



Florida Department of Environmental Protection

Basin Management Action Plan (BMAP) Crystal River/Kings Bay

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Topics

- Onsite Sewage Treatment and Disposal System (OSTDS) Remediation Plan
 - Florida Department of Health (FDOH) Study – Elke Ursin
 - Requirements of Florida Law 2016-1
 - Legal requirements
 - Data needs
 - Process to develop the OSTDS Remediation Plan



Springs Coast

BMAPs in development:

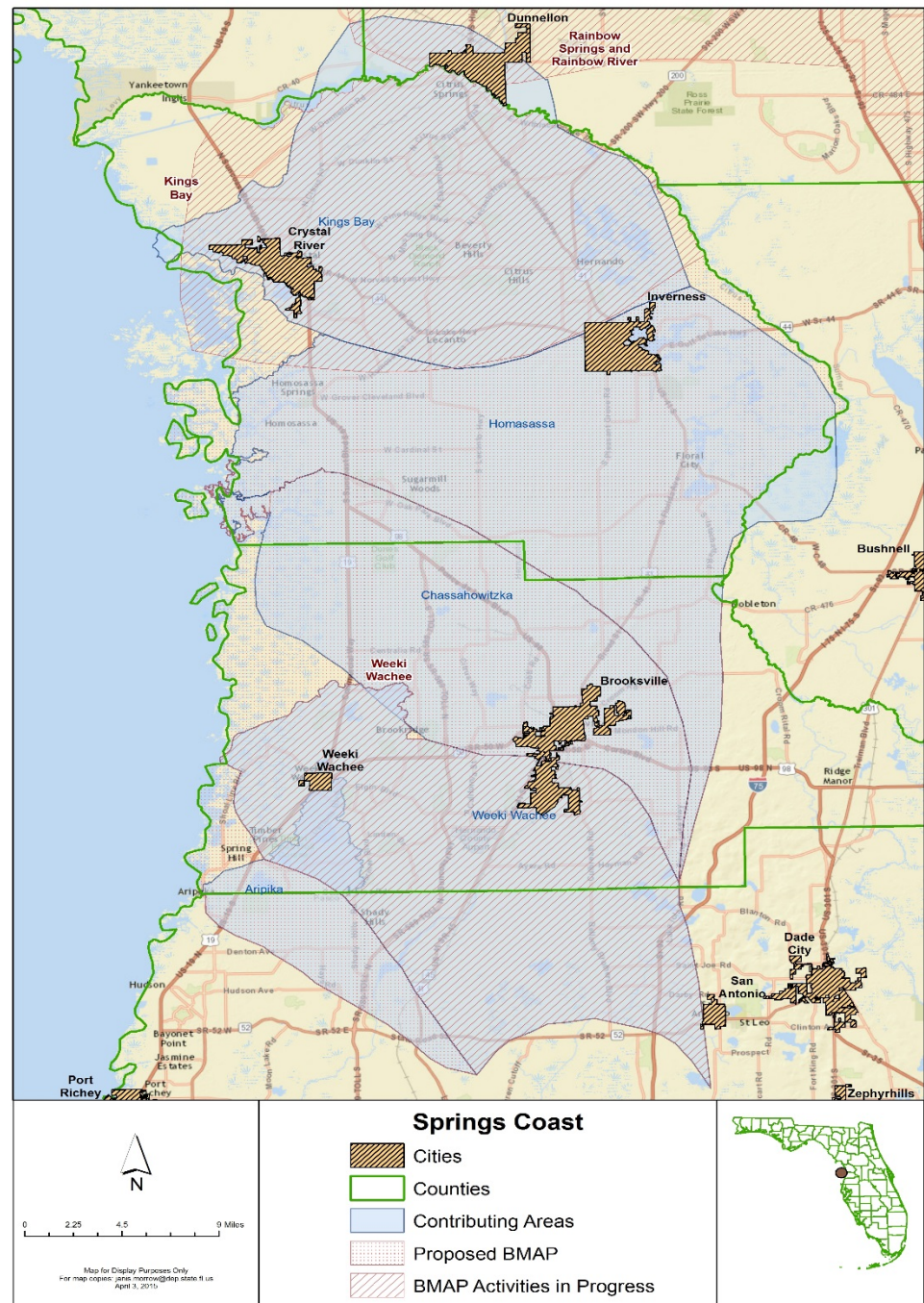
- Crystal River / Kings Bay
- Weeki Wachee

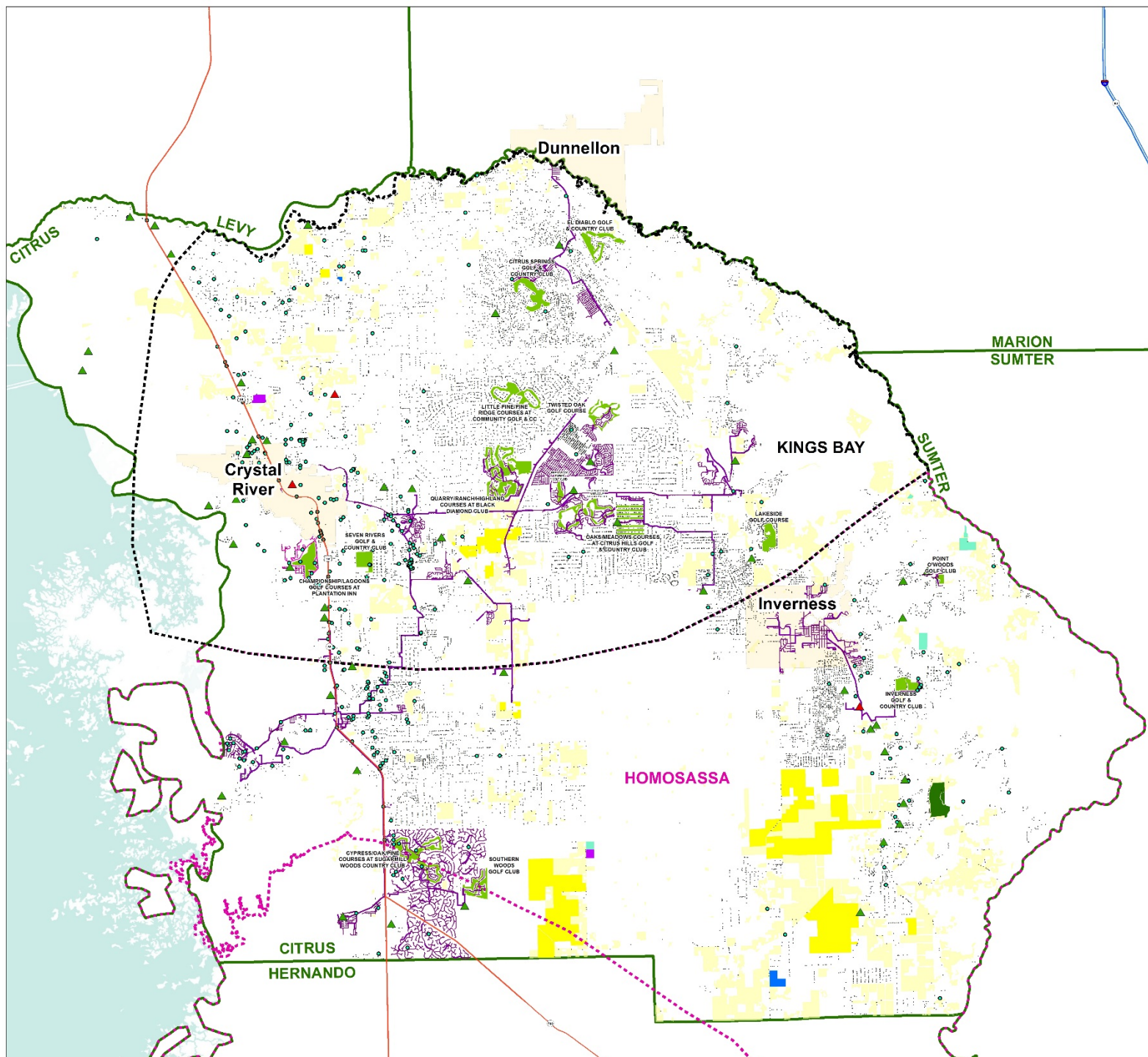
Total maximum daily loads (TMDLs) finalized:

- Homosassa
- Chassahowitzka

TMDL in development:

- Aripeka

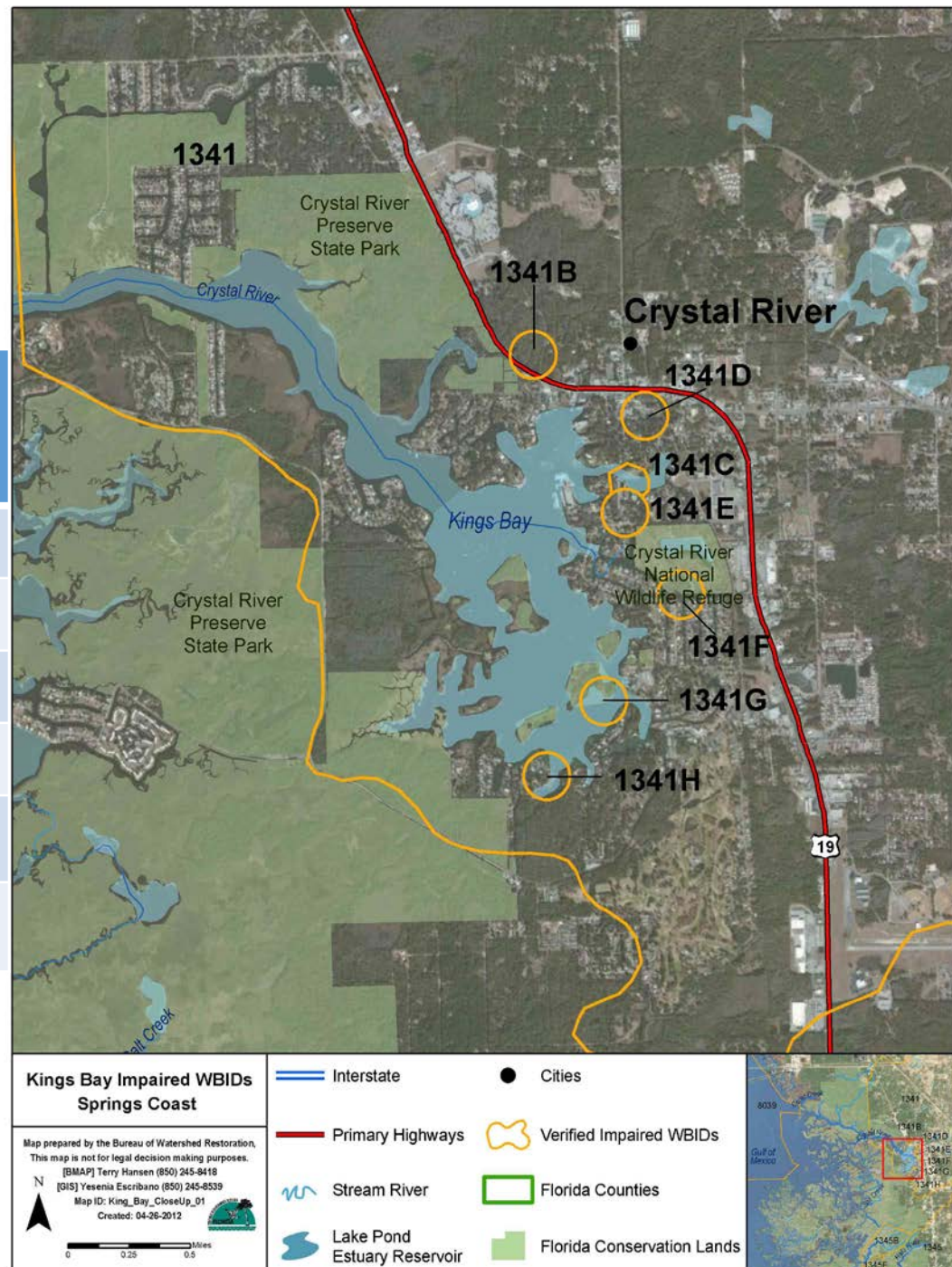






TMDLs

Water Body Identification (WBID)	Reduction- Total Nitrogen (TN)	Reduction- Total Phosphorus (TP) and Orthophosphorus (ortho-P)
1341	22%	14% TP
1341C	64%	0% ortho-P
1341D	53%	0% ortho-P
1341F	26%	7 % ortho-P
1341G	21%	10% ortho-P
1341H	26%	0% ortho-P





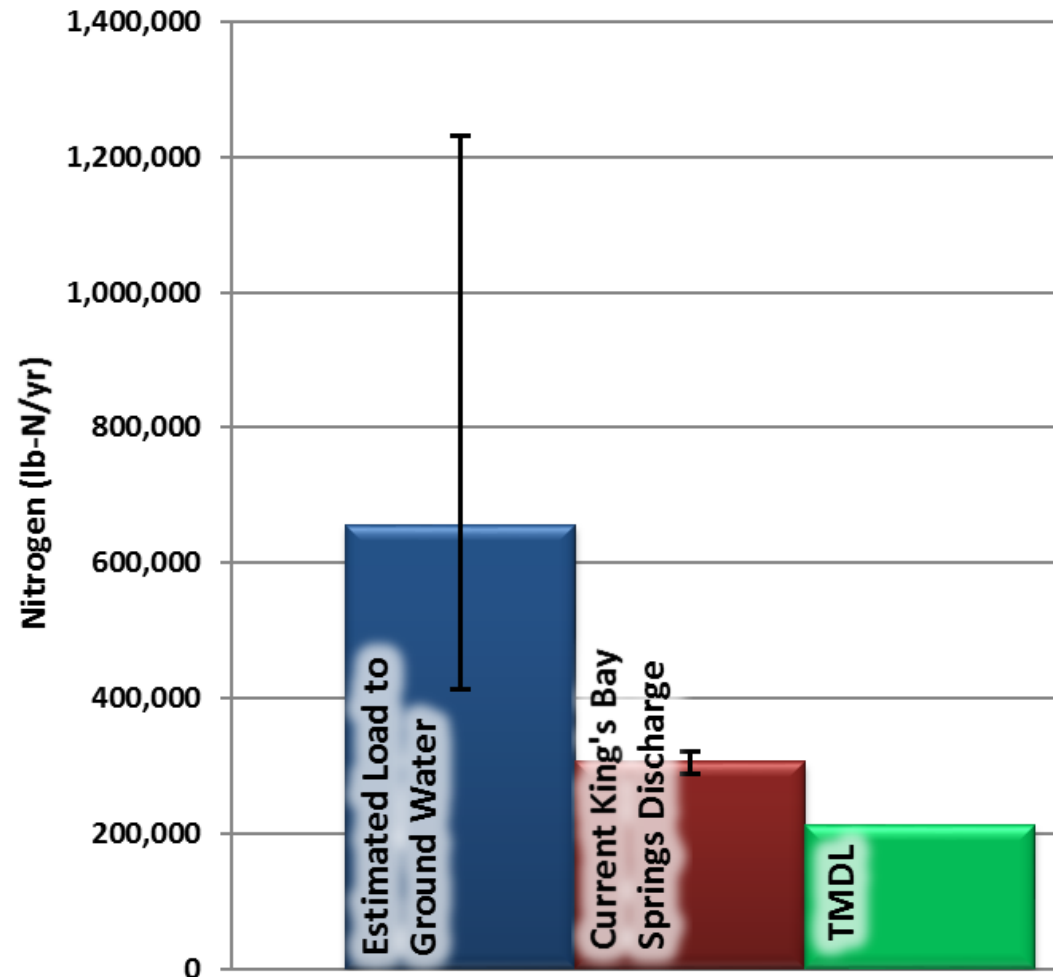
Kings Bay Discharge of Nitrogen

Current

- Discharge = 466 cubic feet per second (ft^3/sec)
- TN = 0.33 milligrams per liter (mg/L)
- Load = 305,897 pounds of nitrogen per year (lbs-N/yr)

