



Florida Department of Environmental Protection

Orange Creek Basin Update

Mary Paulic
November 28, 2018





Agency Updates

- FWC
- Alachua County
- Gainesville
- Others?



Project Changes

- Agencies in multiple BMAPs have all their projects in one spreadsheet.
- Database requires that only one entity be named as lead agency. In the past we have had the option of multiple co-leads.
- Please provide a shortened project description as a new field (column) when the current description is greater than 250 characters.



Annual Project Reporting

- Deadline is January 15, 2019.
- Provide new project information and loading information.
- Please pay attention to primary agency.
- Guidance will be sent.



Orange Creek Basin Management Action Plan Amendment

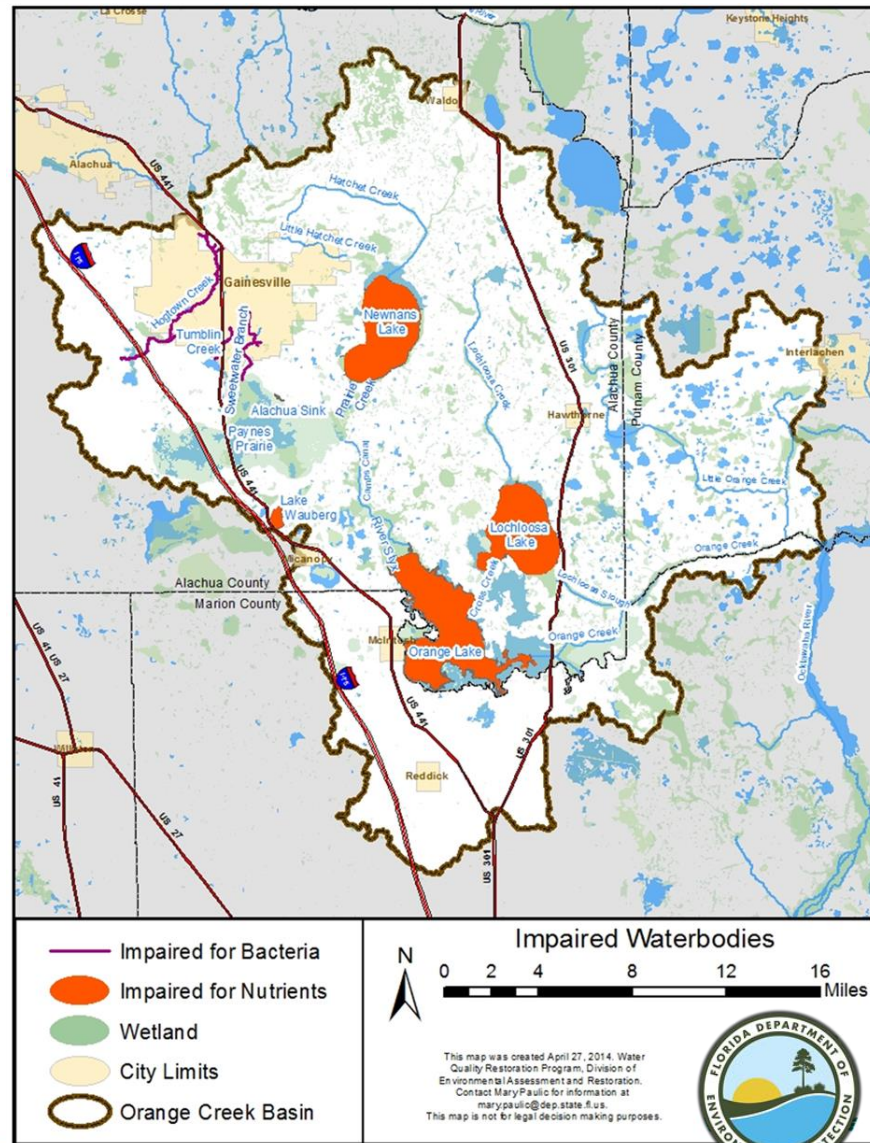
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November 28, 2018



