# MINIMUM FLOWS AND LEVELS (MFLS)

For regional water supply planning, St. Johns River Water Management District (SJRWMD) performs an assessment of minimum flows and levels (MFLs) to determine if existing flows and levels are above established MFLs under current conditions and throughout the 20-year planning horizon (2030). Water bodies for which flows or levels are projected to be below MFLs by 2030 require recovery and prevention strategies. The following text provides an overview of the SJRWMD MFLs program, including statutory/regulatory framework; priorities; MFLs establishment process; MFLs assessment process; prevention and recovery strategy approach, and timetable; and a brief discussion of water reservations within SJRWMD.

## MFLS PROGRAM OVERVIEW

### Statutory and Regulatory Framework

The basis for establishing MFLs is provided in Chapter 373, *Florida Statutes* (F.S.); Chapter 62-40, *Florida Administrative Code (F.A.C.)*; and Chapter 40C-8, *F.A.C*. These explicitly include provisions for the establishment of MFLs to protect nonconsumptive uses of water and conserve natural systems.

Chapter 373, F.S., requires water management districts to establish MFLs. Section 373.042, F.S., requires water management districts to establish minimum flows for surface watercourses and minimum levels for both groundwater and surface waters, below which significant harm to the water resources or ecology of the area would result. Water management districts are to calculate MFLs by using the best information available. Subsection 373.042(2), F.S., directs water management districts to develop an annual priority list and schedule for the establishment of MFLs and to submit these to the Florida Department of Environmental Protection (DEP) for approval. The priority list is to be based upon the importance of waters to the region and the existence of or potential for significant harm to the water resources or ecology of the region. If the existing flow or level of a water body is below or projected in 20 years to fall below established MFLs, then Subsection 373.0421(2), F.S., directs water management districts to implement a recovery strategy to restore the system to established MFLs or a prevention strategy to prevent the system from falling below established MFLs. Subsection 373.0421(3), F.S., requires that MFLs be reevaluated periodically and revised as needed by the water management district.

Chapter 62-40, *F.A.C.*, highlights the state's approach to water management (Rule 62-40.110, *F.A.C.*). Subsection 373.103(1), F.S., requires water management district programs to be consistent with Chapter 62-40, *F.A.C.* Rules 62-40.310(4)(a) and 62-40.473(1), *F.A.C.*, direct the establishment of MFLs to protect water resources, considering the environmental values associated with marine, estuarine, freshwater, and wetlands ecology. Furthermore, Rule 62-40.473(2), *F.A.C.*, directs water management districts to express MFLs as multiple flows and levels, defining a minimum hydrologic regime to establish the limit beyond which further withdrawals would cause significant harm.

Chapter 40C-8, *F.A.C.,* presents policy, purpose, and important definitions used in the establishment of MFLs. It also lists all water bodies for which MFLs are adopted as administrative rule. Rule 40C-8.011(3), *F.A.C.*, states that the water management districts shall use the best information and methods available to establish MFLs to prevent significant harm to the water resources or ecology.

SJRWMD considers MFLs in its regulatory programs, including both consumptive use permitting and environmental resource permitting. One criterion of the SJRWMD consumptive use permitting rule is the requirement that permitted water uses not cause water levels or flows to fall below established MFLs. Permits may include specific conditions to protect MFLs, including allocations from sources that are less than requested or needed, shorter permit durations, requirements for development of alternative water supplies, and required environmental monitoring.

The SJRWMD MFLs program addresses all of the requirements related to MFLs as expressed in Chapter 373, F.S.; Chapter 62-40, *F.A.C.*; and Chapter 40C-8, *F.A.C.*

**Priority-Setting Process**

In accordance with the requirements of Section 373.042, F.S., SJRWMD has established a list of priority water bodies for which MFLs are to be established (Table 1). SJRWMD intends to obtain independent peer review for all MFLs shown in Table 1. This priority list is based upon the importance of waters to the region and the existence of or potential for significant harm to the water resources or ecology of the region.

In addition, SJRWMD proposes to consider prioritizing additional water bodies, to establish MFLs at those sentinel sites where hydrologic change is expected to occur first due to regional groundwater withdrawals. The establishment of MFLs at sentinel sites within regions of expected hydrologic change should not only protect the specific water body having established MFLs but also provide for broader regional water resource protection.

As part of determining the priority list, the following factors identified in Subsection 373.042(2), F.S., are considered:

- The importance of the waters to the state or region
- The existence of or potential for significant harm to the water resources or ecology of the state or region
- Whether the waters are experiencing or may be reasonably expected to experience adverse impacts

The priority-setting process also considers the number of MFLs that can be reasonably completed, with consideration of staffing and funding constraints. The list provided to DEP each year is subject to change and is contingent upon funding. The list of priority water bodies was transmitted to DEP in October 2010.

Table 1. 2011 MFLs priority water body list and schedule

### YEAR 2011

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| **Rivers** | Ocklawaha River at State Road (SR) 40 | Marion | Yes |
| | Silver River | Marion | Yes |
| | St. Johns River at SR 520 (Lake Poinsett) | Brevard/ Orange | Yes |
| **Aquifers (springs)** | DeLeon Springs | Volusia | Yes |
| | Silver Springs | Marion | Yes |
| **Lakes** | East Crystal | Seminole | Yes |
| | Searcy | Seminole | Yes |
| **Wetlands** | | | |
| **Reevaluations** | | | |

### YEAR 2012

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| **Rivers** | | | |
| **Aquifers (springs)** | Gemini Springs | Volusia | Yes |
| **Lakes** | Johnson | Clay | Yes |
| | Pebble | Clay | Yes |
| | Saunders | Lake | Yes |
| **Wetlands** | | | |
| **Reevaluations** | Banana, Como, Little Como, Trone chain-of-lakes | Putnam | Yes |
| | Brooklyn | Clay | Yes |
| | Cowpen | Putnam | Yes |
| | Cow Pond | Volusia | Yes |
| | Kerr | Marion | Yes |
| | Melrose | Putnam | Yes |
| | Norris | Lake | Yes |
| | Purdom | Volusia | Yes |

