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POTENTIAL IMPACTS OF INCREASES IN DOMESTIC SELF-SUPPLY WATER USE IN EAST-CENTRAL FLORIDA, FOR THE PERIOD 2013-2030

Potential Impacts of Increases in Domestic Self-Supply Water Use in East-Central Florida, for the Period 2013-2030

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St. Johns River Water Management District
Palatka, Florida

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Introduction

The Lake County Water Alliance (Alliance) developed the *Lake County Water Supply Plan* (Plan) for its member governments. The St. Johns River Water Management District (SJRWMD) has published the Plan as SJRWMD Special Publication SJ2008-SP1. SJRWMD provided funding to the Alliance for Plan development. Throughout the Plan development process SJRWMD was an active participant in providing data and review of work-products. The Plan was completed in September 2007, and accepted by the Alliance in January 2008.

The Plan incorporated the most current projections at that time for population and water demands. Subsequently, SJRWMD developed projections to support the 2008 District Water Supply Assessment (WSA). Based on these projections, water demands for domestic self-supply (DSS) water use in Lake County are projected to increase from 10.85 mgd for a population of 55,290 in 2005 to 33.50 mgd for a population of 170,737 in 2030. These projections reflect a DSS per capita water use value of 196.22. DSS water use includes water used for basic human needs such as drinking, bathing, washing clothes, flushing toilets, etc; as well as other residential uses such as lawn and landscape irrigation and car washing; and small public supply systems that use less than 100,000 gallons per day. The DSS uses that supply basic human needs are exempt from consumptive use permitting. The other uses in this water use category are generally below the consumptive use permitting quantity threshold of 100,000 gallons per day and are generally supplied by wells with a diameter of less than six inches – the consumptive use permitting threshold. The water to support these DSS uses is assumed to be derived from the Floridan aquifer. These DSS uses include uses of water to support essential human needs in the home (bathing, cooking, drinking, cleaning, etc.) as well as uses outside the home (car and house washing, gardening, lawn and landscape irrigation, swimming pool augmentation, etc.). These DSS water use increases are primarily projected to occur outside of the current or projected service area boundaries of the Alliance member utilities. In addition, because there is no requirement that residential developments in the unincorporated areas of Lake County have central water service, Alliance members expressed concern that projected increases in DSS water use in Lake County could be concentrated in areas of new, large residential developments and, therefore, could cause the same kinds of unacceptable impacts related to groundwater withdrawals that SJRWMD proposes to restrict through its newly adopted rules governing water use in the Central Florida Coordination Area (CFCA). Furthermore, these DSS withdrawals would not be evaluated by SJRWMD for the acceptability of their impacts through the consumptive use permitting process because the size of these wells and the quantities produced are generally below consumptive use permitting thresholds (40C-2.041, F.A.C.). Therefore, Alliance members have expressed concern that increases in DSS water use could cause the public supply utilities managed by Alliance members to develop more alternative water supply than would otherwise be necessary to meet projected water demands in their service areas because the responsibility for avoiding unacceptable impacts would fall on public supply utilities rather than DSS users.

SJRWMD's consumptive use permitting rules provide that increases in groundwater withdrawals in CFCA will generally not be authorized for amounts greater than an applicant's demonstrated demand through the end of 2013 (Section 40C-2.12.10, F.A.C.). Projected withdrawals of water through the end of 2013 in the Lake County portion of CFCA are expected to generally result in acceptable impacts to native vegetation, lakes, and springs. SJRWMD recognizes that groundwater withdrawals to support DSS water use will continue to increase in the unincorporated areas of Lake County as well as in other areas of CFCA beyond 2013. Typically, such increased withdrawals from the Floridan aquifer would not be expected to result in significant cumulative impacts because the withdrawals would be spaced at reasonable distances and would involve only relatively small quantities of water. However, the magnitude and concentration of withdrawals associated with projected 2030 DSS water use could have significant impacts on Floridan aquifer water levels. SJRWMD is sensitive to the concerns expressed by the Lake Alliance and has assessed the potential impacts to the water resources from the projected increase in DSS water use in Lake County and other areas in CFCA from the end of 2013 through the end of 2030, hereinafter referred to as 2013-2030. This document reports the results of this assessment.

