Introduction

The community of Homosassa, Florida is barely above sea level and just a handful of miles from the Gulf of Mexico, so it is on the front lines of the nation’s flood insurance crisis and will likely face problems associated with future sea level rise. The Ellie Schiller Homosassa Springs Wildlife State Park is now known more for its collection of mostly native Florida animals and the annual, cold season invasion of dozens of manatees to its life saving 72-degree (F) waters. Indeed, the community’s centerpiece is its springs, which empty into a common pool that forms the head of the Homosassa River. Homosassa’s Springs have been a roadside attraction for nearly a century, and like other Florida springs, they are sending warning signs regarding the condition of the Floridan aquifer that supplies them; as such they serve as “canaries in the coal mine.” This paper situates Homosassa’s springs within the constellation of Florida’s more than 1,000 springs as well as recent challenges and efforts to better manage and conserve these impressive water resources.

Morris (1995, p.121) cites a Great Depression Era scholar, who defined Homosassa as a combination of Seminole-Creek words meaning “a place where wild pepper grows.” Morris (p.121) then claims that others (whom he does not cite) contend that the word Homosassa “means smoking creek—from the dense vapor that on cool days envelops the warm springs and river.” Whatever its name means, Homosassa’s springs are located in the small town of the same name in Citrus County, Florida—about 75 miles north of Tampa Bay. According to the U.S. Census, Homosassa (pronounced HO-muh-SASS-ah) had a 2010 population of fewer than 14,000, and is in the heart of what the Florida Department of Environmental Protection calls the Springs Coast (Figure 1). The Springs Coast watershed is the coastal halves of four west central Florida counties stretching from Citrus County/Crystal River in the north through Hernando and Pasco Counties, and ultimately Pinellas County/St. Petersburg in the south. The Springs Coast is named for its several coastal area springs including significant springs such as Weeki Wachee, Chassahowitzka, the Kings Bay/Crystal River group, and Homosassa.

Figure 1. West central Florida’s Springs Coast watershed. Source: Florida Department of Environmental Protection http://www.dep.state.fl.us/Water/basin411/springscoast/index.htm
A Primer on Florida’s Springs

According to Copeland (2003, p.12), a spring is “a point where underground water emerges onto the earth’s surface (including the bottom of the ocean).” Indeed, Florida has several offshore springs. According to Dave DeWitt, a geologist with the Southwest Florida Water Management District (personal conversation, 2014), earth scientists know relatively little about Florida’s offshore springs. We do know that offshore springs often have different water chemistry than onshore springs, including a much higher concentration of dissolved solids (Champion and Starks, 2001); and we know that changing tides can impact offshore springs, with lower tides allowing more spring discharge than high tides (Lane, 2001). Moreover, the presence of such offshore springs should not be a surprise because the modern state of Florida is part of a much larger and older geologic feature called the Florida platform (Figure 2), which appeared as exposed dry land during the most recent ice age when sea levels were nearly 400 feet lower than those of today (Hine, 2013). In any case, except for a few cave divers, offshore springs are not used by many people.

Figure 2. The Florida Platform extends well into the Gulf of Mexico but less far out into the Atlantic Ocean. Source: This Google Earth image may be found at: http://written-in-stone-seen-through-my-lens.blogspot.com/2013/07/a-geological-and-biological-first-visit.html

Florida’s onshore (or land-based) springs are a variable lot and can be divided into three primary categories. Probably the most significant in Florida are karst springs: places featuring artesian (natural, upward) flow of groundwater through a well-defined vent (or group of closely spaced vents) at the surface. Although it is common for almost any spring or group of springs to be referred to in the plural, in some cases, there is really a single spring vent and writers should use the singular. For example, Homosassa Springs consist of three nearly adjacent spring vents.
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(emptying into the same pool) and more than a dozen separate spring vents within just a few miles, so it is appropriate to refer to Homosassa Springs in the plural. On the other hand, the centerpiece of a Tampa neighborhood called Sulphur Springs is a single spring vent discharging water to a small pool that ultimately drains to the nearby Hillsborough River. The spring, like the neighborhood, is often referred to in the plural—Sulphur Springs—but the spring itself is more appropriately called Sulphur Spring.