Table 1.—*Continued*

**YEAR 2013**

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| **Rivers** | Alexander Springs Creek | Lake | Yes |
| **Aquifers (springs)** | Alexander Springs | Lake | Yes |
| | Silver Glen | Marion/Lake | Yes |
| **Lakes** | Apopka | Lake/Orange | Yes |
| | Beauclair | Lake | Yes |
| | Dora | Lake | Yes |
| | Eustis | Lake | Yes |
| | Griffin | Lake | Yes |
| | Harris | Lake | Yes |
| | Hodge | Seminole | Yes |
| | Island | Seminole | Yes |
| | Yale | Lake | Yes |
| **Wetlands** | | | |
| **Reevaluations** | Wekiva River at SR 46 Bridge | Seminole/ Lake | Yes |

## Establishment and Assessment of MFLs

### General Approach

Methods generally used by SJRWMD as a basis for the establishment of MFLs are described in Minimum Flows and Levels Methods Manual (SJRWMD 2006 draft) and the SJRWMD multiple MFLs method (Neubauer et al. 2008). The SJRWMD approach for establishing and assessing MFLs can be applied to lakes, rivers, springs, isolated wetland systems, and aquifers. The approach is used in a regulatory framework to protect aquatic and wetland systems from significant ecological harm that might otherwise result from permitted surface water or groundwater withdrawals. MFLs are primarily ecologically based, but they also consider such factors as water levels needed for recreational activities.

SJRWMD establishes MFLs based on statistically defined hydrologic events. In most cases, these hydrologic events are flows and levels with a specific magnitude, duration, and return interval. SJRWMD may define several MFLs for a single water body, as appropriate. Common examples include a minimum frequent low, a minimum average, and a minimum frequent high.

SJRWMD considers the following when establishing and assessing MFLs:

- The use of groundwater flow models to establish changes in groundwater levels that influence flows and levels in MFLs water bodies
- The use of hydrologic simulation models (water budget models) to predict whether flows and levels will be at or above established MFLs if groundwater levels decline
- Evaluation of period-of-record flows and levels to establish historic conditions and changes in historic conditions
- Modeling of predicted changes in flows and levels, including ranges of predicted changes based on uncertainty in methods
- Long-term monitoring of flows, levels, and ecological communities to verify predictions and ensure that MFLs are preventing significant harm

SJRWMD uses hydrologic models to assess whether existing flows or levels are below established MFLs or projected to be below MFLs within the planning horizon of 2030. The models simulate a time-varying series of flows and levels based on specific withdrawal scenarios. The time-varying series of flows and levels from a model simulation are statistically evaluated to assess whether MFLs would be met for a specific withdrawal scenario. This approach allows SJRWMD to assess the potential for anticipated adverse impacts before the impacts occur.

**Threshold Hydrologic Regime**

SJRWMD's MFLs define a threshold hydrologic regime that allows for consumptive use of water while protecting the water resources and ecology from significant harm. Thus MFLs do not represent the historic or optimal hydrologic conditions, but rather the minimum acceptable hydrologic conditions.

For example, a historic condition might consist of an unaltered river or lake system with no withdrawals from local groundwater or surface water sources and no significant effects from regional groundwater withdrawals. A new hydrologic regime is associated with each increase in consumptive use, from very small withdrawals that have no measurable effect to very large withdrawals that significantly alter the long-term hydrologic regime. Within that range of withdrawals, there is a threshold hydrologic regime that is lower than historic conditions but still protects the water resource and ecology of the system from significant harm.

MFLs are not discrete points chosen from a hydrograph. Instead, MFLs are represented as statistically defined hydrologic events, having three components: (1) water level or flow (magnitude); (2) duration (how long); and (3) return interval (how often). Actual flows or levels will fluctuate above, among, and below the established MFLs during extreme wet, normal rainfall, and extreme drought periods, respectively.

Ecological criteria that protect important system structures or ecosystem functions over the range of high-, intermediate-, and low flows and levels help define the threshold hydrologic regime. MFLs reflect a series of ecological thresholds to evaluate potential environmental impacts over a long period. The threshold hydrologic regime can be defined by a series of up to five MFLs:

- Minimum infrequent high
- Minimum frequent high
- Minimum average
- Minimum frequent low
- Minimum infrequent low

"Minimum infrequent high" (MIH) means a surface water level and/or flow that usually occurs during wet seasons with periods of well-above normal rainfall. These floods (i.e., flooding events) typically occur for defined periods (i.e., duration). The duration can vary from short (e.g., 30 days) to medium (e.g. 120 days), depending on the water body, with many years (i.e., defined by return intervals) between flood events (e.g., 25 years). These high water events inundate the river floodplain or lake bed to near the upland edge, killing upland plants that may have grown downslope during periods of lower water levels, preventing permanent establishment of upland plants. In addition, these high water levels occasionally allow aquatic animals to use the full extent of the river floodplain or lake bed and are important to move and redistribute sediment, debris, and nutrients.

"Minimum frequent high" (MFH) means a high surface water level and/or flow that usually occurs during wet seasons with periods of normal or above normal rainfall. These flooding events typically occur for short durations (e.g., 30 days) or longer durations in certain water bodies (e.g., 90 days) and with short return intervals between floods (e.g., 2-year return interval). Such floods protect seasonally flooded wetland plant communities and allow fish and other aquatic animals frequent access to floodplain wetlands to feed and reproduce.

"Minimum average" (MA) means a low surface water level and/or flow that usually occurs during normal dry seasons. These dewatering events typically occur for long durations (e.g., 180 days) and with short return intervals between dewatering events (e.g., 2 years). Such low water levels are important to protect deep muck soils from losses caused by decay processes.

"Minimum frequent low" (MFL) means a low surface water level and/or flow that usually occurs during moderate droughts. These dewatering events typically occur for medium durations (e.g., 120 days) and with medium return intervals between dewatering events (e.g., 5 years). These low water events let seasonally flooded wetland plants reseed and grow while allowing upland plants and animals to temporarily live in the floodplain wetlands.