Methods

Public water supply service area boundary delineations that were available to SJRWMD were refined by each local government in Lake County in support of this assessment. The refined delineations contain served and unserved areas within the public water supply service areas. For this assessment, all population within the served portion of each public water supply utility service area was considered served by a utility in 2030; while all population in the unserved portion of each public water supply service area and the population outside of public water supply service areas were considered to be served by DSS with a per capita rate of 196.2 gallons. This value represents the average per capita water use for public supply utilities in Lake County as reported in the draft version of the 2008 WSA.

The assessment of the potential impacts of groundwater withdrawals to support increased DSS water use in Lake County and other areas in CFCA focused on projected increases in DSS water use from 2013-2030. The current planning horizon associated with SJRWMD's water supply planning efforts is 2030. This 2013-2030 timeframe was chosen in recognition that withdrawals of projected 2013 water use quantities in CFCA are expected to generally result in acceptable impacts to native vegetation, lakes, and springs. Although CFCA does not include the northern portion of Lake County, impacts of similar magnitudes as those in southern Lake County, which is within CFCA, are expected to occur there.

This assessment included the following steps.

- Projection of DSS water use quantities and distributions for 2013 and 2030
- Estimation of groundwater-level declines based on projected increases in DSS water use from 2013-2030, using the East-Central Florida Regional Groundwater Flow Model (ECF model) [McGurk and Presley 2002]
- Assessment of the acceptability of potential impacts to native vegetation, lakes, and springs associated with projected groundwater-level declines

Projection of DSS water use quantities and distributions for 2013 and 2030

DSS water use projections and distributions used in this assessment are based on projections developed for SJRWMD by GIS Associates, Inc., in association with SJRWMD's 2008 WSA (Figure 1). DSS water use values for 2013 were developed by interpolating between 2010 and 2015 values. The methodology used by GIS Associates, Inc., is presented in the draft document titled *Methodology for Projections for All Water Use Categories* (GIS Associates, Inc. 2007).

Estimation of groundwater-level declines based on projected increases in DSS water use from 2013-2030, using the ECF model

SJRWMD used the ECF model to conduct simulations of projected water levels related to 2013 demands for all categories of water use and a simulation of projected water levels related to projected increases in only DSS water use through 2030. Estimated groundwater-level declines are based upon the difference between the two simulations. This difference represents the effect of projected increases in DSS water use between 2013 and 2030.

Assessment of the acceptability of potential impacts to native vegetation, springs, and lakes associated with projected groundwater-level declines

The changes in groundwater levels based on the difference between the 2013 and 2030 simulations were evaluated for the likelihood of harm to native vegetation (primarily wetland vegetation) using the method defined by Kinser and Minno in SJRWMD Technical Publication SJ95-8 and SJRWMD Professional Paper SJ2003-PP3.

These same groundwater-level changes were the basis of evaluating the likelihood of harm to lakes using the method described by Kinser et al. in SJRWMD Professional Paper SJ2006-PP1.

These groundwater-level changes were also the basis of determining whether lake levels and flows from lakes and springs would fall below established or recommended minimum flows and levels (MFLs) or screening flows for springs as described in the 2003 District Water Supply Assessment. District consumptive use permitting rules prohibit withdrawals of water that will cause water levels or flows to fall below established MFLS.

Analysis

Withdrawals of water from the Floridan aquifer to support DSS water use are projected to increase from 49.3 mgd to 81.3 mgd in the ECF model domain from 2013-2030. In the Lake County portion of the model domain, DSS water use is projected to increase from 18.6 mgd to 43.6 mgd for the same period. The model simulation based on projected increases in DSS water use from 2013-2030 in the model domain indicates that these water use increases will result in water level declines for the surficial aquifer ranging up to 1.4 ft and declines ranging up to 2.2 ft for the Floridan aquifer (Figures 2 and 3).

Analysis of the likelihood of harm to native vegetation (primarily wetland vegetation) indicates that 9,463 acres in the ECF model domain are likely to experience higher to moderate likelihood of harm if projected DSS water use increases occur from 2013-2030 (Figure 4). Of this amount, 9,248 acres are located in Lake County.

