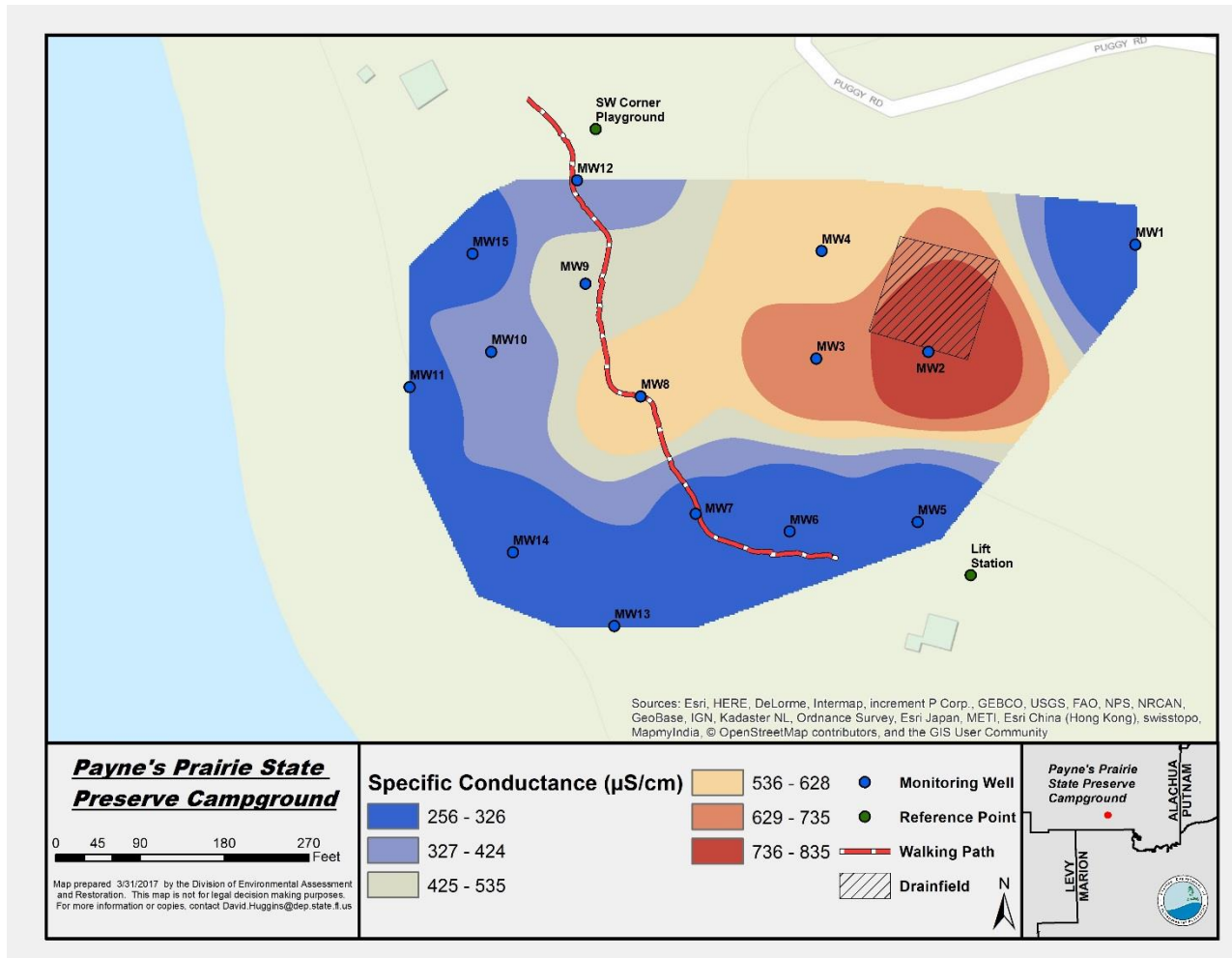




Lake Wauberg





Florida Department of Environmental Protection

Loading Reductions for Lochloosa Lake

Mary Paulic

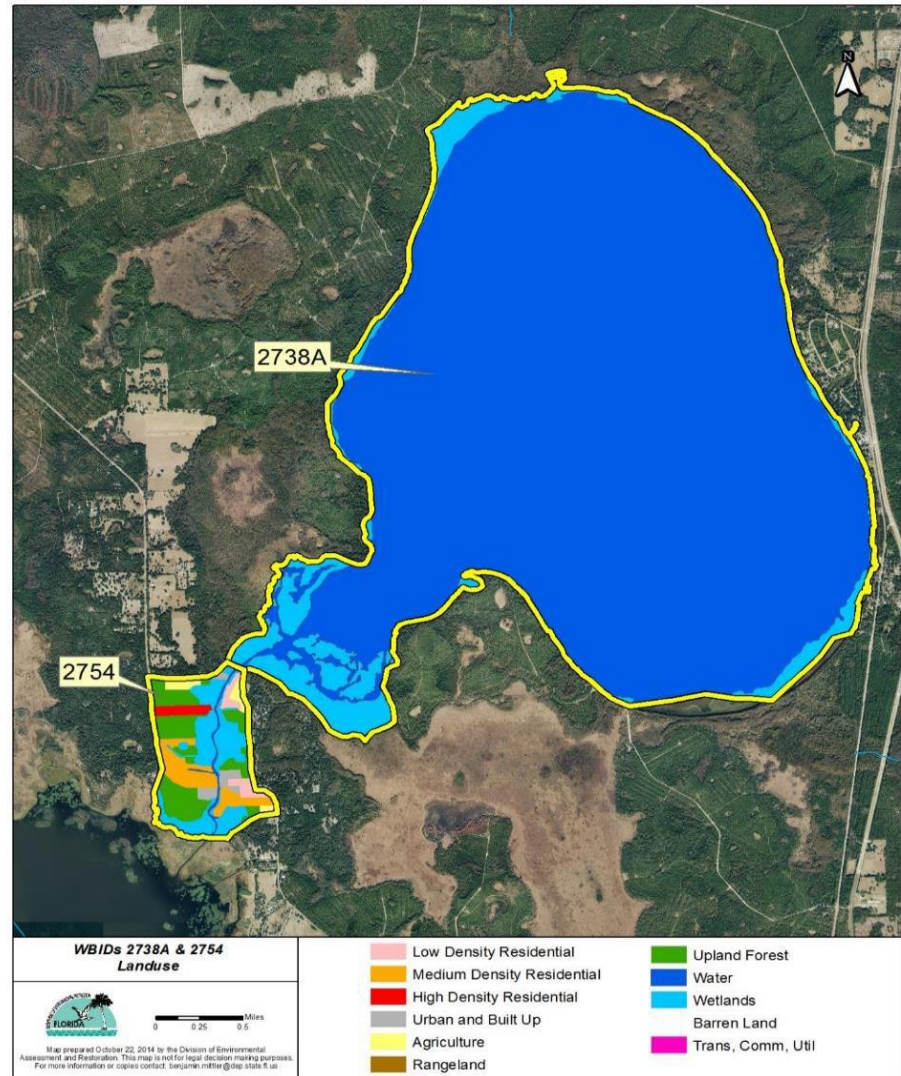
April 4, 2017





Lochloosa Lake

Lochloosa Lake WBID=2738A
Cross Creek WBID=2754





TMDL Adoption

- Posted at http://www.dep.state.fl.us/water/tmdl/draft_tmdl.htm earlier this year.
 - Recalculated watershed loadings.
- Hearing on April 21
<http://www.dep.state.fl.us/water/tmdl/index.htm>.
- The public is invited to an **April 21st, 2017** public hearing on the Total Maximum Daily Loads (TMDLs) rules, and their allocations, for certain waters impaired for nutrients in the Aucilla River Basin (62-304.406), Lower St. Johns River Basin (62-304.415), and Ocklawaha River Basin (62-304.500). Furthermore, in accordance with paragraph 62-302.531(2)(a), F.A.C., the nutrient TMDLs for Wacissa Springs, Crescent Lake, Lochloosa Lake, Cross Creek, and Lake Roberts will constitute site specific numeric interpretations of the narrative nutrient criterion set forth in paragraph 62-302.530(90)(b), F.A.C., that will supersede the otherwise applicable numeric nutrient criteria in subsection 62-302.531(2), F.A.C., for these surface water segments. The nitrate TMDL for the