Florida Department of Environmental Protection

Loading Reductions and Projects for Lake Denham, Marshall Lake, and Lake Roberts

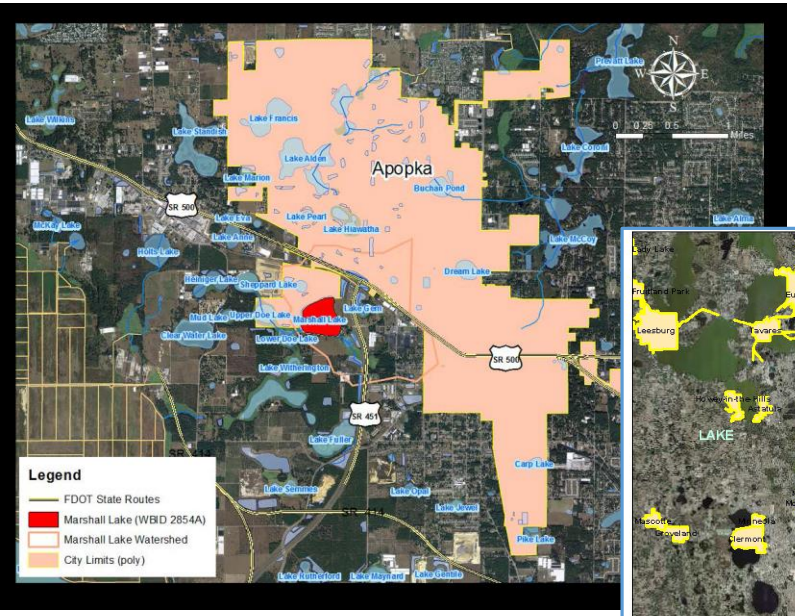
Mary Paulic

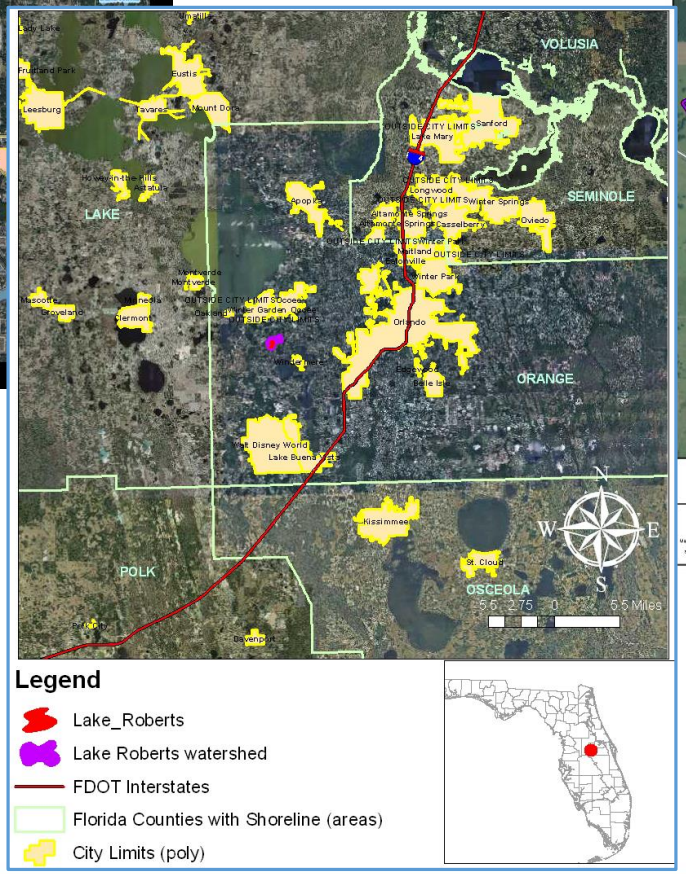
March 16, 2017

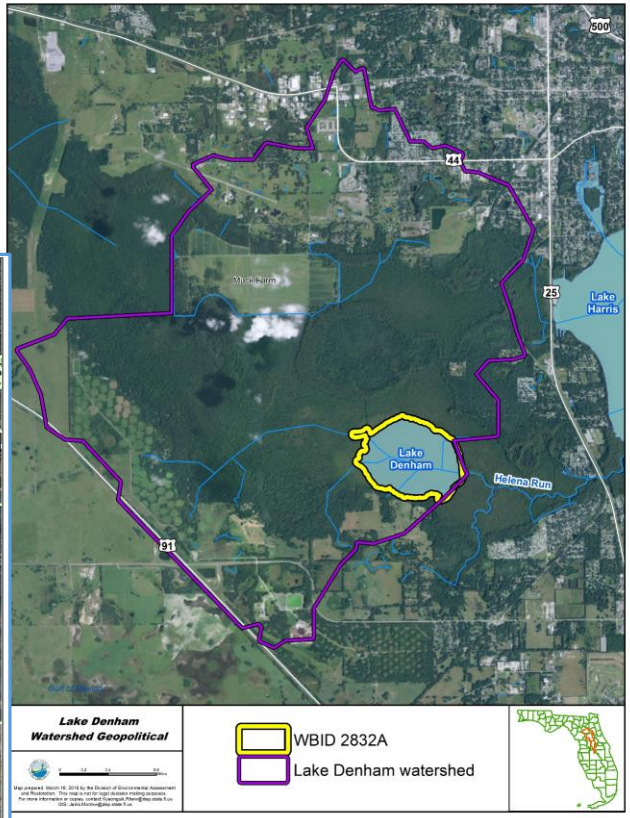




New TMDL Locations







New TMDLs

Waterbody	Waterbody Identification Number	Parameter	TMDL kg/yr	Target Concentration Annual Geometric Mean mg/L	TMDL Baseline Load kg/yr (2000-2012)	Wastewater Wasteload Allocation kg/yr	NPDES Stormwater Wasteload Allocation (% reduction)	Load Allocation (nonpoint) (kg/yr)	Overall Needed Reduction (kg/yr)
Lake Denham	2832A	TP	593	0.04	1,504	NA	61%	61%	911
Lake Denham	2832A	TN	16,468	1.10	42,755	NA	61%	61%	26,287
Marshall Lake	2854A	TP	97	0.037	310	NA	69%	69%	213
Marshall Lake	2854A	TN	2,046	0.90	3,136	NA	35%	35%	1,090
Lake Roberts	2872A	TP	100	0.044	139	NA	28%	28%	39
Lake Roberts	2872A	TN	1,655	1.02	1,975	NA	16%	16%	320

