has held that the Act does waive sovereign immunity of the government with respect to a person whose property has been inordinately burdened. *Royal World Metropolitan, Inc. v. City of Miami Beach*, 863 So. 2d 320, 321-23 (2003).

²⁸⁵ FLA. STAT. § 70.001(12) (2006).

²⁸⁶ *Id.*

²⁸⁷ FLA. STAT. § 70.001(2) (2006).

²⁸⁸ FLA. STAT. § 70.001(6)(b) (2006).

settlement offer and ripeness decision.²⁸⁹ This compensation does not include business damages for development or uses which are prohibited.²⁹⁰

B. Settlement Procedure

The Act establishes a mandatory settlement procedure for disputes arising under the Act. At least 180 days before filing suit in circuit court under the Act, a landowner must give the governmental entity notice, including a valid appraisal supporting the claim of an “inordinate burden,” and demonstrating the loss in fair market value to the property.²⁹¹ During the 180-day period, the governmental entity must make a written settlement offer which would resolve the claim,²⁹² along with a written “ripeness decision”²⁹³ detailing permitted uses of the property.²⁹⁴ The landowner may file suit in circuit court after the ripeness decision has been issued or upon the expiration of the 180-day notice period.

A settlement offer may include the following changes:

- An adjustment of land development or permit standards or other provisions controlling the development or use of land
- Increases or modifications in the density, intensity, or use of areas of development
- The transfer of developmental rights
- Land swaps or exchanges
- Mitigation, including payments in lieu of onsite mitigation
- Location on the least sensitive portion of the property
- Conditioning the amount of development or use permitted
- A requirement that issues be addressed on a more comprehensive basis than a single proposed use or development
- Issuance of the development order, a variance, special exception, or other extraordinary relief
- No changes to the action of the governmental entity²⁹⁵

²⁸⁹ *Id.*

²⁹⁰ *Id.*

²⁹¹ FLA. STAT. § 70.001(4)(a) (2006). Landowners affected by government action which falls within the scope of the Act have one year in which to file suit. FLA. STAT. §70.001(11) (2006). This one-year period does not begin to run until after any administrative appeals have been completed. *Id.*

²⁹² FLA. STAT. § 70.001(4)(c) (2006).

²⁹³ “Ripeness decision” in this context constitutes the “last prerequisite to judicial review.” FLA. STAT. § 70.001(5)(a) (2006).

²⁹⁴ FLA. STAT. § 70.001(5)(a) (2006).

²⁹⁵ FLA. STAT. § 70.001(4)(c) (2006).

Creative use of these mitigating features in efforts to protect Florida springs can reduce the likelihood of successful claims that the ordinance “inordinately burdens” a particular property. If the property owner rejects the government’s settlement offer and ripeness decision and files suit, the circuit court judge must examine the existing use of the property²⁹⁶ and determine whether the owner has an additional vested right to a specific use of the property.²⁹⁷ Then, considering the proposed settlement offer and ripeness decision, the judge will decide whether the “action of the governmental entity”²⁹⁸ has inordinately burdened the real property.

If the landowner accepts a settlement offer, this does not necessarily end the process. The governmental entity may implement the offer subject to certain conditions.²⁹⁹ If the settlement offer “would have the effect of a modification, variance, or a special exception to the application of a rule, regulation, or ordinance as it would otherwise apply to the subject real property, the relief granted shall protect the public interest served by the regulations at issue and be the appropriate relief necessary to prevent the governmental regulatory effort from inordinately burdening the real property.”³⁰⁰ If a proposed settlement agreement might contravene a relevant statute, the governmental entity and the property owner must file a joint action for circuit court approval of the settlement so that the circuit court can ensure that the public interest protected by the statute is still served by the settlement agreement.³⁰¹ Florida cases have not addressed a settlement in which a court concluded that the settlement did not comply with state statutes, such as would occur should a court find a settlement agreement inconsistent with other planning requirements under the Growth Management Act.³⁰²

²⁹⁶ "Existing use" means an actual, present use or activity on the real property, including periods of inactivity which are normally associated with, or are incidental to, the nature or type of use or activity or such reasonably foreseeable, nonspeculative land uses which are suitable for the subject real property and compatible with adjacent land uses and which have created an existing fair market value in the property greater than the fair market value of the actual, present use or activity on the real property. FLA. STAT. §70.001(3)(b) (2006).

²⁹⁷ "The existence of a 'vested right' is to be determined by applying the principles of equitable estoppel or substantive due process under the common law or by applying the statutory law of this state." FLA. STAT. §70.001(3)(a) (2006).

²⁹⁸ "Action of a governmental entity" is a "specific action...which affects real property, including action on an application or permit." FLA. STAT. §70.001(3)(d) (2006).

²⁹⁹ FLA. STAT. § 70.001(4)(c), (d)1, (d)2 (2006).

³⁰⁰ FLA. STAT. § 70.001(4)(d)1 (2006).

³⁰¹ FLA. STAT. § 70.001(4)(d)2 (2006).

³⁰² Two administrative cases have addressed claims of inconsistency with the Growth Management Act, but in both instances, the administrative law judge found that the proposed settlements did not violate Growth Management Act requirements. 1000 Friends of Florida, Inc. v. Dept. of Community Affairs, WL 1174557 (Fla.Div.Admin.Hrgs.), *12 (2001); Parker v. St.

C. Inordinate Burden

The most significant issue raised by the Act is often determination of what constitutes an “inordinate burden.” The statutory definition describes two types of “inordinate burdens.” The first is an action that directly restricts or limits the use of real property to the extent that the owner is permanently unable to attain “reasonable investment-backed expectations” for an existing use or a vested right to a specific use of the property as a whole.³⁰³ The second inordinate burden is one in which the owner is left with “unreasonable existing or vested uses such that he bears permanently a disproportionate share of the burden imposed for the good of the public.”³⁰⁴ Temporary impacts and governmental actions to remediate a “public nuisance at common law or a noxious use of private property” are not included in the definition of “inordinate burden.”³⁰⁵

The primary question is what degree of regulation or what diminution of value will constitute an “inordinate burden” under the statute. Reported cases have not interpreted inordinate burden.³⁰⁶ While there has been a finding of inordinate burden in unreported cases, the test for inordinate burden is still not clear under the Act. Though the Act is intended to provide a separate cause of action from present takings jurisprudence,³⁰⁷ it is unlikely that courts will be able to easily draw a bright line between this new cause of action and takings jurisprudence. Given the history and logic of traditional takings analysis, courts hearing cases under the Act will find it difficult to ignore such precedents when determining whether property has been “inordinately burdened” by government regulations.