Wacissa River also will constitute a site specific numeric interpretation of the narrative nutrient criterion set forth in paragraph 62-302.530(90)(b), F.A.C., for this water segment that is in addition to the otherwise applicable numeric nutrient criteria in subsection 62-302.531(2), F.A.C., for the water segment. Written comments should be directed to: Erin Rasnake, Program Administrator, Water Quality Evaluation and TMDL Program, Florida Department of Environmental Protection, Mail Station #3555, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400 via post or email: Erin.Rasnake@dep.state.fl.us.



TMDL

Waterbody	Parameter	TMDL kg/yr	Target Concentration Annual Geometric Mean mg/L	TMDL Baseline Load kg/yr (2004-2010)	Waste water Wasteload Allocation kg/yr	Load Allocation (nonpoint) (kg/yr)	Overall Needed Reduction (kg/yr)
Lochloosa Lake	TP	4,505	0.052	7,595	NA	41%	3,090
Lochloosa Lake	TN	78,163	1.09	188,951	NA	59%	110,788
Cross Creek	TP	1,601	0.055	2,309	NA	31%	708
Cross Creek	TN	32,514	1.15	57,140	NA	43%	24,626

Note: NA=not applicable.

- No reduction needed for Cross Creek=Lochloosa Lake TMDL and Cross Creek watershed loading



Cross Creek

- TMDL = Lochloosa Lake TMDL + watershed loading.
- No reductions required for Cross Creek watershed.