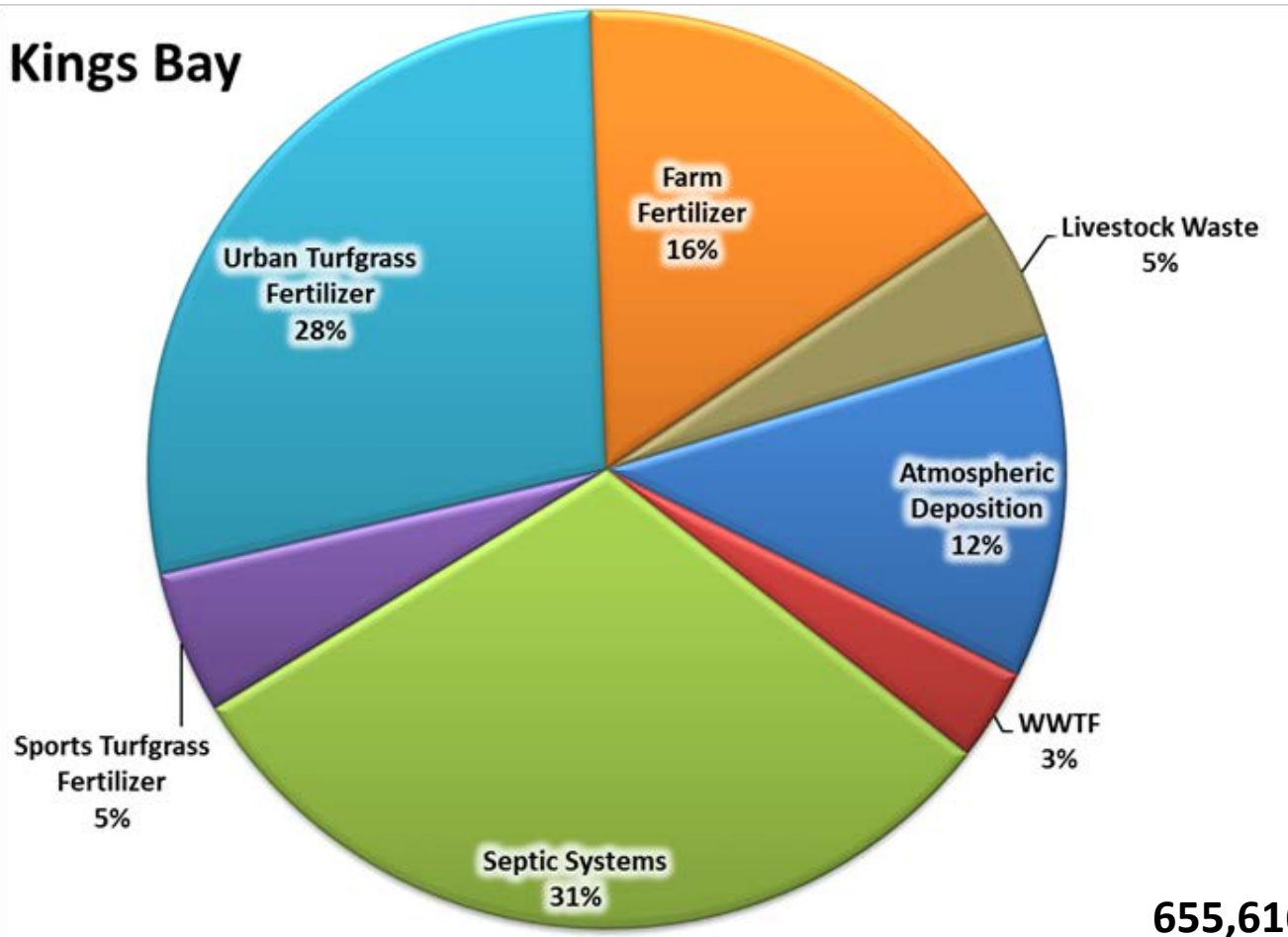
TMDL

- Using current discharge
- TN = 0.23 mg/L
- Load = 210,648 lbs-N/yr





Kings Bay Load to Ground Water





OSTDS Loads to Ground Water

- NSILT load to ground water = 655,616 lbs-N/yr
- TMDL % reduction needed = 35.33% (average of 6 TMDLs)
- Reduction needed = 231,650 lbs-N/yr
- OSTDS load is 31% of total nitrogen load in springshed
 - $231,650 \times 0.31 = \mathbf{71,811 \text{ lbs-N/yr reduction from OSTDS}}$
- OSTDS load per system estimated at 18 lbs-N/yr
 - 40% (0.4) of OSTDS load is NOT attenuated (reaches ground water) and recharge rate is 90% (0.9)(high)
 - $18 \text{ lbs-N/yr} \times 0.4 \text{ not attenuated} \times 0.9 \text{ recharge rate} = \mathbf{6.48 \text{ lbs-N/yr/OSTDS reaches ground water}}$
- We need to estimate the final TN concentration of the possible projects to determine the minimum number of OSTDS remediation (additional *in situ* treatment or sewer) needed to meet the TMDL target



OSTDS Remediation Plan

- Required - If OSTDS within a priority focus area (PFA) contribute greater than or equal to 20% of the nitrogen load
- Include FDOH, Florida Department of Environmental Protection (DEP), relevant local governments, relevant local public and private wastewater utilities
- 5-, 10-, and 15-year project schedules
- Goal is a Crystal River/Kings Bay OSTDS Remediation Plan with the 2016-1 provisions



OSTDS Remediation Plan

2016-1 Requirements

- Collect and evaluate credible scientific information on the effect of nutrients, particularly forms of nitrogen, on springs and springs systems
- Develop a public education plan to provide area residents with reliable, understandable information about onsite sewage treatment and disposal systems and springs



OSTDS Remediation Plan

2016-1 Requirements (continued)

- Include options for repair, upgrade, replacement, drainfield modification, addition of effective nitrogen reducing features, connection to a central sewerage system or group of systems within a PFA (meet 20% of source – Crystal River/Kings Bay 31%)
- Priority ranking of the projects to assist with funding

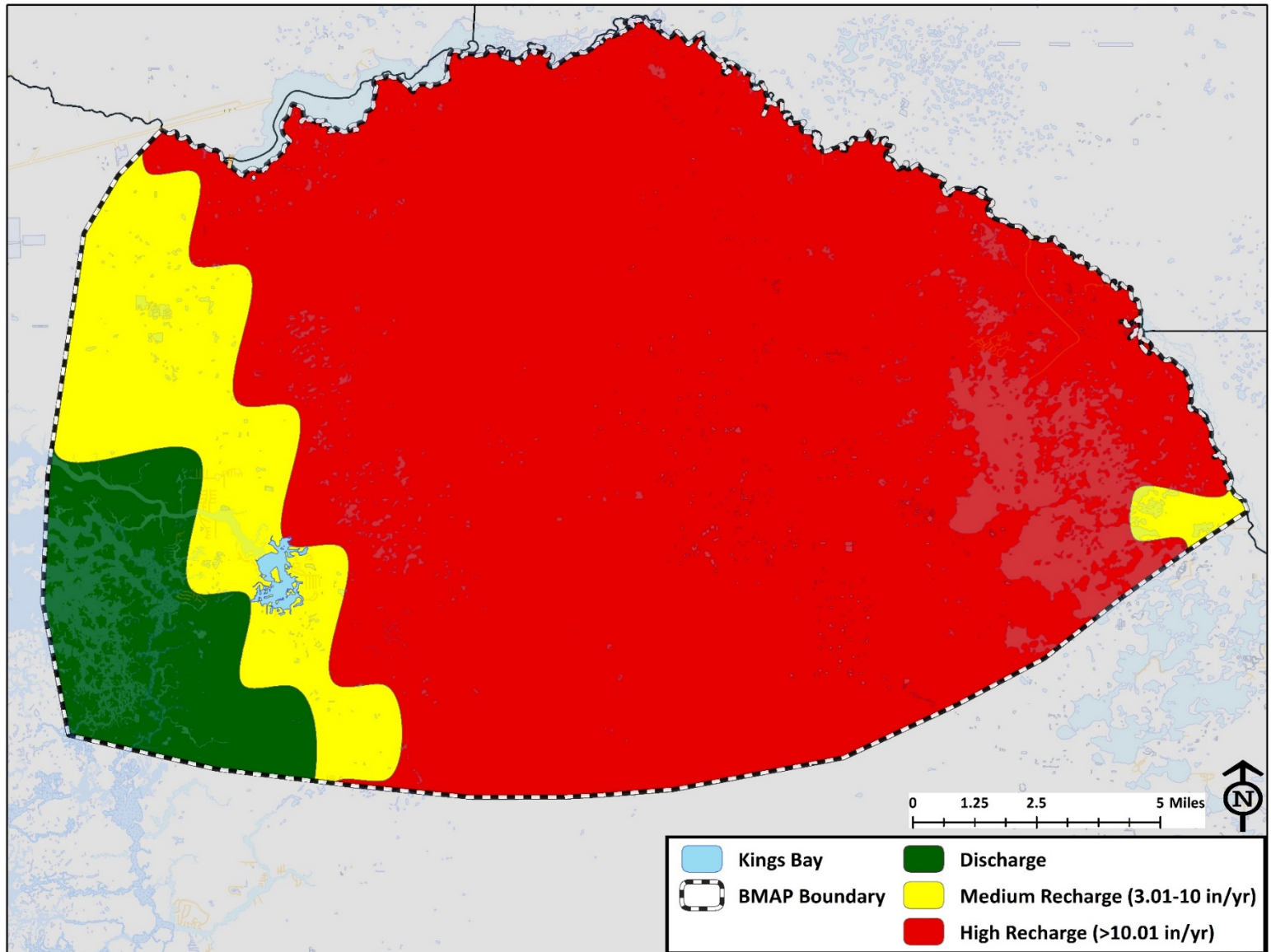


PFA Requirements

- Sub-Section 373.802, Chap. 2016-1 Laws of Florida:
 - Definition: Area or areas of a basin where the Floridan Aquifer is generally most vulnerable to pollutant inputs where there is a known connectivity between ground water pathways and an Outstanding Florida Spring (OFS)
- Sub-Section 373.803, Chap. 2016-1 Laws of Florida:
 - To be delineated considering factors that may lead to degradation of an OFS, such as:
 - Ground water travel time to the spring
 - Hydrogeology
 - Nutrient load, etc.