Johns County, 2002 WL 31846456 (Fla.Div.Admin.Hrgs.), *5+ (2002). In *Parker v. St. Johns County* the administrative law judge held that the petitioner had failed to carry her burden to demonstrate that a change to the St. Johns County Future Land Use Map, which was made pursuant to a settlement agreement under the Bert Harris Act, was contrary to the relevant provisions of the Local Government Comprehensive Planning and Land Development Regulation Act, Chapter 163, Part, II, Florida Statutes. A similar result emerged in *1000 Friends of Florida, Inc. v. Dept. of Community Affairs*, WL 1174557, *12 (Fla.Div.Admin.Hrgs.) (2001).

³⁰³ FLA. STAT. § 70.001(3)(e) (2006).

³⁰⁴ *Id.*

³⁰⁵ *Id.*

³⁰⁶ Further research needs to address the hundreds of claims that have been brought under the Bert J. Harris, Jr. Private Property Protection Act since its passage. These cases have not been published because the majority of them settle before ever reaching a courtroom.

³⁰⁷ FLA. STAT. §70.001(1) (2006) (“...[S]ome laws, regulations, and ordinances of the state and political entities in the state, as applied, may inordinately burden, restrict, or limit private property rights without amounting to a taking . . .”).

As an example of the difficulty in separating traditional takings analysis from the Act's language, one need only look to the Act's description of "inordinate burden." According to the Act, an "inordinate burden" is placed on private property whenever the owner is "permanently unable to attain the reasonable, investment-backed expectations" for the use of the property.³⁰⁸ "Investment-backed expectations" were first introduced as a factor in takings jurisprudence by the United States Supreme Court in *Penn Central Transportation Co. v. New York City*.³⁰⁹ However, the role this factor should play, and its relative importance, was never made clear. The use of terminology from traditional takings analysis in the Act confuses how courts should interpret the Act. Still more confusion arises from Florida Statute Section 70.001(9), which notes that "[t]his section may not necessarily be construed under the case law regarding takings if the governmental action does not rise to the level of a taking."

A second question involves determining when "reasonable, investment-backed expectations" as to the use of land arise. One Federal Claims Court decision applying the standards of traditional takings analysis held that "the relevant date for determining plaintiff's historically rooted expectancies . . . [should be] the dates on which the plaintiffs themselves acquired title to their properties."³¹⁰ Where land is already subject to government regulation, a buyer's expectations concerning the property should account for this existing regulation of the property.

The Act supports this interpretation by providing that "existing use" should mean actual present use of the land and "reasonably foreseeable, nonspeculative land uses" appropriate to the property and its surroundings.³¹¹ Speculators who have purchased land with knowledge of existing land use restrictions should have much less success arguing that developing the land in a manner that exceeds those restrictions is a "reasonable" expectation or that land already restricted for certain uses due to environmental concerns is "appropriate" for development that is prohibited for the property and its surroundings.

At this point in the interpretation of the Act it is impossible to predict whether every diminution in value of a property as a result of future government regulation will meet this test of inordinately burdening the use of property, or whether it will be possible for some regulation to "burden" the property without that burden becoming inordinate. Those advocating increased protection of property rights interpret the Act to provide relief beginning with the loss of the first dollar of fair

³⁰⁸ FLA. STAT. § 70.001(3)(e) (2006).

³⁰⁹ 438 U.S. 104, 124 (1978).

³¹⁰ *Preseault v. United States*, 27 Cl. Ct. 69, 88 (1992), rev'd by *Preseault v. U.S.* 100 F. 3d 1525 (1996).

³¹¹ FLA. STAT. § 70.001(3)(b) (2006).

market value.³¹² However, this argument is opposed to the traditional state court evaluation of whether government action has resulted in a regulatory taking.³¹³

D. Existing Use

There are two types of “existing use” defined in the Act. The first is “an actual, present use or activity on the real property.”³¹⁴ This includes “periods of inactivity which are normally associated with, or are incidental to, the nature or type of use or activity.”³¹⁵ The second includes land uses which are reasonably foreseeable and nonspeculative, suitable for the subject real property, compatible with adjacent land uses, and which have created an existing fair market value in the property greater than the fair market value of the actual present use or activity.³¹⁶ This second type of “existing use” lends itself to more dispute about its interpretation.

A claimant under the Act may argue that any use permitted before a new, challenged regulation fits the definition of an inordinate burden of “reasonably foreseeable and nonspeculative [uses] which have created an existing fair market value in the property greater than the fair market value of the actual present use or activity.”³¹⁷ Such an argument, however, fails to account for the statutory language that requires an “existing use” also must meet tests for compatibility with adjacent land uses and for suitability.³¹⁸ The test for suitability is not further defined in the statute. One approach would be to focus on the issue of suitability of the subject property and argue that land development that would contribute to degradation of springs or the aquifer is not “suitable” development for the subject land.

The Act’s definitions of “reasonably foreseeable” and “nonspeculative” uses were intended to incorporate concepts from eminent domain valuation law.³¹⁹ In this area of law, courts will sometimes accept appraisal testimony regarding highest and best use based in part on the appraiser’s determination of whether zoning changes or other land use changes were reasonably foreseeable. It is possible that a proposed land use that tracks the land’s classification in the future land use

³¹² See Robert C. Downie, II, *Property Rights: Will Exceptions Become the Rule?*, 69 FLA. B. J., Nov. 1995, at 71.

³¹³ Id.

³¹⁴ FLA. STAT. § 70.001(3)(b) (2006).