Orange Creek Basin Lakes



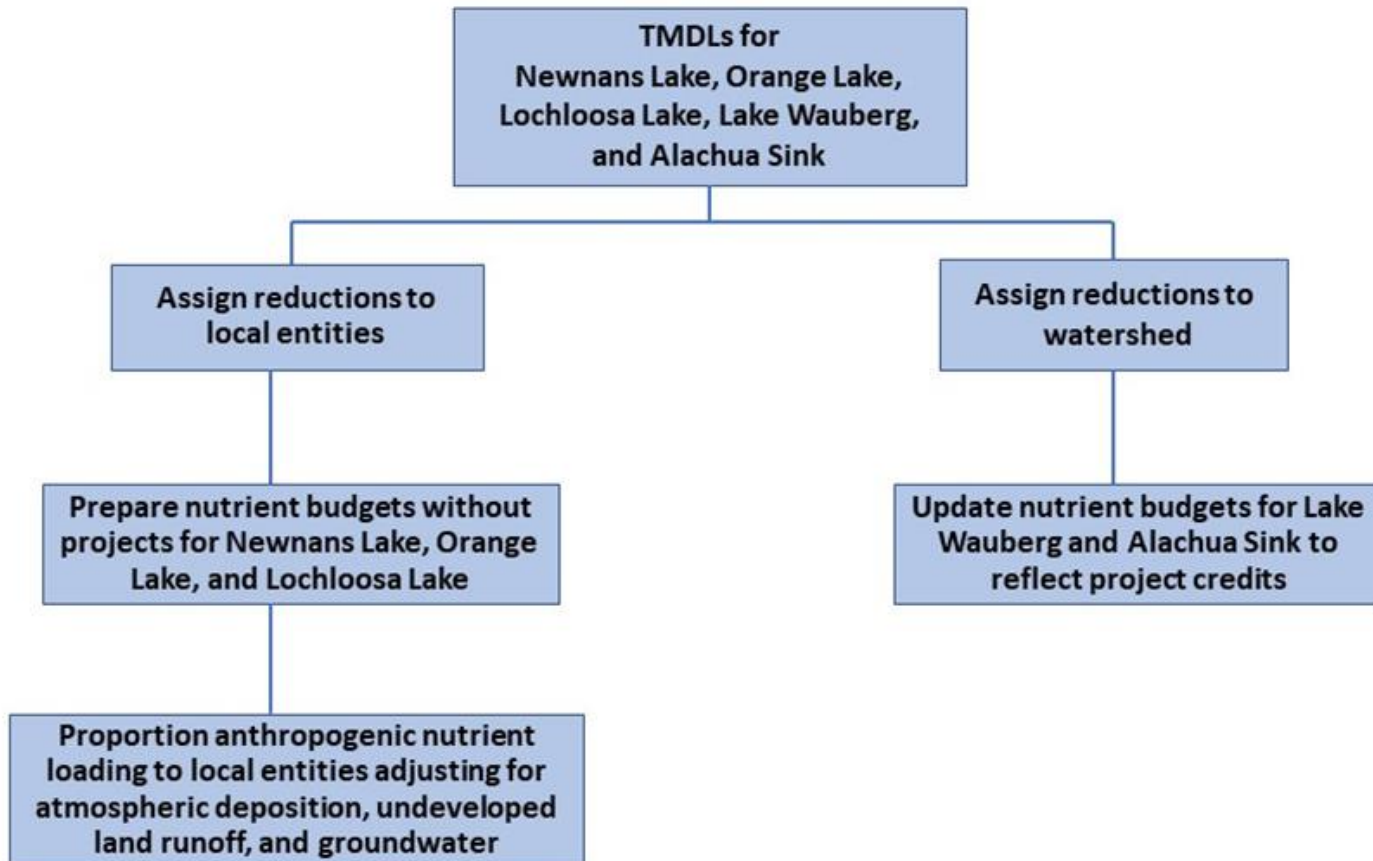


Purpose

- Amendment to 2014 adopted Orange Creek BMAP.
- Provide allocations for Newnans Lake, Orange Lake, and Lochloosa Lake.
- Adds Lochloosa Lake TMDL to BMAP.
- Provides updated nutrient budgets for Lake Wauberg and Alachua Sink.
- Amendment adopted by Secretarial Order.
- Existing 2008 and 2014 BMAPs still under Secretarial Order and enforceable.



Process





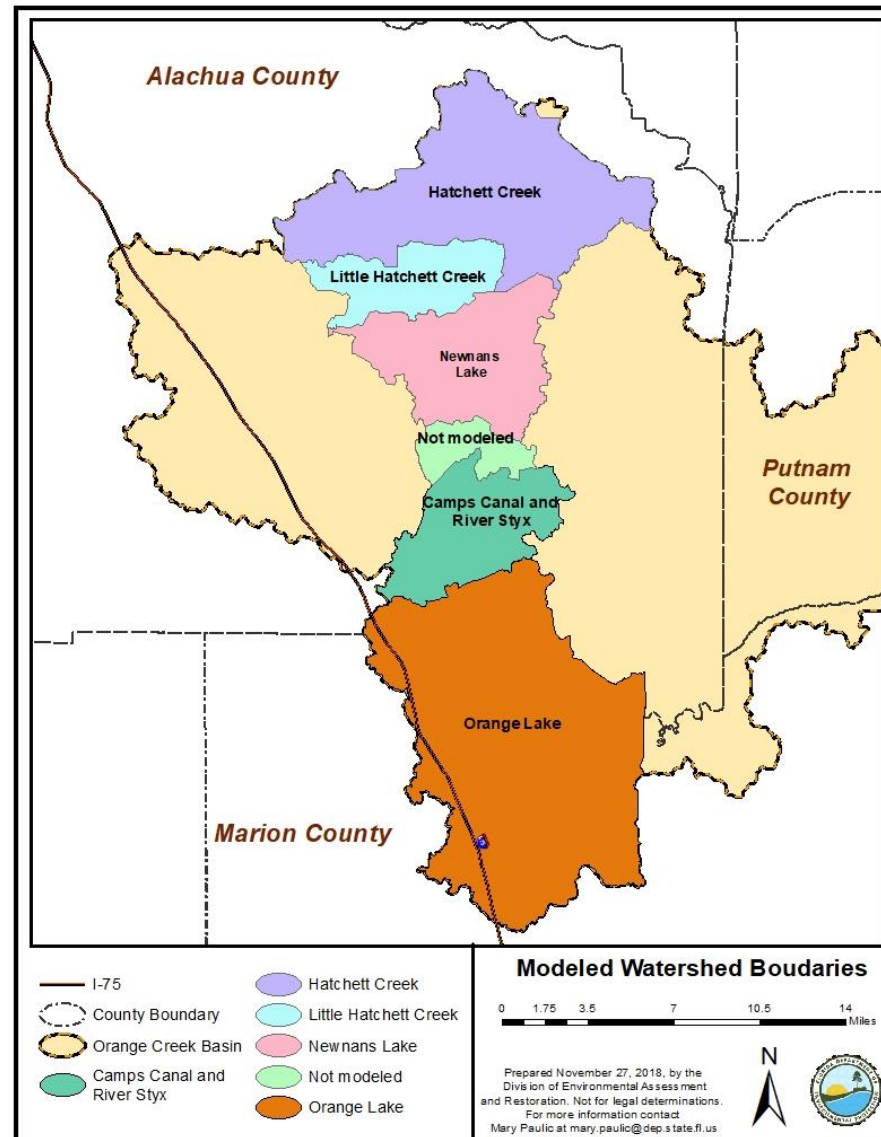
TMDLs

Waterbody	WBID Number	Parameter	TMDL Starting Load (lbs/yr)	TMDL (lbs/year)	Target Concentration (mg/L)	Waste-water Wasteload Allocation (lbs/yr)	Load Allocation (nonpoint) (lbs/yr)	Overall Needed Reduction
Newnans Lake	2705B	TP	25,732	10,924	0.062	386	10,538	59%
Newnans Lake	2819A	TN	315,510	85,470	0.97	3,104	82,366	74%
Lochloosa Lake	2738A	TP	16,752	9,932	0.0552	NA	9,932	41%
Lochloosa Lake	2738A	TN	416,142	172,318	1.152	NA	172,318	59%
Cross Creek	2754	TP	5,090	3,530 ¹	-	NA	3,530	31%
Cross Creek	2754	TN	125,971	71,680 ¹	-	NA	71,680	43%
Orange Lake	2749A	TP	27,889	15,262	0.031	NA	15,262	45%
Lake Wauberg	2741	TP	748	374	0.056	NA	16,696	50%
Lake Wauberg	2741	TN	4,064	2,062	1.01	NA	2,207	51%
Alachua Sink	2720A	TN	462,557	256,322	-	41,003	215,319	45%

¹ Cross Creek TMDLs addressed by Lochloosa Lake remediation.