Marshall, Roberts, Denham Nutrient Budgets

Sources of Total Phosphorus (loading in kg/yr)	Lake Roberts TMDL Baseline loading (2000-2012)	Lake Denham TMDL Baseline loading (2000-2012)	Marshall Lake TMDL Baseline loading (2000-2012)
Atmospheric deposition (wet/dry)	17	35	18
Stormwater runoff	66.1	1135.6	224.2
Natural area runoff	30.2	380.3	9.1
Agricultural runoff	2.7	106.3	44.1
Developed uses runoff	33.2	149.3	171.1
Muck farm	-	499.7	-
Seepage/groundwater/septic Systems	56.0	7	68
Internal load	-	326	-
Loading information			
Baseline and net TP-loading (kg/yr)	139.1	1504	310.2
Total Maximum Daily Load (kg/yr)	100	593	97
Additional reduction needed in TP-loading to meet TMDL (kg/yr)	39.1	911	213.2

Florida Department of Environmental Protection

Water Quality Restoration Program

Upper Ocklawaha Basin Supplemental Report

March 16, 2017

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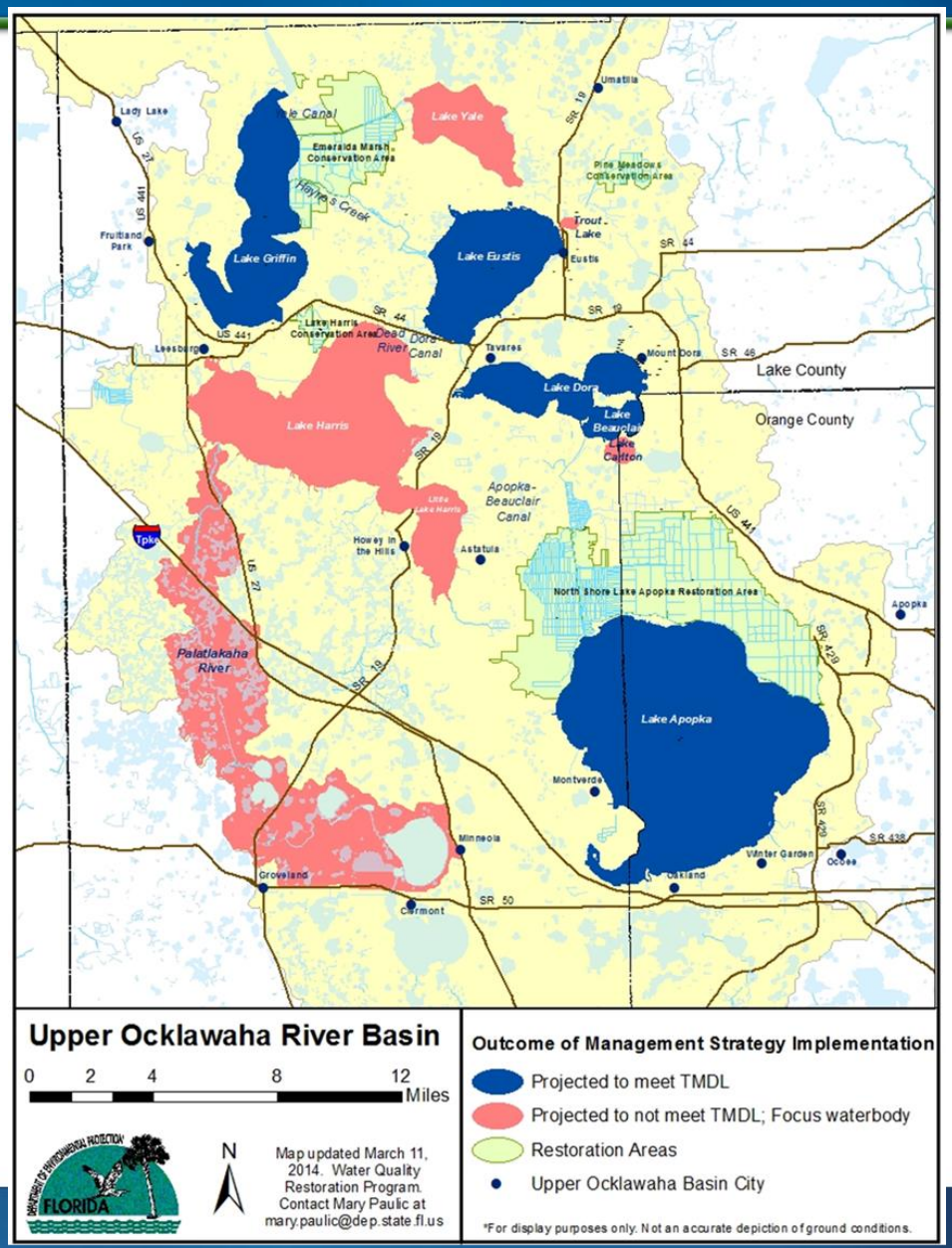
Purpose