³¹⁵ Id.

³¹⁶ Id.

³¹⁷ FLA. STAT. § 70.001(3)b (2006).

³¹⁸ Id.

³¹⁹ See, David L. Powell, et al., *Florida's New Law to Protect Private Property Rights*, 69 FLA. B.J., Oct. 1995, at 12.

element of the local comprehensive plan may be sufficient to demonstrate that the proposed development is reasonably foreseeable and not speculative. Thus, in certain cases, regardless of the inclusion of an area in an environmental protection area, if the future land use classification for that area is not compatible with springs or aquifer protection, a proposed use which matches the future land use classification may be found to be “reasonably foreseeable.”³²⁰ In these cases, the tests of “suitability” and “compatibility” from the previous paragraph will take on additional importance.

E. Vested Rights

The Act protects “vested rights” to a specific land use.³²¹ In order for an owner’s rights to vest, Florida courts have required that four conditions be met: (1) a property owner’s good faith reliance (2) on some act or omission of the government resulting in (3) a substantial change in position or the incurring of extensive obligations and expenses so that (4) that it would make it highly inequitable to interfere with the acquired right.³²²

For example, where a landowner spent substantial amounts to install water service to his land in reliance upon the existing plan that allowed multi-family housing, a county was estopped from denying building permits for the development.³²³ However, courts have also held that the mere existence of a present right to a certain land use based upon a zoning ordinance is not a sufficient “act” of the government to base a vested right or equitable estoppel claim to prevent enforcement of later zoning restrictions.³²⁴

³²⁰ A property owner will have a vested right to development—and thus an excellent takings claim—if a county planning commission makes representations to a landowner and the landowner then expends substantial money in reliance on such representations. However, cases clearly state that merely purchasing property without more does not give one the right to rely on existing zoning. *Monroe County v. Ambrose*, 2003 WL 22900537, *2 (2003) (citing *City of Miami Beach v. 8701 Collins Ave., Inc.*, 77 So. 2d 428 (Fla. 1955)).

³²¹ FLA. STAT. § 70.001(2) (2006).

³²² *Monroe County v. Ambrose*, 866 So.2d 707, 710 (Fla. 3d DCA, 2003).

³²³ *Metropolitan Dade County v. Brisker*, 485 So. 2d 1349, 1351 (Fla. 3d DCA 1986).

³²⁴ *Monroe County v. Ambrose*, 866 So.2d 707, 711 (Fla. 3d DCA 2003) (“A subjective expectation that land can be developed is no more than an expectancy and does not translate into a vested right to develop the property”); *Franklin County v. Leisure Property, Ltd. by Brown*, 430 So. 2d 475, 480 (Fla. 1st DCA 1983); *Jones v. First Virginia Mortgage & Real Estate Inv. Trust*, 399 So. 2d 1068, 1074 (Fla. 2d DCA 1981).

F. Recent Cases Under the Act³²⁵

Brevard County v. Stack, 932 So.2d 1258 (Fla. 5th DCA 2006)

Brevard County appealed a judgment that a county wetlands regulation had resulted in an “inordinate burden” on Stack’s property. In the appeal, Brevard County challenged the constitutionality of the Act. First, the county asserted that the Act forced the county to contract away its inherent police power authority and then buy it back through compensation, thus violating due process.³²⁶ The appeals court rejected this argument, noting that the Act aimed to provide relief to property owners from inordinate burdens on their property; the county may still exercise its police powers to regulate, but if an inordinate burden results, the county must “*inter alia*, waive, modify, transfer, purchase or financially compensate the property owner by entering into a settlement agreement providing relief, as enumerated in section 70.001(4)(c).”³²⁷

Next, the county argued the unconstitutionality of the Act because it violated the separation of powers by providing insufficient standards, conditions, or criteria to guide the judiciary in its application.³²⁸ The court rejected this argument as well by noting that the Act contains “definitions, time periods, settlement options, and other requirements and guidance for the judiciary.”³²⁹ While the appeals court rejected all claims of the Act’s unconstitutionality, the court did find merit in claims that the trial court had failed to make certain findings required by the act. The appellate court remanded the case to the trial court to offer the trial court the opportunity to make the requisite findings.³³⁰

Palm Beach Polo, Inc. v. The Village of Wellington, 918 So. 2d 988 (Fla. 4th DCA 2006)

In *Palm Beach Polo* the plaintiff claimed that designation of an area in its already-constructed development as “conservation” in the comprehensive plan of the newly-minted town of Wellington effected a taking as well as grounds for a Bert Harris claim. The land in question was known as “Big Blue” and was designated as “preserve” land in the original PUD plan of 1971. As part of the PUD, the development density from Big Blue Preserve had been transferred to other parts of the PUD. Thus, the court emphasized that the plaintiff lacked any reasonable

³²⁵ Some of the following information was informed by Ronald L. Weaver, 2006 Update on Bert Harris Property Rights Law.

³²⁶ *Brevard County v. Stack*, 932 So.2d 1258, 1261 (Fla. 5th DCA 2006).

³²⁷ *Id.*

³²⁸ *Id.* at 1262.

³²⁹ *Id.*

³³⁰ *Id.*

expectation of ever developing Big Blue and that the Bert Harris claim was thus frivolous.

Osceola County v. Best Diversified, Inc., 936 So.2d 55 (Fla. 5th DCA 2006), rev. denied 945 So.2d 1289 (Fla. 2006)

Osceola represents the final chapter in the saga of a landfill. The owner of the landfill had attempted to secure an extension of a conditional use permit to operate the landfill. The county rejected the permit. The landfill's owner claimed that this permit denial and the county's supposed denial of owner's ability to properly close the landfill resulted in a taking as well as a claim under the Bert Harris Act. The district court observed that the takings claim was barred because the use of the land as a landfill constituted a public nuisance. This, said the court, also foreclosed the Bert Harris Act claim. In addition, the court noted that the owner had not submitted a bona fide appraisal of the land as required by the Act.