Characteristics of Watershed Loading

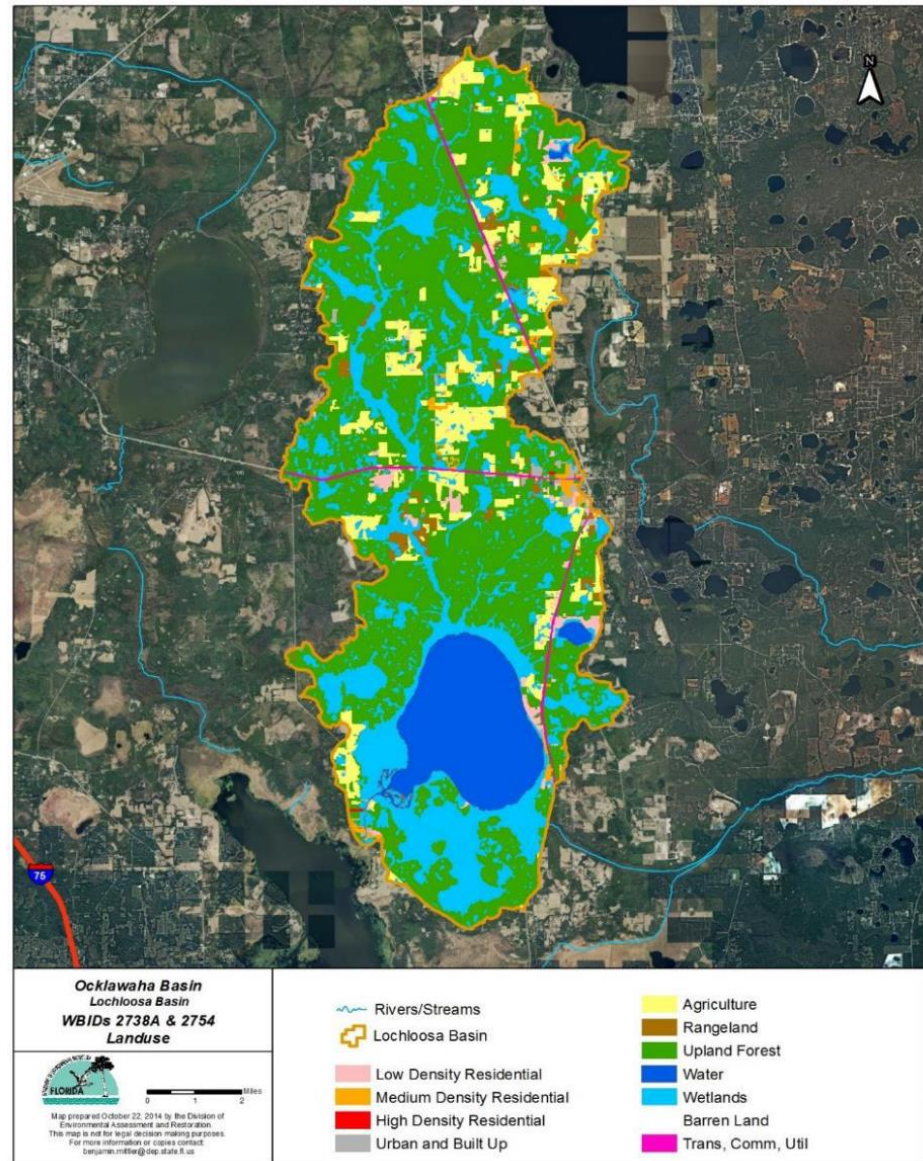
- TMDL watershed loading calculated using HSPF model.
 - Build up and wash-off model generates stormwater runoff.
 - Dependent on amount of rainfall.
 - Amount of runoff generated varies by wet or dry year and location in watershed.



2009 Land Use

Land use categories:

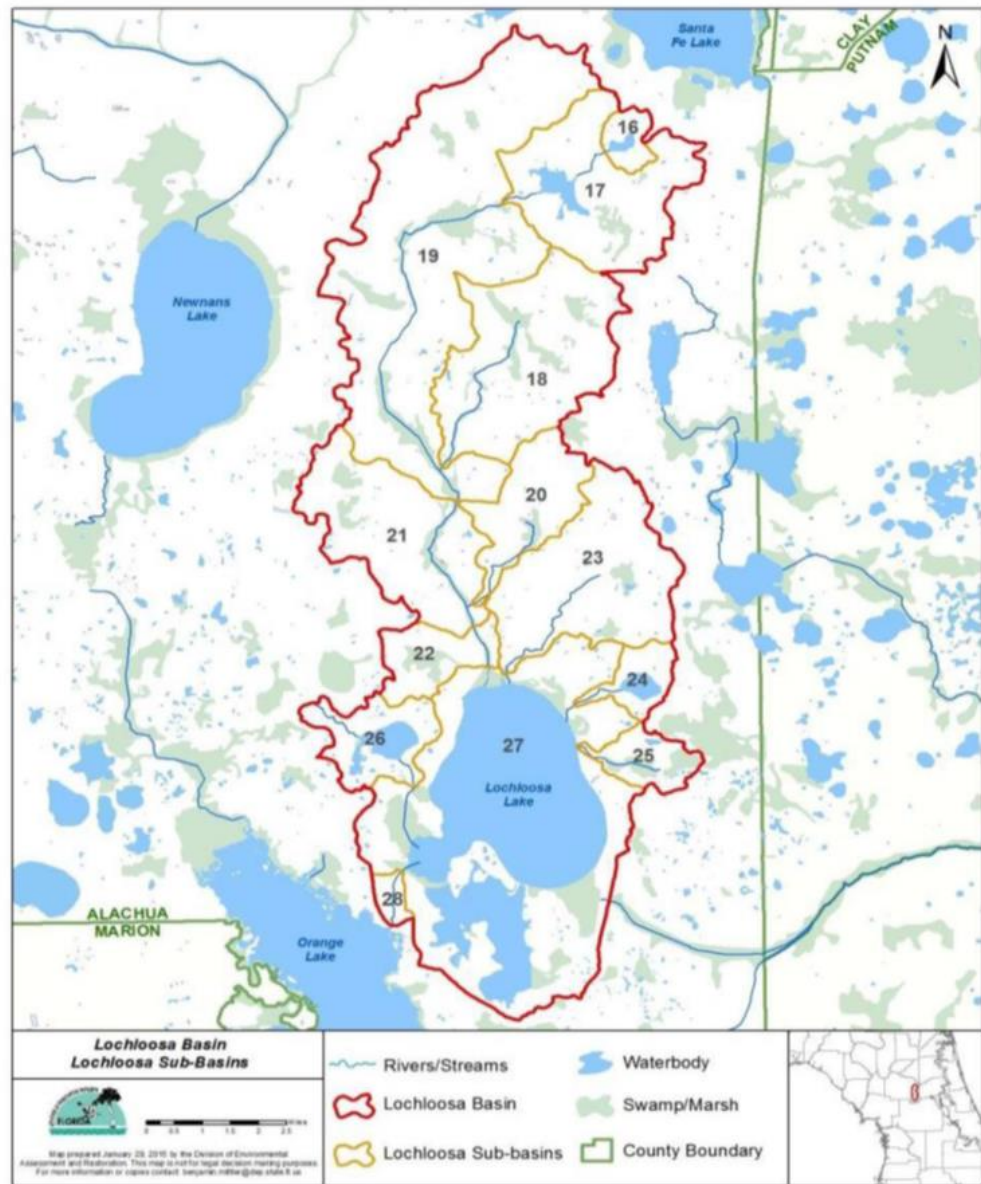
- Low density residential.
- Medium density residential.
- High density residential.
- Industrial/commercial.
- Mining.
- Open land.
- Pasture.
- Tree crop.
- Agriculture crops.
- Water and wetlands.
- Rangeland.
- Forest.
- Forest regeneration.