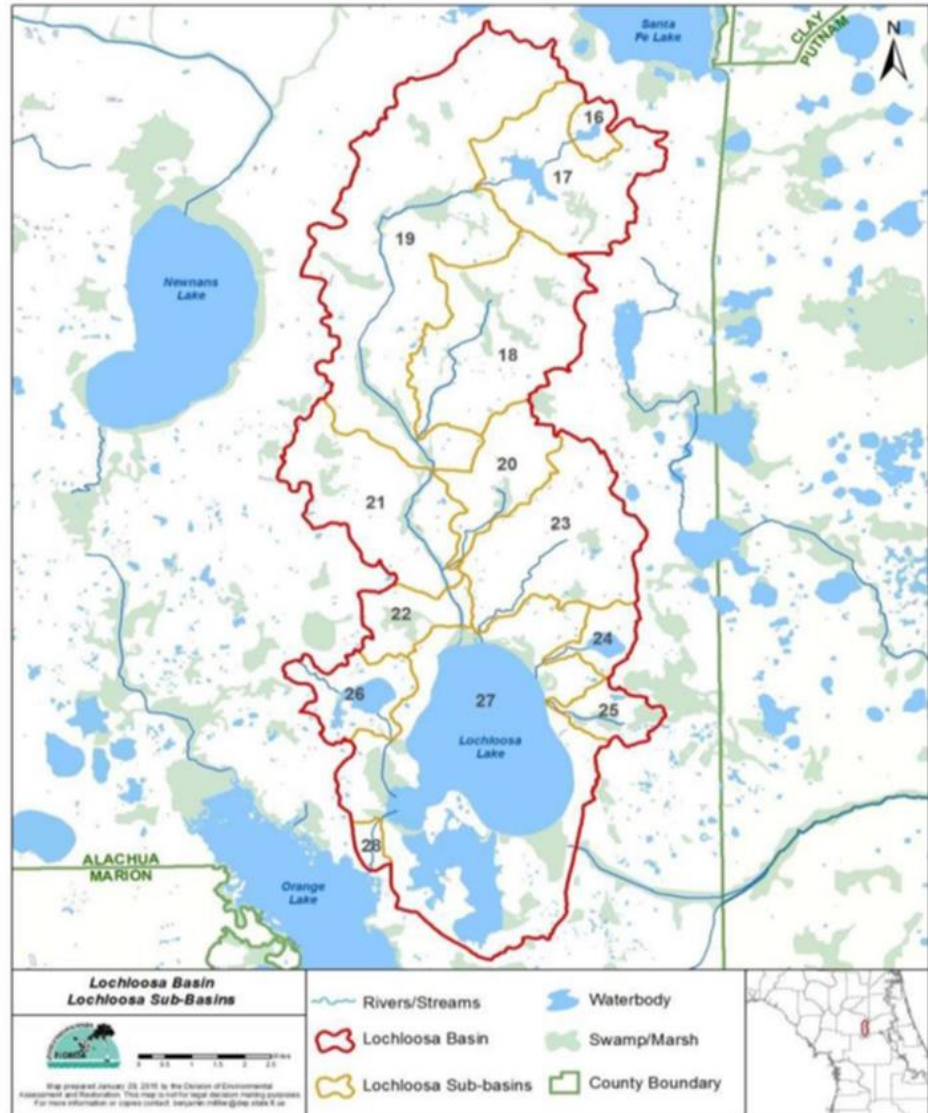
Modeled Boundaries





Lochloosa Lake Boundaries

- Sub-basins 16-27 contribute to lake.





Loading Steps

- Assemble nutrient budget by sub-basin.
Separate loadings by:
 - Forest - set aside.
 - Undeveloped land uses.
 - Developed land use.
 - Agriculture.
 - Septic systems.
 - Atmospheric deposition.
 - Groundwater/seepage.
 - Internal loading.



Land Use Category

General Category	Lake Wauberg	Orange Lake, Newnans Lake, and Alachua Sink	Lochloosa Lake
Agriculture	Agriculture	Agriculture	Agriculture General - Crops Pasture Tree Crops
Forest	Forest	Forest/Rural Open ¹	Forest Forest Regeneration
Stormwater Undeveloped Uses	Rangeland Water Wetland	Rangeland Water/Wetlands	Rangeland Water Wetlands Wetlands Nonreach ²
Stormwater Developed Uses	Urban Transportation	Low Density Residential Medium Density Residential High Density Residential Urban Open Transportation/Communic a-tion Rural Open	Low-Density Residential Medium-Density Residential High-Density Residential Industrial and Commercial Mining Open Land and Barren Land

¹ Land uses separated for allocation.

² Wetlands nonreach merged with wetlands for allocation.



Loading Steps cont.

- Loading reductions not assigned to forest, other undeveloped land, atmospheric deposition, or groundwater.
- Loading reductions are focused on reducing stormwater loading sources and internal loading.
- Source loadings adjusted to compensate for uncontrollable sources.
- Allocations to jurisdictions is by magnitude of contribution to a loading source, in this case percent of a land use within the jurisdiction is used as a surrogate.
- Total reduction for a jurisdiction is the sum of stormwater loading reductions plus any loading reductions from septic systems.