"Minimum infrequent low" (MIL) means a more extreme low surface water level and/or flow that usually occurs during severe droughts. These dewatering events typically occur for defined durations. The duration can vary from short (e.g., 30 days) to medium durations (e.g., 90 days) in certain water bodies and with long return intervals between dewatering events (e.g., 30 years). The river floodplain or lake bed may remain dry for extended periods, allowing time for upland plants and animals to become temporarily established.

### MFLs Established to Date

SJRWMD has established MFLs for 123 water bodies (Figure 1). A complete list of established MFLs is included in Rule 40C-8.031, *F.A.C.* The following is a brief list of water bodies for which MFLs have been established:

- Eight (8) springs in the Wekiva River Basin, with both flows and associated groundwater levels established
- Six (6) flowing surface water bodies, with levels and flows established:
  - Wekiva River at State Road (SR) 46 bridge
  - Black Water Creek at SR 44 bridge
  - St. Johns River, 1.5 miles downstream of Lake Washington Weir
  - Taylor Creek, 1.7 miles downstream of structure S-164
  - St. Johns River at SR 44 near DeLand, Volusia County
  - St. Johns River at SR 50 in Orange and Brevard counties
- A total of 108 lakes and wetlands with established levels
- Blue Spring near Orange City, in Volusia County, with a phased minimum flow regime established

### Reviewing and Updating Established MFLs

Pursuant to the requirements of Subsection 373.0421(3), F.S., SJRWMD periodically reviews established MFLs to determine if the MFLs should be updated. Although SJRWMD establishes MFLs based on the best data available at the time, improvements in data collection, longer hydrologic periods of record, and improved scientific/engineering tools and methods may indicate a need to reevaluate MFLs.

The process for MFLs review and evaluation typically includes desktop analyses of period-of-record hydrologic data, consideration of the adequacy of the methods used to develop the MFLs relative to best available methods, and a review of the data used to develop the surface water hydrologic model in light of current conditions. If updating established MFLs is warranted based on these criteria, then SJRWMD recalculates the MFLs based on current methods (with the best available information) and proposes amendments to the MFLs through rulemaking.

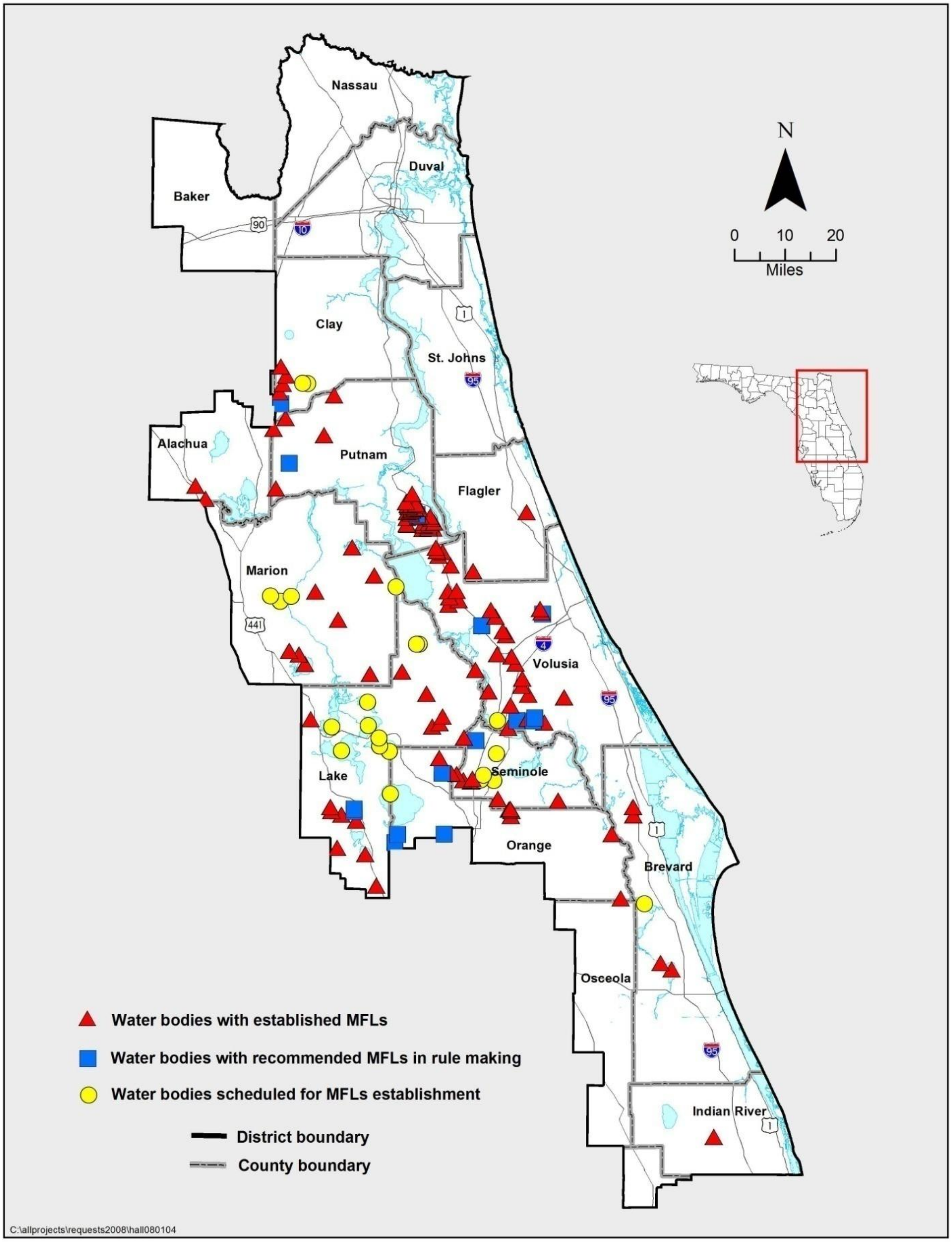


Figure 1. Established MFLs and MFLs priority water bodies in SJRWMD

## ASSESSMENT OF MFLS FOR REGIONAL WATER SUPPLY PLANNING

MFLs are one of several water resource constraints used in the regional water supply planning process to evaluate sustainable water supply options. An important part of identifying areas with potential constraints in the water supply planning process is an assessment of whether existing flows and levels are below established MFLs or projected to fall below MFLs within 20 years. In such a case, the regional water supply plan will include recovery and prevention strategies to achieve recovery or prevent the existing flow or level from falling below the established MFLs.