Similarly, the analysis of the likelihood of harm to lakes indicates that about 3,075 acres in the ECF model domain are likely to experience high likelihood of harm to lakes if projected DSS water use occurs from 2013-2030 (Figure 5). Of this amount, 3052 acres are located in Lake County.

SJRWMD assessed the hydrologic impact of the estimated water-level declines to determine if water levels in lakes and flow from springs would fall below established and recommended MFLs for lakes and springs, and screening flows for springs (Tables 1 and 2). Based on this assessment three lakes for which MFLs are established, Lakes Cherry, Louisa, and Minneola are projected to experience water levels lower than the established MFLs for these lakes if the projected increases in DSS water use (Table 1) occur. In addition to these lakes, five other lakes (Apshawa North, Apshawa South, Brantley, Prevatt, and Sylvan) are projected to have water levels that would already be below established MFLs by 2013 if water use projections in all water use categories occur (Table 2). Projected DSS increases from 2013-2030, if they occur, would cause water levels in these lakes to fall even further below the established MFLs.

No springs in Lake County for which MFLs have been established are projected to experience flows below established MFLs. However, one spring in Lake County, Holiday Spring, is projected to experience a decline in flow of greater than 15% below the long-term median flow for the spring (screening flow) [Table 2]. SJRWMD uses screening flows in its water supply assessment process to identify springs, for which MFLs have not been established, that are likely to experience unacceptable impacts as a result of projected water use increases.