Sub-watersheds

- Distance from lake a factor affecting magnitude of loading from a sub-watershed.
 - Attenuation of loading.
- Sub-watersheds 16-27 contribute to lake.
- Attenuation factor is the ratio of output/input.





Routing of Water

Sub-watershed 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



TP Attenuation Ratio

Attenuation		Year					
Reach	2004	2005	2006	2007	2008	2009	2010
16	0.467167	0.542104	0.345576	0.60985	0.48226	0.257811	0.194435
17	0.420936	0.375203	0.375482	0.304061	0.400647	0.343103	0.273425
18	0.540227	0.575947	0.517014	0.488098	0.550978	0.512941	0.46679
19	0.755361	0.785382	0.726542	0.74261	0.778135	0.736642	0.668579
20	0.672923	0.704556	0.645931	0.637815	0.691594	0.662156	0.605686
21	0.912728	0.930395	0.901612	0.903074	0.91894	0.901751	0.886004
22	0.988789	0.990232	0.9869	0.989967	0.988814	0.988406	0.982659
23	0.913861	0.94	0.934701	0.921647	0.925	0.941176	0.86166
24	2.983683	1.531409	1.329897	0.810409	1.186047	0.862408	0.623431
25	0.862559	0.887324	0.830097	0.907801	0.871111	0.86014	0.854015
26	1.599407	0.643243	0.630208	0.517699	0.633333	0.537671	0.561111

- Reach 27 drains directly to lake, attenuation factor of 1 applied.



TN Attenuation Ratio

Attenuation	Year						
Reach	2004	2005	2006	2007	2008	2009	2010
16	0.493365	0.541091	0.297371	0.542199	0.509117	0.27042	0.220398
17	0.525541	0.451151	0.444082	0.360874	0.49457	0.409607	0.358308
18	0.62765	0.679254	0.615526	0.60409	0.672743	0.637752	0.613806
19	0.810044	0.849843	0.791391	0.799936	0.847551	0.812711	0.770267
20	0.720001	0.78776	0.727086	0.717694	0.773437	0.743442	0.718149
21	0.929034	0.951678	0.925383	0.922749	0.944221	0.930377	0.920444
22	0.991886	0.994698	0.992278	0.99169	0.994307	0.990762	0.990909
23	0.916583	0.954839	0.95992	0.939511	0.95122	0.944	0.917197
24	1.443709	0.97449	0.822727	0.527331	0.955814	0.683721	0.515625
25	0.901288	0.922141	0.908333	0.91875	0.917647	0.892405	0.909677
26	0.725	0.614144	0.584718	0.476323	0.610619	0.465368	0.540146



Load by Sub-Watershed

- Calculate attenuation ratio as $\text{Load out} / \text{Load in}$ = portion of loading delivered to next sub-watershed.
- Complete attenuation attained by multiplying each sub-watershed attenuation ratio by the next sub-watershed's attenuation ratio in its flow path.
- Example for sub-watershed 21, Lochloosa Creek South.
 - Sub-watershed 21 attenuation ratio x sub-watershed 22 attenuation ratio x sub-watershed 27 attenuation ratio x load from sub-watershed 21.
 - This is what will reach Lochloosa Lake from sub-watershed 21.



Lochloosa Lake Nutrient Budget TP

Sources of Total Phosphorus (loading in kg/yr) DRAFT DATA	Lochloosa Lake TMDL Baseline loading (2004- 2010)
Atmospheric deposition (wet/dry)	1,927
Watershed Loading	3,207
Forest and Forest Regeneration	770
Agriculture	1,139
Rangeland, Water, Wetlands	546
Developed land uses	751
Open land	5
Internal load	2,461
Loading information	
Baseline and net TP-loading (kg/yr)	7,595
Total Maximum Daily Load (kg/yr)	4,505
Additional reduction needed in TP-loading to meet TMDL (kg/yr)	3,090