### Overview of Models Used to Assess MFLs

For purposes of regional water supply planning, hydrologic models are used to assess whether existing flows/levels are below established MFLs or projected to fall below MFLs within 20 years (2030). An example of the modeling-based approach for lakes is included in Minimum Levels Determination: Lake Hiawassee, Orange County, Florida (Slater 2010 draft), and the associated hydrologic methods document, Lake Hiawassee Minimum Flows and Levels Hydrologic Methods Report (Robison 2010 draft). An example of this approach for springs is included in Minimum Flows Determination: Green Springs, Volusia County, Florida (Ware 2010 draft).

Wherever direct withdrawals from streams with established MFLs are a concern, SJRWMD uses surface water models for specific streams or stream segments. This approach can utilize consumptive use permit (CUP)-allocated water use data for withdrawals directly from the stream of interest, or direct withdrawal data for specific estimated past or projected future conditions. An example of this approach is reported in *Middle St. Johns River Minimum Flows and Levels Hydrologic Methods Report* (Robison 2004).

Changes in groundwater levels are important for assessing MFLs for some water bodies, particularly springs and lakes that have significant connection to the Floridan aquifer system. For these water bodies, SJRWMD uses regional groundwater models to simulate groundwater levels, then uses those groundwater levels in conjunction with more detailed hydrologic models to assess MFLs.

### Groundwater Model Sensitivity Analysis

The development of any useful groundwater flow model relies on the amount and quality of data available for developing the model. It also depends upon the overall knowledge and understanding of the geologic conditions represented in the model. Professional judgment on how to conceptualize the geologic systems represented in the model is often as important as the available data. The process of adjusting groundwater flow model parameters to best simulate actual hydrologic conditions is called model calibration. However, given that subsurface conditions are not fully known, the model calibration process typically does not yield unique results. Thus there is some level of uncertainty in groundwater modeling.

SJRWMD quantified the uncertainty in the groundwater models by varying model calibration parameters within a plausible range of values. This process yielded a range of model results, indicating the sensitivity of the model to a plausible range of model calibration parameters. This sensitivity analysis yielded minimum (low)-, base (intermediate)-, and maximum (high) cases for groundwater level conditions that bracketed the range of uncertainty in groundwater models. SJRWMD then used these high-, intermediate-, and low values when assessing whether the water bodies' flows and levels were above their MFLs.

**Assessing the Status of MFLs**

SJRWMD assessed MFLs by using flows and levels from the best-calibrated versions of its groundwater flow models as well as the flows and levels derived from the sensitivity analyses. For each MFLs water body, SJRWMD assessed MFLs based on low-, intermediate-, and high cases of modeled groundwater levels. For some water bodies, the results of the MFLs assessment were the same regardless of which cases were used. For example, flows and levels for some water bodies were below or projected to fall below MFLs when assessed under all three cases of modeled groundwater conditions. Flows and levels for other water bodies were above or projected to be above MFLs under all three cases of modeled groundwater conditions. For water bodies in which differences in the three groundwater conditions did not affect the outcome of the assessment, SJRWMD considered the effect of uncertainty in the model to be limited, thus rendering greater confidence in the MFLs assessment.

However, for other water bodies, the MFLs assessment results varied when using low-, intermediate-, and high cases for groundwater levels. For example, flows and levels for some water bodies were projected to be below their MFLs with the low or intermediate case of modeled groundwater levels, but were projected to be above their MFLs with the high case of modeled groundwater levels. Similarly, flows and levels for some water bodies were projected to be above their MFLs based on intermediate and high cases for modeled groundwater levels, but projected to be below their MFLs based on the low case for modeled groundwater levels. Table 2 provides a conceptual view of how confidence in the MFLs assessment is associated with the model sensitivity analysis. In cases of mixed results, SJRWMD intends to pursue additional data collection, monitoring, modeling enhancements, or other efforts, to reduce uncertainty in the MFLs assessment as a first step in addressing these MFLs.

Table 2. Conceptual matrix for evaluating confidence in assessing MFLs based on results from groundwater model sensitivity analysis

| Projected Water Body Flows and Levels | | | |
|---|---|---|---|
| **Based on high value for modeled groundwater levels or flows** | **Based on intermediate value for modeled groundwater levels or flows** | **Based on low value for modeled groundwater levels or flows** | **Confidence in projecting flows and levels** |
| At or above | At or above MFLs | At or above MFLs | Higher |
| Below MFLs | Below MFLs | Below MFLs | Higher |
| At or above MFLs | At or above MFLs | Below MFLs | Lower |
| At or above MFLs | Below MFLs | Below MFLs | Lower |

MFLs = minimum flows and levels

## RESULTS OF MFLS ASSESSMENT

Of the 123 water bodies with established MFLs, there are 47 water bodies in the northern water supply planning area, 75 water bodies in the central water supply planning area, and one (1) water body in the southern water supply planning area. In addition to the 123 water bodies with established MFLs, SJRWMD is currently developing MFLs for three (3) water bodies in the central planning area. SJRWMD has identified 37 water bodies [34 with established MFLs and three (3) with proposed MFLs] with flows and levels that are below MFLs or with flows and levels that are projected to fall below MFLs by 2030. All 37 of these water bodies are located in the northern or central water supply planning areas.