Yet Florida has two other types of land-based springs. Some of the state’s springs are best called seeps, places where groundwater oozes to the surface in modest quantities and sometimes over a broad area. Occasionally seeps provide water to rivers or lakes; other times, they provide only a trickle of water across the landscape. Meanwhile, a resurgence or river rise is a spring caused by a stream that “disappears” into a hole in the bed of a stream (often called a swallet hole or just swallet)—and then reappears at the surface some distance away, usually merged with additional groundwater. For example, north Florida’s Santa Fe and Alapaha Rivers each disappear into the ground only to reappear out of the ground and continue flowing across the surface just a few miles away.

Most Florida springs discharge water from the upper Floridan aquifer (Scott et al., 2004; Figures 3a and 3b). Florida has several aquifers. South Florida’s Biscayne aquifer, northwest Florida’s Sand and Gravel aquifer, and many other lesser known surficial aquifers, store large quantities of groundwater supplied directly from precipitation, which infiltrates the surface and moves downward under the force of gravity until reaching a relatively impermeable layer of clay or rock. Surficial aquifers do not support any of Florida’s most significant springs. Moreover, “relatively impermeable” confining layers have sections that “leak” groundwater to deeper aquifers, such as the moderately productive Intermediate aquifer in southwest Florida, and the deeper, more prolific Floridan aquifer (which underlies all of Florida, extending as far north as the southern edge of South Carolina, and as far west as Alabama/Mississippi; Johnston and Bush, 1988). Even the Floridan aquifer is often separated (by more relatively impermeable layers of clay and rock) into upper and lower Floridan aquifers. Portions of the lower Floridan are often more than 3,000 feet below the surface and usually contain mostly salt water, left over from a time when Florida was a shallow sea floor. Much of the upper Floridan aquifer (extending from near the surface in northern and central Florida, to as much as 2,000 feet below the surface in some places) is mostly fresh water and is the source of most Florida spring water as well as 40% of Florida’s fresh water supply (Marella, 2014). Scott (2001) estimated that the Florida portion of the Floridan aquifer system contains more than 2.2 quadrillion gallons of water, although only a fraction of this can be sustainably accessed for human consumption. Rosenau et al. (1977) estimated that Florida’s springs discharge some 8 billion gallons of water per day.
Just as a river depends on a larger land area called a watershed/drainage basin to supply it with water, springs obtain their water from broad areas (including water on and beneath the surface) called spring recharge basins or springsheds (Figure 4). In addition, some springsheds have more permeable soils or sinks/sinkholes (or both) and these provide more rapid recharge than springsheds with less permeable soils and no sinks/sinholes (Brinkman, 2013). Accordingly, the concept of a springshed is important not only from a water quantity perspective, but also from a water quality perspective. To the extent that parts of some springsheds provide more direct or rapid groundwater recharge, they represent spaces of vulnerability: contaminants from land use activities in vulnerable places can be more quickly funneled into the aquifer. Since the upper Floridan aquifer is either exposed or thinly covered in much of north and central Florida (a portion of the state with many sinkholes and conduits to the Floridan aquifer), much of the upper and middle peninsula is generally more vulnerable to groundwater contamination. Once below the surface, groundwater can move slowly or quickly. In much of the subsurface, groundwater moves slowly—taking years, decades or more to reach a spring vent (Katz, 2004). Yet some dye tracing studies have estimated groundwater movement of more than one mile per day (Stewart and Mills, 1984). Indeed, Pittman (2013a) contends that some water managers use groundwater flow models that assume sub-surface water moves much more slowly than it often does.
Extending inland several miles from the Gulf of Mexico, there is a transition zone in the Floridan aquifer where fresh groundwater from the land moving toward the Gulf mingles with salty groundwater that is oozing inland under pressure from the ocean. While most Florida springs discharge freshwater from the Floridan aquifer, some springs—especially Homosassa and others associated with the Springs Coast—discharge slightly brackish water because they sit on top of this transition zone. Salinity values can vary daily depending on precipitation, local withdrawals from the aquifer, and daily tides. During low tides, for example, salinity values at coastal springs in Citrus and neighboring Hernando Counties are a bit lower, as fresh groundwater pushes seaward; but they are a bit higher during high tide, when salty groundwater is forced inland (Yobbi, 1992). Yet according to Champion and Starks (2001, p.57), “Chloride concentrations across the [Springs Coast] group [of springs] may range from less than 50 mg/l to greater than 500 mg/l, indicating that water quality at the spring group is strongly influenced by the coastal transition zone even at low tide.” Of course, continued sea level rise has the potential to push more salty groundwater toward Florida’s coastal springs.