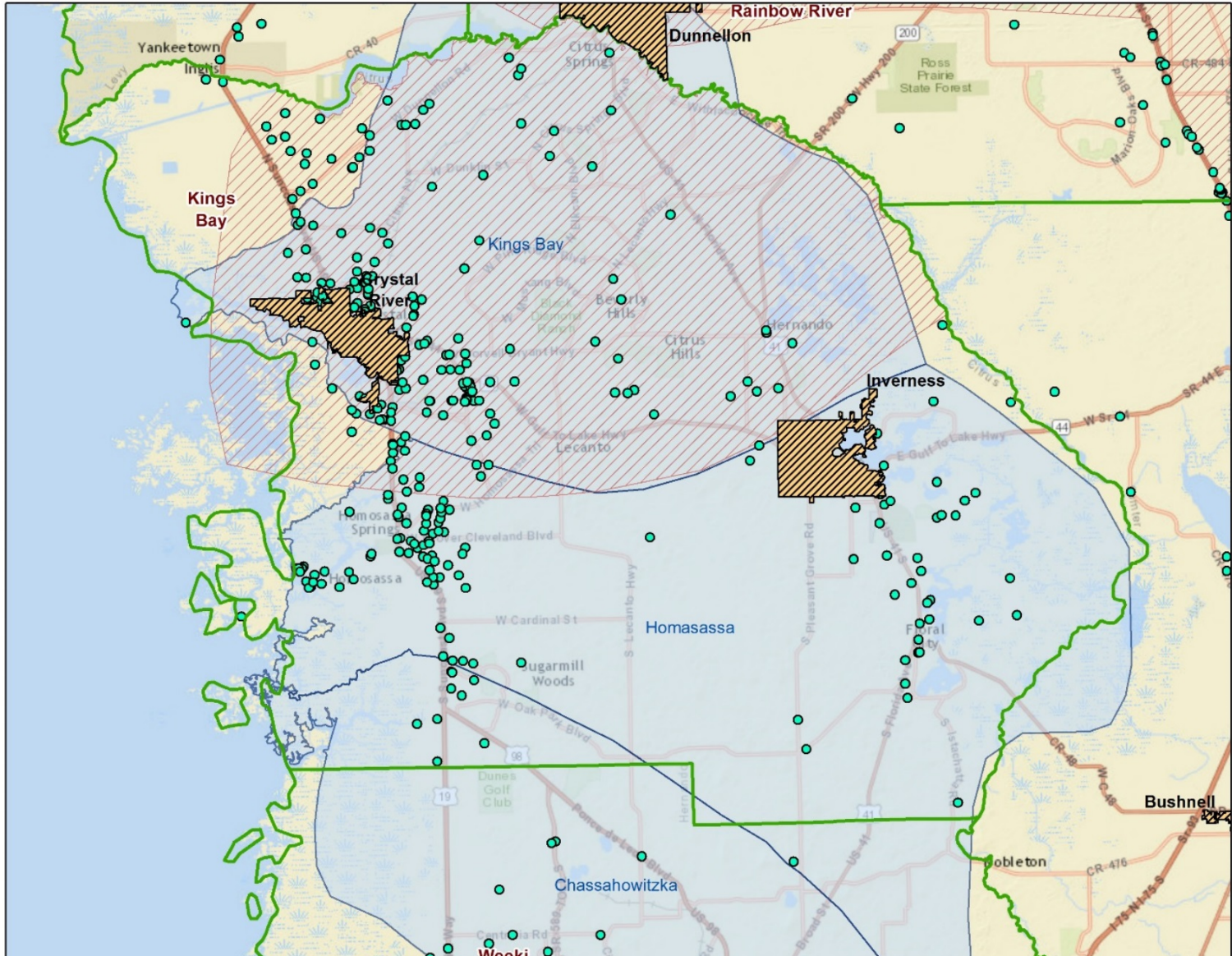
Crystal River/Kings Bay PFA Designation



This map was prepared on 06/17/16 by FDEP Ground Water Management Section. For display purposes only. For more information: K.Eller (850)245-8652.