- Phase 2 BMAP adopted in 2014.
  - Identified 5 waterbodies that needed additional effort.
  - Stated goal of identifying management strategies.
- Assignment of loading reductions for urban land use for 5 priority waterbodies and strategy for identifying management actions.
- Document sets deadline for achieving TMDLs as 2027.
- 2007 and 2014 BMAPs remain in effect.

Priority Waterbodies

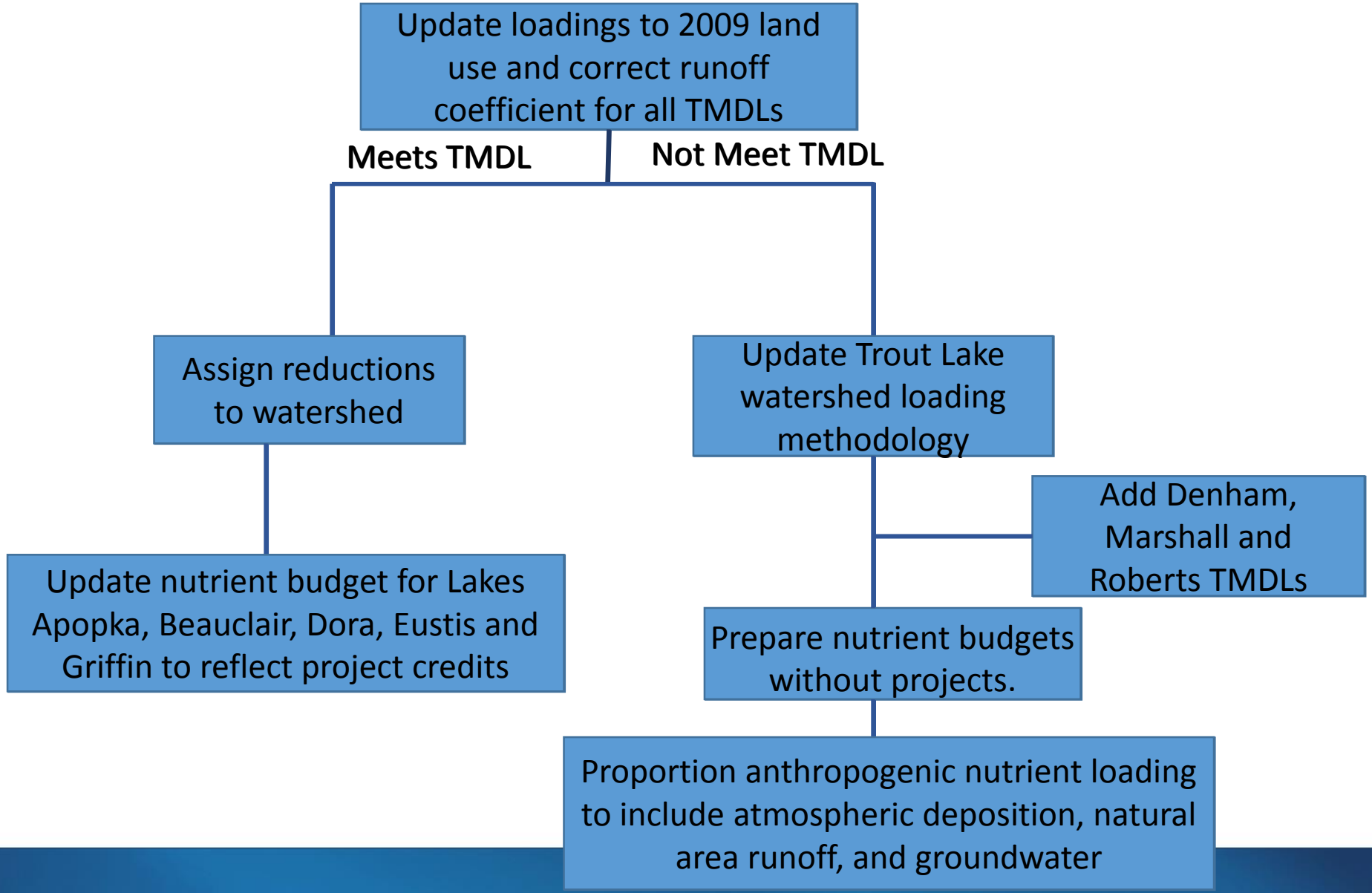
- Lake Harris.
- Trout Lake.
- Lake Carlton.
- Lake Yale.
- Palatlakaha River.