Springs in the United States have been characterized by their discharge ever since groundwater hydrologist Oscar E. Meinzer (1927) developed the following classification scheme nearly a century ago (see Table 1).
Magnitude  |  Average Flow (Discharge)  
------- | ------- 
1       | greater than 100 cfs  (64.6 mgd)  
2       | greater than 10 to 100 cfs  (6.46 - 64.6 mgd)  
3       | greater than 1 to 10 cfs  (0.646 - 6.46 mgd)  
4       | greater than 100 gpm to 1 cfs  (100 – 448 gpm)  
5       | greater than 10 to 100 gpm  
6       | greater than 1 to 10 gpm  
7       | greater than 1 pint/minute to 1 gpm  
8       | less than 1 pint/minute  

cfs = cubic feet per second; mgd = million gallons per day; gpm = gallons per minute  

Table 1. Spring Magnitude and Discharge (Meinzer 1927).

Scott et al. (2002) report 33 first magnitude springs in Florida, and one might be tempted to assume that spring discharge is as consistent as the temperature of the spring water making its way to the surface (often at or very near 72 degrees [F] in many Florida springs throughout the year)—but this is not the case. In fact, spring discharge varies from year to year, season to season, and even day to day (Figures 5-7). Because Homosassa’s main springs are connected by the Homosassa River to the Gulf of Mexico (less than 10 miles away), spring flow is tidally influenced. According to Leeper et al. (2012, p.50), “Discharge from the main Homosassa Springs (and other [coastal] system springs) tends to be lowest in late spring and early summer . . . likely as a result of the higher median and low tides during this period. Lower tides in the winter exert less hydraulic head pressure over the spring vents, thus allowing greater spring discharge relative to higher tide conditions.” Complicating the analysis of spring discharge values even further is the fact that prolonged onshore winds can push tide water inland, reducing spring flow (Leeper et al., 2012).

![Annual Discharge at Homosassa Springs, 1930-2013](http://waterdata.usgs.gov/fl/nwis/uv/?site_no=02310678&PARAMeter_cd=00065,00060)  

**Figure 5.** Even ignoring the extremely productive year of 1984, Homosassa’s Springs have produced annual mean discharges ranging from 66 to 150 cfs. In many years, no measurements
were taken. In some years, there is only a single measurement for the entire year, while in other years there are more than a dozen measurements. All USGS discharge data for each year were reduced to an annual mean, regardless of the number of measurements.

**Figure 6:** Note that Homosassa spring discharge reaches its annual minimum at a time when tides are highest (Leeper et al. 2012) and at the end of central Florida’s drier season, suggesting that these springs might also be impacted by seasonal changes in precipitation.

**Figure 7.** Note the discharge range, in a single month, of between 78 and 95 cubic feet per second.
Meanwhile, in some cases, authorities measured discharge in selected springs many years ago and at that time, some springs produced enough water to warrant first magnitude designation. Subsequent measurements, however, suggest that some of these springs could be re-classified. For example, despite many years in which Homosassa Springs discharge measurements exceeded the 100 cubic feet per second threshold for first magnitude springs (see Figure 5), according to more recent U.S. Geological Survey data, the bulk of spring discharge measurements since the late 1990s, show discharge below Meinzer’s threshold for a first magnitude spring. Even though Homosassa Springs appears in Scott et al.’s 2002 inventory of Florida’s 33 first magnitude springs, clearly it is no longer producing first magnitude flows, and is now more properly thought of as a “historical” first magnitude spring (see discussion of this issue in Copeland 2003). Of course, the same could be said for nearly half of Florida’s (former) first magnitude springs in 2001, which happened to be at the end of a three-year drought. Confounding long-term spring discharge analyses even further is the fact that measurements in the past were taken in different locations AND many older measurements were one-time efforts (as opposed to continuous measurements), possibly taken at a time when discharge was abnormally high or low that year. The point of all this is not to analyze with precision the discharge of Homosassa Springs as much as it is to suggest that spring flow is dynamic at daily, seasonal, and annual time scales.