Lochloosa Lake Nutrient Budget TN

Sources of Total Nitrogen (loading in kg/yr) DRAFT DATA	Lochloosa Lake TMDL Baseline loading (2004- 2010)
Atmospheric deposition (wet/dry)	33,033
Watershed Loading	34,964
Forest and forest regeneration	11,034
Agriculture	10,162
Rangeland, Water, and Wetlands	7,561
Developed uses	5,948
Open land	69
Internal load	120,954
Loading information	
Baseline and net TN-loading (kg/yr)	188,951
Total Maximum Daily Load (kg/yr)	78,163
Additional reduction needed in TN-loading to meet TMDL (kg/yr)	110,788



Developed Land Use Loadings

Land Use	Developed Uses TP kg/yr	Developed Uses TN kg/yr
High Density Residential	10	83
Medium Density Residential	52	476
Low Density Residential	291	2,036
Industrial/Commercial	398	3,349
Mining	<0.5	4
Total	751	5,948



Stakeholders

- Alachua County.
- Hawthorne.
- FDOT, District 2.
- Agriculture.
- Forest – large part of the watershed.



Allocation Approach

- Load delivered by sub-watershed.
- Averaged over 2004-2010.
- Apportion loading by percent area of a land use within a jurisdiction based on 2009 land use. Similar to Orange and Newnans Lakes.



Florida Department of Environmental Protection

Water Quality Restoration Program

Orange Creek Basin Supplemental Report

April 4, 2017

Mary Paulic
Mary.paulic@dep.state.fl.us





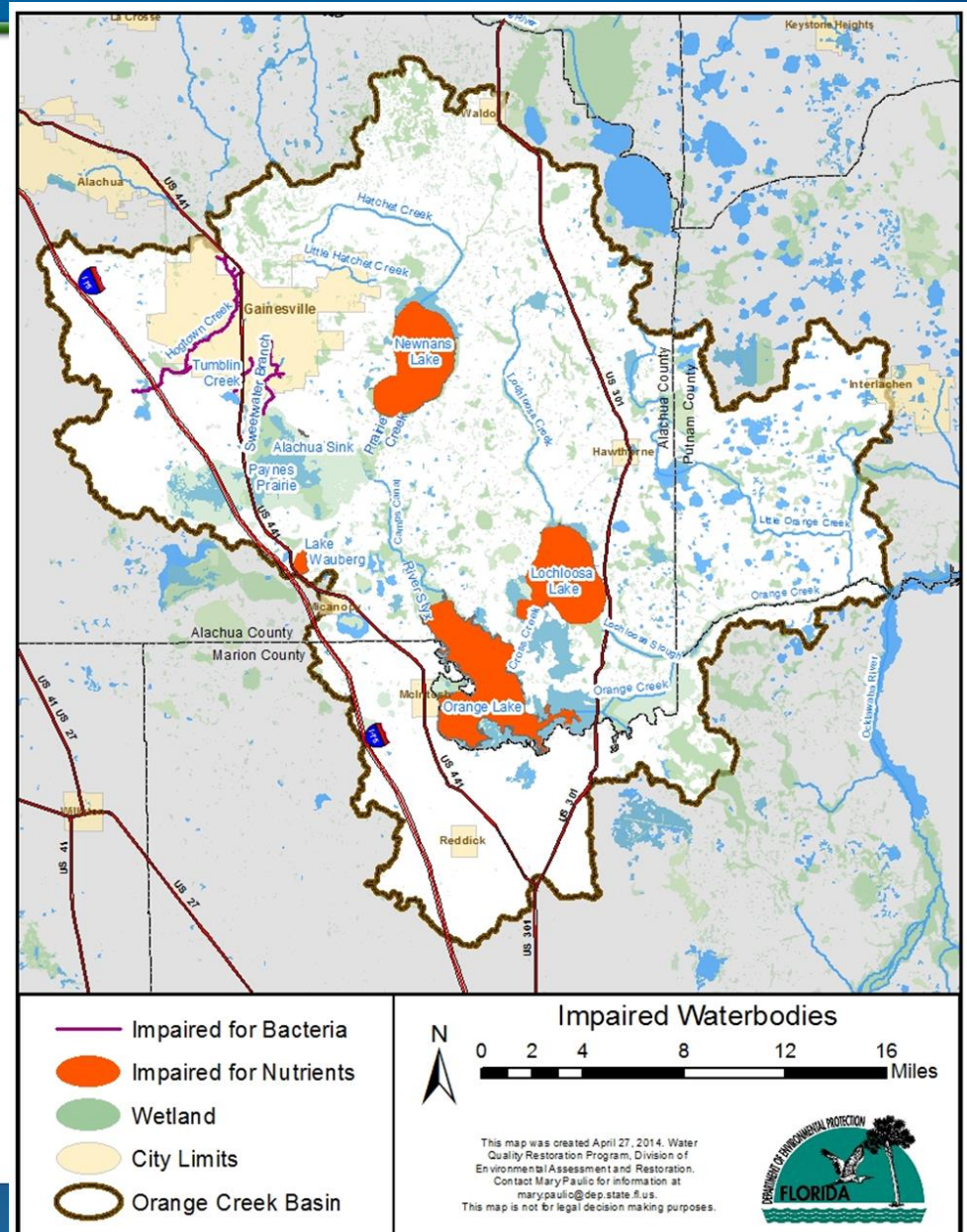
Purpose

- Phase 2 BMAP adopted in 2014.
 - Identified lakes as priorities that needed additional effort.
 - Stated goal of identifying management strategies.
- Assignment of loading reductions for developed (urban) land use for Newnans Lake, Orange Lake, and Lochloosa Lake.
 - Add Lochloosa Lake as adopted TMDL to BMAP.
- Outline remediation actions for Lake Wauberg.
- Document sets deadline for achieving TMDLs as 2028.
- 2008 and 2014 BMAPs remain in effect.