Royal World Metropolitan, Inc. v. City of Miami Beach, 862 So. 2d 320 (Fla. 3d DCA 2004)

Plaintiff Royal World claimed that new height and density restrictions affecting land owned by the plaintiff violated the Act. The trial court concluded that the city enjoyed sovereign immunity for any legislative acts leading to an inordinate burden on property based on section 13 of the Act.³³¹ The appeals court noted that a literal reading of section 13 would contradict the purpose of the Act. Thus, the court read section 13 in context and stated that section 13 merely maintains sovereign immunity as otherwise enjoyed by governmental entities.

G. Conclusion

In conclusion, downzoning of property, high open space requirements, mandatory TDRs, or any other law, regulation, or ordinance that may diminish property values may also give rise to claims under the Bert J.Harris, Jr. Property Rights Protection Act. Even if such claims settle, they can impose administrative and financial costs on the regulating authority. Thus, local governments protecting springs and springsheds should strive to use strategies that maintain as much value for the land as possible while furthering environmental goals.

³³¹ Section 13 states that the Act "does not affect the sovereign immunity of government." FLA. STAT. § 70.001(13) (2006).

VII. Transfer of Development Rights

A. Overview

Land development regulations may allow for the transfer of development rights. Transfer of development rights, known as TDR, involves the movement of a portion of an owner's property rights—the right to develop the property—from one piece of land to another. TDRs resemble cluster developments, except that in TDRs, the transfer of development density goes to a separate parcel of land.³³² The desire to both protect environmental resources and respect the rights of private property owners contributed to great interest in TDRs in the 1970s. The great promise of TDRs and the many programs to implement them have historically met with limited success. Programs often failed because no market existed for the development rights that could be transferred, thus rendering the TDR credits worth very little. Additionally, TDRs embroiled many districts in litigation involving claims that the government effected a taking through the TDR restrictions, especially in mandatory programs if they were poorly designed and thus did not create sufficient value for the credits held by landowners who needed to sell. After decades of interest in TDRs, it appears they may finally be gaining traction in Florida through the Transferable Rural Land Use Credit program established by statute. This statute will be discussed after the following sections on statutory references to TDR in Florida and Florida case law on TDRs.

B. Use of TDRs in Florida

1. Florida Statute References to TDRs

Florida Statutes encourage the use of TDRs in creative growth management strategies.³³³ The Florida Department of Community Affairs provides technical assistance “to promote the transfer of development rights within urban areas for high-density infill and redevelopment projects.”³³⁴ Florida comprehensive planning law encourages consideration of TDRs as one of the methods for complying with the requirement that local governments discuss strategies for protection of environmentally-sensitive lands during public meetings for the community visioning process.³³⁵ TDRs also qualify as an innovative strategy for programs that

³³² Patrick W. Maraist, *Introduction and General Overview of Transferable Development Rights*, in *Treatise on Florida Environmental & Land Use Law* 29.1-4 (Environmental and Land Use Law Section The Florida Bar) (2003).

³³³ FLA. STAT. 163.3202(3) (2006).

³³⁴ FLA. STAT. 163.3177(11)(f) (2006).

³³⁵ *Id.* at 163.3177(13)(c)1 (2006).

the Florida Communities Trust helps establish and fund³³⁶ as well as being a method government entities can use in a settlement offer for a Bert Harris claim.³³⁷ In 2006 the Florida Legislature added a requirement that any application by an “agricultural enclave” for a comprehensive plan amendment affecting more than 640 acres must include appropriate new urbanism concepts, of which TDR is listed as one.³³⁸

2. Case law

U.S. Constitutional takings law forms the background for case law on the implementation of TDR programs in Florida. As early as 1978, the U.S. Supreme Court in its foundational takings case of *Penn Central*³³⁹ mentioned TDRs. The Court observed that a possibility of transferring and selling development rights is clearly valuable and counts to mitigate any financial burden that a zoning change creates for a property owner.³⁴⁰ In the Court’s words: “While [transferable development] rights may well not have constituted ‘just compensation’ if a ‘taking’ had occurred, the rights nevertheless undoubtedly mitigate whatever financial burdens the law has imposed on appellants and, for that reason, are to be taken into account in considering the impact of regulation.” The Court’s statement that TDRs in this case mitigated the financial impact of permit denials in *Penn Central* would seem to clearly indicate that the value of TDRs goes to determine whether or not a taking occurred and not to whether or not just compensation has been paid. In light of this 1978 statement in *Penn Central*, the value of TDR credits should offset value lost due to prohibitions in a TDR program. Surprisingly, in the 1997 of *Suitum v. Tahoe Regional Planning Agency*,³⁴¹ the Court may have cast doubt on this by stating in that case that the Court was not asked to rule upon, nor would it rule upon, whether any value that may inhere in TDR credits counts towards determination of whether a taking has occurred or whether a taking that was found to have occurred has been compensated via the TDR credit’s value.³⁴² Despite the 1997 statement in *Suitum*, the value of TDR credits arguably still mitigates the economic impact of any restrictions forming part of a TDR program.

³³⁶ FLA. STAT. 380.503(6), 380.508(4)(e), 380.511(2) (2006).

³³⁷ FLA. STAT. 70.001(4)(c) (2006).

³³⁸ 2006 Laws of Florida, Chapter 255 § 2, codified at FLA. STAT. § 163.3162(5) (2006).

³³⁹ 438 U.S. 104 (1978).

³⁴⁰ *Id.* at 137.

³⁴¹ 520 U.S. 725 (1997).

³⁴² *Suitum v. Tahoe Reg’l. Planning Council*, 520 U.S. 725, 728 (1997).