### Northern Water Supply Planning Area

There are 47 water bodies in the northern water supply planning area with established MFLs. All 47 of these water bodies are lakes. SJRWMD has identified eight (8) water bodies in the northern planning area with existing flows and levels that are below MFLs [identified by an asterisk (*) in the list below] and three (3) water bodies with flows and levels that are projected to fall below MFLs by 2030:

1. Lake Geneva*
2. Lake Brooklyn*
3. Banana Lake*
4. Lake Como*
5. Cowpen Lake*
6. Little Lake Como*
7. Tarhoe Lake*
8. Trone Lake*

9. Grandin Lake
10. Orio Lake
11. Silver Lake

All of these water bodies are located in Clay and Putnam counties. Seven (7) of the water bodies (Banana, Como, Little Como, Tarhoe, Trone, Orio, and Silver) are located in the southeastern portion of Putnam County between the St. Johns River and Crescent Lake. Cowpen Lake is located in the southwestern portion of Putnam County. Lake Geneva and Lake Brooklyn are located near Keystone Heights in Clay County. Grandin Lake is located in western Putnam County.

**Central Water Supply Planning Area**

There are 75 water bodies in the central water supply planning area with established MFLs and three (3) with proposed MFLs: Sixty (60) of these are lakes or wetlands; six (6) are rivers or creeks; and nine (9) are springs. The three (3) water bodies with proposed MFLs include Lake Avalon, Lake Hiawassee, and Johns Lake. Through the assessment process, SJRWMD determined that 11 water bodies [10 water bodies with established MFLs and one (1) water body with proposed MFLs] have existing flows and levels that are below MFLs [identified by an asterisk (*) in the list below] and 15 water bodies [13 water bodies with established MFLs and two (2) water bodies with proposed MFLs] have flows and levels that are projected to fall below MFLs by 2030:

1. Fox Lake (Brevard County)*
2. South Lake (Brevard County)*
3. Lake Apshawa North (Lake County)*
4. Lake Apshawa South (Lake County)*
5. Palm Springs (Seminole County)*
6. Sanlando Springs (Seminole County)*
7. Lake Sylvan (Seminole County)*
8. Starbuck Spring (Seminole County)*
9. Emporia Lake (Volusia County)*
10. Indian Lake (Volusia County)*
11. Lake Minneola (Lake County)
12. Cherry Lake (Lake County)
13. Lake Louisa (Lake County)
14. Pine Island Lake (Lake County)
15. Lake Prevatt (Orange County)

16. Lake Brantley (Seminole County)
17. Mills Lake (Seminole County)
18. Big Lake (Volusia County)
19. Blue Spring (Volusia County)
20. Lake Daugharty (Volusia County)
21. Lake Helen (Volusia County)
22. Lake Hires (Volusia County)
23. Three Island Lakes (Volusia County)

MFLs proposed:

1. Lake Avalon (Orange County)
2. Lake Hiawassee (Orange County)*
3. Johns Lake (Orange County)

Fifteen (15) of these water bodies are located within the Central Florida Coordination Area (CFCA): Lake Apshawa North, Lake Apshawa South, Lake Sylvan, Lake Minneola, Cherry Lake, Lake Louisa, Lake Prevatt, Lake Brantley, Mills Lake, Lake Avalon, Lake Hiawassee, Johns Lake, Starbuck Springs, Palm and Sanlando springs.

**Recovery and Prevention Strategies: Targeted Water Bodies With Established MFLs**

SJRWMD uses an assessment process to apply the results of the MFLs assessment and determine if a recovery or prevention strategy is needed (Figure 2). If a water body's flows and levels are projected to be above MFLs by 2030 (the 20-year planning horizon), then neither a recovery nor a prevention strategy is needed. For water bodies with flows and levels that are projected to be below their MFLs by 2030, SJRWMD assesses whether existing flows and levels are sufficient to be above the MFL. If the current flows and levels are above MFLs under current conditions but below MFLs by 2030, then a prevention strategy is needed. If the existing flows or levels are below the MFLs under current conditions, then a recovery strategy is needed.