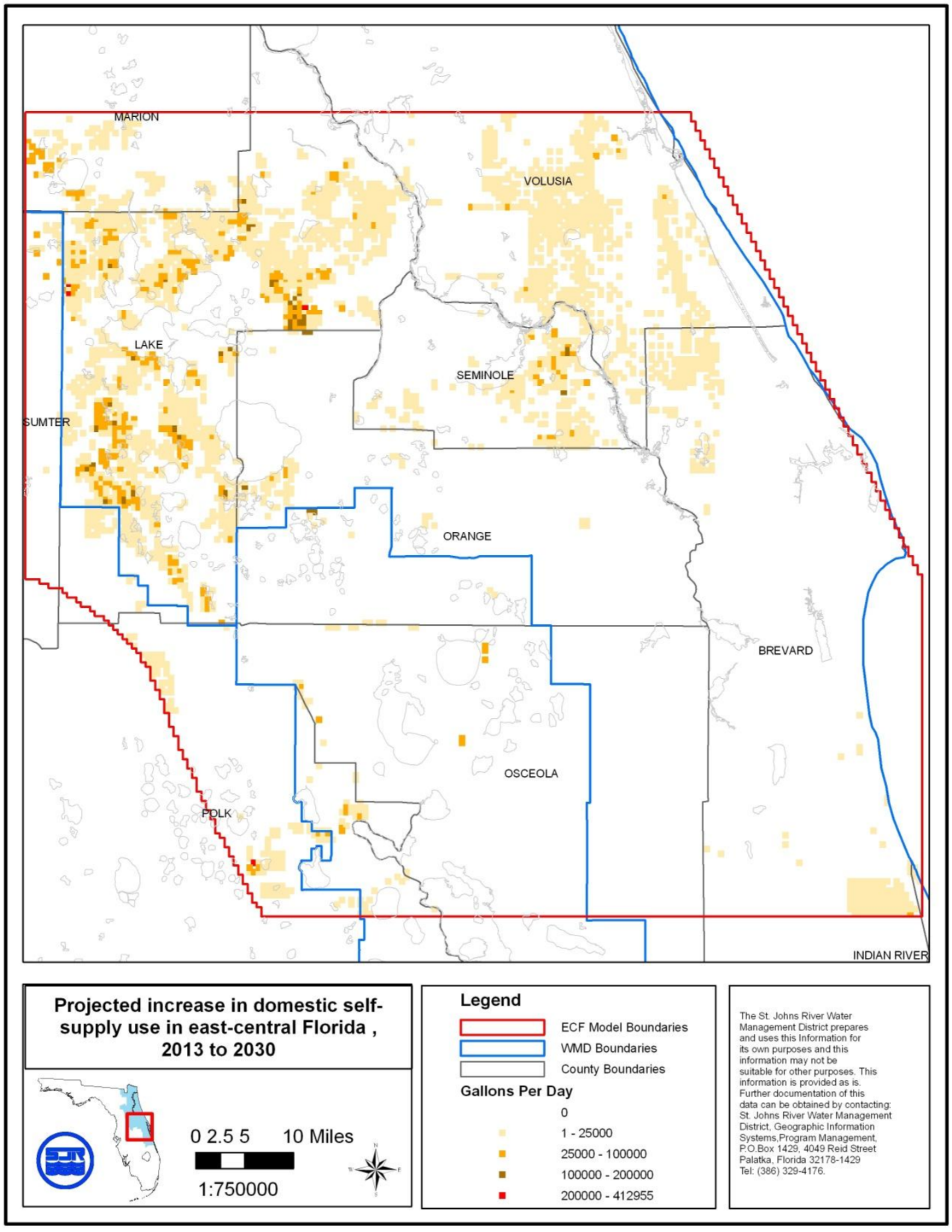
Conclusions

Based on SJRWMD's assessment of the potential impacts of increased withdrawals of water from the Floridan aquifer to support projected increases in DSS water use in east-central Florida, for the period 2013-2030, SJRWMD has reached the following conclusions.

1. There is a reasonable likelihood that projected increases in DSS water use in east-central Florida from 2013-2030, if implemented, will result in unacceptable impacts to more than 9,463 acres (9,248 acres in Lake County) of wetlands and about 3,075 acres (3,052 in Lake County) of lakes.

2. There is a reasonable likelihood that projected increases in DSS water use in east-central Florida from 2013-2030, will cause water levels to fall below established MFLs for three lakes (Lakes Cherry, Louisa, and Minneola). In addition to these lakes, five other lakes (Apshawa North, Apshawa South, Brantley, Prevatt, and Sylvan) are projected to have water levels that would already be below established MFLs by 2013 if water use projections in all water use categories occur (Table 2). Projected DSS increases from 2013-2030, if they occur, would cause water levels in these lakes to fall even further below the established MFLs.

3. There is a reasonable likelihood that projected increases in DSS water use in east-central Florida from 2013-2030, will cause water levels to fall the screening level for one spring (Holiday Spring) in Lake County.



Note: D*omestic self-supply water use in the northeast corner of Sumter County as shown on this figure has been slightly over estimated because of incorrect assignment of this water use to a public water supply service area in the Villages. This overestimate does not significantly affect the conclusions in this document.*

Figure 1. Projected increases in domestic self-supply water use in east-central Florida, 2013-2030

