

A CLASSIFICATION OF MAJOR SPRINGS IN FLORIDA USING THE WATER RECREATION OPPORTUNITY SPECTRUM FRAMEWORK

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Abstract

For the past three decades, many researchers and land managers have utilized the recreation opportunity spectrum framework (ROS) to provide a diverse set of recreational opportunities to users. However, the concepts on which ROS is based and most of the previous applications of ROS, have not addressed the water-based land management and research. Water recreation opportunity spectrum (WROS) that reflects a more applicable approach for water-based planning should be taken. The purpose of this study was to help water-based recreation resource managers protect spring-based resources and provide diverse recreational settings. The purpose of this project was to use Florida Springs as a case study in WROS with the addition of a spatial component. The main objectives were to classify major springs in Florida into water recreation opportunity spectrum, to identify currently available recreational classes of major springs, and to identify patterns of spatial distribution of major springs by using GIS. The results indicated that there are some differences in the distribution of overall physical, social, and managerial conditions, along with different classes of recreational opportunities. The findings showed that rural developed, rural natural, and semi-primitive settings were considered to be currently available regarding overall inventory of major springs in Florida with some patterns of spatial distribution. Based on these findings, it is recommended that recreation managers and planners may consider providing other unavailable recreational settings to meet diverse needs of recreationists.

1.0 Introduction

Since the 1970s, planners in the primary U.S. land management agencies realized needs for a framework that would better combine outdoor recreation with management planning of diverse use. Those strong needs of recreation planning have been more accelerated since the initiation of several significant statutes such as Renewable Resources Planning Act in 1974, Federal Land Policy and Management Act in 1976 (Driver et al. 1987), and National Forest Management Act in 1976 (Heywood et al. 1991). As a result, Clark and Stankey (1979), other researchers and federal land management agencies introduced the recreation opportunity spectrum (ROS) framework and planning system that would help recreationists to seek and achieve opportunities for activities, settings, experiences, and benefits by participating in recreation. Many empirical studies about the land-based ROS concept interrelating activities, settings and experiences have been done in the past two decades (Floyd & Gramann 1997; Heywood 1991; Manfredo et al. 1983; Shafer & Hammitt 1995).

Although some ROS studies (Harris et al. 1985; Williams & Knopf 1985) have been conducted around water-related areas, much of the concept and application of ROS have not been addressed directly in the water-based land agencies and research. A more applicable approach for water-based planning should be taken. That is, the water recreation opportunity spectrum (WROS) should be discussed more widely in the current literature. WROS is not a new concept, but modeled after the ROS. Aukerman and Haas (2004) have proposed that WROS is a new tool tailored to water resources such as reservoirs, lakes, rivers, bays, wetlands, costal zones, and marine protected areas and helps understand the type and location of six types of water-related recreation opportunities from urban to primitive. WROS allows recreation resource managers to inventory and map those classes to help visitors and recreationists decide where to recreate. The basic concept of WROS could contribute to planning of recreational use to meet diverse recreational opportunities and protect natural resources.

There are approximately 500 springs in Florida managed by four different Water Management Districts. Florida's springs play a considerable role contributing the economy of Florida as well as providing outdoor recreation opportunities for millions of residents and tourists. They also provide a good habitat for a variety of species (Carter & Pearch 1985; Stamm 1994). However, the recreational use and development of springs has grown rapidly. Major water-based recreation activities such as swimming, motorboating, canoeing, kayaking, tubing, and fishing tend to be heavily contingent upon springs-based natural resources. Highly developed recreational facilities and intense natural resource modification appear at some springs. These changes could have negative environmental impacts on the ecosystem of the springs. In this sense, there is clearly a need for a study designed for water-based recreation managers to plan management strategies of inventorying recreational settings, deciding types and location of recreational opportunities, and ameliorating negative environmental impacts on spring resources. Therefore, the purpose of the study was to help water-based recreation resource managers protect spring-based resources and provide diverse recreational settings. The main objectives of the study were to classify major springs in Florida into the water recreation opportunity spectrum, to identify currently available recreational classes of major springs, and to identify patterns of spatial distribution of major springs based on a WROS map. This study also sought to generate recommendations for management and future research.