How many springs does Florida have? It depends on when one asks. The number of documented springs has changed over time. For example, in 1913, the U.S. Geological Survey listed 50 springs in Florida (Matson and Sanford 1913). In the state’s first attempt to systematically inventory and describe its springs, Ferguson et al. (1947) list 108 springs. Revising Ferguson et al.’s report thirty years later, Rosenau et al. (1977) verified 300 springs in Florida. However, Rosenau et al. (1977, p.2) cautioned, “There are other springs: some too small to be significant, others that are little known or secreted away in the woodlands and the marshlands of the state, and many others that lie undetected in the beds of Florida’s rivers, in its estuaries, and offshore.” Indeed, in the state’s most recent report on its springs, Scott et al. (2004) tabulate 720 springs; and according to a database maintained by the Florida Department of Environmental Protection (FDEP, 2011), the Sunshine State had at least 1,013 springs in 2011 (Figure 8).

The number of Florida springs also depends on how one counts them: are multiple vents in very close proximity separate springs or simply counted as one spring group? Homosassa Springs appears in both Matson and Sanford (1913) and Ferguson et al. (1947) as a single spring. Yet Rosenau et al. (1977) map a dozen springs within six miles of the main pool at the Ellie Schiller Homosassa Springs Wildlife State Park. Furthermore, Scott et al. (2004) clarify that three spring vents discharge into a single pool at Homosassa, and Leeper et al. (2012, p.31) map two dozen springs within a 5 mile radius of Homosassa Springs Wildlife State Park (including the three main springs forming the common pool at the state park).
Figure 8. Geographic distribution of Florida’s many springs. Source: FDEP’s 2011 database; map by Michelle Sonnenberg.

At the same time, none of the earlier inventories/reports mentions Ulele Spring, at the northern edge of downtown Tampa, adjacent to the Hillsborough River. More than a century ago, what was then called Magbee Spring, named for a local, and not particularly well-liked judge—James T. Magbee—served as Tampa’s water supply (Zayas 2006; Wiatrowski 2014). Many decades ago the city abandoned the spring as a potable water supply, but the spring’s discharge continued to flow through an underground pipe to the Hillsborough River, and the site became infested with exotic vegetation. As part of the City of Tampa’s riverfront redevelopment effort, authorities obtained several hundred thousand dollars in grant funding to remove the pipe, clear
the exotic species, and plant native vegetation around the site—essentially restoring the spring for the benefit of manatees, birds, fish—and people. This spring does not appear in Scott et al.’s (2004) list of springs for Hillsborough County, but the FDEP’s 2011 springs database now has it listed. The total number of Florida springs will likely never be known with certainty, partly because of how we count them, partly because some springs are in secluded or difficult to access places (including river bottoms) and remain undocumented, partly because some are forgotten, and partly because some springs—such as Polk County’s Kissengen Spring—have stopped flowing (see Peek, 1951). Clearly, springs are constantly being discovered and enumerated while others disappear from our view.

As Figure 8 makes clear, most of the state’s springs are in central, northern and western (but not far western) Florida; and they are virtually absent in Florida’s southern counties. Springs are not common in far western and southern Florida because the Floridan aquifer (source of most springs) is very deeply buried and covered by one or more significant confining layers. In much of central and northern Florida, the Floridan aquifer is either very thinly covered or exposed at the surface—making it easy for water under pressure to escape to the surface.