The first Florida case to address TDRs and takings was *Hollywood v. Hollywood, Inc.*³⁴³ The court in *Hollywood* upheld a drastic downzoning of part of the claimant's land while another was upzoned, and a TDR was offered as a *quid pro quo* for dedication to the city of the downzoned portion of claimant's property.³⁴⁴

In the next major Florida case addressing TDRs, *Glisson*, the court found that regulations allowing existing uses, limiting density, restricting specific areas, and providing for TDRs did not effect a facial taking.³⁴⁵ The regulations in question were passed under the authority of the Local Government Comprehensive Planning and Land Development Regulation Act.³⁴⁶ *Glisson* has been cited in an administrative case in Florida for the proposition that inclusion of TDRs, among other things, in a comprehensive plan in an effort to avoid "as applied" takings challenges does not render the plan "confiscatory."³⁴⁷

Together *Hollywood* and *Glisson* clearly indicate that a TDR program which does not remove all value from property will not fail under a facial takings challenge. These cases also make unlikely that a TDR program which leaves a reasonable amount of value or return on the affected property would fail in an as-applied challenge.

3. Transferable Rural Land Use Credits (TRLUCs)³⁴⁸

The statutory regime for Transferable Rural Land Use Credits (TRLUCs) presents another model for how to implement TDRs.

Section 163.3177(11)(d) Florida Statutes seeks to "encourage implementation of innovative and flexible planning and development strategies and creative land use planning techniques."³⁴⁹ TRLUCs may only exist in a Rural Land Stewardship Area (RLSA).³⁵⁰ While assigning TRLUCs to a parcel of land within a RLSA does not increase the underlying density of the parcel, if TRLUCs are transferred from the parcel to a designated receiving area, the underlying density of the transferring

³⁴³ 432 So. 2d 1332 (Fla. 4th DCA 1983), review denied 442 So. 2d 632 (Fla. 1983).

³⁴⁴ *Id.* at 1338.

³⁴⁵ *Glisson v. Alachua Cty.*, 558 So. 2d 1030 (Fla. 1st DCA 1990), review denied, 570 So. 2d 1304 (Fla. 1990).

³⁴⁶ FLA. STAT. ch. 163, Pt. II (2006).

³⁴⁷ *Monroe County Chowder and Marching Society, Inc., et. al. v. DCA*, 1994 WL 1027567, *380 (Fla.Div.Admin.Hrgs.1994).

³⁴⁸ FLA. STAT. § 163.3177(11)(d)1 (2006).

³⁴⁹ FLA. STAT. § 163.3177(11)(d)1 (2006).

³⁵⁰ FLA. STAT. § 163.3177(11)(d)6.a (2006).

land is extinguished.³⁵¹ If the underlying density on a parcel of land assigned TRLUCs is utilized, this also extinguishes the TRLUCs assigned to the parcel.³⁵² No increase of density is permitted on any parcel within a designated receiving area for TRLUCs except by transfer of TRLUCs.³⁵³ Such transfer and change of density for the receiving area does not require a plan amendment³⁵⁴ but must be specified as part of a development order.³⁵⁵

The legislation notes that TRLUCs “may be assigned at different ratios of credits per acre according to the natural resource or other beneficial use characteristics of the land and according to the land use remaining following the transfer of credits, with the highest number of credits per acre assigned to the most environmentally valuable land or, in locations where the retention of open space and agricultural land is a priority, to such lands.”³⁵⁶ Use or conveyance of TRLUCs must be recorded in the public records as a covenant or restrictive easement running with the land.³⁵⁷

C. Types of TDR Programs

Three general types of TDR programs generally present themselves: 1) Mandatory TDRs, 2) Voluntary TDRs, and 3) a Universal TDR system.

1. Mandatory TDRs

Mandatory TDR programs prohibit all development in the sending area and require that all parcels in the sending area transfer their development rights to a designated receiving area. From a local government’s perspective, a mandatory TDR presents the most powerful TDR tool for protecting environmentally-sensitive areas as it prohibits development. At the same time, the outright prohibition on development means these programs are more likely to provoke takings claims.

Mandatory TDR programs may provoke takings claims because the prohibition on development means that most of the value of parcels in the mandatory sending area is in the form of the TDR credit that can be transferred. If, as has been the case in the past, the TDR credits prove to have little value, initiation of a mandatory TDR program will have arguably diminished the value of parcels. It is also important to

³⁵¹ FLA. STAT. § 163.3177(11)(d)6.d (2006).

³⁵² FLA. STAT. §163.3177(11)(d)6.f (2006).

³⁵³ FLA. STAT. §163.3177(11)(d)6.g (2006).

³⁵⁴ FLA. STAT. §163.3177(11)(d)6.g (2006).

³⁵⁵ FLA. STAT. §163.3177(11)(d)6.h (2006).

³⁵⁶ FLA. STAT. §163.3177(11)(d)6.j (2006).

³⁵⁷ FLA. STAT. §163.3177(11)(d)6.k (2006).

note that if pre-existing legal constraints on developing a property—such as wetland setbacks or prohibitions on dredge and fill permits—already prohibited development to the underlying zoning, a TDR program will not create a new cause of action for a takings claim. Rather, a properly structured and functioning TDR program could actually add value to properties limited by pre-existing limitations on development.

The credits in mandatory programs often lack value due to insufficient market demand in the receiving area. Courts might also look unfavorably on the fact that a very significant stick in the bundle of rights—the right to develop the land in at least some form—has been entirely abrogated by the mandatory TDR program. Due to the increased likelihood of a successful takings claim arising from mandatory TDR programs, such programs should be utilized with great care. When environmental goals require a mandatory TDR program, great care must be exercised in implementation to pay close attention to market analysis and administration to ensure the commercial/economic viability of the TDR program.

2. Voluntary TDRs

Voluntary TDRs differ from mandatory schemes by allowing development in the sending area. Property owners in the sending area may decide between developing their property to the underlying zoning capacity or transferring developing rights to a receiving area. If a transfer takes place, one question to address is whether any development can remain on the transferring land. The advantage of the voluntary system is that it runs less risk of challenge on takings grounds since landowners still have the choice to develop the land to the underlying zoning potential.

Choice also, however, forms the weakness in voluntary systems since this choice requires incentives to convince landowners in the sending area (i.e.—the area sought to be preserved from most development) to transfer development rights to a receiving area instead of developing the underlying zoning capacity. Such incentives in TDR programs typically involve a bonus whereby a landowner with a right to develop, for example, up to ten dwelling units on a parcel may receive more than ten dwelling units in TDR credits if those credits are transferred to a receiving area. One effect of such bonuses is to make more credits available for transfer. Since the market for TDRs in the receiving area determines the value of credits, more credits available means more receiving area demand is required to preserve the value of the increased number of credits. Thus, a voluntary system may result in only some landowners choosing to forgo development to underlying zoning in favor of selling TDR credits while other property owners in the sending area may choose to develop on their parcels.