Orange Creek Basin TMDL Lakes

- Newnans Lake.
- Lake Wauberg.
- Orange Lake.
- Lochloosa Lake and Cross Creek.





-
- DRAFT**
- Alachua County**
- Marion County**
- Watershed Delineation**
- 0 1.25 2.5 5 7.5 10 Miles
- Prepared March 28, 2017, by the
Division of Environmental Assessment
and Restoration. Not for legal determinations.
For more information contact
Mary Paulic at mary.paulic@dep.state.fl.us
- FLORIDA DEPARTMENT OF
ENVIRONMENTAL
PROTECTION



Orange and Newnans Lake Land Use

- Orange Lake and Newnans Lake TMDL loading based on 1995 land use to define baseline condition.
- 2009 land use used for distribution of sources.
- Agriculture is a separate category.
- Forest loading set aside. Loading removed from estimates of baseline loading and needed reductions in loading.
- Land use categories used for allocation of reductions to jurisdictions:
 - Urban open
 - Low density residential
 - Medium density residential
 - High density residential
 - Rural open
 - Transportation/communication



Orange Lake and Newnans Lake Nutrient Budget

Sources of total phosphorus and total nitrogen (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	Newnans Lake TN TMDL Baseline Loading	Newnans Lake Net TN Reductions
Point Source			145	122	655	546
<i>Stormwater runoff forest</i>	<i>594</i>	<i>NR</i>	<i>1,767</i>	<i>NR</i>	<i>28,121</i>	<i>NR</i>
Stormwater runoff undeveloped land use	3,363	NR	3,371	NR	31,850	NR
Stormwater runoff from developed uses	946	542	1,244	1,045	11,128	9,280
Agriculture	5,986	3,432	522	439	3,580	2,986
Septic systems	390	224	256	215	1,870	1,560
Atmospheric deposition (wet/dry)	2,941	NR	3,223	NR	6,446	NR
Tributary inflows	13,671	7,837	4,343			
Camps Canal (Newnans Lake)	10,344	5,930				
Cross Creek (Lochloosa Lake)	3,327	1,907				
Seepage/groundwater	0	0	1827	NR	6,698	NR
Internal nutrient recycling	0	0	13,478	11,322	226,527	188,913
Loading information						
TMDL baseline TP-loading and % (lbs/yr)	27,296		24,067		288,755	
Total Maximum Daily Load (lbs/yr)	15,262		10,924		85,470	
Reduction needed in loading and % (lbs/yr)	12,034	12,034	13,143	13,143	203,285	203,285

Note: NR=no reduction



Data Sources Used

- 2009 land use mapped from aerial photography.
- Gainesville city limits data obtained.
- Gainesville urban area boundary.
- Small community boundaries obtained from U.S. Census 2010 Tiger Places data.
- DEP delineation of watershed boundaries for Newnans Lake, Lake Wauberg, and Orange Lake. SJRWMD delineated Lochloosa Lake.
- DOH 2014 septic system inventory data.



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 natural lands; those are separated from the local developed land use loads.
- Forest land is set aside. Loading not included in apportioning reductions of loading.



Apportionment Concept

- Start with individual Total Maximum Daily Load (TMDL) models.
- Apportion reductions of Total Phosphorus (TP) and Total Nitrogen (TN) loading defined in TMDLs.
 - Calculate reductions for local governments and Florida Department of Transportation (FDOT).
 - Agricultural reductions are first based on Best Management Practice (BMP) implementation.