2.0 Methods

2.1 Study Areas

A spring is a point from which natural groundwater discharges into surface water bodies. Recent geologists estimate that there are nearly 700 springs in the State of Florida, representing perhaps the largest concentration of freshwater springs on Earth (Florida Department of Environmental Protection 2003). Springs in Florida provide a good habitat for a variety of species, offer outdoor recreation opportunities to residents and visitors,

Table 1.—Setting attributes and indicators

Setting attributes	Indicators of settings
Physical	Degree of public access*
	Degree of natural resource modification*
	Degree that natural resource dominate an area*
Social	Degree of crowding*
	Degree of diverse recreation activities
	Degree of suitability of activities
Managerial	Degree of protection*
	Degree of safety*
	Number of developed facilities
	Facility development

*Data sources were mainly from FDEP websites

and contribute the economy of Florida (Carter & Pearch 1985; FDEP 2003; Stamm 1994). For instance, hundreds of manatees living at the most northerly edge of Florida are dependent on springs for warm water refuges to survive winter seasons. Twelve state parks that were named for springs attracted over two million visitors in 2003. Water, especially in the headsprings, is remarkably clear and has long been an attraction to local residents and visitors.

2.2 Data Sources

For physical, social, and managerial attributes, this study used multiple sources compiled from published books, published reports, Florida Department of Environmental Protection (FDEP) websites, and other online sources in 2004. FDEP websites provide setting indicators that describe degrees of public access, natural resource modification, crowding, protection, etc. (Table 1). Descriptions of those degrees are very similar to those for the continual recreation opportunity spectrum although characterized by a subjective point of view. Other published sources helped identify types and number of activities and facilities in this study.

For geographic patterns, geographic data of Geographic Information Systems (GIS) shape files that locate the spring areas were obtained from the FDEP geological survey team and Florida Geological Data Library (FGDL) website in 2004. After acquisition of the data, a