New TMDLs

- Lake Denham, Lake Roberts, and Marshall Lake.
- Should be in rule later this year.
- Supplemental Report assigns loading reductions and 10 year time frame for reducing loadings.

Decision Tree



Revised Nutrient Budget

- Lake Apopka, Lake Beauclair, Lake Dora, Lake Eustis, Lake Griffin.
- Aggregated land use types. Updated to 2009 land use. Handout.

Agriculture	Stormwater Natural Areas	Stormwater Developed Uses
Pasture	Water	Low density residential
Cropland	Wetlands	Medium density residential
Tree crops	Forest and rangeland	High density residential
Feeding operations	-	Low density commercial
Other agriculture	-	High density commercial
-	-	Industrial
-	-	Mining
-	-	Open land recreational
-	-	Sprayfields

- Allocation of loading reductions to watershed because these lakes will meet their TMDLs.
- Project reductions and agriculture BMPs estimated through 2015.

Priority Waterbody Nutrient Budget

Sources of Total Phosphorus	Lake Harris Net Estimated Load lbs TP/yr	Palatlakaha River Net Estimated Load lbs TP/yr	Lake Carlton Net Estimated Load lbs TP/yr	Trout Lake Net Estimated Load lbs TP/yr	Lake Yale Net Estimated Load lbs TP/yr
Spring discharge	2,047	-	-	-	-
Muck farm discharges	1,827	-	-	455.2	-
Restoration area discharges	-1	-	-	539.5	-
Atmospheric deposition	5,422	-	118	29.6	1,443
Discharge from Lake Eustis	84	-	-	-	-
Discharge from Palatlakaha River	4,586	-	-	-	-
Point Source	1	-	-	-	-
Stormwater runoff	-	-	-	-	-
Natural Area runoff	2,253	1,049	69	381.7	610
Agriculture runoff	488	414	100	69.8	361
Developed uses runoff	3,295	1,306	121	514.3	693
Seepage/groundwater	-	27	-	-	-
Septic systems total	2,191	-	70	7.4	586
Septic systems	1,515	-	54	7.4	191
Package plants	675	-	16	-	394
Loading Information	-	-	-	-	-
Net TP loading (lbs/yr)	22,192	2,796	478	1,997.5	3,692
Total Maximum Daily Load (lbs/yr)	18,302	2,207	195	521	2,844
Additional reduction needed in TP loading to meet TMDL (lbs/yr)	3,890	589	283	1,476.5	848

Apportionment Approach

- Equitable approach.
  - Approach does not favor or burden any one stakeholder relative to another.
  - Previous stormwater projects/efforts are accounted for.
- Loading reduction is proportional to the amount of loading generated from a jurisdiction.
- Local governments are not responsible for loads from agriculture or historic muck farm restoration areas or natural lands; those are separated from the local developed land use loads.

Apportionment Concept

- Start with individual Total Maximum Daily Load (TMDL) models.
- Apportion reductions of Total Phosphorus (TP) loading defined in TMDLs.
  - Calculate reductions for local governments and Florida Department of Transportation (FDOT).
  - Agricultural reductions are based on Best Management Practice (BMP) implementation.
- Consider connection of lakes.
  - Loading transport losses and gains. Next step in allocation tables.