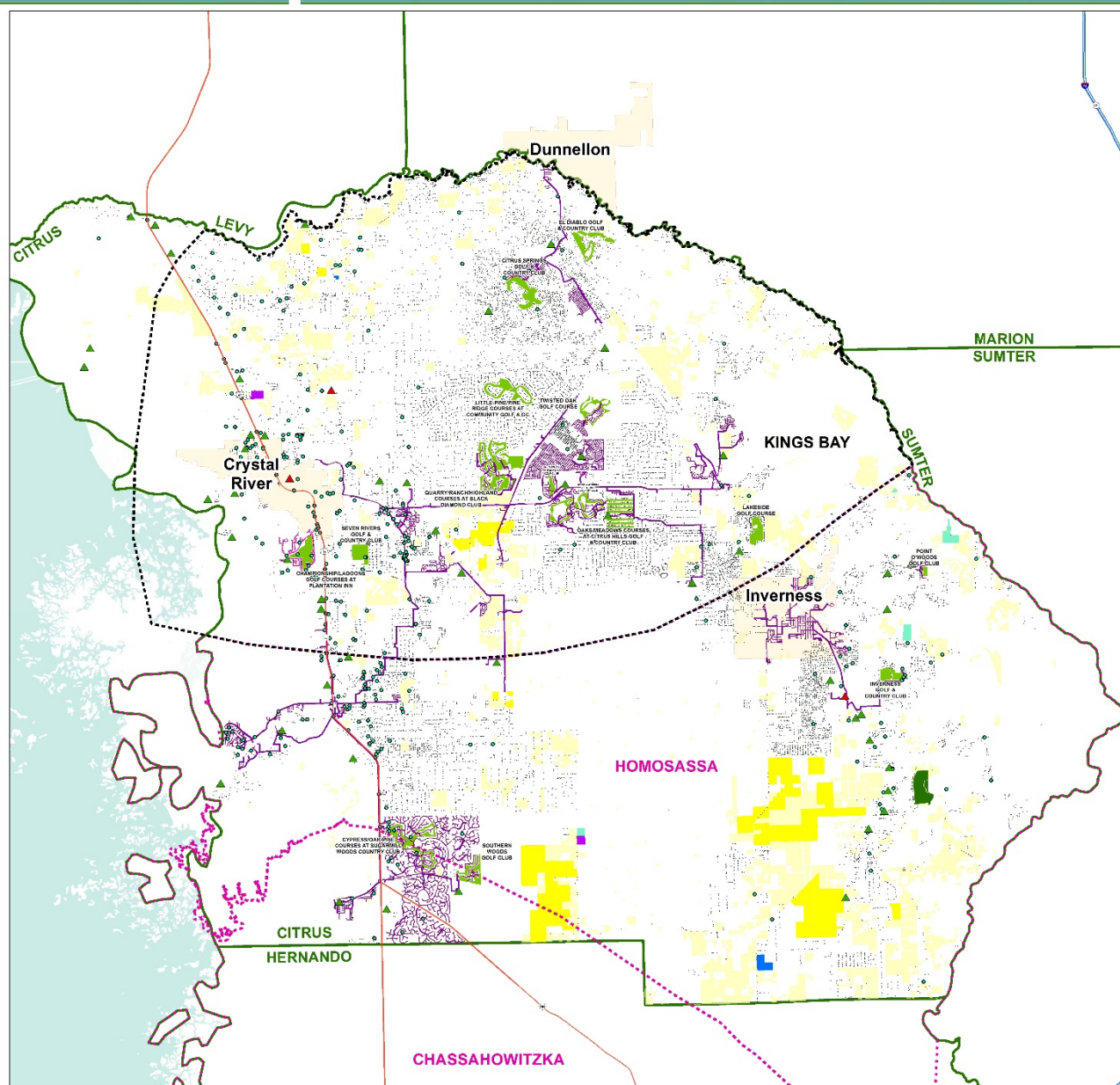


PFA Designation- Sinkholes in Citrus County





PFA Designation- Septic Tank Locations





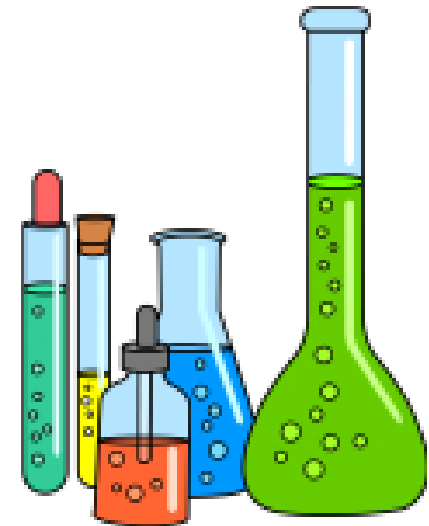
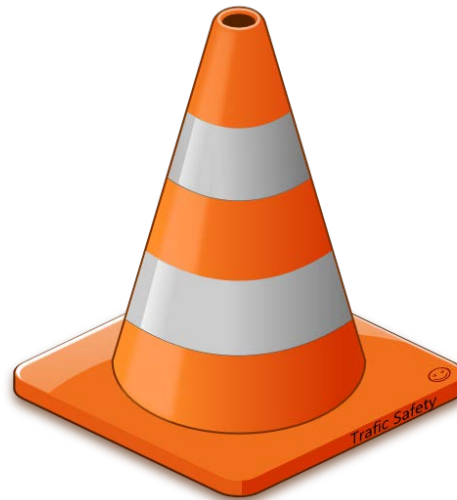
Kings Bay/Crystal River PFA Designation

- DEP is determining the PFA for the Kings Bay/Crystal River OSTDS Remediation Plan:
 - Uniform high recharge area
 - Flow mechanics not well understood
 - OSTDS locations fairly uniform across area
 - Evaluating soil profile
- The PFA provides an area for stakeholders to focus on restoration efforts
- Restoration activities will have to occur in entire BMAP area
- 2016-1 provisions will apply in entire BMAP area/PFA



OSTDS Remediation Plan Components

1. Public education strategy
2. Projects
3. Scientific information on OSTDS effects





Crystal River/Kings Bay Surface Water Improvement and Management (SWIM) Plan

A Comprehensive Conservation and Management Plan

December 2015





OSTDS-Related Public Education Actions– 2015 Crystal River/Kings Bay SWIM Plan

Management Action	Lead Entity
Education campaign	FDOH/FDEP/Local



Public Education and OSTDS-Related Projects

Ongoing Projects	Lead Entity
Citrus County NPDES Program Education	Citrus County
Education Campaign--Septic Systems Inspection and Maintenance	SWFWMD



Other Public Education and OSTDS-Related Projects

Other Proposed Projects*	Lead Entity
Septic Tanks on Our Watershed Campaign	Citrus County

**Projects and initiatives provided by members of the SWIM Plan Technical Working Group that were not approved by the Springs Coast Management Committee or Springs Coast Steering Committee to be included as a priority project or initiative.*



Public Education Discussion

- Discussion objectives:
 - Confirm key audiences
 - Further refine who are the audiences
 - Identify some major themes for communications/education
 - Identify major misconceptions
 - “Piggyback” opportunities
- Future discussion:
 - Prioritize actions
 - Measuring improvements in knowledge





Public Education

- Who are the key audiences that we should target with the Crystal River/Kings Bay public education plan?
 - Homeowners
 - Elected officials/leadership
- What specific points do you think we need to convey about OSTDS nitrogen loads?
- Are there additional misperceptions we need to overcome? What are they?
- Are there existing public education efforts with which we could piggyback communications?
- Can we set high, medium, and low priority actions?





OSTDS-Related Actions– 2015 Crystal River/Kings Bay SWIM Plan

Management Action	Lead Entity
Improve existing septic tank performance	FDOH/FDEP/Local where applicable
Conversion from septic tanks to sewer systems where practical	FDOH/FDEP/SWFWMD/Local
Limit new septic tank installations	Local



OSTDS Remediation-Related 2015 SWIM Plan Projects

Ongoing Projects	Lead Entity
Fort Island Trail Septic Interconnection	Citrus County

Potential Projects	Lead Entity
Septic Tank Removal at Crystal River Preserve State Park and Crystal River Waterfront Neighborhood	FDEP / Citrus County / City of Crystal River
Septic Tank Retrofit Pilot Program	SWFWMD
Crystal River / Kings Bay Springshed Septic to Sewer Initiative	Citrus County
Indian Waters Sewer Expansion	City of Crystal River / FDEP



Other OSTDS-Related Projects

Other Proposed Projects*	Lead Entity
Northwest Quadrant Sewer Extension	Citrus County
Septic Tank Advanced Treatment	FDOH
Septic Tank Inspection Program	FDOH / Citrus County

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OSTDS-Related Projects

- Discussion objectives:
 - Identify time constraints on different project approaches
 - Data needs to evaluate sewer versus septic field enhancement approaches
 - Understanding of calculation approaches
- Future determinations based on discussion:
 - Constraints on projects to list for the 5-, 10-, and 15-year milestones
 - Areas with site limitations for sewer
 - Areas with site limitations for OSTDS field enhancements
 - Using the calculation approaches to estimate reductions
- Future discussions:
 - Costs and cost differences based on site conditions
 - Estimated wastewater facility treatment levels and disposal methods
 - Addressing growth of OSTDS and wastewater loads



OSTDS Projects

- Understanding time constraints on installing new OSTDS treatment technology:
 - Improving OSTDS treatment is likely going to be the only or best option in some (or many) locations, so...
 - FDOH-
 - When is the expected date that the nitrogen reducing enhancements will be eligible for FDOH permits?
 - OSTDS Industry—
 - Lead time to make these types of systems available for installation?





OSTDS Projects

- Understanding time constraints on installing new OSTDS treatment technology:
 - Local governments—Anticipating a BMAP requirement to reduce OSTDS loading, what would be an overall timeline for putting local policies in place for additional treatment requirements?
 - All—Are there other timing considerations to consider for septic field enhancements?



Sewer Expansion Projects

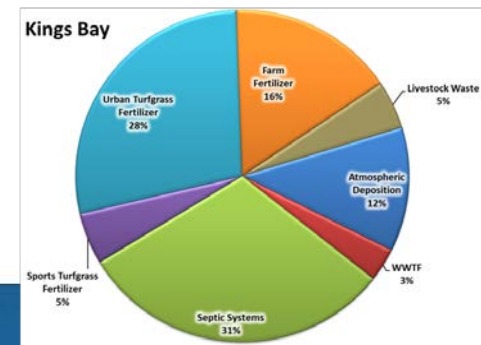
- Understanding time constraints on installing additional sewer and treating nitrogen at a wastewater plant:
 - Phasing out OSTDS to sewer service and facility treatment may be the best option some (or many) locations, so...
 - Utilities—What are your major time constraints for undertaking some sewer expansion?
 - Local governments—Anticipating a BMAP requirement to reduce OSTDS loading, what would be an overall timeline for putting local policies in place for sewer hook up?
 - All—Are there other timing considerations to consider for sewer expansion?