Florida Springs Policy

By the late 1990s, many Florida officials recognized that several of the state’s springs appeared stressed, and they pledged to take action. In 1999, Secretary of the Florida Department of Environmental Protection (FDEP) David Struhs directed Jim Stephenson (of FDEP’s Division of State Lands) to assemble a Florida Springs Task Force (FSTF or Task Force) “to recommend strategies to protect and restore Florida’s springs” (Scott et al., 2004, p.5). Stephenson ultimately selected 15 people: mostly scientists from state and federal agencies, Florida land and water managers, and planners. The FSTF met monthly for a year starting in September 1999. Members examined a host of environmental, social, and economic issues in Florida’s springsheds, airing a range of perspectives and receiving technical advice from more than a dozen experts. A year later, the Florida Springs Task Force (2000) released a report and long list of springs protection recommendations in five strategic areas: outreach, information, management, regulation, funding.

Armed with this report, Gov. Jeb Bush asked for funding from the 2001 Florida Legislature to begin the Florida Springs Initiative—and he received $2.5 million for springs research, protection, and restoration (Scott et al., 2004). Indeed, the legislature provided approximately $2.4 million annually for the Florida Springs Initiative for a decade (Stephenson, 2009). Moreover, officials formed the Florida Springs Nomenclature Committee in 2002, which ultimately produced a spring classification system and glossary (Copeland 2003). In 2004, the Florida Geological Survey released the state’s most recent inventory of Florida Springs (Scott et al., 2004). Several Florida communities established Spring Basin Working Groups to prepare specific plans for protecting local springs. Despite all this activity, however, the springs protection momentum ultimately stalled. Florida’s legislature ignored the Task Force’s recommendations and refused to establish a broad-based policy for the state’s struggling springs. Protecting springs (or anything else in the environment) means passing rules to limit what people can do on the landscape, and since 1998, Floridians consistently voted for conservative Republican legislators, who prioritize freedom from government intervention and low taxes. And then came the election of 2010.
In November 2010, Floridians elected Republican Rick Scott Governor AND solid Republican majorities to the Florida House of Representatives and Florida Senate—and most of these elected officials were/are far more interested in balancing the state budget by cutting taxes, reducing fees, and cutting government spending for many things—including environmental and springs protection. Gov. Scott terminated the Florida Springs Task Force and the Florida Springs Initiative shortly after taking office in 2011. In addition, despite plummeting property values (and plummeting property tax collections) from 2008-2010, Gov. Scott demanded that Florida’s water management districts further reduce their ad valorem tax revenue. In 2011, the legislature passed Senate Bill (SB) 2142, which slashed water management district property taxes by 30%.

As it happens, an increasingly conservative legislature took action on just one FSTF recommendation. In 2010, law makers passed House Bill (HB) 550, requiring Floridians to have their septic tanks inspected every five years—and repaired or replaced if necessary. Florida has an estimated 2.6 million septic tanks (FDOH, n.d.), and many of them are contributing excess nitrogen to groundwater. After an uproar from many Florida septic tank owners over the inspection price tag (some say as low as $150, others as high as $500), and the price of replacing an improperly functioning septic tank (several thousand dollars)—legislators repealed this law in 2012 before it could be implemented (Pinnell, 2012; Pittman, 2012).

In 2013, the legislature asked Florida’s water management districts how much money they needed to spend on springs protection, and the districts claimed they needed to invest a minimum of $122 million just to begin to cope with Florida’s failing springs (Pittman, 2013b). Much of this funding is necessary to buy land, build water treatment plants and sewer lines in order to replace septic tanks, and help farmers implement best management practices to reduce nutrient pollution. Instead of $122 million in state funding, Gov. Scott announced a $37 million investment in springs restoration, only $11 million of which came from the state. Water management districts and local governments redirected some of their budgets to cover the remaining $26 million of Scott’s initiative. Moreover, some $20 million of this funding was directed at water treatment plant upgrades to benefit just one spring: Florida’s famous Silver Springs, near Ocala (Spear, 2013; Pittman 2013c).