3. Universal TDR System

A universal TDR system is less a distinct TDR system than it is a modification that can be applied to a mandatory system. A universal system, like the mandatory system, creates a mandatory sending zone. In the case of springs protection, this might include the most sensitive springshed areas requiring protection. The difference is that the receiving area would consist of any area newly rezoned for a higher density. When an area is newly rezoned to a higher density, however, only a part of the increased density would be as of right for property holders; the rest of the potential increased density would need to be secured through purchase of TDR credits. Appropriate provisions to permit this must appear in the local government's comprehensive plan and development regulations. The system would need to be structured with constant oversight and revision taking account of the value of TDR credits as determined by the availability and demand for the credits. Establishment of too large a sending zone coupled with insufficient price and demand for the credits available could lead to takings challenges just as readily as could a poorly designed mandatory system could. It is unclear whether such a challenge might be overcome by arguing that the value of the TDR credits would increase as more receiving areas were established.

The universal system concept of creating new receiving zones each time a piece of land is granted a higher zoning density could also be applied to voluntary TDR programs. Such a program could involve agencies, regional authorities, municipalities, and counties utilizing their authority to enter into inter-local agreements.

D. Recommendations

Precedent indicates that properly structured and administered TDR programs should seldom result in a judgment of a taking against a local government. Local governments seeking to protect Florida springs and springsheds should avoid regulations that eliminate all economically viable use of land. This means that local governments imposing a mandatory TDR program should carefully craft the program to ensure value for the credits. Furthermore, inclusion of bonuses for transfer of the TDR based on the environmental sensitivity and importance of the transferring property could help increase the value of such land despite the low underlying zoning capacity. Such support of land value through TDR bonus credits should, according to language in *Penn Central*, help diffuse Fifth Amendment takings claims.³⁵⁸

³⁵⁸ See *supra* notes 339-40 and accompanying text (discussing *Penn Central* and *Suitum* Supreme Court cases and their statements on TDRs).

Due to a lack of clarity and case law on the Bert J. Harris Jr., Private Property Rights Protection Act, prediction of how it might treat various springs protection strategies is difficult.

Next, a jurisdiction should identify less environmentally-significant land that can support higher densities. These lands would then be designated receiving areas for the TDRs originating from the most environmentally-sensitive lands. The designated receiving areas would also have only densities that could be increased only by the transfer of credits from areas assigned TDRs.³⁵⁹

Clearly such a program would require detailed evaluation and amendment of the local comprehensive plan to both permit and promote the successful implementation of TDRs. The comprehensive plan would have to be amended not only to promote the transfer of development rights from sending areas but to allow the transfer of development rights into suitable receiving areas. The effect of increased density or intensity of development in those areas would have to be considered. Market analysis would be necessary to ensure the viability of the TDR program.

³⁵⁹ This mimics the dynamic established by the Transferable Rural Land Use Credits discussed above.

APPENDIX

A.3

WATER BUDGET

3.1 POST EQUALS PRE RECHARGE FOR THREE DEVELOPMENT SCENARIOS

Required land areas for stormwater treatment that maintain yearly recharge volumes for three different development scenarios are illustrated. The examples have, as the primary goal, the maintenance of the recharge associated with pre development conditions in a springshed area. The development scenarios are characteristic of single-family, conservation cluster, and commercial areas. The commercial development is presented for two different soil conditions – namely, a high recharge soil and a low recharge soil.

The three main purposes for the presentation of these examples are to demonstrate:

1. Calculation procedures for post equal pre yearly recharge volumes and the required stormwater areas to retain the post equal pre recharge.
2. A comparison of stormwater system land areas, runoff, and recharge volumes for different land uses and soil types.
3. A comparison of post equal pre calculations to existing rule calculations for land areas, runoff, and recharge volumes.

It is understood that some existing calculation procedures may change in the future rule-making process; however, the procedures used here are those in current use.

3.2 HYDROLOGIC AND WATERSHED CONDITIONS

The hydrological and watershed conditions have to be known and are variable across the State in the areas where springsheds are located. This is most likely well understood among professionals, but mentioned here to emphasize the need for site specific data and to establish the conditions for which the conclusions were derived. The watershed conditions are explained for each development scenario example.

The yearly hydrological conditions used for the examples are from the central Florida area. These data are precipitation (P), evapotranspiration (ET), evaporation (E), and evaporation from impervious areas (ED). The yearly values used for the comparisons are average yearly values and are shown in Table 1.

| Hydrological Parameter | Yearly Values in Inches |
|-----------------------------------|-------------------------|
| Precipitation (P) | 50 |
| Evaporation (E) | 44 |
| Evapotranspiration (ET) | 40 |
| Evaporation from impervious areas | 4 |

3.3 STORMWATER MANAGEMENT OPTIONS

The stormwater management options must be designed to permit stormwater excess to infiltrate into the ground. Retention is the term used to describe systems that infiltrate stormwater excess and can mimic the natural condition for infiltration and recharge.

Retention in low impact development and regional retention ponds are two commonly used options for recharge. Irrigation of detained stormwater is the third general option for recharge and is usually associated with regional ponds. The term regional is relative, but in this context, it is a pond that collects rainfall excess from impervious areas which exceed about ten acres.

Retention areas are either off-line diversions or on-line flow through ponds or swales. Retention areas are designed to infiltrate the rainfall excess that would otherwise not enter the ground. Some retention examples are roadside swales, intentional depression areas, rain barrels, exfiltration tanks, pervious pavements, bio-filters, and disconnected impervious areas. Rainfall excess is a term used to describe the rainwater that remains on the ground surface after storm events and is either stored for infiltration and recharge or will run off to become part of the surface waters in an area. Some of the runoff water will eventually become part of the flow in a river.