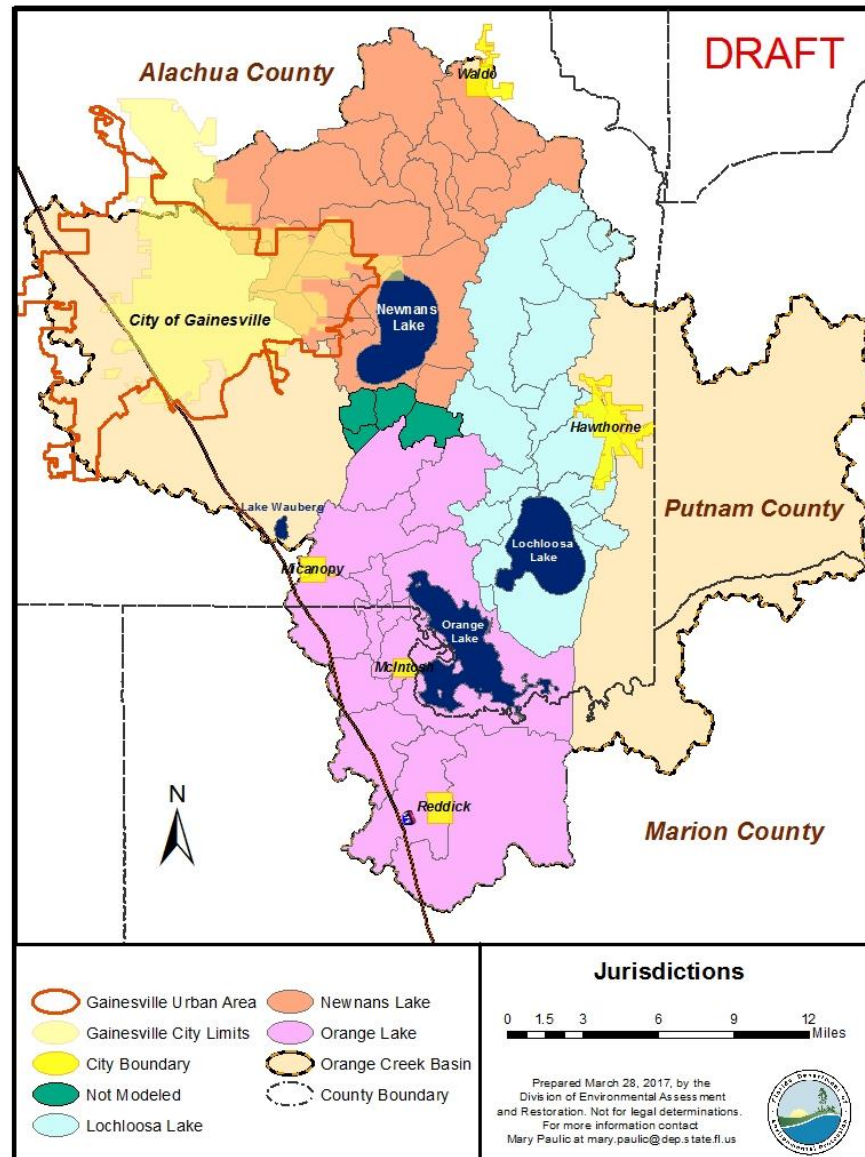


Future Apportionment

- Consider connection of lakes and internal loading.
 - Loading transport losses and gains. Next step in allocation tables.
 - Crediting watershed reductions in proportion to internal loading reductions.
 - Literature examples of crediting.
 - Document response of lakes as actions are taken within watershed.



Orange Creek Basin Jurisdictions





Land Use Categories

- Developed land use loading categories.
 - High density residential.
 - Medium density residential.
 - High density residential.
 - Urban open land.
 - Rural open land.
 - Transportation and communication.
- Agriculture.
- Forest. Commercial pine treated same as natural forest.
- Natural Lands.
 - Water and wetlands.
 - Range and shrubland.



Calculations for Jurisdictions

- Starting with 2009 land uses, add jurisdictional boundaries and watershed boundaries.
- Calculate area of different developed land use for the entire watershed.
- Calculate developed land use area (acres) by category within each jurisdiction.
- Calculate each jurisdiction's percent of the total area of developed land use.
 - This percent used to apportion reduction in TP and TN loading required by that jurisdiction.
- Percent of area time proportional reduction to estimate jurisdiction loading reduction.



Percent Developed Land

Watershed	Jurisdiction	Urban Open Percent	Low Density Residential Percent	Medium Density Residential Percent	High Density Residential Percent	Transportation and Communication Percent	Rural Open Percent
Newnans Lake - Hatchett Creek	Alachua County	82.3%	90.6%	85.7%	18.7%	19.7%	100.0%
Newnans Lake - Hatchett Creek	Gainesville	16.2%	0.4%	-	79.7%	1.8%	-
Newnans Lake - Hatchett Creek	FDOT, District 2	-	-	-	-	78.5%	-
Newnans Lake - Hatchett Creek	Waldo	1.4%	9.0%	14.3%	1.6%	-	-
Newnans Lake - Little Hatchett Creek	Alachua County	2.0%	17.0%	4.2%	5.8%	0.5%	-
Newnans Lake - Little Hatchett Creek	Gainesville	98.0%	83.0%	95.8%	94.2%	89.7%	100.0%
Newnans Lake - Little Hatchett Creek	FDOT, District 2	-	-	-	-	9.9%	-
Newnans Lake - Little Hatchett Creek	Waldo	-	-	-	-	-	-
Newnans Lake - Newnans Lake	Alachua County	8.8%	80.4%	42.5%	28.9%	2.3%	100.0%
Newnans Lake - Newnans Lake	Gainesville	91.2%	19.6%	57.5%	71.1%	14.1%	-
Newnans Lake - Newnans Lake	FDOT, District 2	-	-	-	-	83.6%	-
Newnans Lake - Newnans Lake	Waldo	-	-	-	-	-	-
Orange Lake - Orange Lake	Alachua County	7.0%	8.5%	3.9%	2.7%	-	0.8%
Orange Lake - Orange Lake	Marion County	88.2%	83.1%	61.3%	87.3%	5.7%	99.2%
Orange Lake - Orange Lake	FDOT, District 2	-	-	-	-	9.0%	-
Orange Lake - Orange Lake	FDOT, District 5	-	-	-	-	85.3%	-
Orange Lake - Orange Lake	McIntosh	3.1%	2.3%	21.2%	5.9%	-	-
Orange Lake - Orange Lake	Micanopy	1.8%	1.2%	13.6%	1.5%	-	0.0%
Orange Lake - Orange Lake	Reddick	-	4.8%	-	2.6%	-	-
Orange Lake - Camps Canal River Styx	Alachua County	-	75.8%	-	15.9%	5.1%	100.0%
Orange Lake - Camps Canal River Styx	Marion County	-	-	-	-	-	-
Orange Lake - Camps Canal River Styx	FDOT, District 2	-	-	-	-	94.9%	-
Orange Lake - Camps Canal River Styx	FDOT, District 5	-	-	-	-	-	-
Orange Lake - Camps Canal River Styx	McIntosh	-	-	-	-	-	-
Orange Lake - Camps Canal River Styx	Micanopy	-	24.2%	100.0%	84.1%	-	-
Orange Lake - Camps Canal River Styx	Reddick	-	-	-	-	-	-