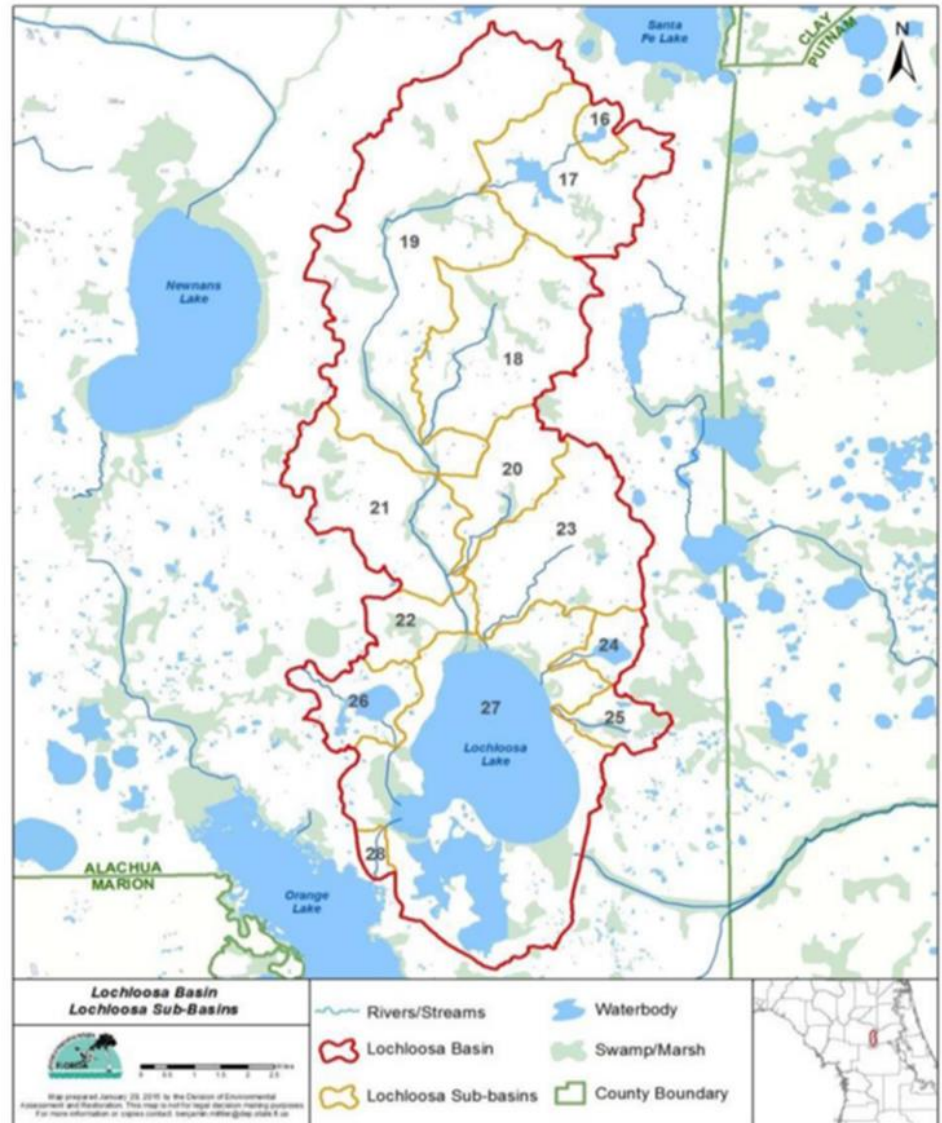
Lochloosa Loading Attenuation

- Loadings from Lochloosa Lake's watershed are attenuated before reaching the lake.
- Distance from lake means the number of sub-basins that water travels through before reaching the lake. Attenuation occurs in each sub-basin. There are attenuation ratios output from the model that compare output loading to input loading.
- Loading from a sub-basin is multiplied by the attenuation factor for the sub-basin and each sub-basin it travels through to reach lake.
- Attenuation varies by year and by TN or TP.
- Loading for a sub-basin was calculated for each year and attenuated for that year. An average loading was taken over the period of the TMDL.
- Projects reductions are also attenuated before credits are assigned.



Lochloosa Lake Sub-basins

- Distance from lake a factor affecting magnitude of loading from a sub-basin.
- Attenuation of loading. Attenuation factor or rate is the ratio of loading output/loading input.





Lochloosa Lake Watershed Routing of Water

Sub-basin Number	Name	Acres	Reach Connection
16	Lake Elizabeth Creek	556.7	Flows into Reach 17
17	Morans Prairie	4,584.5	Flows into Reach 19
18	Unnamed Slough North	5,746.0	Flows into Reach 19
19	Lochloosa Creek SR20	12,949.5	Flows into Reach 21
20	Unnamed Slough South	2,248.2	Flows into Reach 21
21	Lochloosa Creek South	4,603.3	Flows into Reach 22
22	Lochloosa Creek	1,444.2	Flows into Reach 27
23	West Hawthorne Branch	5,071.8	Flows into Reach 27
24	Lake Jeffords	887.7	Flows into Reach 27
25	Unnamed Drain	1,020.3	Flows into Reach 27
26	Watson Prairie	1,849.9	Flows into Reach 27
27	Lochloosa Lake	15,306.0	Flows into Reach 28
28	Cross Creek	321.3	Discharges to Orange Lake

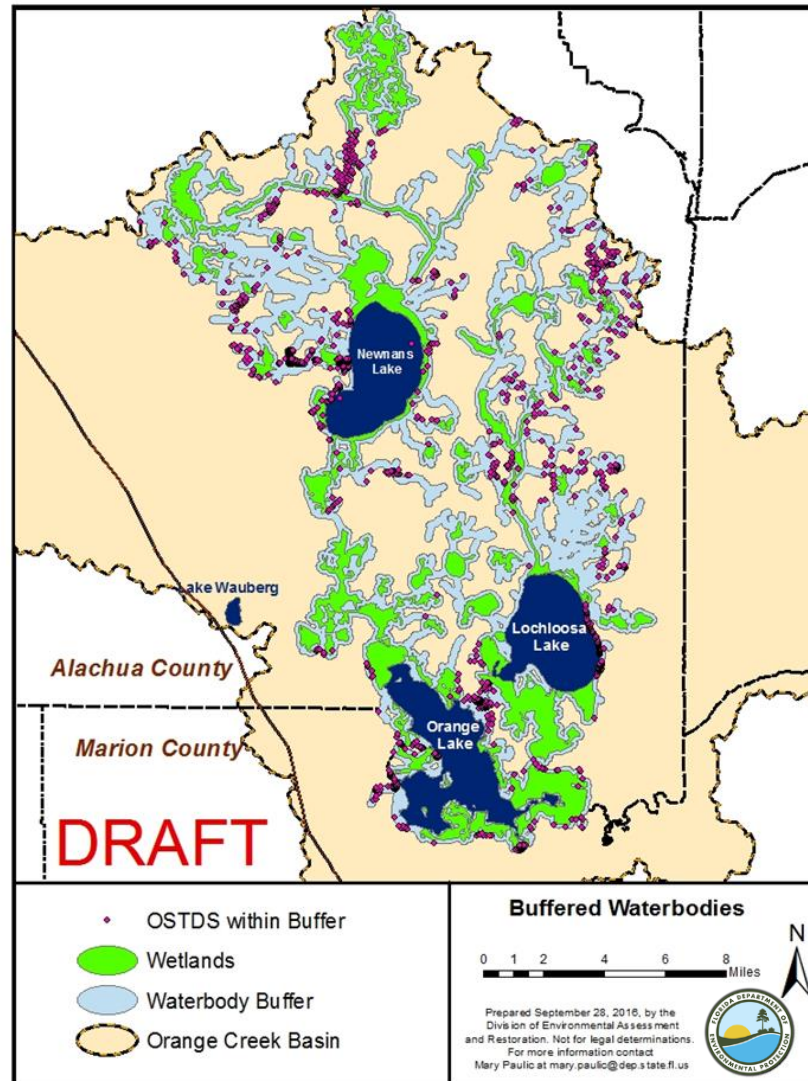


Septic System Loading

- Basin Working Group agreed that only septic systems within 200 meters of a waterbody or conveyance would be considered as part of loading.
- Lochloosa Lake TMDL evaluated septic systems, but did not include as separate source.
- Delineated what waterbody shorelines and conveyances looked like, then added 200 meter buffer.
- Septic system loading apportioned to local jurisdictions depending on location of septic system. Number of systems located within a jurisdiction as portion of total loading.



Septic System Delineation





Draft TP Nutrient Budgets

Sources of total phosphorus (loading in lbs/yr)	Orange Lake TP TMDL Baseline loading	Orange Lake Net TP Reductions	Newnans Lake TP TMDL Baseline Loading	Newnans Lake Net TP Reductions	Lochloosa Lake TP TMDL Baseline Loading	Lochloosa Lake Net TP Reductions
Point Source	-	-	145	122	-	-
<i>Stormwater runoff forest not allocated</i>	<i>594</i>	<i>NR</i>	<i>1,767</i>	<i>NR</i>	<i>1,698</i>	<i>NR</i>
Stormwater runoff undeveloped land use	3,363	NR	3,371	NR	1,203	NR
Stormwater runoff from developed uses	946	542	1,244	1,045	1,667	889
Agriculture	5,986	3,432	522	439	2,510	1,339
Septic systems	390	224	256	215	-	-
Atmospheric deposition (wet/dry)	2,941	NR	3,223	NR	4,248	NR
Tributary inflows	13,671	7,837	-	-	-	-
Camps Canal (Newnans Lake)	10,344	5,930	-	-	-	-
Cross Creek (Lochloosa Lake)	3,327	1,907	-	-	-	-
Seepage/groundwater	-	-	1,827	NR	-	-
Internal nutrient recycling	-	-	13,478	11,322	5,426	2,894
Loading information						
TMDL baseline loading (lbs/yr)	27,296		24,067		15,054	
Total Maximum Daily Load (lbs/yr)	15,262		10,924		9,932	
Reduction needed in loading (lbs/yr)	12,034	12,034	13,143	13,143	5,122	5,122