3.4 GENERAL FINDINGS

- A. The calculations to retain post equal pre yearly recharge volumes are an extension of current practice.
- B. Existing design practices for retention in general do not achieve a post equal pre yearly recharge. However, a land use was developed to illustrate that, in some cases, the yearly recharge can be maintained or exceeded with existing criteria. Thus, an over design can result and possibly flood-land locked areas.
- C. It is recommended and understood at this date that the intent of the regulatory community is to consider changing the existing design criteria for retention in springshed areas.

3.5 SINGLE-FAMILY COMPARISONS TO CONSERVATION CLUSTER FINDINGS

All examples use 100-acre areas. For this comparison, the soil condition is in primarily good infiltration or hydrologic class “A” soils. The cover vegetation is dense and, thus, a high evapotranspiration yearly rate of 40 inches is used. The post development condition for single-family residences results in 100 units, with a directly connected impervious area (DCIA) of 13.5 acres in a total impervious area of 20 acres. The conservation cluster post development results in 117 units with 50 percent open space and a DCIA of 6.2 acres in a total impervious area of 15.9 acres. The open space does not contribute rainfall excess to the stormwater system. The conclusions are:

- A. For the assumed pre and post land use conditions, a single-family development of 100 units on 100 acres requires retention areas of 9.1 acres to retain post equal pre yearly recharge volumes. This compares to 6.0 acres of land required for a conservation cluster development on 100 acres. Open space is considered to not contribute rainfall excess to the stormwater system.
- B. There exists in current practice a provision to design irrigation systems. This design will maintain post equal pre yearly recharge. For the single-family development, application of the design results in an irrigation pond of 2.4 acres with an irrigation area of 27 acres, while for the cluster development, the pond area is 2.0 acres with an irrigation area of 26 acres.
- C. Using existing design criteria, the land required as retention is 6.3 acres for both development conditions. The pond area does not change from one land use to the other because there is no provision for using directly connected impervious areas (DCIA) to calculate the runoff and recharge.
- D. The post yearly recharge volume using post equal pre recharge calculations is equivalent to the pre recharge volume with either the retention option or the irrigation option and for both developments. While retention areas using existing design criteria for both off-line retention and flow-through retention (on-line), ponds do not retain the pre condition yearly volume of recharge.

For the single-family and conservation cluster developments, comparisons of the pond areas and the recharge volumes are shown in Table 2

| Retention Calculation method | Single-Family | | Conservation Cluster | |
|------------------------------|------------------------|-------------------------------|------------------------|-------------------------------|
| | Retention Area (Acres) | Recharge Volume (Inches/Year) | Retention Area (Acres) | Recharge Volume (Inches/Year) |
| Post = Pre | 9.1 | 10 | 6.0 | 10 |
| Irrigation | 2.4 | 10 | 2.0 | 10 |
| Off-Line Existing | 6.3 | 6.5 | 6.3 | 5.9 |
| On-Line Existing | 12.5 | 9.6 | 12.5 | 8.7 |

3.6 COMMERCIAL DEVELOPMENT COMPARISONS TO CONSERVATION CLUSTER

The soil condition is in primarily good infiltration or hydrologic class “A” soils. The cover vegetation is dense. The post development condition is commercial use and defined by a directly connected impervious area (DCIA) of 24 acres in a total impervious area of 34 acres. The total contributing area is 100 acres. The conservation cluster post development is as defined in the previous comparison. The conclusions are:

- A. For the assumed pre and post land use conditions, a commercial development of 34 impervious acres requires retention areas of 7.3 acres to retain post equal pre yearly recharge volumes. This compares to 6.0 acres of land required for a conservation cluster development on 100 acres.
- B. There exists in current practice a provision to design irrigation systems. This design will maintain post equal pre yearly recharge. For the commercial area, application of the design results in a pond area for the commercial area of 3.0 acres with an irrigation area of 22.4 acres, while for the cluster development, the pond area is 2.0 acres with an irrigation area of 26 acres.
- C. Using existing design criteria, the land required as retention is 6.3 acres for both development conditions. The pond area does not change from one land use to the other because there is no provision for using directly connected impervious areas.
- D. The post yearly recharge volume using post equal pre recharge calculations is equivalent to the pre recharge volume with either the retention option or the irrigation option and for both developments. While retention areas using

existing design criteria for both off-line retention and flow-through retention (on-line) ponds do not retain the pre condition yearly volume of recharge.

For the single-family and conservation cluster developments, comparisons of the pond areas and the recharge volumes are shown in Table 3.

| Retention Calculation Method | Commercial Type "A" Soils | | Conservation Cluster | |
|------------------------------|---------------------------|-------------------------------|------------------------|-------------------------------|
| | Retention Area (Acres) | Recharge Volume (Inches/Year) | Retention Area (Acres) | Recharge Volume (Inches/Year) |
| Post = Pre | 7.3 | 10 | 6.0 | 10 |
| Irrigation | 3.0 | 10 | 2.0 | 10 |
| Off-Line Existing | 6.3 | 8.1 | 6.3 | 5.9 |
| On-Line Existing | 12.5 | 11.9 | 12.5 | 8.7 |

3.7 COMMERCIAL DEVELOPMENT COMPARISONS WITH DIFFERENT SOIL TYPES

The pre development soil condition is the difference between the two commercial developments. The cover vegetation is dense for both. The post development condition is commercial use and defined by a directly connected impervious area (DCIA) of 24 acres in a total impervious area of 34 acres. The total area is 100 acres and contributes to the stormwater system. The conclusions are:

- A. For the assumed pre and post land use conditions, a commercial development of 34 impervious acres in "C" type soils requires retention areas of 10.0 acres to retain post equal pre yearly recharge volumes. This compares to 7.3 acres of land required for the same post-development commercial area, but in "A" type soils.
- B. There exists in current practice a provision to design irrigation systems. This design will maintain post equal pre yearly recharge. For the commercial area in type "C" soils, application of the design practice results in a pond area of 4.6 acres with an irrigation area of 34.4 acres, while for the "A" soil commercial development, the pond area is 3.0 acres, with an irrigation area of 22.4 acres.
- C. Using existing design criteria, the land required as retention is 6.3 acres for both development conditions. The pond area does not change from one land use to the other because there is no provision for using directly connected impervious areas.