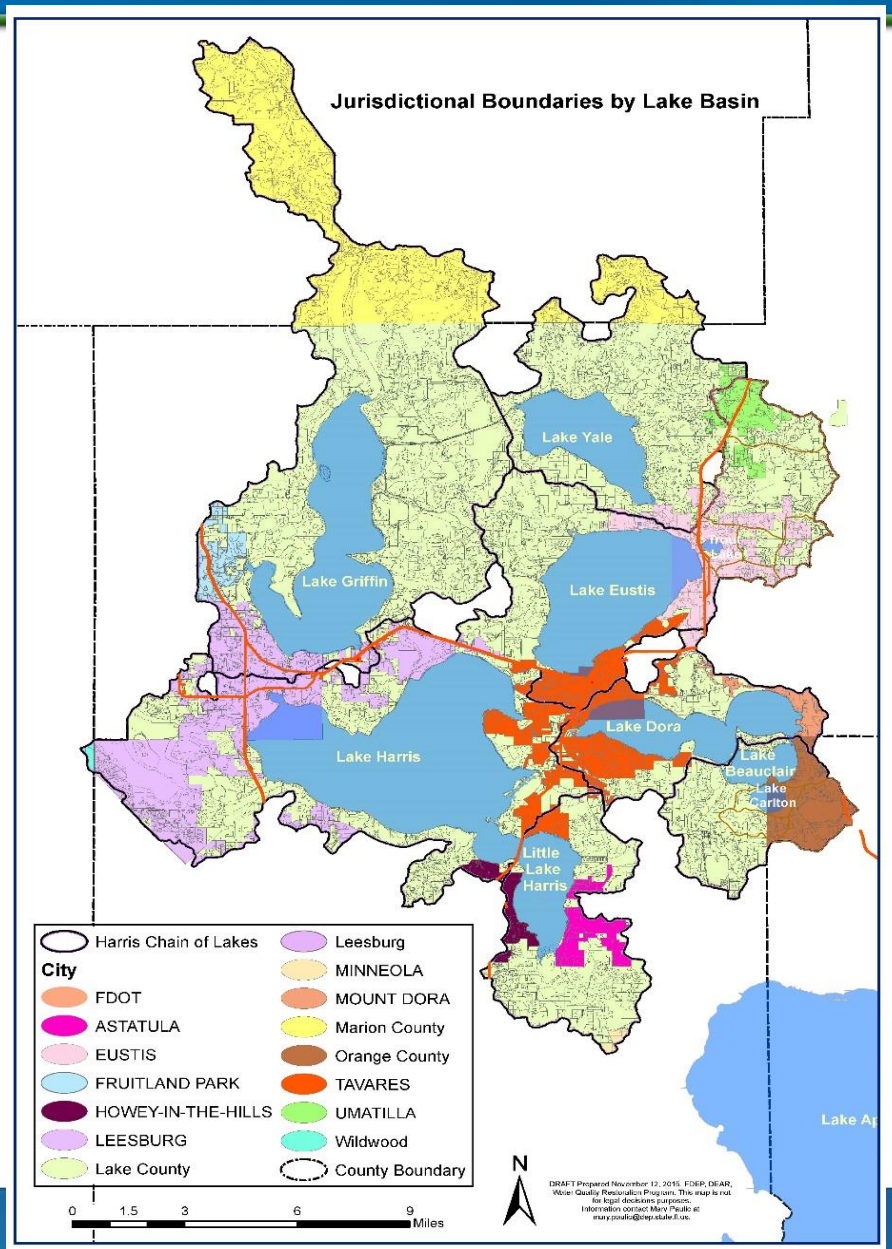
Data Sources

- Lake County Jurisdictions. Coverage dated December 2015 created by Lake County Planning Department.
- Orange County Jurisdictions. Coverage dated March 1, 2017 created by Orange County GIS.
- Wildwood boundary obtained from U.S. Census 2010 Tiger Places data.
- District 5, FDOT provided delineation of state roads and stormwater treatment areas.
- Watershed boundaries, sprayfields, restoration areas delineated by St. Johns River Water Management District.
- DEP delineation Palatlakaha River boundary as WBID 2839.