NR= no reduction



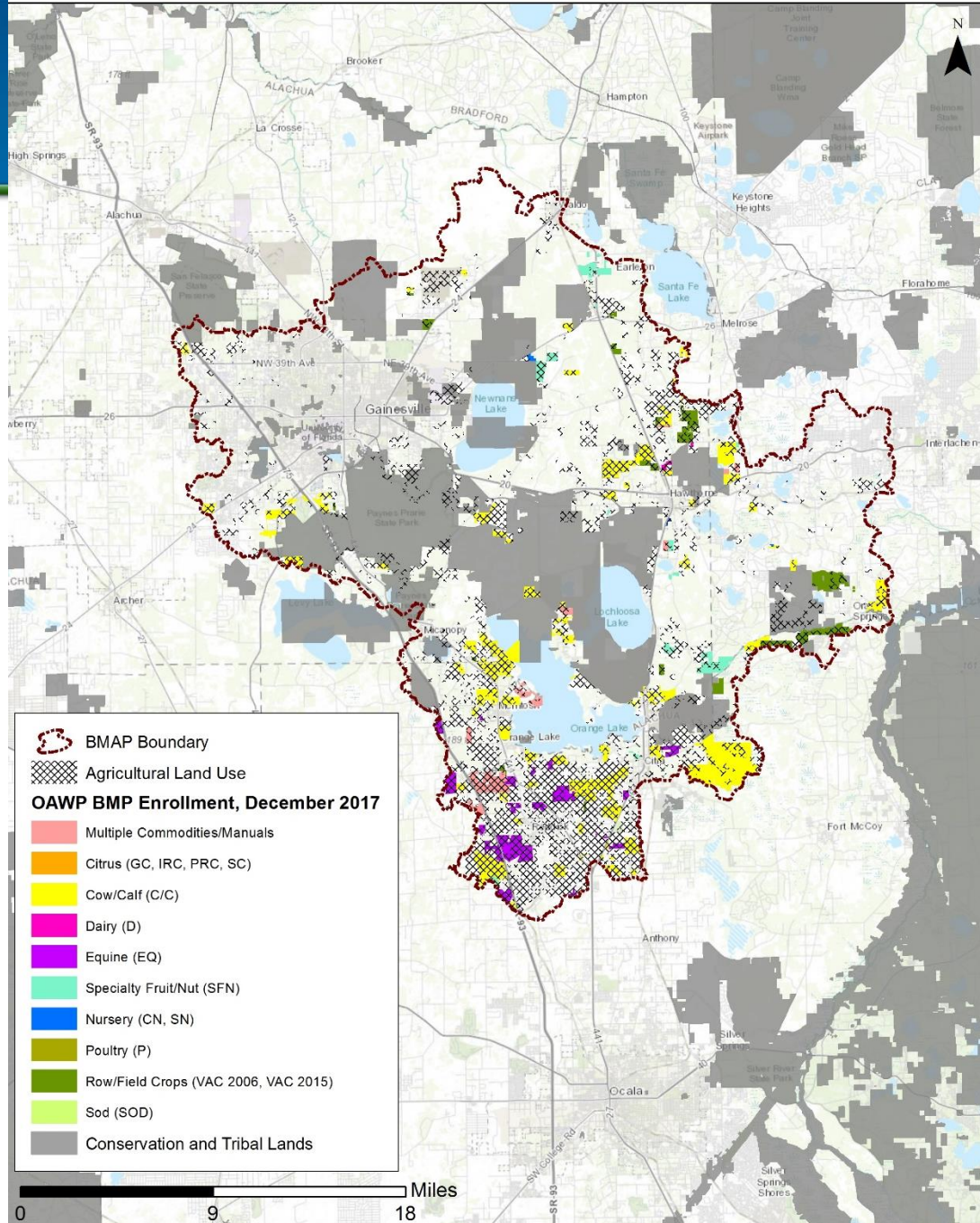
Draft TN Nutrient Budgets

Sources of total nitrogen (loading in lbs/yr)	Newnans Lake TN TMDL Baseline Loading	Newnans Lake Net TN Reductions	Lochloosa Lake TN TMDL Baseline Loading	Lochloosa Lake Net TN Reductions
Point Source	655	546	-	-
<i>Stormwater runoff forest not allocated</i>	<i>28,121</i>	<i>NR</i>	<i>24,325</i>	<i>NR</i>
Stormwater runoff undeveloped land use	31,850	NR	16,669	NR
Stormwater runoff from developed uses	11,128	9,280	13,266	9,631
Agriculture	3,580	2,986	22,403	16,265
Septic systems	1,870	1,560	-	
Atmospheric deposition (wet/dry)	6,446	NR	72,825	NR
Tributary inflows	-	-	-	-
Camps Canal (Newnans Lake)	-	-	-	-
Cross Creek (Lochloosa Lake)	-	-	-	-
Seepage/groundwater	6,698	NR	-	-
Internal nutrient recycling	226,527	188,913	266,655	193,602
Loading information				
TMDL baseline loading (lbs/yr)	288,755		391,817	
Total Maximum Daily Load (lbs/yr)	85,470		172,318	
Reduction needed in loading (lbs/yr)	203,285	203,285	219,499	219,499

NR= no reduction



Agriculture acres covered by NOI



Disclaimer: This map is the product of the Department of Agriculture and Consumer Services, Office of Agricultural Water Policy. It represents estimated areas of production agriculture, it is not binding, and does not otherwise affect the interests of any persons, including any vested rights or existing uses of real property. The accuracy and reliability of this map is not guaranteed. Production agricultural acreage is affected by continual changes in land use, crop production, and other socioeconomic factors.