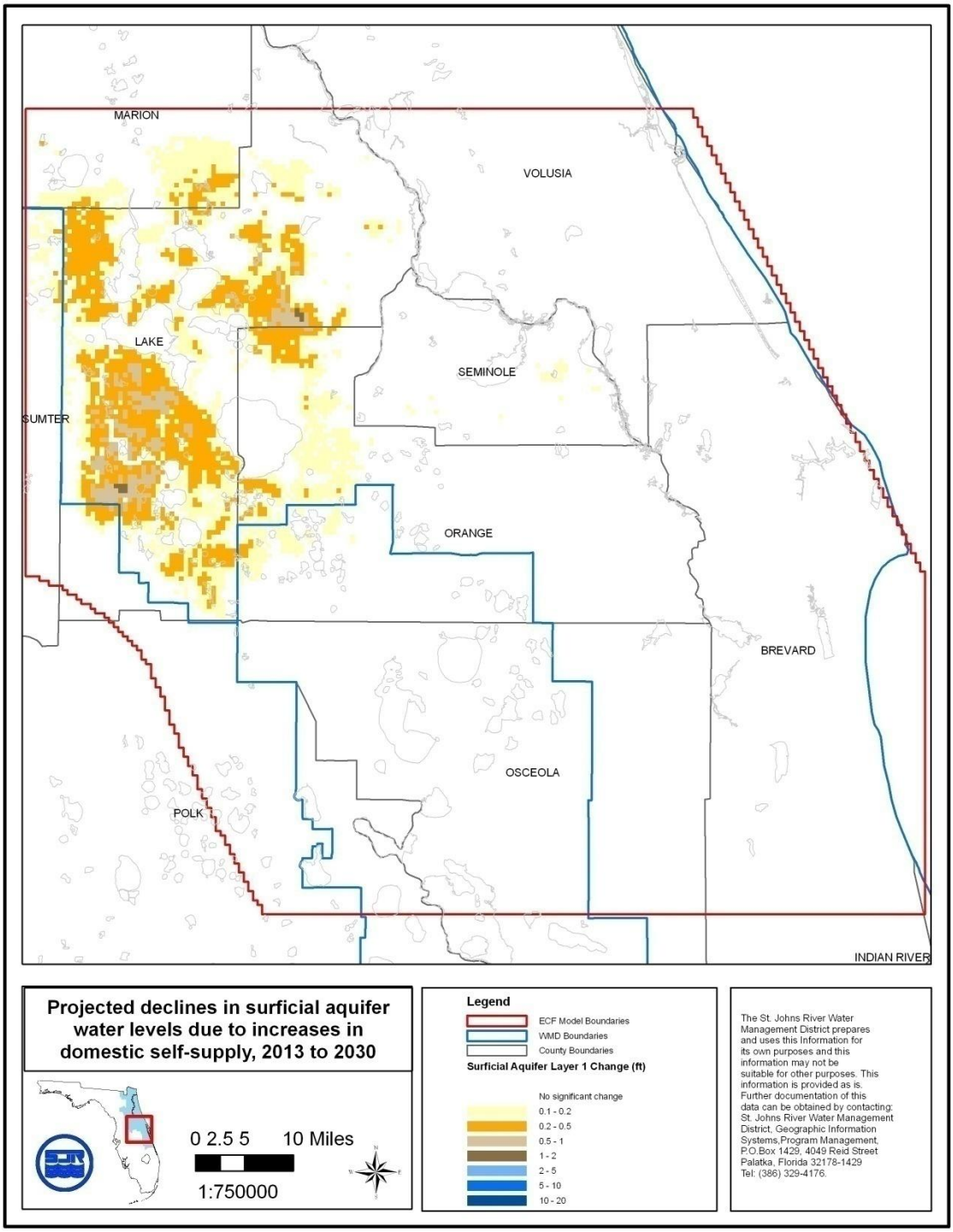


Figure 2. Estimated changes in surficial aquifer water levels as a result of projected increases in domestic self-supply water use in east-central Florida, 2013 to 2030