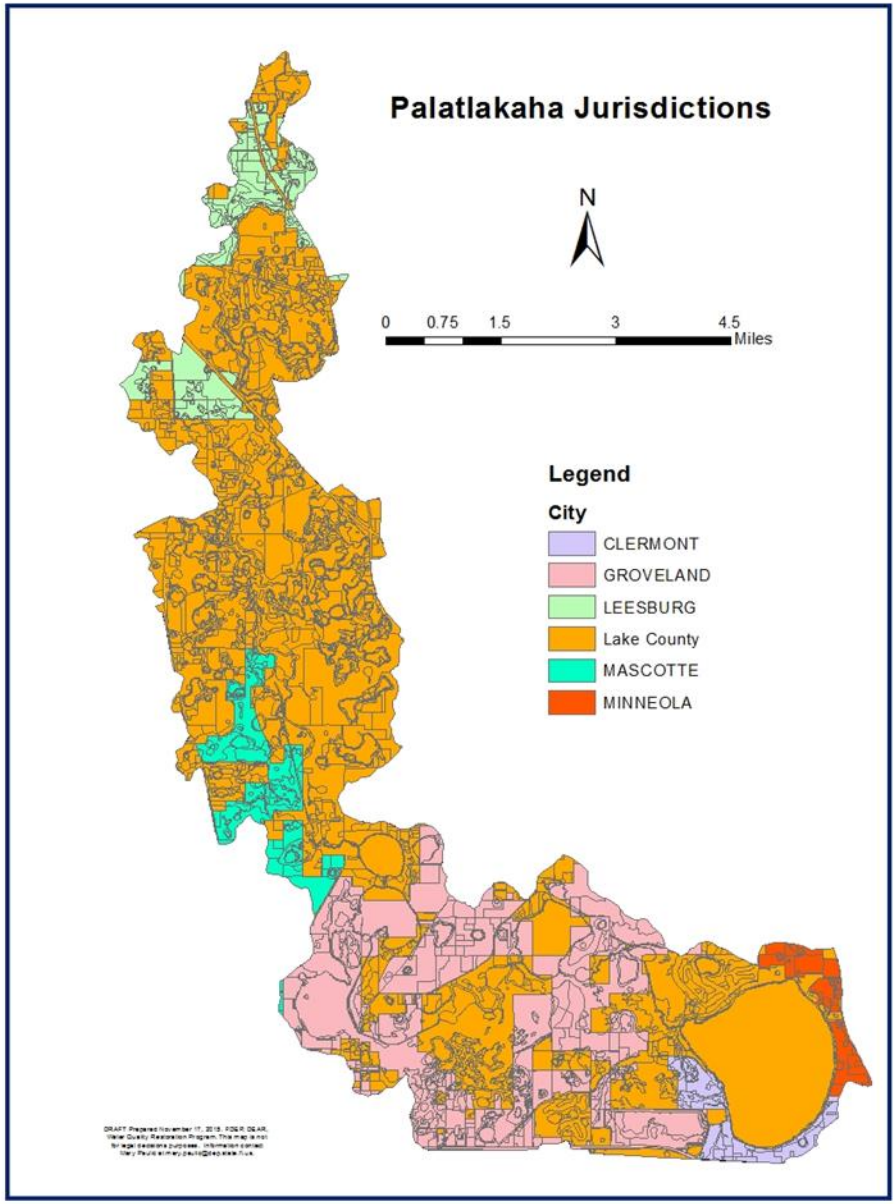
Developed Land Use Categories

Category	Description
Developed Land Use – High	High density residential, high density commercial, and industrial
Developed Land Use – Medium	Medium density residential and low density commercial
Developed Land Use – Low	Low density residential, mining, sprayfields, and open land recreational
Category Palatlakaha River	Description Palatlakaha River
Developed Land Use – High	High density residential
Developed Land Use – Medium	Medium density residential and transportation
Developed Land Use – Low	Low density residential and urban open

Jurisdictions in the Harris Chain of Lakes



Palatlakaha River Jurisdictions



Calculations for Jurisdictions

- Using the land uses, add jurisdictional boundaries.
- Calculate area of different developed land use for the entire watershed.
- Calculate developed land use area (acres) within each jurisdiction.
- Calculate each jurisdiction's percent of the total area of developed land use.
  - This percent used to apportion reduction in TP loading required by that jurisdiction.
- Percent of area time proportional reduction to estimate jurisdiction loading reduction.

Percent Developed Land

Watershed	Jurisdiction	Developed - High	Developed- Medium	Developed- Low
Lake Harris	Astatula	2.2%	9.1%	1.6%
Lake Harris	FDOT	6.4%	0.9%	0.1%
Lake Harris	Howey-in-the-Hills	0.1%	7.6%	1.7%
Lake Harris	Lake County	33.7%	40.2%	57.6%
Lake Harris	Leesburg	40.1%	32.0%	35.7%
Lake Harris	Tavares	17.4%	9.7%	3.2%
Lake Harris	Wildwood	0.0%	0.6%	0.0%
Palatlakaha River	Clermont	2.3%	5.1%	3.0%
Palatlakaha River	Groveland	34.3%	19.6%	11.5%
Palatlakaha River	Lake County	52.4%	52.1%	75.6%
Palatlakaha River	Leesburg	10.3%	1.7%	6.3%
Palatlakaha River	Mascotte	0.0%	0.3%	1.0%
Palatlakaha River	Minneola	0.5%	13.6%	1.9%
Palatlakaha River	Turnpike	0.0%	2.6%	NA
Palatlakaha River	FDOT	0.1%	5.1%	0.6%
Lake Carlton	FDOT	98.1%	0.2%	0.0%
Lake Carlton	Lake County	0.0%	2.0%	23.4%
Lake Carlton	Orange County	1.9%	97.8%	76.6%
Trout Lake	Eustis	50.1%	38.7%	19.1%
Trout Lake	FDOT	10.8%	0.4%	0.1%
Trout Lake	Lake County	3.1%	26.7%	64.6%
Trout Lake	Umatilla	36.0%	34.2%	16.3%
Lake Yale	Eustis	43.0%	17.2%	1.6%
Lake Yale	FDOT	9.8%	0.3%	0.1%
Lake Yale	Lake County	40.6%	75.5%	61.5%
Lake Yale	Marion County	0.0%	0.0%	30.9%
Lake Yale	Umatilla	6.6%	7.0%	6.0%
Lake Denham	FDOT	6.0%	0.0%	0.0%
Lake Denham	Lake County	24.1%	4.4%	17.0%
Lake Denham	Leesburg	69.9%	82.6%	83.0%
Lake Denham	Wildwood	0.0%	12.9%	0.0%
Marshall Lake	Apopka	90.9%	63.2%	95.8%
Marshall Lake	Orange County	9.1%	36.8%	4.2%
Marshall Lake	FDOT*	NA	NA	NA
Roberts Lake	Orange County	22.5%	48.4%	95.0%
Roberts Lake	Winter Garden	77.5%	51.6%	5.0%

Septic System Calculations

- Septic systems within 200 meters of waterbody or tributaries.
- Priority waterbodies apportion reduction by percent of septic systems within a jurisdiction.
- New TMDLs groundwater and septic system load combined.
  - Loading allocated in TMDL.
  - Proportioned to jurisdiction by percent area of watershed.

Deminimus Calculation

- Jurisdiction loading as percent of watershed stormwater loading.
- Less than 1 % not assigning loading reduction.
- But, does not completely release jurisdiction from any BMAP responsibilities.
  - Inventory De minimus jurisdictions for potential projects.
  - Reevaluate status in 5 years.