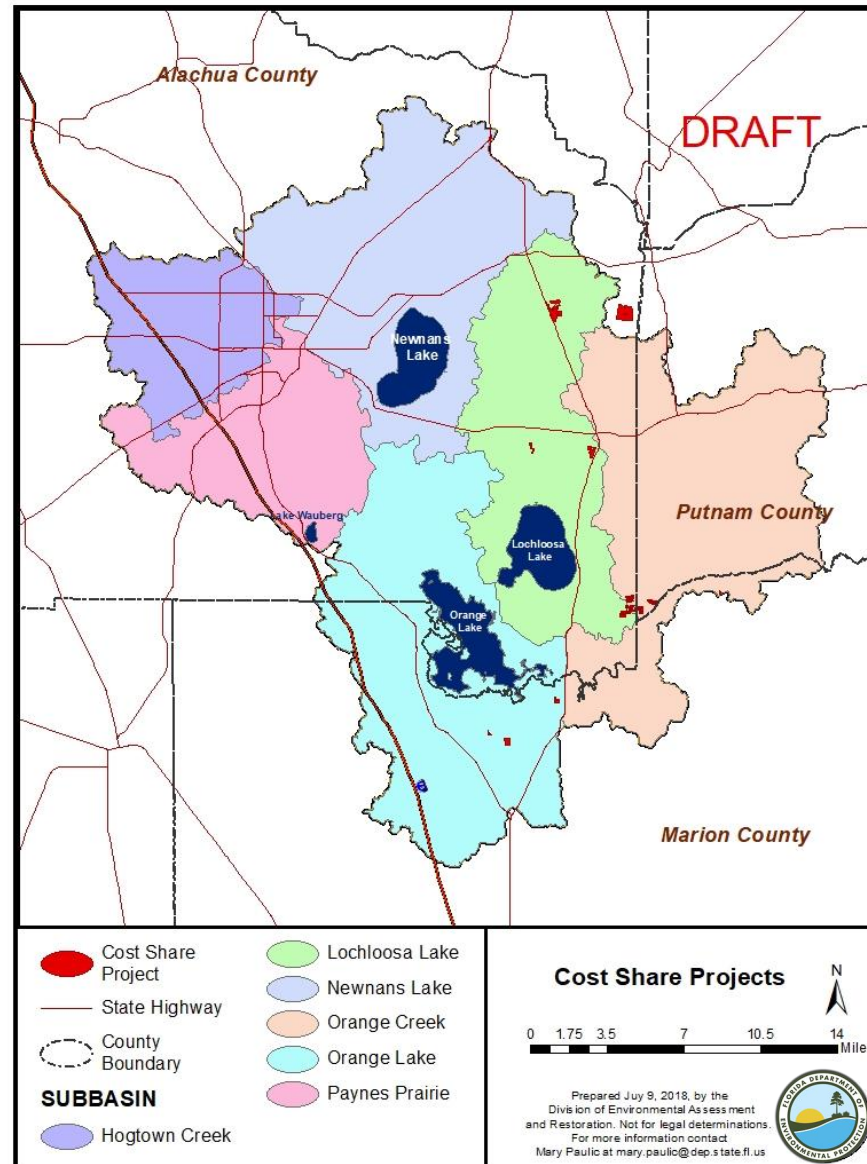


Agriculture Credits

- Best Management Practices Notice of Intent (NOI).
 - Proportion loading as percent of agriculture acreage covered by NOI.
 - Apply 30% efficiency.
 - Additional step in Lochloosa Lake watershed of attenuating loading by sub-basin.
- Credits for projects.
 - Cost share projects funded by SJRWMD.
 - Apply 30% efficiency to estimated reductions to obtain credit.
 - Additional step in Lochloosa Lake watershed of first attenuating loading by sub-basin.



Agricultural Cost Share Projects





Draft Agriculture NOI Credits

Watershed	Total/Modeled Agricultural Acres	Total/Modeled Acres Covered by NOIs	Reduction in Loading from NOIs (lbs-TP/yr)	Reduction in Loading from NOIs (lbs-TN/yr)
Newnans Lake	1,269.2	334.7	29	117
Orange Lake	29,547.6	9,153.1	559	NA
Lochloosa Lake	5,623	1,164.5	165	1,295
Alachua Sink	5,727.2	605.8	NA	363
Lake Wauberg	79.3	15.3	5	35
Hogtown Creek	1321.1	98.2	NA	NA
Orange Creek	24,391.3	4,226.8	NA	NA

Watershed	Reduction in Loading from Projects (lbs-TP/yr)	Reduction in Loading from Projects (lbs-TN/yr)
Orange Lake	691	NA
Lochloosa Lake	186	605
Orange Creek	7,833	46,962



Draft Agriculture Total Credit

Watershed	Total TP Credit lbs-TP/yr	Total TN Credit lbs-TN/yr
Newnans Lake	29	199
Orange Lake	1,250	NA
Lochloosa Lake	351	1,900
Alachua Sink	NA	363
Lake Wauberg	5	35
Orange Creek	7,833	46,962



FYN Credits

- Extended Florida Yards and Neighborhoods (FYN) credit to Hawthorne, Waldo, Micanopy, McIntosh, and Reddick based on county programs.
- Alachua County Fertilizer Code and Water quality Code apply throughout county. Irrigation Code applies to Gainesville and Hawthorne.

Jurisdiction	Credit for Educational Activities as Percent
Alachua County	6.00%
FDOT, District 2	4.00%
Gainesville	6.00%
Waldo	3.50%
Marion County	5.50%
McIntosh	3.00%
Micanopy	3.50%
Reddick	3.00%
Hawthorne	4.00%
FDOT, District 5	0.50%





Education Credits Draft

Jurisdiction	Credit for Educational Activities (%)	Newnans Lake TP Education Credits lbs/yr	Newnans Lake TN Education Credits lbs/yr	Orange Lake TP Education Credits lbs/yr	Lochloosa Lake TP Education Credits lbs/yr	Lochloosa Lake TN Education Credits lbs/yr	Alachua Sink TN Education Credits lbs/yr
Alachua County	6.00	33	296	4	46	335	1,900
FDOT, District 2	4.00	4	42	1	20	202	-
Gainesville	6.00	33	292	-	-	-	884
Waldo	3.50	1	10	-	-	-	-
Marion County	5.50	-	-	31	-	-	-
McIntosh	3.00	-	-	1	-	-	-
Micanopy	3.50	-	-	2	-	-	-
Reddick	3.00	-	-	1	-	-	-
Hawthorne	4.00	-	-	-	12	105	-
FDOT, District 5	0.50	-	-	1	-	-	-
Total Credits		71	640	40	78	642	2,784



Internal Loading

- Portion of nutrient that enters lake is stored in sediment, but can be recycled back into lake.
- The rates of release can be high, particularly for shallow lakes (Cooke and Welch, 2005).
- Initial strategy is to address watershed loadings.
 - Emphasis on TP removal, but not excluding TN.
- May need to address internal loading in future.
- Dredging and alum treatments (there are other chemical treatments) are typical methods employed in Florida to address internal loading.
 - Presence of cultural resources limits the manipulation of sediment.
 - Expensive.
 - Disposal of a large volume of material if dredged.
- Not assigned to jurisdictions.