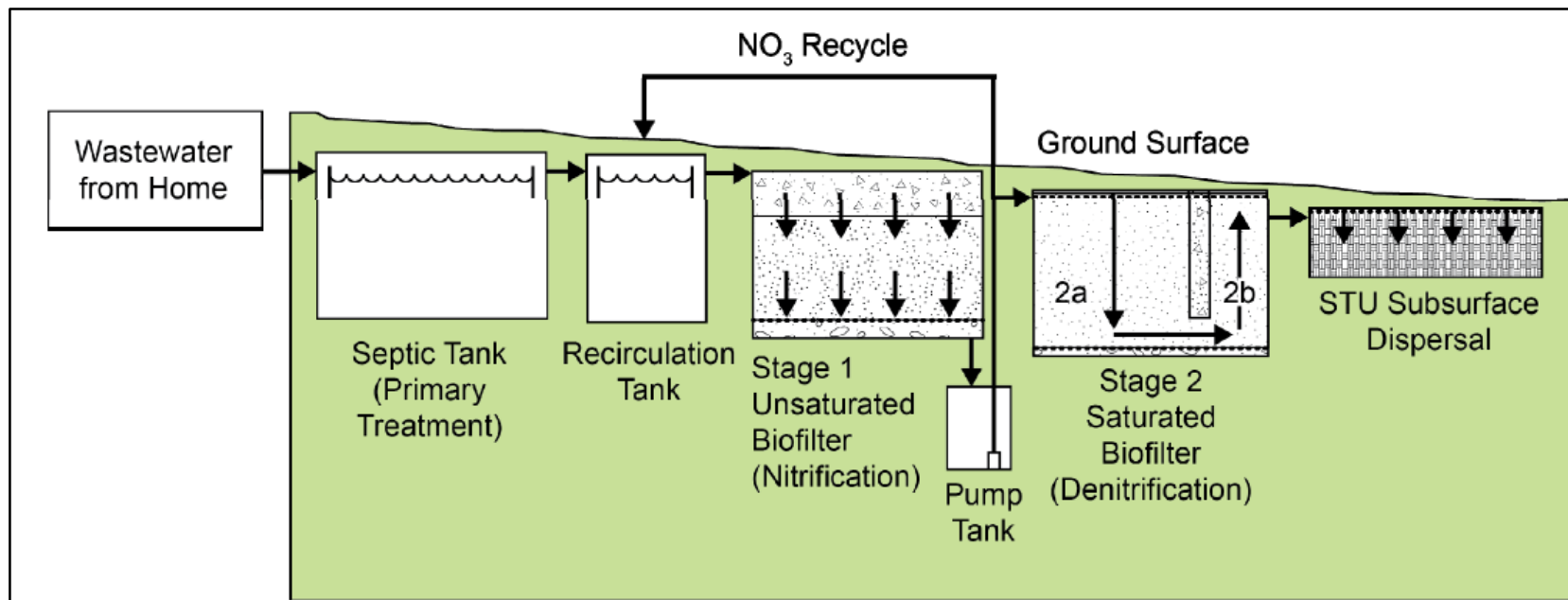
Reduction Estimates

- Use the Crystal River/Kings Bay Nitrogen Source Inventory Loading Tool (NSILT) approaches to estimate OSTDS reductions to ground water:
 - Establish OSTDS project location and final disposal method
 - For those being remediated, estimate the current OSTDS load to ground water (based on attenuation and recharge rate)
 - Estimate the OSTDS load to ground water after the project is accomplished--whether field enhancement or sewer/facility discharge to ground water (based on attenuation and recharge rate)
 - Difference in load is the net benefit/project reduction





FDOH Study: In-Tank Passive Nitrogen System



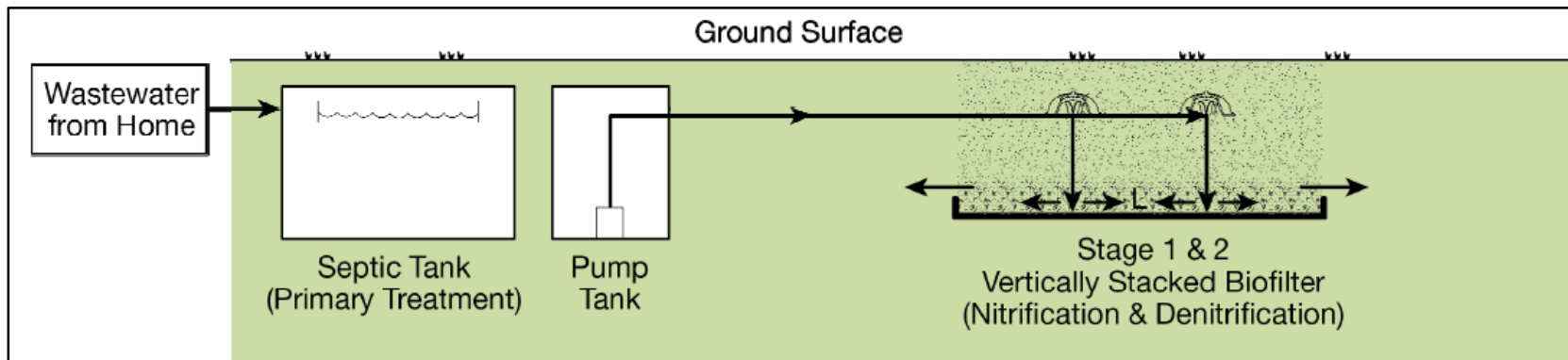
FDOH system performance estimate: 85-95% reduction of nitrogen

DEP BMAP reduction estimate: 85%, unless additional information provided to support higher efficiencies



Reduction Calculations

FDOH Study: In-Ground Passive Nitrogen System



FDOH system performance estimate: 40-70% reduction of nitrogen
DEP BMAP reduction estimate: 40%, unless additional information provided to support higher efficiencies



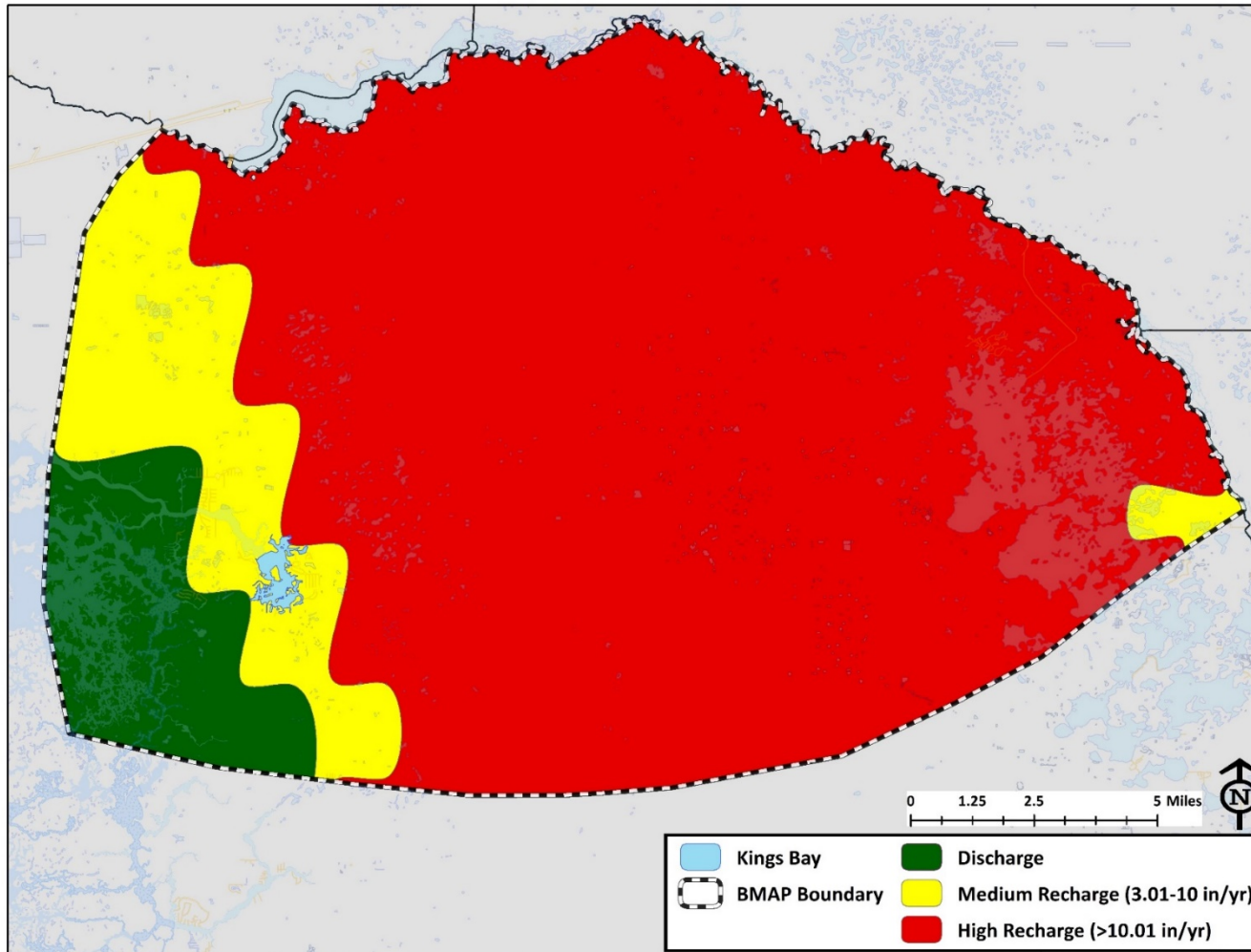
Reduction Calculations

- Location matters for the calculations:
 - Recharge rate of OSTDS location
 - Recharge rate at disposal location (same site or moved to plant)





Reduction Calculations



This map was prepared on 06/17/16 by FDEP Ground Water Management Section. For display purposes only. For more information: K.Eller (850)245-8652.