De Minimus

Lake Basin	2009 Developed Land Loading by Jurisdiction	Total Loading Developed-High lbs/yr TP	Total Loading Developed-Medium lbs/yr TP	Total Loading Developed-Low lbs/yr TP	Developed Land Total Loading lbs/yr TP	Percent of Developed Land Total Loading
Carlton	Lake County	0.0	1.1	11.1	12.3	10.1%
Carlton	FDOT	15.9	0.1	0.0	16.0	13.3%
Carlton	Orange County	0.3	55.9	36.5	92.7	76.6%
Harris	Wildwood	0.0	4.8	0.0	4.8	0.1%
Harris	Howey-in-the-Hills	3.1	61.0	4.8	68.9	2.1%
Harris	Astatula	49.6	73.3	4.6	127.5	3.9%
Harris	FDOT	142.1	7.0	0.4	149.5	4.5%
Harris	Tavares	383.8	78.0	9.1	470.9	14.3%
Harris	Lake County	743.4	323.2	163.9	1230.5	37.4%
Harris	Leesburg	883.5	257.2	101.6	1242.3	37.7%
Palatlakaha	Mascotte	0.1	1.2	1.4	2.7	0.2%
Palatlakaha	Turnpike	0.0	12.3	0.0	12.3	0.9%
Palatlakaha	FDOT	0.6	23.7	0.0	24.4	1.9%
Palatlakaha	Clermont	16.1	23.9	4.2	44.2	3.4%
Palatlakaha	Minneola	3.7	63.7	2.7	70.0	5.4%
Palatlakaha	Leesburg	72.0	8.2	8.8	89.0	6.8%
Palatlakaha	Groveland	239.0	92.0	16.0	347.1	26.6%
Palatlakaha	Lake County	365.1	244.7	105.4	715.2	54.8%

De Minimus Continued

Lake Basin	2009 Developed Land Loading by Jurisdiction	Total Loading Developed-High lbs/yr TP	Total Loading Developed-Medium lbs/yr TP	Total Loading Developed-Low lbs/yr TP	Developed Land Total Loading lbs/yr TP	Percent of Developed Land Total Loading
Trout	FDOT	30.2	0.9	0.0	31.1	6.1%
Trout	Lake County	8.7	57.9	11.1	77.7	15.1%
Trout	Umatilla	101.1	73.9	2.8	177.8	34.6%
Trout	Eustis	140.6	83.8	3.3	227.6	44.3%
Yale	Marion County	0.0	0.0	14.8	14.8	2.1%
Yale	FDOT	44.8	0.6	0.0	45.5	6.6%
Yale	Umatilla	30.4	13.0	2.9	46.2	6.7%
Yale	Eustis	197.7	31.9	0.8	230.3	33.2%
Yale	Lake County	186.9	139.8	29.5	356.2	51.4%
Denham	FDOT	7.2	0.0	0.0	7.2	4.8%
Denham	Lake County	28.9	1.1	0.9	30.9	20.7%
Denham	Leesburg	84.0	20.0	4.2	108.2	72.4%
Denham	Wildwood	0.0	3.1	0.0	3.2	2.1%

Total Reduction

- Total Reduction = Developed Land Uses + Portion of Septic System Loading.
  - Septic system load reduction apportioned by jurisdiction.
  - Palatlakaha River does not have septic system reduction.

- Marshall Lake, Lake Roberts, Lake Denham.
  - Total Reduction = Developed land uses + portion of groundwater/septic system loading.
  - Groundwater septic system loading apportioned by percent area of jurisdiction.

Priority Waterbody Reductions

Jurisdiction	Palatlakaha Developed Land Use Reduction TP lbs/yr	Lake Harris Developed Land Use Reduction TP lbs/yr	Lake Harris Septic System Reduction TP lbs/yr	Lake Carlton Developed Land Use Reduction TP lbs/yr	Lake Carlton Septic System Reduction TP lbs/yr	Lake Yale Developed Land Use Reduction TP lbs/yr	Lake Yale Septic System Reduction TP lbs/yr	Trout Lake Developed Land Use Reduction TP lbs/yr	Trout Lake Septic System Reduction TP lbs/yr	Total TP Reduction Assigned to Jurisdiction lbs/yr TP
Astatula	-	40.1	25.2	-	-	-	-	-	-	65.3
Clermont	15.1	-	-	-	-	-	-	-	-	15.1
Eustis	-	-	-	-	-	119.2	3.8	211.9	1.3	336.2
FDOT	8.6	46.9	-	15.6	-	23.5	-	29.0	-	123.7
Groveland	118.9	-	-	-	-	-	-	-	-	118.9
Howey-in-the-Hills	-	21.6	41.8	-	-	-	-	-	-	63.4
Lake County	244.9	386.4	402.3	11.9	24.9	184.3	95.0	72.3	5.6	1422.1
Leesburg	30.5	390.1	1.0	-	-	-	-	-	-	421.6
Marion County	-	-	-	-	-	7.7	-	-	-	7.7
Mascotte	0.9	-	-	-	-	-	-	-	-	0.9
Minneola	24.0	-	-	-	-	-	-	-	-	24.0
Orange County	-	-	-	90.2	27.6	-	-	-	-	117.8
Tavares	-	147.9	5.4	-	-	-	-	-	-	153.3
Umatilla	-	-	-	-	-	23.9	-	165.5	-	189.4
Wildwood	-	1.5	-	-	-		-	-	-	1.5
Turnpike	4.2	-	-	-	-		-	-	-	4.2
Total Reduction Developed Land Use and Septic Systems	**447.1**	**1034.6**	**475.8**	**117.7**	**52.5**	**358.5**	**98.8**	**478.7**	**6.9**	**3,065.1**

Basin Attenuation

- Reductions in downstream loading from upstream reductions.
- Address in second 5 year phase of allocations.
- Most important for Lake Harris as a receiving waterbody.
  - Other priority waterbodies and new TMDLs are terminal waterbodies.