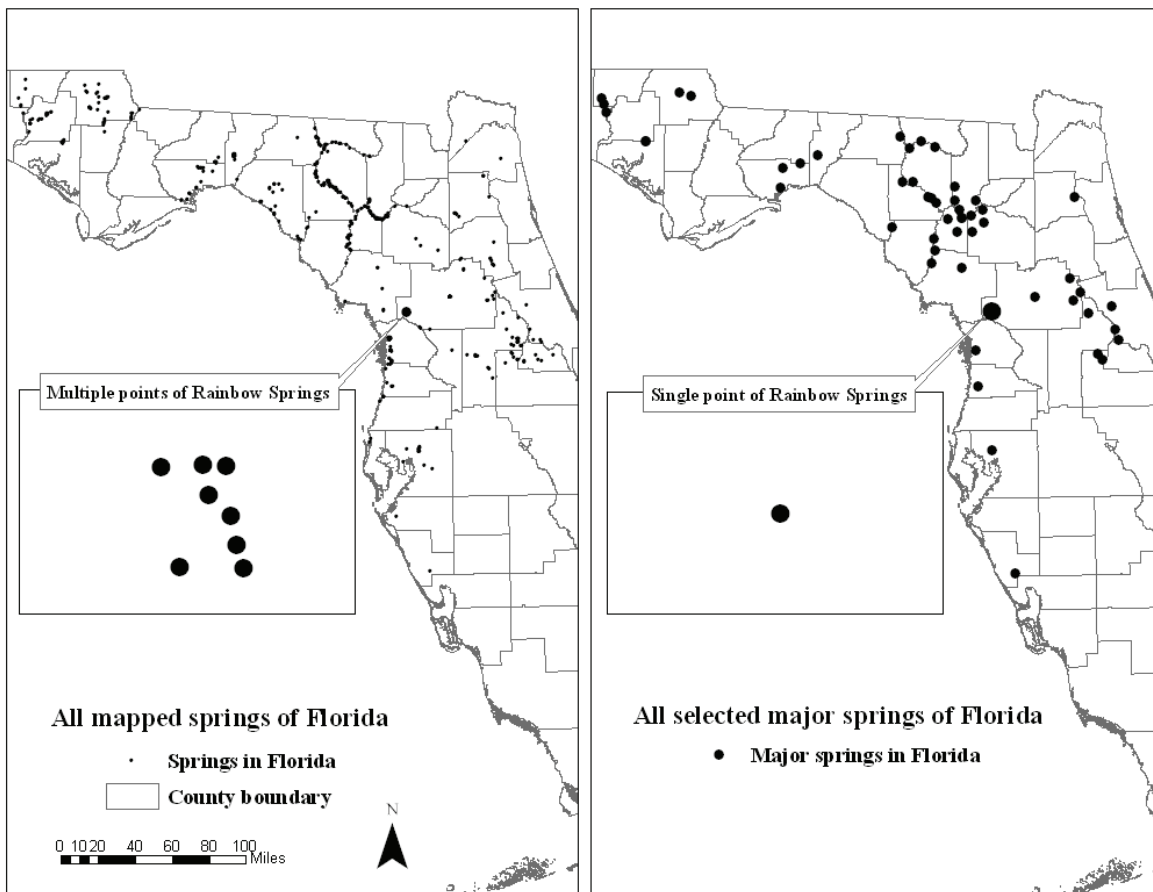


Figure 1.—All mapped springs and major springs in Florida

total of 462 springs' sites in Florida, including 1st to 4th magnitude and unknown springs, were mapped out as a point using ArcGIS software, version 8.3 (Environmental Systems Research Institute, 2003). Even multiple points of a spring were mapped (Fig. 1). In this study a total of 53 springs described as 1st to 3rd magnitude were considered to be major springs with a single point of a spring (Fig. 1). Other springs were not included in this study because setting indicator data was not available in multiple sources.

3.0 Results

As Table 1 shows, physical, social, and managerial setting attributes were used in this study to determine WROS of major springs in Florida. Indicators for physical setting consisted of public access, natural resource modification, and domination of natural resource surrounding spring areas. Indicators used for social setting were crowding, diverse recreation activities, and suitability of activities. Indicators used for managerial setting were protection,

safety, number of developed facilities, and level of facility development. Setting attributes and indicators of WROS are similar to those of ROS, but as stated earlier, WROS indicators focus more on water resources.

For continual degrees of each setting indicator a 6-point scale was also used in this study to be consistent with six gradations of water-based recreation opportunities in WROS users' guidebook proposed by Aukerman and Haas (2004). Those six types are:

1. urban,
2. suburban,
3. rural developed,
4. rural natural,
5. semi-primitive
6. primitive.

As an example of physical indicator degrees, public access ranges from "an excellent condition" in an urban setting

Table 2.—WROS physical inventory

Physical indicators of settings	Urban (1)	Suburban (2)	Rural developed (3)	Rural natural (4)	Semi-primitive (5)	Primitive (6)
Public access	Excellent	Very good	Good	Strenuous	Very strenuous	Extremely strenuous
Natural resource modification	Completely degraded	Very degraded	Fairly degraded	Fairly pristine	Very pristine	Extremely pristine
Natural resource dominating an area	Poor	Fair/fine/good	Good-very good	Very good	Very good-outstanding	Excellent or outstanding

Adopted from WROS users' guidebook proposed by Aukerman and Haas (2004)