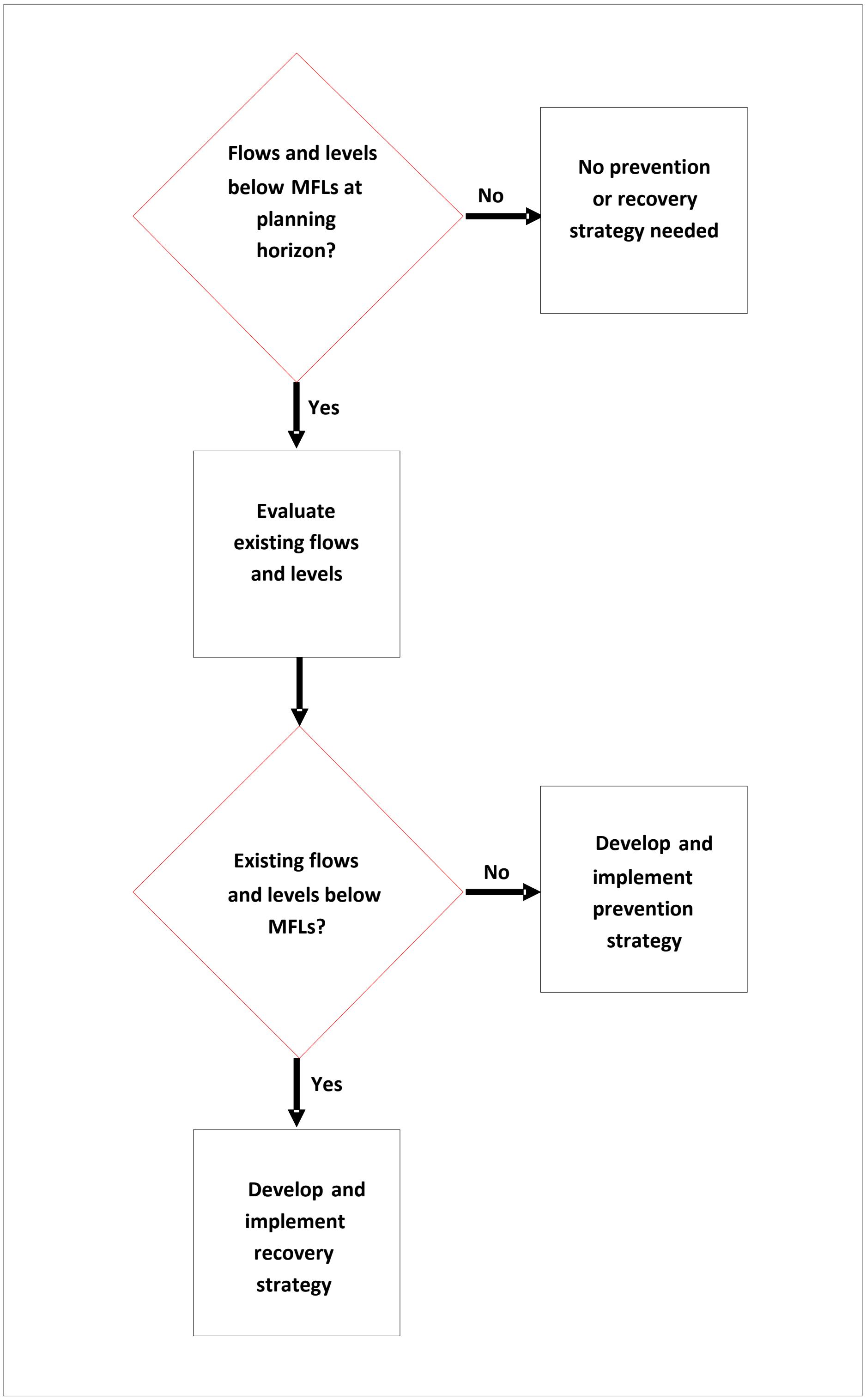


Figure 2. Decision flowchart to determine the need for MFLs recovery or prevention strategy

Of the 123 water bodies with established MFLs and three (3) water bodies with proposed MFLs, SJRWMD identified 33 lakes and four (4) springs which have flows and/or levels that are either currently below their MFLs or are projected to fall below their MFLs by 2030 (the planning horizon). These 37 water bodies [34 established MFLs and three (3) water bodies with proposed MFLs] are the focus of an MFLs Prevention and Recovery Strategy development process by SJRWMD, which is described below.

**MFLs Prevention and Recovery Strategy Approach**

The goal of the MFLs Prevention and Recovery Strategy is to identify sufficient economically, environmentally, and technically feasible measures to meet all reasonable-beneficial water supply needs and ensure that flows and levels for MFLs water bodies do not fall below established MFLs. What follows is a general description of the SJRWMD approach for developing MFLs Prevention and Recovery Strategies for the affected water bodies, which is presented in Figure 3.

- *Define MFLs Prevention and Recovery Strategy Development Areas*: Six MFLs Prevention and Recovery Strategy Development Areas have been identified that incorporate the 37 affected water bodies [34 established MFLs and three (3) water bodies with proposed MFLs]: Volusia, Brevard, Clay-Putnam, Putnam-Volusia, Seminole-North Orange, and South Lake-West Orange (Table 3 and Figure 4). Grouping water bodies into Strategy Development Areas allows for the development of coordinated strategies that consider hydrologic connections and geographic proximity among the affected water bodies as well as the efficient use of SJRWMD resources.
- *Establish MFLs Prevention and Recovery Strategy Development Teams*: In each Strategy Development Area, SJRWMD will convene stakeholders with appropriate SJRWMD staff. Each team will be tasked with development of a MFLs Prevention and Recovery Strategy that contains sufficient measures to meet water supply needs and the affected MFLs.
- *Stakeholder Team Education and Outreach*: SJRWMD will conduct necessary education and public outreach with stakeholders to achieve a common understanding of the affected water bodies, their MFLs, and future water supply needs.
- *Conduct Applicable Technical Assessments*: In cooperation with the stakeholders, SJRWMD will conduct the necessary technical assessments to identify the relative effect of water users upon a specific MFLs water body.
- *Define Preliminary Measures*: The stakeholders in conjunction with SJRWMD staff will develop a preliminary suite of economically, environmentally, and technically feasible measures intended to meet future water supply needs while achieving the affected MFLs.
- *Evaluate Measures Relative to MFLs and Refine as Needed*: In cooperation with the Stakeholder Team, SJRWMD will conduct the necessary technical analyses to determine if the proposed suite of measures is sufficient to bring flows and levels above the affected MFLs. This will likely involve groundwater and surface water modeling. However, other technical approaches may be used where

appropriate. Stakeholder Teams will use the results of these technical analyses to refine the suite of measures in the MFLs Prevention and Recovery Strategy.

- *Develop Implementation Mechanisms and Agreements*: Upon compilation of a final suite of measures by the Stakeholder Team, SJRWMD will work with the Stakeholder Team and individual stakeholders to develop applicable mechanisms and agreements to implement the strategy.