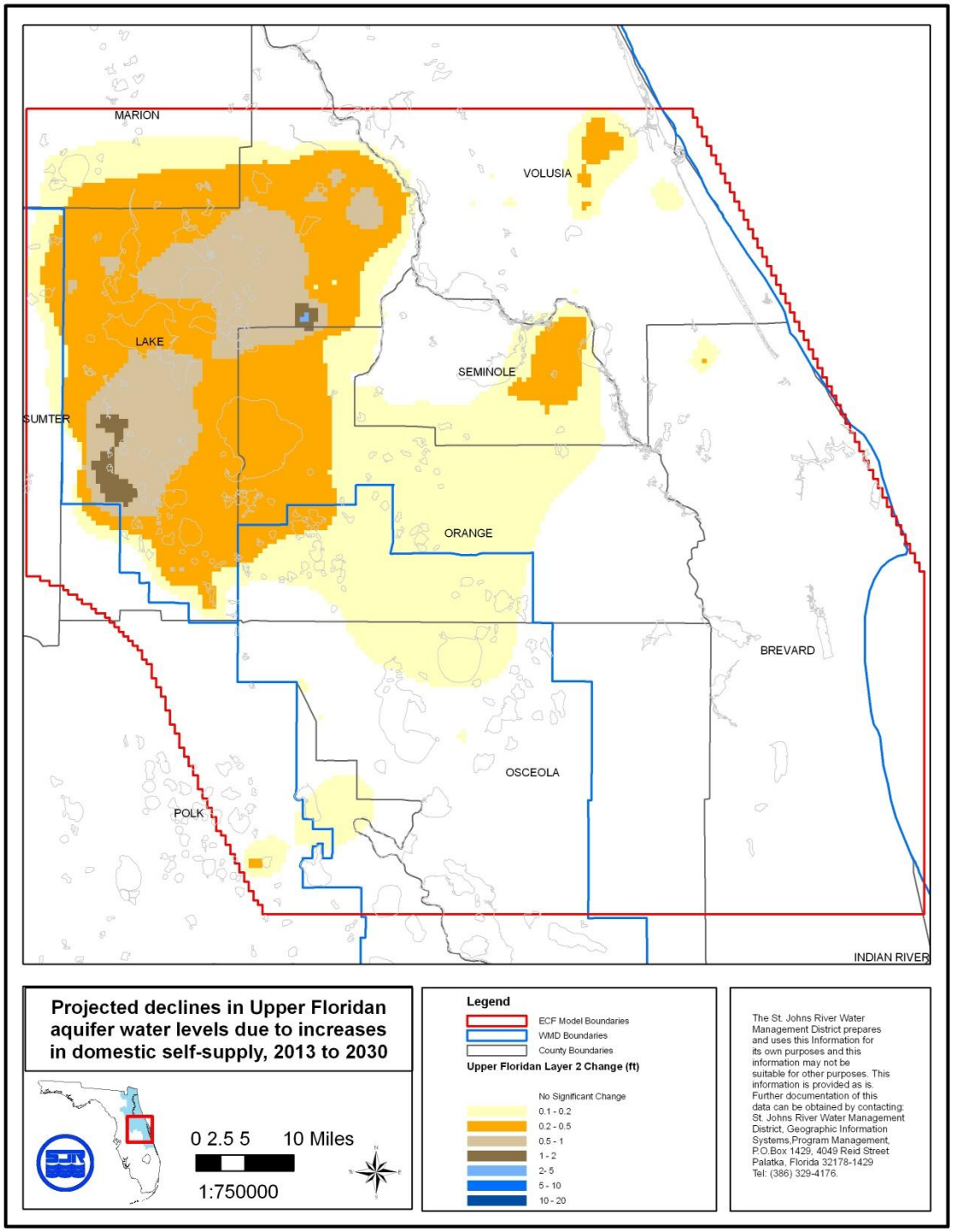


Figure 3. Estimated changes in Upper Floridan aquifer water levels as a result of projected increases in domestic self-supply water use in east-central Florida, 2013 to 2030