Table 3.—WROS social inventory

Social indicators of settings	Urban (1)	Suburban (2)	Rural developed (3)	Rural natural (4)	Semi-primitive (5)	Primitive (6)
Crowding	Heavy or crowded	Very large or heavy on warm days	Very large or heavy on warm weekends	Small or moderate on warm weekends	Very small	None
Number of diverse recreation activities	Extensive or dominant (+6)	Very prevalent or widespread (6)	Prevalent or common (5)	Infrequent (4)	Little or seldom (3)	Very little or rare (-2)
Suitability of activities		Diving	Kayaking Canoeing Swimming			

Adopted from WROS users' guidebook proposed by Aukerman and Haas (2004)

Table 4.—WROS managerial inventory

Managerial indicators of settings	Urban (1)	Suburban (2)	Rural developed (3)	Rural natural (4)	Semi-primitive (5)	Primitive (6)
Protection	Excellent or outstanding	Outstanding-very good	Very good	Very good-good	Good/fair/fine	Poor
Safety	Excellent or outstanding	Outstanding-very good	Very good	Very good-good	Good/fair/fine	Poor
Number of developed facilities	Extensive or dominant (+6)	Very prevalent or widespread (6)	Prevalent or common (5)	Infrequent (4)	Little or seldom (3)	Very little or rare (-2)
Facility development		Parking lot, marina, or dock				

Adopted from WROS users' guidebook proposed by Aukerman and Haas (2004)

to “an extremely strenuous condition” in a primitive setting (Table 2). As an example of social indicator degrees, crowding is “heavy” in an urban setting and “none” in a primitive setting (Table 3). As an example of

managerial indicator degrees, developed facilities range from “an extensive or dominant condition” in an urban setting to “very little or rare condition” in a primitive setting (Table 4).

Table 5.—Overall WROS classification

Inventory sites*	Setting attribute ratings			WROS classification (average ratings)
	Physical	Social	Managerial	
Ginnie Springs	3.0	4.6	3.0	Rural natural (3.5)
Rainbow Springs	3.0	4.4	2.5	Rural developed (3.3)
Blue Spring (Levy county)	1.5	4.7	2.6	Rural developed (2.9)
Holton Creek Rise Spring	6.0	5.7	2.5	Semi-primitive (4.7)

*Example of four sample sites; Adopted from WROS users' guidebook proposed by Aukerman and Haas (2004)

Notably, this study allowed some flexibility of coding system. For instance, if a spring area has more than 6 different recreation activities, degree of diverse recreation activities was considered to be extensive so an urban setting (1) was assigned to the spring area. Additionally, if there are less than two recreation activities available in a spring area, a primitive setting (6) was assigned to the spring area (Table 3). Coding for number of developed facilities was considered to be consistent with that for diverse recreation activities (Table 4). Furthermore, as far as suitability of recreation activities is concerned, swimming, canoeing and kayaking were considered to be appropriate from urban to primitive settings, so a primitive setting (6) was given to a spring area with those activities available. In the same manner, a middle point of rural natural setting (4.5) was assigned to diving (Table 3). Coding for facility development was also considered to be consistent with that for suitability of recreation activities (Table 4).

As Table 5 shows, to determine overall classification of Ginnie Springs as an example, once each physical indicator was assigned to a certain value of recreational class, all values of physical indicators were summed and then divided by the number of physical indicators to acquire an average of recreational classes. As a result, a rural developed setting (3.0) was considered to be available in Ginnie Springs regarding overall physical inventory. Overall social rating (4.6) and overall managerial rating (3.0) were obtained in the same way as overall physical rating. We then averaged all values of physical, social and managerial attribute ratings to

identify overall classification of Ginnie Springs as a rural natural setting (3.5). Finally, this study integrated all values of physical, social, managerial and overall inventory ratings into GIS layers of major springs in Florida.

The geographic distributions of the 47 physical inventory ratings sites are displayed in Figure 2. Suburban and rural developed settings were considered to be more active than the primitive, less developed settings. More than 35 percent of the sites appeared to be suburban and more than 30 percent were rural developed settings. In addition, some settings were more likely to appear clustered, and neighboring settings tended to be continual regarding the WROS classes. For instance, suburban and rural developed settings were adjacently located.