Calculation Steps for On-site Sewage Treatment and Disposal System (OSTDS) Remediation

**Step 1: Calculate OSTDS
Nitrogen Load ^{1,2,3}**

*(Avg. pph (x) Avg.
input/person) = A*

**Step 2: Apply Attenuation
Factor**

*(40% reaches ground water)
(A*40% = B)*

Step 3: Apply Recharge Factor

*(High-90%; Med.-50%; Low-
10%; based on location of
OSTDS)
(B*Recharge % = C)*

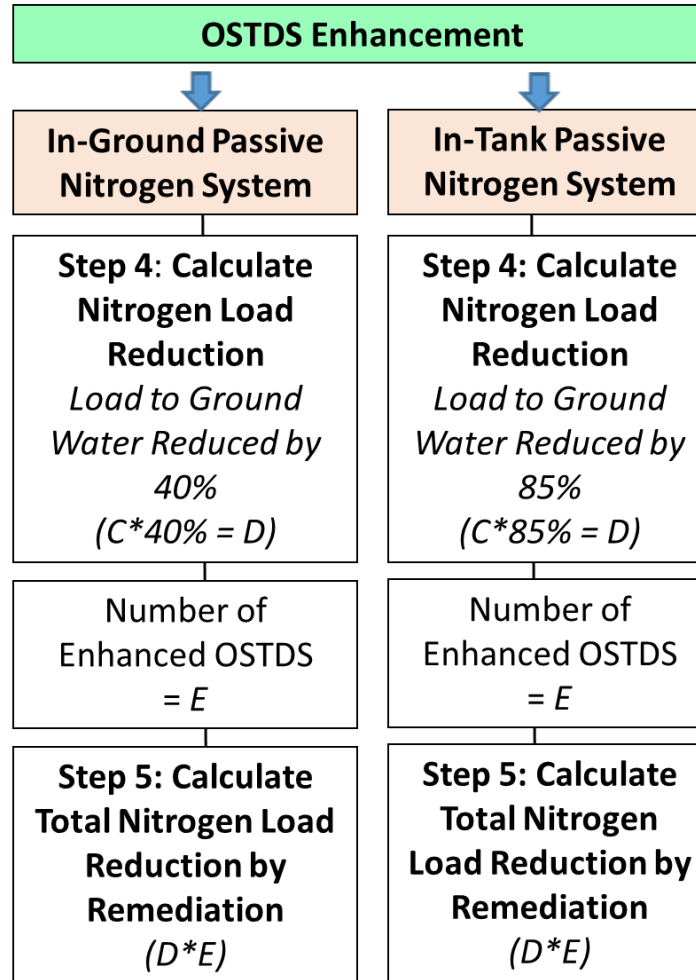
**Total Unremediated OSTDS
Nitrogen Load to Ground
Water = C**

Notes:

1. pph = person per household
2. Per U.S. 2010 Census, 1.95 pph in Citrus County; 2.08 pph in Hernando County; and 2.07 pph in Pasco County
3. Average input/person is 9.012 lb-N/person (U.S. EPA)



Calculation Steps for On-site Sewage Treatment and Disposal System (OSTDS) Remediation





Calculation Steps for On-site Sewage Treatment and Disposal System (OSTDS) Remediation

OSTDS Phase Out to Sewer
(Sewer line installed and OSTDS properly abandoned; treatment at wastewater treatment facility (WWTF))

Step 4: Calculate WWTF Load
Average Nitrogen Discharge from WWTF multiplied by the
Average Volume of Wastewater per Household = D

Step 5: Apply Attenuation Factor for Disposal Type ⁴
(Reuse-25%; RIB-75%; Sprayfield-40%)
 $(D * \text{Factor \%} = E)$

Step 6: Apply Recharge Factor
(High-90%; Med.-50%; Low-10%; based on location of WWTF)
 $(E * \text{Recharge \%} = F)$

Nitrogen Load Reduced by Remediation = F

Number of Abandoned OSTDS = G

Step 7: Calculate Remediated Load
 $(F * G = H)$

Step 8: Calculate Total Nitrogen Load Reduction by Remediation
 $(C - H)$

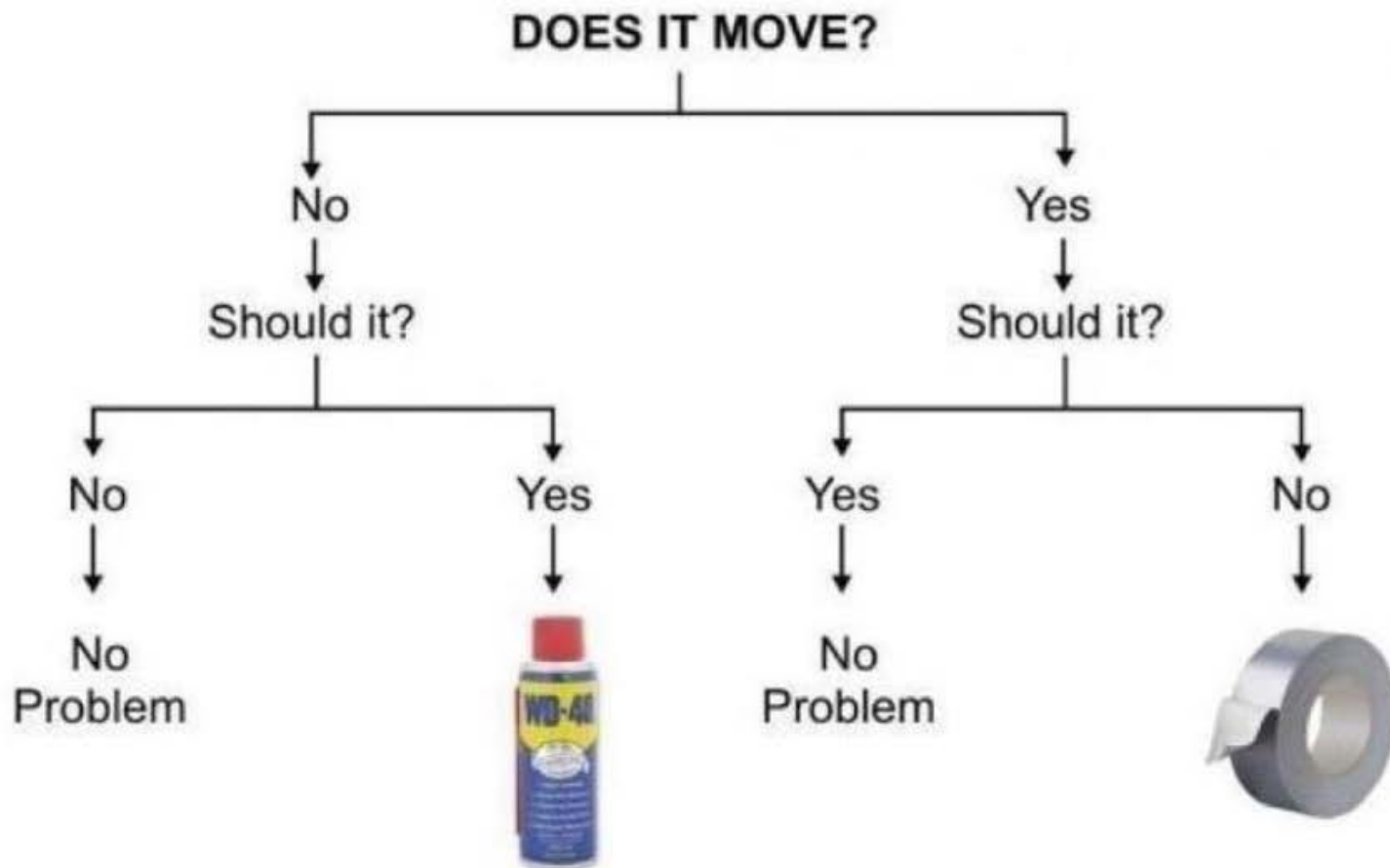
Note:

4. RIB = rapid infiltration basin



Calculation Flowchart

Engineering Flowchart





OSTDS Loads to Ground Water

- Initial inputs to reduction calculations
- OSTDS portion of load reduction to ground water estimated at **72,000 lbs-N/yr**
- OSTDS load per system to ground water estimated at **6.5 lbs-N/yr/OSTDS**
- We need to estimate the final N concentration of the possible projects to determine the minimum number of OSTDS to be remediated (additional *in situ* treatment or sewer)



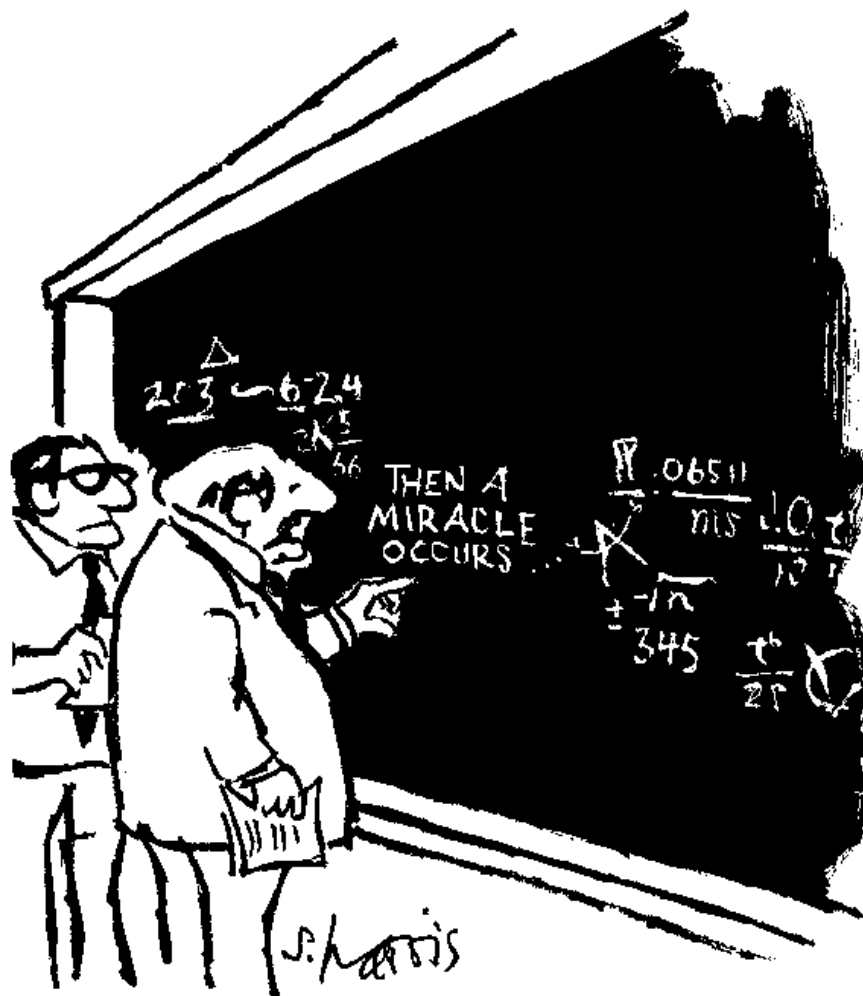
Reduction Calculations

- OSTDS estimated loading will be averaged—not specific to each individual system
 - Average people per household
 - Conservative reduction estimate of field enhancements
- Wastewater facility loading will be estimated (if applicable):
 - Treatment level/remaining nitrogen concentration
 - Disposal method (reuse, rapid infiltration basin [RIB] or sprayfield)
 - Recharge rate at disposal site
- Reduction benefits will be estimated, not individually measured—approach may need refinement over time





Questions About Calculations?



"I think you should be more explicit here in step two."



Science-Related Actions– 2015 Crystal River/Kings Bay SWIM Plan

Management Action	Lead Entity
Monitoring and Research	
Improve our understanding of the ecological responses to nutrient enrichment and reductions	FDEP/SWFWMD/ Universities
Maintain and expand water quality monitoring programs	SWFWMD/FDEP
Report annual status and trends	SWFWMD
Evaluate new and emerging technologies	SWFWMD
Septic Tank Systems	
Research and develop advanced septic tank systems	FDOH/FDEP/UF-IFAS



Science & OSTDS Related 2015 SWIM Plan Projects

Ongoing Projects	Lead Entity
Quarterly Springs Water Quality Monitoring	SWFWMD
Stream Water Quality Monitoring	SWFWMD
Upper Floridan Aquifer Nutrient Monitoring	SWFWMD
Springs Initiative Monitoring	SWFWMD
Evaluation of Nitrogen Leaching from Reclaimed Water Applied to Lawns, Spray Fields, and RIBs	SWFWMD
Project COAST	SWFWMD
Florida Onsite Sewage Nitrogen Reduction	FDOH
Developing Tools for Surface Nutrient Loading Attributable to Reclaimed Water	WaterReuse / Water Management Districts / FDEP
USGS Ground Water Data Collection	USGS / SWFWMD
USGS Surface Water Data Collection	USGS / SWFWMD



Science & OSTDS Related 2015 SWIM Plan Projects

Proposed Projects	Lead Entity
Nutrient Hot Spot Loading Identification	FDEP / SWFWMD
Ground Water Quality Monitoring for BMAP Assessment	FDEP / SWFWMD



Other OSTDS-Related Science Projects

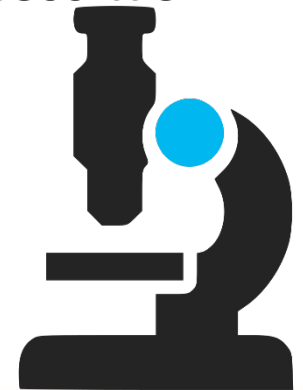
Other Proposed Projects*	Lead Entity
Kings Bay (Continuous) Water Quality Monitoring Station	DEP-FCO St. Martins Marsh Aquatic Preserve
Sinkhole Identification and Prioritization	SWFWMD / DEP / Local Government
OSTDS Initiative	USF / FDOH
Florida Water Management Inventory	FDOH
Nutrient Removal in Septic Drainfield	FDOH
Onsite Nutrient Removal vs. Sewers	USF (FDOH)
Locate & Identify Extent of Spring Conduits	USGS

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Science Strategy

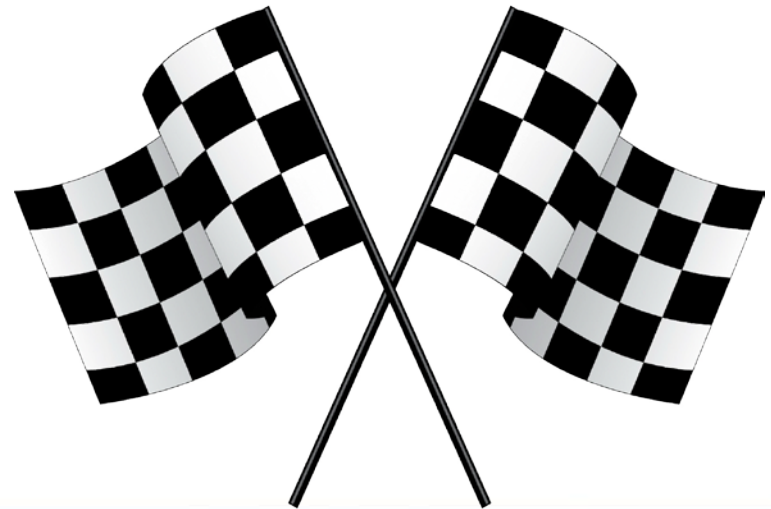
- SWIM Plan Item: Research and develop advanced septic tank systems
- Are there other OSTDS-related science questions we haven't covered?
 - Are there other data needed to identify potential project areas?
 - Are there specific questions about the ground water system we would like to answer?
 - Are there specific questions about project effectiveness we would like to answer?





Wrap Up

- Next meeting date
- Other comments/announcements
- Action items
- Prepare for next meeting





Basin Management Action Plan

Contacts: Terry Hansen, P.G. terry.hansen@dep.state.fl.us

<http://www.dep.state.fl.us/water/>

http://publicfiles.dep.state.fl.us/DEAR/BMAP/Springs Coast/BMAPs/CR_KB_BMAP/





OSTDS Field Enhancements— next meeting???

- FDOH—Are there site conditions/limitations that should be considered for installation of field enhancements?
- All—Do we have the information we need to evaluate site conditions for field enhancements?
- FDOH—What are the site conditions that affect the cost estimates (up or down)?
- All—Do we have the information we need to estimate costs of field enhancements?