If Florida springs protection advocates thought they were on the verge of turning the corner in 2014, they were cruelly disappointed. In early 2014, the Florida legislature considered Senate Bill (SB) 1576: the Florida Springs and Aquifer Protection Act. Originally drafted in late 2013, SB 1576 called for designation of 38 Outstanding Florida Springs and corresponding delineation of springs protection and management zones, improved sewage treatment, abandoning septic tanks while hooking up to central sewer plants in these zones, reduced groundwater pumping in some places, and a dedicated, annually recurring source to help pay for it (33% of Documentary Stamp taxes, which are levied on each sale of real estate in Florida). Yet SB 1576 sponsors received a letter on 28 January 2014 from more than a dozen of Florida’s most powerful business lobbying groups objecting to the bill (one Florida Senate staff member provided me a copy of the letter). During the 2014 legislative session, state senators watered down SB 1576 substantially and a companion bill in the Florida House (HB 1313) never received a single committee hearing and was never voted on by the House. Indeed, Florida’s House of Representatives refused to pass any water policy, but it agreed to make a one-time budget allocation of $25 million on springs restoration and another $5 million to help farmers clean up their pollution near springs. Adding insult to injury, the 2014 legislature declared April “Springs Protection Awareness Month.” If
SB 1576’s original funding mechanism sounds familiar, it should: it is the same mechanism found in Amendment 1 to Florida’s constitution, The Florida Land and Water Conservation Initiative approved by nearly 75% of November 2014 Florida voters. Where does Homosassa Springs fit in to all this?

A Short History of the Ellie Schiller Homosassa Springs Wildlife State Park

Homosassa Springs consist of three nearly adjacent spring vents issuing from a collapsed limestone cavern that fill a common pool measuring 189 feet by 285 feet, and which form the headwaters of the six-mile long Homosassa River (Scott et al., 2004). There are nearly two dozen additional springs within a few miles of the three main springs at the state park. Little more than a whistle stop in the early 1900s, Homosassa Springs served as a convenient rest area for passengers while workers loaded railroad cars with local seafood and spring water. Beginning in the 1940s, new property owners ran the springs as a modest roadside attraction. Over the next several decades, a parade of owners took turns running the attraction, which—by the 1960s—featured alligators reaching up for food dangled over the water (Figures 9a and 9b).

Figure 9a. Award winning St. Petersburg Times photographer Bob Morelan’s famous 1956 photo of an alligator at Homosassa Springs. The attraction’s owner turned this photo into a post card for promotional purposes. Source: Florida Memory Project, Florida Division of Library and Information sciences, available at: [http://www.floridamemory.com/items/show/163682](http://www.floridamemory.com/items/show/163682)
Figure 9b. Many people are no longer amused by animal shows. Attendance at Sea World declined significantly after the 2013 documentary film Blackfish criticized the attraction for keeping orcas for shows. Yet this photo from several decades ago at Homosassa Springs reveals that animal shows were once quite popular. Source: Ellie Schiller Homosassa Springs Wildlife State Park, available at: http://www.floridastateparks.org/history/parkhistory.cfm?parkid=71