D. The post yearly recharge volume using post equal pre recharge calculations is equivalent to the pre recharge volume with either the retention option or the irrigation option and for developments. While retention areas using existing design criteria for both off-line retention and flow-through retention (on-line) ponds do not retain the pre condition yearly volume of recharge.

For the single-family and conservation cluster developments, comparisons of the pond areas and the recharge volumes are shown in Table 4.

| Retention Calculation Method | Commercial Type "A" Soils | | Commercial Type "C" Soils | |
|------------------------------|---------------------------|-------------------------------|---------------------------|-------------------------------|
| | Retention Area (Acres) | Recharge Volume (Inches/Year) | Retention Area (Acres) | Recharge Volume (Inches/Year) |
| Post = Pre | 7.3 | 10 | 10.0 | 10 |
| Irrigation | 3.0 | 10 | 4.6 | 10 |
| Off-Line Existing | 6.3 | 8.1 | 6.3 | 8.1 |
| On-Line Existing | 12.5 | 11.9 | 12.5 | 11.9 |

GLOSSARY OF TERMS

Aquifer

An underground geologic formation that allows for the movement of water; aquifers are the source of spring water and well water.

Best Management Practices (BMPs)

A practice or combination of practices, including non-structural preventive actions or structural improvements, based on sound science and professional judgment to be the most effective and practicable means of preventing or reducing negative water quality impacts to environmental resources, including springs.

Buffers

Undisturbed vegetated zone between uses and resources or around sinkholes, springs, or other water bodies. These zones are meant as a protective barrier between the resources and harmful activity.

Cluster

Means grouping buildings and structures on a portion of a development site. A development design technique that concentrates buildings on a small portion of the site to allow the remaining land to be used for open space or preservation of sensitive areas.

Commercial

Means activities which are predominantly connected with the sale, rental, and distribution of products, or the performance of services.

Evapotranspiration

Means that portion of precipitation returned to the air through evaporation and transpiration.

Florida Aquifer Vulnerability Assessment (FAVA)

An ongoing project to develop a Florida-specific model, using existing geographic information system (GIS) data that will predict the vulnerability of Florida's major aquifer systems to contamination. The object of FAVA is to develop a tool that can be used by environmental, regulatory, and planning professionals to facilitate protection of Florida's groundwater resources, and thus the health and safety of Florida's residents.

Florida Springs Protection Areas

That portion of the State of Florida where the Floridan aquifer system is highly or moderately vulnerable.

Impervious Surface

Any hard-surfaced, man-made area that does not readily absorb or retain water. Any material that substantially reduces or prevents the infiltration of stormwater into previously undeveloped land.

Impervious Area, Directly Connected

The area covered by a building, impermeable pavement, or other impervious surfaces, which has a direct hydraulic connection to storm drains or storm water conveyances without first flowing across permeable land areas.

Impervious Area, Indirectly Connected

The area covered by a building, impermeable pavement, or other impervious surfaces, which is not hydraulically connected to storm drains or storm water conveyances, and allows water to flow across pervious land areas.

Impervious Surface Ratio (ISR)

Means the proportion of a site covered by impervious surfaces. It is determined by dividing the total area of impervious surface(s) by the total site area.

Karst

Means a limestone region with underground drainage and cavities and passages caused by the dissolution of the rock.

Native Vegetation

Plant species indigenous to the region and identified in the document, *Guide to the Vascular Plants of Florida*, by R. P. Wunderlin, 1998, published by the University Press of Florida, Gainesville.

Natural Area

Land that retains its original character and contains native vegetation or has been replanted in native trees and vegetation.

Natural Condition

That condition that arises from or is found in nature and has not been modified by human intervention.

Open Space

Means undeveloped land suitable for passive recreation or conservation purposes.

Pre-development

Means the natural condition of the land or the condition of the land prior to alteration by man-made structures.

Professional Geologic Study

Includes preparation of final boring logs and an analysis of subsurface conditions and materials, submitted in the form of a report. The report includes, but is not limited to, bearing capacity for deep or shallow foundations, settlement analysis, slope stability analysis, locations of unsuitable soils, subcut depths and types of backfill, muck excavation limits and treatments, culvert treatments, pavement designs, and geologic recommendations and must be sealed by a Florida licensed professional geologist.

Recharge Rate

The annual amount of rainfall which contributes to groundwater as a function of hydrologic soil group.

Rural

Means low density areas characterized by social, economic, and institutional activities which may be largely based on agricultural uses or the extraction of natural resources in unprocessed form, or areas containing large proportions of undeveloped, unimproved, or low-density property.

Sinkhole

Means a hole or depression that forms when underlying limestone collapses.

Spring

A place where ground water emerges from the aquifer onto the surface of the earth, including the bottom of a body of water. The point where groundwater flows out of the ground, and is thus where the aquifer surface meets the surface of the earth.

Springshed

Means the area of land whose water will eventually end up in a spring and spring run. The shape of this recharge area is influenced not only by topography, but also by the presence of cave systems, fissures, and other karst features.

Stormwater

Means rainwater that flows over land after falling.

Subsurface Channels

Underground caves or channels that have been mapped by various organizations and are connected to springs, open sinkholes, or sinkholes with stream inflow. The area 300 feet either side of the subsurface mapped channel is the surface expression of the channel.

Transfer of Development Rights (TDRs)

Means a land use management technique where development potential is legally conveyed from one parcel, typically a sensitive area, to another parcel which has been identified as suitable for development.

Urban

Means an area or development characterized by social, economic, and institutional activities which are predominantly based on the manufacture, production, distribution, or provision of goods and services in a setting which typically includes residential and nonresidential development uses other than characteristic of rural areas.

Vulnerability

As used in relation to springs, means the susceptibility of the Floridan aquifer system and its related springs to pollution from nitrates and other sources.