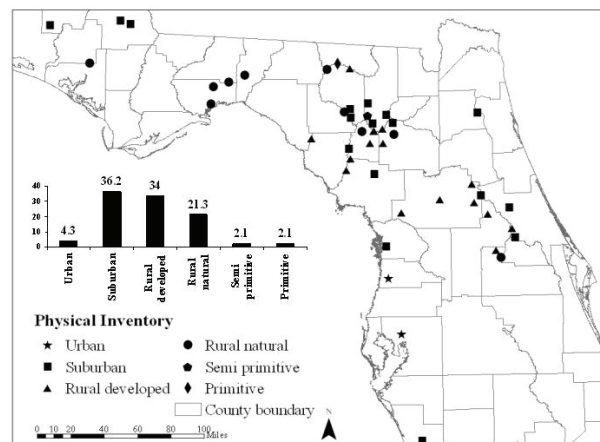


Figure 2.—Physical inventory

Figure 3 displays the geographic distribution of the 53 social inventory sites. Semi-primitive settings were more likely to be dominant in the study region. More than 55 percent of the sites appeared to be semi-primitive and around 30 percent rural natural settings. Rural developed and semi-primitive settings were more likely to appear evenly dispersed. Neighboring settings tended to be continual. The 53 managerial inventory sites are displayed in Figure 4. Rural developed settings appeared to be more dominant than any other setting. They represented more than 50 percent of the sites and tended to appear evenly dispersed in the study region.

The distributions of a total of 53 overall inventory sites were mapped in Figure 5. In the study region, rural developed, rural natural and semi-primitive settings were found to be currently available. Around 45 percent of the sites were considered to be rural developed, nearly 40 percent rural natural, and about 15 percent semi-primitive. Other settings such as urban, suburban and primitive settings were not available. Furthermore, rural developed settings were dispersed mostly in northern and central Florida regions, rural natural settings dispersed mostly in northern and panhandle Florida regions, and semi-primitive settings dispersed mainly in panhandle Florida regions.

4.0 Summary

In the physical inventory, suburban and rural developed settings tended to be active and those same settings more likely to appear clustered. In the social inventory, semi-primitive settings were usually dominant, while rural developed and semi-primitive settings appeared fairly evenly dispersed. The managerial inventory showed rural developed settings to be more dominant and evenly dispersed. Rural developed, rural natural and semi-primitive settings were all shown to be available in the overall inventory. In addition, rural developed settings were likely to be dispersed mostly in northern and central Florida, while rural natural settings appeared to be dispersed mostly in northern and panhandle Florida.

4.1 Management Implications

Overall, this study provided a baseline for inventorying water-based recreation resources and identifying the types of recreational opportunities available in major springs of