Attraction owners ultimately built an underwater observatory (opened in 1964) on top of the springs so that visitors could peer into what is affectionately called the “fish bowl,” a spring pool that almost always has thousands of fresh and salt water fish lounging in the spring water (Figure 10). Over the years, a host of both native and exotic species were introduced including Lucifer, a Hippopotamus, who at age 54, is among the oldest residents of the park today. Indeed, by the early 1980s, the privately owned attraction was known as Homosassa Springs Nature World (Sanchez 2001). Yet the construction of interstate highway 75 (well east of Homosassa) in the 1960s, and the emergence of the Orlando area entertainment/recreation complex in the 1970s (featuring Walt Disney World, Sea World and a host of others), ultimately reduced visitors to Homosassa Springs, leading the Citrus County Commission to buy the attraction in 1984, in order to preserve surrounding wetlands and this aspect of the region’s history. Citrus County ran the park until the state of Florida purchased the property and incorporated Homosassa into its state park system in 1989. In 2009, authorities changed the attraction’s name to Ellie Schiller Homosassa Springs Wildlife State Park, in honor of a significant state park benefactor (personal conversation, Susan Strawbridge, long time employee of Homosassa Springs Wildlife State Park, 2014)
Visitors can still descend the half century old underwater observatory, only now, one can occasionally stare eye to eye with manatees. During the cool season, cold fronts can chill coastal water temperatures to below 60 degrees (F)—which is dangerous for warm blooded manatees. Many manatees defend themselves by swimming up the Homosassa River toward the life-saving springs, which yield water close to 72 degrees (F). Yet visitors can observe manatees even during summer because park officials have long participated in the U.S. Fish and Wildlife Service’s Manatee Rescue, Rehabilitation and Release Program (USFWS, n.d.). Manatees receive critical care elsewhere, but they can recuperate at Homosassa Springs. Homosassa workers have rehabilitated several dozen injured manatees over the past few decades (FDEP, 2010), and the park opened an elaborate manatee care unit in 2001, which currently houses four manatees that have been injured or abandoned when very young.
These captive animals are not allowed to mingle or escape with winter visitors, but they are routinely fed in public by park staff near the underwater observatory during summer (Figure 11). The park now features a robust collection of native Florida birds and other animals, many of which—like the resident manatees—have been injured or abandoned in the wild. For example, park authorities recently received a Florida panther kitten that had been found (barely alive) in January 2014 by biologists in southwest Florida (Figure 12). Since the cat survived only because of human intervention and never had the necessary (wild) upbringing, authorities decided to house “Yuma” at Homosassa Springs, where he will spend the rest of his life, viewed by a few hundred thousand visitors each year (Anonymous, 2014; Strawbridge, personal conversation, 2014).

Figure 11. Captive manatees at Homosassa Springs, just before feeding. Photo by Becca David

Figure 12. Biologists rescued Yuma near Naples, Florida, in early 2014. In this November 2014 photo, Yuma is just 10 months old. Photo by Max Meindl.
An alphabet soup of water policy for Homosassa Springs: MFLs, OFWs, and TMDLs

One might assume that water quality and water quantity are completely separate issues. Sometimes this is true, for instance in coastal waters; but increasingly, water quality and quantity are intimately related. This is especially true in Florida where sinkholes, springs, and spring runs feature water that is never purely surface or groundwater. In addition to the many requirements of the Federal Water Pollution Control Act (including the significant amendments of 1972, often referred to as the Clean Water Act), the state of Florida attempts to protect water quality with a host of rules and regulations. Indeed, building on momentum from the Clean Water Act, Florida began designating some of its water bodies Outstanding Florida Waters (OFWs) in 1979 (see chapter 403.061 [27], Florida Statutes), listing Homosassa Springs and its river system an OFW in 1993. Such a designation is like listing certain species of plants or animals “endangered”; OFW listing affords the highest level of protection for designated Florida waters—or so it would seem. As it happens, the OFW anti-degradation policy limits “protection” of OFWs to control of land and water use activities that require a permit. According to section 62.402[2] of the Florida Administrative Code, “No Department permit or water quality certification shall be issued for any proposed activity or discharge within an Outstanding Florida Waters . . .” Of course, most activities that might degrade water quality require a permit, such as discharging treated wastewater or disposing of dredged or fill material; permit conditions generally attempt to minimize harm to receiving waters. Others activities, like setting minimum flows and levels for rivers and streams do not require a permit. And according to environmentalists, this is a problem.

As part of its landmark water resources legislation in 1972 (Blake et al., 2010), Florida demands that all five of the state’s water management districts (Figure 13) establish minimum flows and levels (MFLs) for each of its rivers (including spring runs), lakes, and aquifers.