Solution

Reductions and Credits by Jurisdiction - Lake Yale	Total Required Developed Land Use Reduction lbs/yr TP	First Five Year 50% Required Developed Land Use Reduction lbs/yr TP	Education Credit lbs yr TP	Project Credits lbs /yr TP	First Five Year Remaining Developed Land Use Reduction to be Achived by 2021 in lbs/yr TP
Eustis	119.2	59.6	13.8	1.8	44.0
FDOT	23.5	11.8	0.2	475.4	-463.9
Lake County	184.3	92.1	17.8	0	74.3
Marion County	7.7	3.8	0.8	0	3.0
Umatilla	23.9	12.0	2.5	4	5.4
Total lbs/yr TP	358.5	179.3	35.2	481.2	-337.1

Second Five Year 50% Required Developed Land Use Reduction (lbs/yr TP)	Basin Attenuation	Additional Projects Credits	Second Five Year Additional Education Credits lbs/yr TP	Remaining Required Developed Land Use Reduction to be Achieved by 2026 in lbs TP/yr
59.6	-	-	0.0	103.5
11.7	-	-	0.0	-452.2
92.2	-	-	0.0	166.5
3.9	-	-	0.0	6.9
11.9	-	-	0.0	17.3

Education

Entity	*Educational Credits (%)
Apopka	5.5
Clermont	2.75
Eustis	6
FDOT	0.5
Fruitland Park	5.5
Howey-in-the Hills	1
Lady Lake	6
Lake County	5
Leesburg	6
LWCA	0
Marion County	5
Minneola	1
Mount Dora	1.5
Ocoee	0.75
Orange County	6
SJRWMD	6
Tavares	1.75
Umatilla	5.5
Winter Garden	6

Activity	Credit
Florida Yards and Neighborhoods program	**3%**
Landscaping local code/ordinance	**0.50%**
Irrigation local code/ordinance	**0.50%**
Fertilizer local code/ordinance	**0.50%**
Pet waste management local code/ordinance	**0.50%**
Public Service Announcements (PSAs)	**0.25%**
Informational pamphlets	**0.25%**
Website	**0.25%**
Inspection program and call-in number for illicit discharges	**0.25%**
Total Credit for Education Activities	**6.00%**

Education Credits

City	Credit for Educational Activities as Percent	Palatlakaha SW Loading	Palatlakaha Reductions	Lake Harris SW Loading	Lake Harris Reductions	Lake Carlton SW Loading	Lake Carlton Reductions	Lake Yale SW Loading	Lake Yale Reductions	Trout Lake SW Loading	Trout Lake Reductions
Astatula	0.00%	-	-	127.5	-	-	-	-	-	-	-
Clermont	2.25%	44.2	1.0	-	-	-	-	-	-	-	-
Eustis	6.00%	-	-	-	-	-	-	230.3	13.8	227.6	13.7
FDOT	0.500%	24.4	0.1	149.5	0.7	16.0	0.1	45.5	0.2	31.1	0.2
Groveland	2.25%	347.1	7.8	-	-	-	-	-	-	-	-
Howey-in-the-Hills	1.00%	-	-	68.9	0.7	-	-	-	-	-	-
Lake County	5.00%	715.2	35.8	1230.5	61.5	12.3	0.6	356.2	17.8	77.7	3.9
Leesburg	6.00%	89.0	5.3	1242.3	74.5	-	-	-	-	-	-
Marion County	5.50%	-	-	-	-	-	-	-	0.8	-	-
Mascotte	0.00%	2.7	0.0	-	-	-	-	-	-	-	-
Minneola	1.00%	70.0	0.7	-	-	-	-	-	-	-	-
Orange County	5.50%	-	-	-	-	92.7	5.1	-	-	-	-
Tavares	1.75%	-	-	470.9	8.2	-	-	-	-	-	-
Umatilla	5.50%	-	-	-	-	-	-	46.2	2.5	177.8	9.8
Wildwood	0.00%	-	-	4.8	-	-	-	-	-	-	-
Turnpike	0.00%	12.3	0.0	-	-	-	-	-	-	-	-
Fruitland Park	5.50%	-	-	-	-	-	-	-	-	-	-
Mount Dora	1.50%	-	-	-	-	-	-	-	-	-	-
Lake County City Jurisdiction	3.00%	464.1	13.9	667.4	20.0	-	-	-	-	-	-
Total Stormwater Loading lbs TP/yr	-	1304.9	50.7	3294.6	145.7	121.1	5.8	693.0	35.2	514.3	27.5


• Any comments or questions???