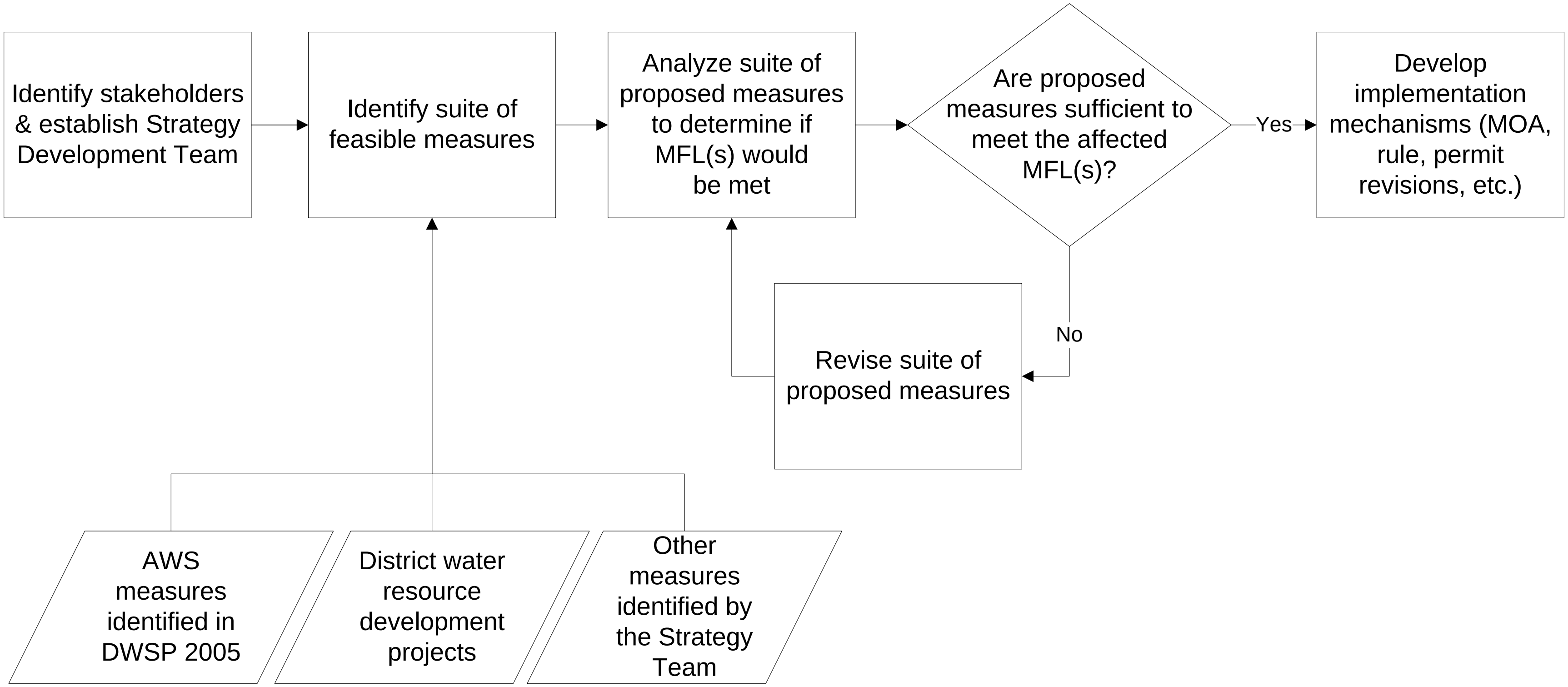


Figure 3. MFLs Prevention and Recovery Strategy development process

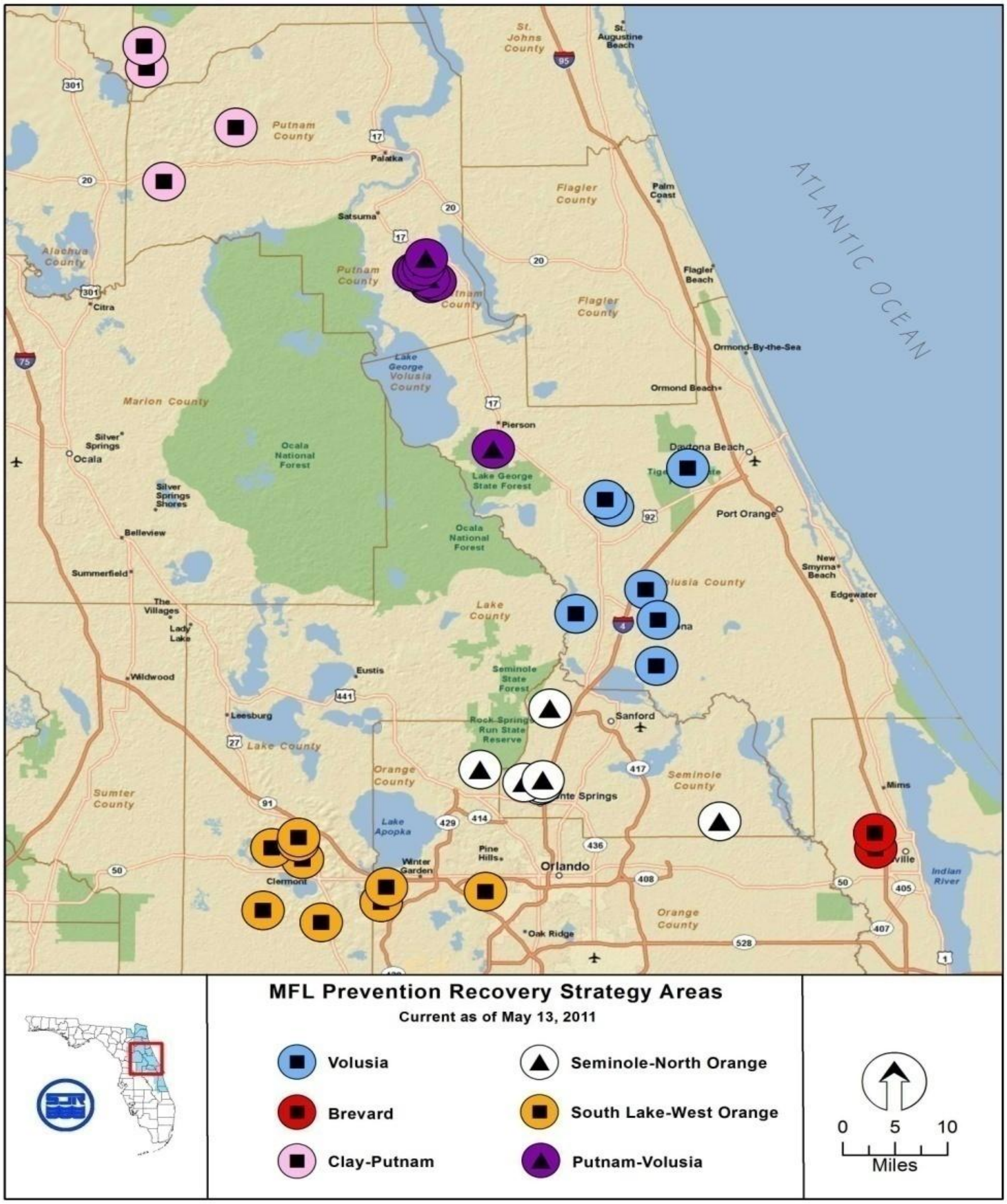


Figure 4. MFLs Prevention and Recovery Strategy development areas

Table 3. MFLs Prevention and Recovery Strategy development areas and affected water bodies (* indicates MFLs are proposed)