Figure 13. Florida’s five water management districts. Both the South Florida and Southwest Florida water management districts existed prior to 1972. Map by Andrew Hayslip.
Minimum flows and levels are thresholds below which additional withdrawals would cause “significant harm” to the water resources or ecology of an area (Chapter 373.042[1] a and b, Florida Statutes); but the legislature never defined the meaning of “significant harm.” In a 2002 scientific review of a proposed MFL for the upper Peace River, however, Gore et al. (2002) claimed that a flow reduction causing a 15% reduction of habitat constituted significant harm, and the Southwest Florida Water Management District has been developing minimum flows and levels with this 15% habitat loss figure in mind. Yet in my conversations with Jim Gore (an aquatic ecologist)—he claims that there is no firm, scientific basis for this 15% figure—it is based mostly on professional judgment. Indeed, Gore contends (in a personal conversation, 2014) that environmentalists believe significant harm occurs with 5% habitat reduction, while developers think significant harm does not happen until there is a 25% to 30% loss of habitat.

One might not think that OFW designation and MFL efforts to protect water resources would cause conflict; but they certainly have in Homosassa Springs. In July 2010, the Southwest Florida Water Management District (often called Swiftmud) released a draft minimum flow recommendation for the Homosassa River (Leeper et al., 2010). Essentially, district scientists recommended that minimum flows in the Homosassa River should be no less than 95% of historic daily mean flows in order to keep habitat loss at 15% or less. Although a scientific review of this draft later that year (Hackney et al., 2010) contends that the District’s methodology and conclusions are defensible, public uproar over the proposed Homosassa River system MFL led District scientists to revise their minimum flow recommendation to 97% of mean daily flows—in other words, allowing a 3% reduction in river system flows (Miller, 2013; Leeper et al., 2012). The District contends (Leeper et al., 2012) that they do not permit any surface water extractions from the Homosassa River system (which begins with Homosassa Springs), and that permitted groundwater withdrawals are responsible for little more than a 1% reduction of historic Homosassa River flows. Accordingly, the revised MFL recommendation means that more groundwater withdrawal permits may be issued causing an additional 2% reduction of the river system’s flow. Local environmentalists tried to persuade the District to further modify the Homosassa MFL during a January 2013 hearing at Swiftmud Headquarters, but the District’s Governing Board adopted the 97% figure in February 2013. In short, MFLs are intended to protect water resources and ecosystems from “significant harm”; yet they also serve as guidance for how much additional water may be withdrawn from the environment—and this has many environmentalists seething.

Why are local environmentalists opposed to such a modest decline in flows of the Homosassa River? For one thing, many people are concerned that Florida is already drawing too much water from the aquifer. According Ron Miller (2012) of the Homosassa River Alliance, “The Minimum Flows and Levels (MFL) program is, in reality, a statewide project to locate water sources for developments.” Indeed, Florida Springs Institute founder and scientist Robert Knight (2014) developed a water budget for north Florida that strongly suggests excessive extraction of groundwater is reducing flows in many Florida springs. Yet another problem has to do with nutrient and other forms of pollution in Florida waters. Section 303(d) of the Clean Water Act requires (among other things) states to periodically identify impaired waters. As it happens, the Homosassa River system appears on Florida’s list of impaired waters because its fish contain too much mercury AND because excessive nutrients (especially nitrogen) periodically produce large mats of algae that block out sunlight and smother eelgrass, which crayfish, shrimp, fish and other
Florida has long depended heavily on copious supplies of high quality, inexpensive, and annually replenished groundwater to support much of its growth from a rural backwater of barely more than a half million people in 1900, to a modern state of more than 20 million people today. Indeed, Florida’s more than 1,000 springs—including those at Homosassa—are just some of its fabulous water resources, along with its many productive marine and estuarine environments, wetlands, lakes, and rivers and streams (some of which, like the Homosassa River, are fed by spring discharge). Florida’s springs used to attract a large percentage of both tourists and natives alike. Yet in recent decades, the vast majority of those pursuing recreation in Florida have flocked to the state’s beautiful beaches or attractive theme parks such as Walt Disney World, Sea World or Busch Gardens. Meanwhile, springs at Homosassa and elsewhere in Florida serve as a window into the state’s all important groundwater resources; and many springs are displaying hydrological, chemical and biological changes that signal potential problems with Florida’s groundwater supply. Florida’s water managers and elected officials would do well to listen
carefully to the state’s canaries in the coal mine; the Floridan aquifer is speaking through the state’s springs, and it is telling us it is sick and requires attention.

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