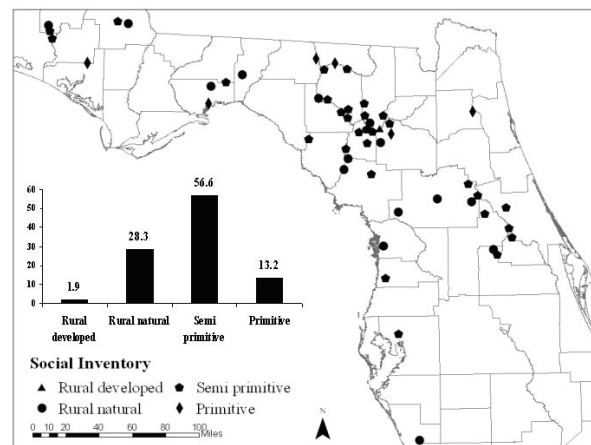


Figure 3.—Social inventory

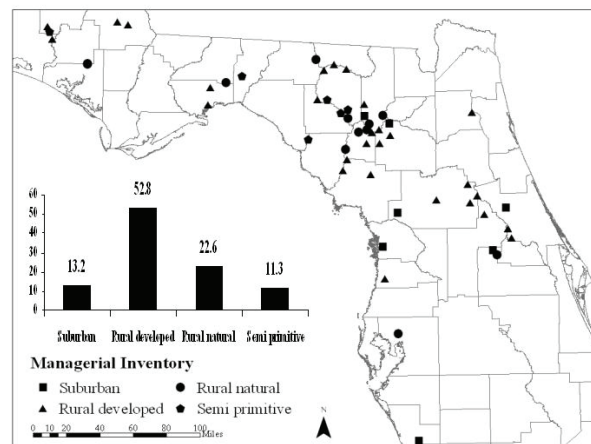


Figure 4. Managerial inventory

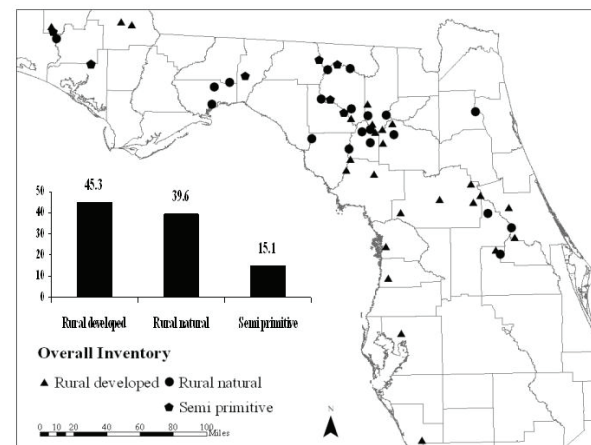


Figure 5.—Overall inventory

Florida. Based on WROS inventory results, more diverse recreation settings should be necessary for recreation managers and planners to consider providing to visitors to Florida spring sites. In other words, they should be urban, suburban and primitive settings, considering the fact that they are not currently available in major springs of Florida. This may secure quality in outdoor recreation. However, it should be noted that recreation management agencies may need more rural natural to primitive settings than urban to rural developed settings in a sense of reducing development level and protecting natural resources in major springs of Florida.

In terms of spatial distribution of recreational opportunities, recreation managers and planners should distribute diverse settings to be more evenly dispersed than being clustered in the study region. This would also assure quality in outdoor recreation that visitors and residents in Florida can have an equal access to choose from a diverse set of recreational opportunities. Regarding role of service providers, settings closer to urban settings may be allocated in private sector. Perhaps water parks may meet this need. Settings closer to primitive settings may be provided by public land agencies.

4.2 Future Research

This study obtained secondary data from multiple sources and used 10 setting indicators to identify what recreational classes are currently available in major springs of Florida. Limitations of this study may be related to subjective descriptions of setting indicators (e.g., natural resource modification, crowding) and a flexible approach to coding setting indicators (e.g., suitability of recreation activities). To overcome those issues and increase credibility of WROS inventory results, future research may obtain and use more setting indicators by inventorying onsite, and working closely with stakeholders and recreation resource managers.

It is more important to identify perceptions, attitudes and opinions of visitors and local communities about current and preferred physical, social, and managerial conditions in spring resource areas. This would better assist recreation managers and planners in making planning decisions to meet the needs of visitors and allocate their budgets more

appropriately. Not finding desirable situations, springs users may be displaced to other places better meeting their needs. Future research should make an effort to survey users to spring resource areas.

This study mapped overall physical, social, and managerial inventories to identify patterns of recreational classes. Future studies may include mapping each of the indicator settings for recreation managers and planners to better manage recreational water resources. For instance, degree of natural resource modification should be mapped for water-based agencies to understand its distributions and to consider taking management actions where the modification condition is extensively heavy. In mapping each setting indicator, it would be helpful to use GIS layers of land use and land cover classification for management decisions.

5.0 Citations

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