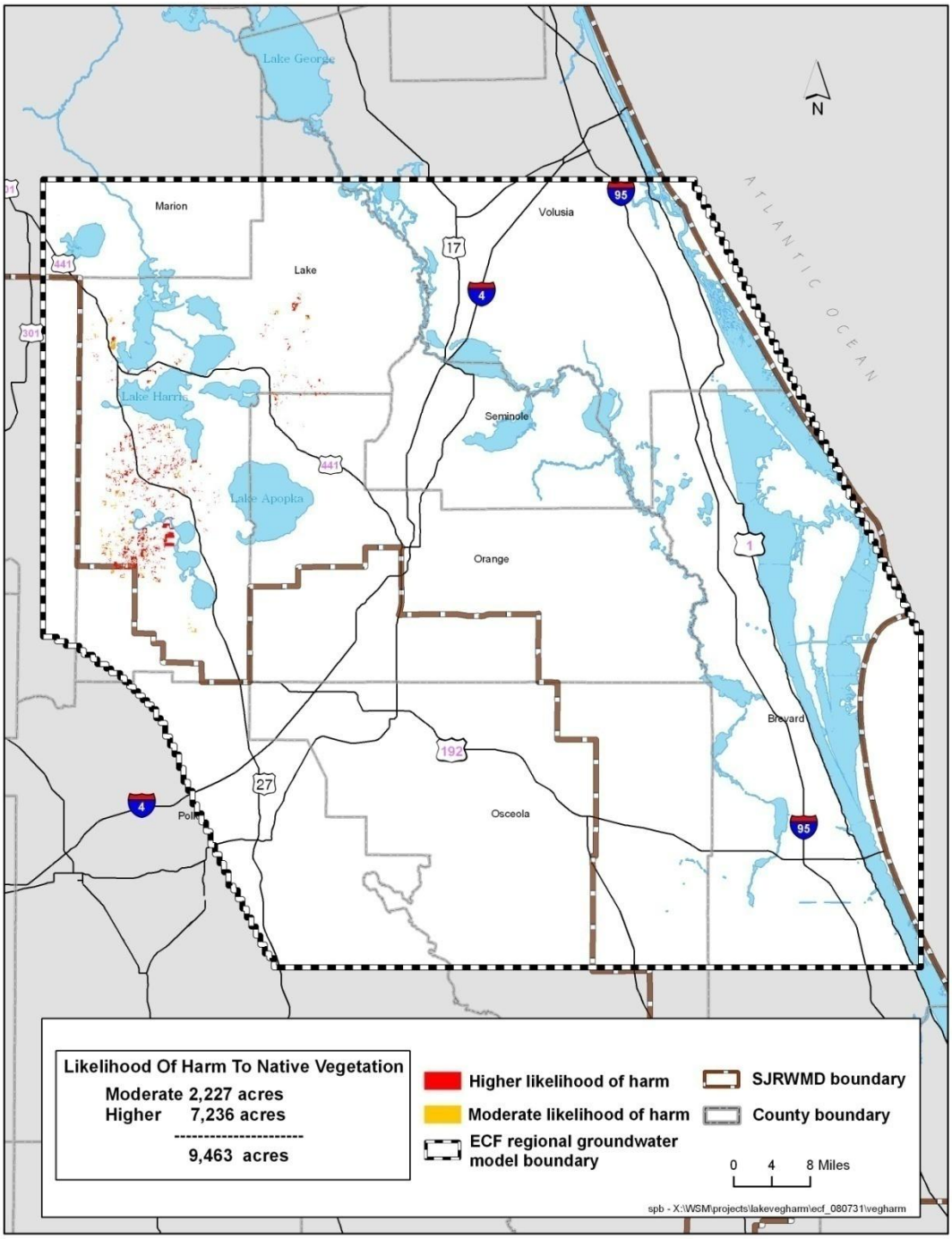


Figure 4. Likelihood of harm to native vegetation as a result of projected increases in domestic self-supply water use in east-central Florida, 2013 to 2030