Draft Newnans Lake Allocation

Jurisdiction	Total TP Required Developed Land Use Reduction	First 5-Year 50 % Required Developed Land Use TP Reduction	TP Education Credit	TP Project Credits	Remaining Developed Land Use TP Reduction to Be Achieved by 2023	Second 5-Year 50 % Required Developed Land Use TP Reduction	Remaining Required Developed Land Use TP Reduction to Be Achieved by 2028	Total Septic System TP Reduction to Be Achieved by 2028	Remaining Septic System and Developed Land Use TP Reductions to Be Achieved by 2028
Alachua County	466	233	33	42	158	233	391	198	589
Gainesville	461	231	33	130	68	230	298	16	315
FDOT, District 2	92	46	4	525	-483	46	-437	0	0
Waldo	27	14	1	0	13	13	26	0	26
Total	1,047	524	72	697		522	277	215	930

All reductions are lbs-TP/yr

Jurisdiction	Total TN Required Developed Land Use Reduction	First 5-Year 50 % Required Developed Land Use TN Reduction	TN Education Credit	TN Project Credits	Remaining Developed Land Use TN Reduction to Be Achieved by 2023	Second 5-Year 50 % Required Developed Land Use TN Reduction	Remaining Required Developed Land Use TN Reduction to Be Achieved by 2028	Total Septic System TN Reduction to Be Achieved by 2028	Remaining Septic System and Developed Land Use TN Reductions to Be Achieved by 2028
Alachua County	4,114	2,057	296	65	1,696	2,052	3,748	1,447	5,195
Gainesville	4,055	2,028	292	723	1,013	2,028	3,041	113	3,154
FDOT, District 2	872	437	42	3,414	-3,019	411	-2,608	0	0
Waldo	239	120	10	0	110	119	229	nd	229
Total	9,280	4,642	640.0	4,202		4,610	4,410	1,560	8,578

All reductions are lbs-TN/yr



Draft Orange Lake Allocation

Jurisdiction	Total Required Developed Land Use TP Reduction	First 5-Year 50 % Required Developed Land Use TP Reduction	TP Education Credit	TP Project Credits	Remaining Developed Land Use TP Reduction to Be Achieved by 2023	Second 5-Year 50 % Required Developed Land Use TP Reduction	Remaining Required Developed Land Use TP Reduction to Be Achieved by 2028	Total Septic System TP Reduction to Be Achieved by 2028	Remaining Septic System and Developed Land Use TP Reductions to Be Achieved by 2028
Alachua County	38	19	4	0	15	19	34	60	94
FDOT, District 2	15	8	1	54	-47	7	-40	0	0
FDOT, District 5	99	50	1	2,934	-2,885	49	-2,836	0	0
Marion County	319	160	31	0	129	159	288	120	408
McIntosh	28	14	1	0	13	14	27	43	70
Micanopy	31	16	2	0	14	15	29	0	29
Reddick	12	6	1	0	5	6	11	0	11
Total	542	273	41	2,988		269		223	612

All reductions are lbs-TP/yr



Draft Lochloosa Lake Allocation

Jurisdiction	Total TP Required Developed Land Use Reduction	First 5- Year 50% Required Developed Land Use TP Reduction	TP Education Credit	TP Project Credits	Remaining Developed Land Use TP Reduction to Be Achieved by 2023	Second 5-Year 50% Required Developed Land Use TP Reduction	Remaining Required Developed Land Use TP Reduction to Be Achieved by 2028
Alachua County	412	206	46	0	160	206	366
FDOT, District 2	321	161	20	802	-661	160	0
Hawthorne	157	79	12	0	67	78	145
Total	890	446	78	802		444	511

All reductions are lbs-TP/yr

Jurisdiction	Total TN Required Developed Land Use Reduction	First 5- Year 50% Required Developed Land Use TN Reduction	TN Education Credit	TN Project Credits	Remaining Developed Land Use TN Reduction to Be Achieved by 2023	Second 5-Year 50% Required Developed Land Use TN Reduction	Remaining Required Developed Land Use TN Reduction to Be Achieved by 2028
Alachua County	4,055	2,028	335	0	1,693	2,027	3,720
FDOT, District 2	3,674	1,837	202	4,759	-3,125	1,837	0
Hawthorne	1,903	952	105	0	847	951	1,798
Total	9,631	4,817	642	4,759		4,814	5,518

All reductions are lbs-TN/yr



TP Comparison Draft

Loading Category (all loads in lbs-TP/yr)	Orange Lake TP	Orange Lake Percent Loading	Newnans Lake TP	Newnans Lake Percent Loading	Lochloosa Lake TP	Lochloosa Lake Percent Loading
Point Source			145	0.6%		
Forest Loading*	594	2.1%	1,767	6.8%	1,698	10.1%
Undeveloped Land Stormwater Loading	3,363	12.1%	3,371	13.0%	1,203	7.2%
Developed Land Stormwater Loading	945	3.4%	1,244	4.8%	1,667	10.0%
Developed Land Reductions	-3,029		-768		-880	
Net Developed Land Stormwater Loading	-2,084		476		787	
Agriculture Loading	5,986	21.5%	522	2.0%	2,510	15.0%
Agriculture Reductions	-1,250		-29		-350	
Net Agriculture Loading	4,736		493		2,161	
Septic System Loading	390	1.4%	256	1.0%		
Groundwater Loading	0		1827	7.1%		
Internal Recycling Loading	0		13,478	52.2%	5,426	32.4%
Atmospheric Deposition	2,941	10.5%	3,223	12.5%	4,248	25.4%
Tributary Inflows	13,671	49.0%				
Newnans Lake	10,344					
Net Reductions	-438					
Net Newnans Lake Loading	9,906					
Lochloosa Lake	3,327					
Net Reductions	-1,230					
Net Lochloosa Lake Loading	2,097					
TMDL Baseline with Forest Loading	27,890		25,834		16,752	
TMDL baseline TP-loading (lbs/yr)	27,296		24,067		15,054	
Total Maximum Daily Load (lbs/yr)	15,262		10,924		9,932	
Reduction needed in loading (lbs/yr)	12,034		13,143		5,122	
Remaining TP Loading	21,349		23,270		13,824	
Remaining TP Reduction	6,087		12,346		3,892	34