| Strategy Development Areas | Affected Water Bodies |
|---|---|
| Volusia | Big Lake<br>Blue Spring<br>Lake Daugharty<br>Lake Helen<br>Lake Hires<br>Three Island Lake<br>Indian Lake |
| South Lake-West Orange | Lake Apshawa North<br>Lake Apshawa South<br>Cherry Lake<br>Lake Minneola<br>Lake Louisa<br>Pine Island Lake<br>Lake Avalon*<br>Lake Hiawassee*<br>Johns Lake* |
| Clay-Putnam | Lake Brooklyn<br>Cowpen Lake<br>Lake Geneva<br>Lake Grandin |
| Seminole-North Orange | Lake Brantley<br>Mills Lake<br>Palm Springs<br>Lake Prevatt<br>Sanlando Springs<br>Starbuck Spring<br>Lake Sylvan |
| Brevard | Fox Lake<br>South Lake |
| Putnam-Volusia | Banana Lake<br>Lake Como<br>Emporia Lake<br>Little Lake Como<br>Orio Lake<br>Silver Lake<br>Lake Tarhoe<br>Lake Trone |

Note: The number of strategy development areas and associated water bodies may change over time.

## MFLs Prevention and Recovery Strategy Timetable

To ensure that each Stakeholder Team receives sufficient support to develop a scientifically defensible and implementable strategy, SJRWMD will phase initiation of the strategy development area process. The timetable for a strategy development area is likely to vary significantly among the nine areas, given the extensive diversity in the types of water users, scientific understanding, resource issues, and existing requirements such as those applicable within the Central Florida Coordination Area (CFCA). Figure 5 shows the approximate timetable for expeditious development and implementation of prevention and recovery strategies.

SJRWMD anticipates that development of each MFLs Prevention and Recovery Strategy will require 2–3 years from initiation through completion of a final set of measures and implementation mechanisms. Implementation of the strategies will occur on a phased time frame over the course of 5–15 years, depending on the type of projects and measures included within each MFLs Prevention and Recovery Strategy.

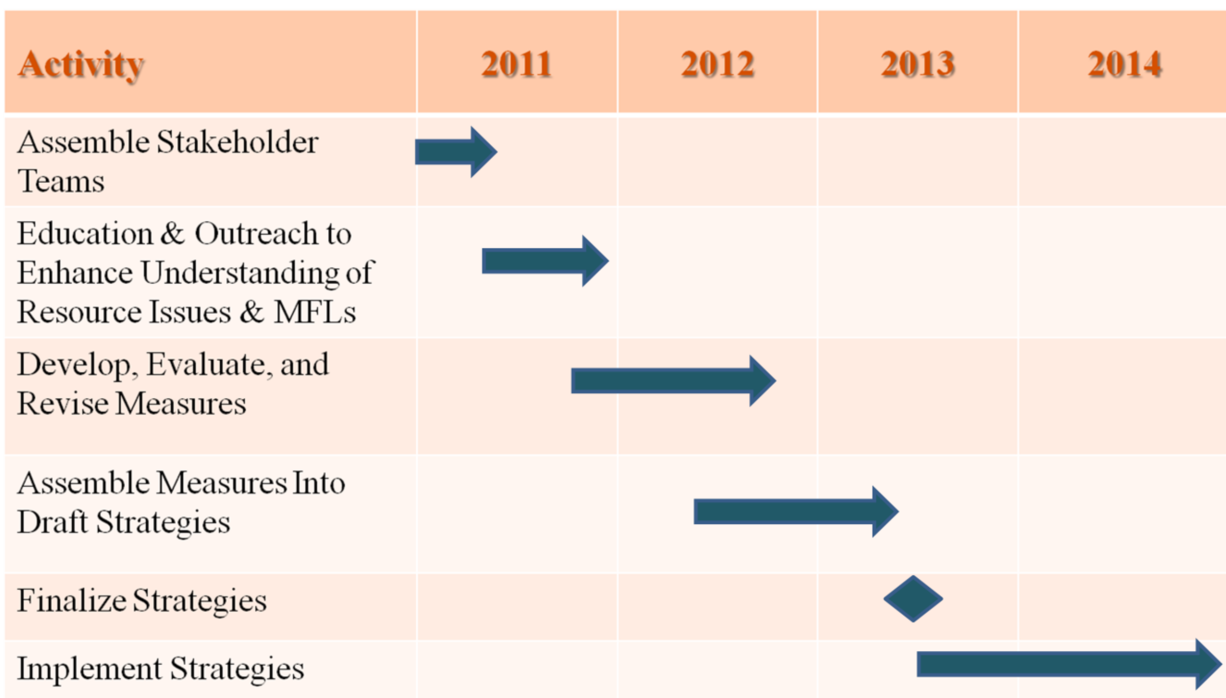


Figure 5. Time frame for development of MFLs Prevention and Recovery Strategy

## RESERVATIONS OF WATER

### Statutory and Regulatory Framework

Subsection 373.223(4), F.S., states the following:

> *The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.*

### Reservations of Water Established to Date

SJRWMD has established only one reservation of water pursuant to the provisions of Subsection 373.223(4), F.S. The reservation is related to flow via Prairie Creek and Camps Canal south of Newnans Lake, in Alachua County, and has been adopted by rule (Rule 40C-2.302, *F.A.C*.) as follows:

> *The Governing Board finds that reserving a certain portion of the surface water flow through Prairie Creek and Camps Canal south of Newnans Lake in Alachua County, Florida, is necessary in order to protect the fish and wildlife which utilize the Paynes Prairie State Preserve, in Alachua County, Florida. The Board therefore reserves from use by permit applicants that portion of surface water flow in Prairie Creek and Camps Canal that drains by gravity through an existing multiple culvert structure into Paynes Prairie. This reservation is for an average flow of 35 cubic feet per second (23 million gallons per day) representing approximately forty five percent (45%) of the calculated historic flow of surface water through Prairie Creek and Camps Canal.*

This rule is implemented through the water supply planning and CUP processes in a manner similar to that used to address MFLs.

## REFERENCES

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