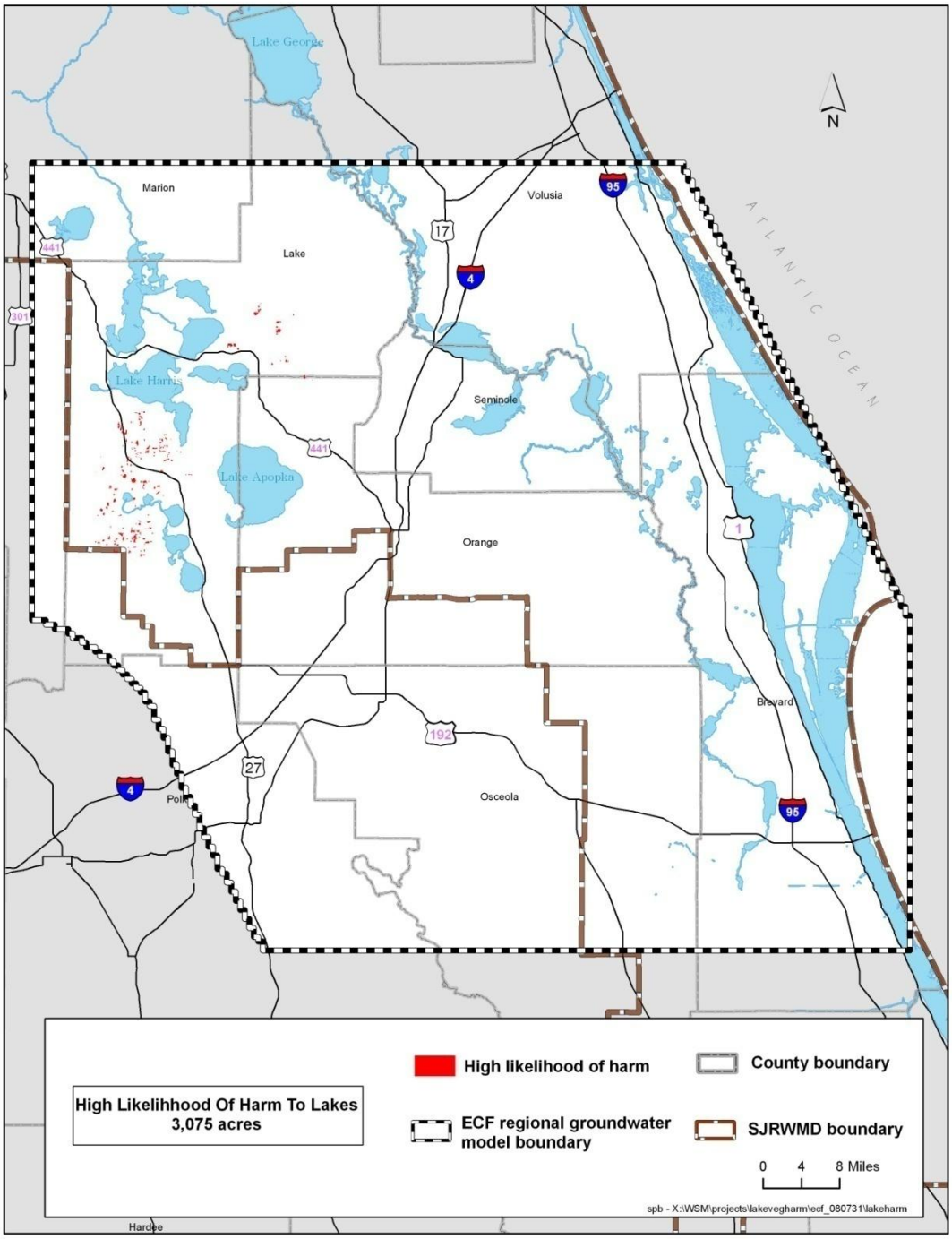


Figure 5. Likelihood of harm to lakes as a result of projected increases in domestic self-supply water use in east-central Florida, 2013 to 2030

Table 1. Impacts of projected increases in domestic self-supply water use in east-central Florida, 2013-2030, on lakes for which minimum flows and levels have been established

NAME	Drawdown Limit 2013 to 2030	Projected Floridan aquifer water level changes	County
APSHAWA NORTH	***0.0***	***0.6***	***LAKE***
APSHAWA SOUTH	***0.0***	***0.6***	***LAKE***
BOGGY MARSH	0.9	0.3	LAKE
BRANTLEY	***0.0***	***0.1***	***SEMINOLE***
BURKETT	NSFAC	0.1	ORANGE
CHERRY	**0.0**	**0.7**	**LAKE**
DORR	NSFAC	0.3	LAKE
EMMA	>2.0	1.0	LAKE
HOWELL	NSFAC	0.1	SEMINOLE
IRMA	NSFAC	0.1	ORANGE
LOUISA	**0.2**	**0.3**	**LAKE**
LUCY	>2.0	0.9	LAKE
MARTHA	NSFAC	0.1	ORANGE
MILLS	0.9	0.2	SEMINOLE
MINNEOLA	**0.0**	**0.5**	**LAKE**
NORRIS	NSFAC	0.4	LAKE
PEARL	NSFAC	0.1	ORANGE
PINE ISLAND	0.7	0.4	LAKE
PREVATT	***0.0***	***0.2***	***ORANGE***
SYLVAN	***0.0***	***0.1***	***SEMINOLE***

Bold print indicates lakes for which projected water level declines would cause lake levels to fall below established MFLs.
Bold and italicized print indicates lakes for which projected water level declines would cause lake levels to fall further below established MFLs.
NSFAC = no significant Floridan aquifer connections

Table 2. Projected changes in discharge of springs in Lake County as a result of projected increases in domestic self-supply water use in east-central Florida, 2013-2030

Spring	Flow Reduction Limit [cfs]	Projected Flow Reduction 2013 to 2030 [cfs]
Alexander	16	1
Messant	**3**	**0**
Seminole	**2**	**2**
Island	1	1
Bugg	2	1
Blue	0.5	0
Holiday	0.5	1**
Apopka	5	1

cfs = cubic ft per second
Information concerning springs for which MFLs are established by rule is in bold type.
** Predicted discharge is below screening flows
Screening flows = historic median flow minus 15%

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McGurk, B., and P.F. Presley. 2002. *Simulation of the effects of groundwater withdrawals on the Floridan aquifer system in east-central Florida: Model expansion and revision.* Technical Publication SJ2002-3. Palatka, Fla.: St. Johns River Water Management District.

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Water Resource Associates. 2007. *Lake County water supply plan executive final report*. Special Publication SJ2008-SP1. Palatka, Fla.: St. Johns River Water Management District.