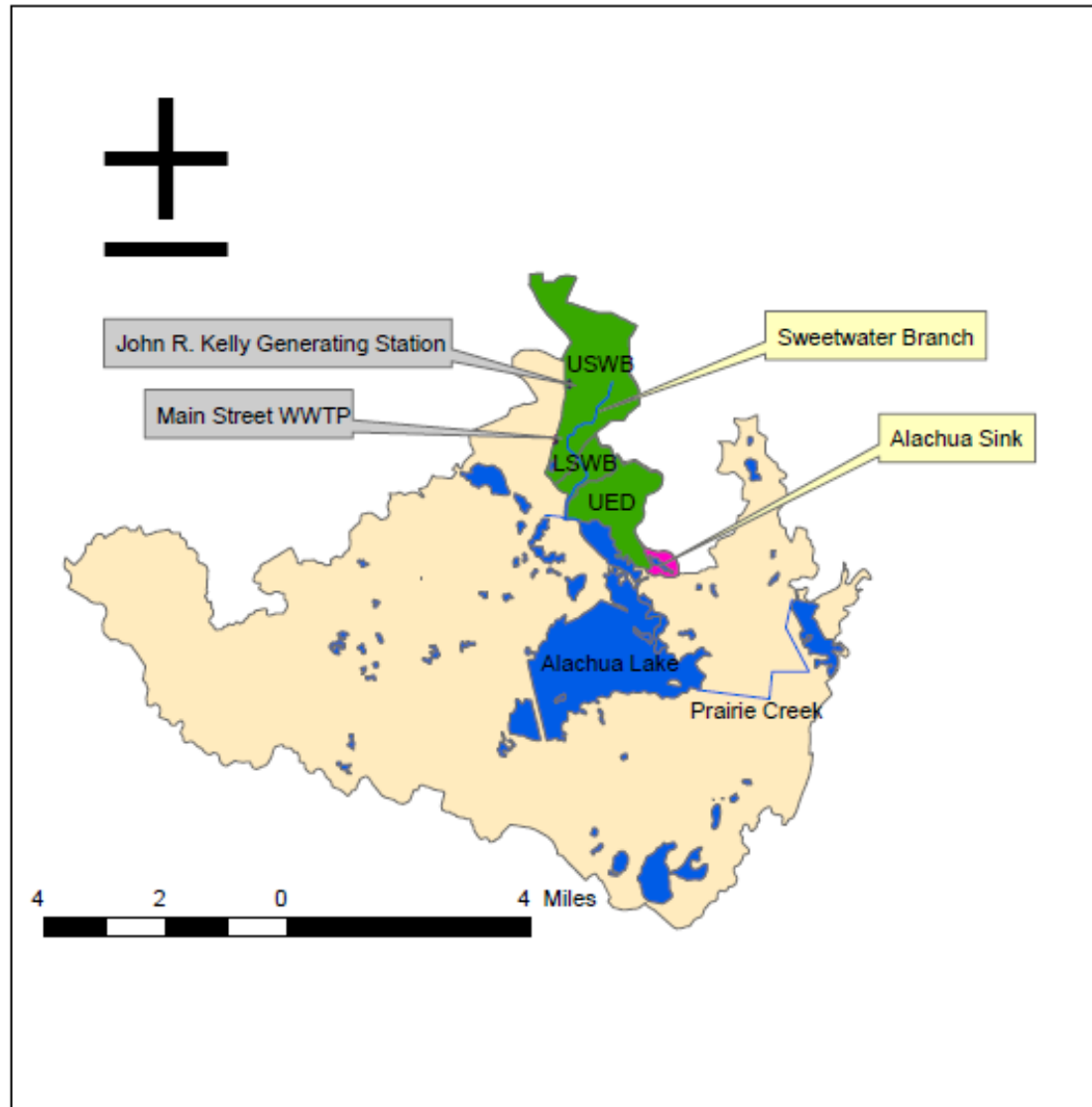


Alachua Sink

- Based budget on 2004 as representative wet year.
 - This year has large loading from Prairie Creek (Newnans Lake watershed).
- TMDL model estimates included some attenuation for Alachua Lake sub-basin.
- Included project reductions for Newnans Lake at 45% of credit.
- Source of loading data:
 - Table 16e and Table 18e and Table 47.
 - Table 47 data used for total baseline loading.
 - TMDL Report Nutrient TMDL for Alachua Sink WBID 2720A, April 4, 2006.



Paynes Prairie Watershed





Draft Alachua Sink TN Budget

Sources of total nitrogen all loadings as lbs-TN/yr	TMDL Baseline loading	Percent of TMDL Baseline Loading	Controllable TMDL baseline loading	Expected load reduction from current projects	Remaining nitrogen load
Stormwater runoff undeveloped land use	72,252	15.4%			72,252
Points Sources and stormwater runoff from developed uses	167,051	35.7%	167,051	-129,004	38,047
Projects				-129,004	
Agriculture	11,434	2.4%	11,434	-363	11,071
Agriculture BMPs				-363	
Agriculture Project Reductions					
Atmospheric deposition	23	0.0%			23
Septic Systems (Alachua Sink watershed)	4,667	1.0%	4,667		4,667
Prairie Creek	212,748	45.4%	212,748	-2,179	210,569
Newnans Lake projects				-2,179	
Total Loading TN lbs/yr	468,175	100.0%	395,900		336,629
Loading Reduction TN lbs/yr					131,546
TMDL baseline TN loading (lbs-TN/yr)	462,457				330,911
Total Maximum Daily Load (lbs-TN/yr)	256,322				
Reduction needed in loading (lbs-TN/yr)	206,135				74,589



Draft Lake Wauberg TP Budget

Sources of total phosphorus loadings as lbs-TP/yr	TMDL Baseline loading	Percent of TMDL Baseline Loading	Controllable TMDL baseline loading	Expected load reduction from current projects	Remaining phosphorus load
Stormwater runoff Lake Wauberg	508	67.9%	508	-39	469
Developed Land	73	9.8%		-34	
Developed Land Reductions				-34	
Agriculture	89	11.9%			
Agriculture BMPs Reductions				-5	
Septic systems Lake Wauberg	240	32.1%	240		240
Loading information					
TMDL baseline TP-loading (lbs-TP/yr)	748		748		709
Total Maximum Daily Load (lbs-TP/yr)	374		374		374
Reduction needed in loading (lbs-TP/yr)	374		374		335



Draft Lake Wauberg TN Budget

Sources of total nitrogen loadings as lbs-TN/yr	TMDL Baseline loading	Percent of TMDL Baseline Loading	Controllable TMDL baseline loading	Expected load reduction from current projects	Remaining nitrogen load
Stormwater runoff Lake Wauberg	2,765	68.0%	2,765	-199	2566
Developed Land	580	14.3%		-164	
Developed Land Reductions				-164	
Agriculture	602	14.8%		-35	
Agriculture BMPs Reductions				-35	
Septic systems	1,299	32.0%	1,299		1299
Loading information					
TMDL baseline TN-loading (lbs-TN/yr)	4,064		4,064		3,865
Total Maximum Daily Load (lbs-TN/yr)	2,062		2,062		2,062
Reduction needed in loading (lbs-TN/yr)	2,002		2,002		1,803



Lake Wauberg Work Plan

- Shallow ground water sampling at UF recreation area septic system sites down gradient of drainfield.
- Phytoplankton sampling of Lake Wauberg.
- Repeat shallow ground water sampling at Paynes Prairie Campground after septic system replaced.



Lake Wauberg Issues

- Old Eutromod model. Loading estimates may be higher than other watershed models.
- Very small watershed dominated by lake surface area.
 - Role of atmospheric deposition needs to be defined.
- Bird roosting around perimeter of lake. Waste can add large amounts of nutrients.
- Solution: evaluate water quality against numeric nutrient criteria to improve estimation of water quality impairment.



Next Steps

- Allocation calculations have been posted to website, available at http://publicfiles.dep.state.fl.us/DEAR/BMAP/OrangeCreek/2018_BMAP/.
- Document in review and editing. To be posted as soon as possible.
- Plan is to take for Secretarial adoption January 2019.



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