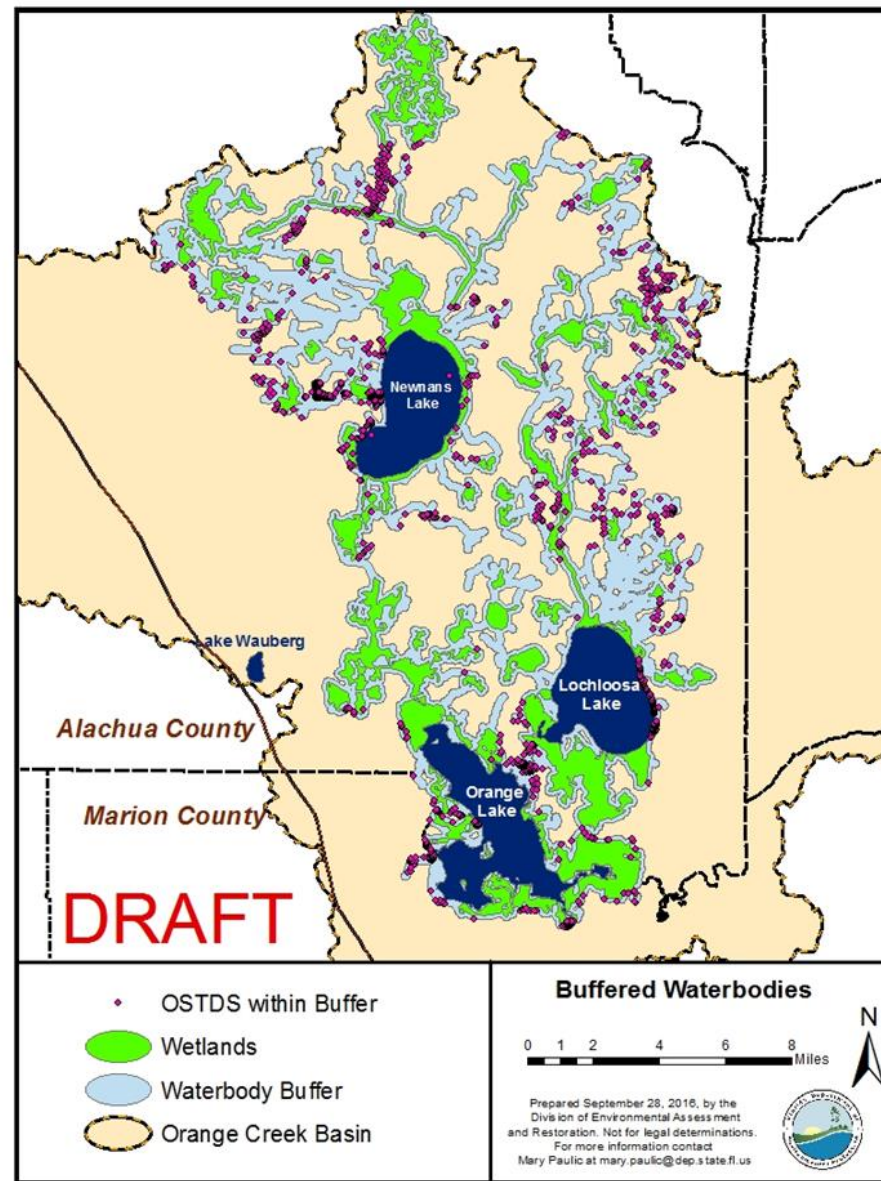


Septic System Calculations

- Septic systems within 200 meters of waterbody or tributaries.
- Conveyance system delineated.
- DOH inventory data used to identify systems.
 - Known and likely categories used.



Delineated Conveyance





Septic System Number

Jurisdiction	Watershed	Number of Septic Systems	Percent of Septic Systems
Alachua County	CCRS	9	100.0%
Alachua County	Hatchett Creek	137	93.8%
Alachua County	Little Hatchett Creek	7	14.0%
Alachua County	Lochloosa Lake	403	95.3%
Alachua County	Newnans Lake	288	92.3%
Alachua County	Orange Lake	54	25.8%
City of Gainesville	Hatchett Creek	9	6.2%
City of Gainesville	Little Hatchett Creek	43	86.0%
City of Gainesville	Newnans Lake	24	7.7%
Hawthorne	Lochloosa Lake	20	4.7%
Marion County	Orange Lake	114	54.5%
McIntosh	Orange Lake	41	19.6%



Total Reduction

- Total Reduction = Developed Land Uses + Portion of Septic System Loading.
 - Septic system load reduction apportioned by jurisdiction based on number of systems out of total in watershed that are located in jurisdiction (percent).



Reductions for Total Phosphorus

Jurisdiction	Orange Lake Developed Land Use TP Reduction lbs/yr	Orange Lake Septic System TP Reduction lbs/yr	Newnans Lake Developed Land Use TP Reduction lbs/yr	Newnans Lake Septic System TP Reduction lbs/yr	Total Developed Land Use Reduction (lbs/yr TP)	Total Septic System Reduction	Total Reduction lbs/yr TP
Alachua County	39	60	198	198	236	258	495
FDOT, District 2	15	-	39	-	54	-	54
FDOT, District 5	99	-	-	-	99	-	99
Marion County	319	120	-	-	319	120	439
McIntosh	28	43	-	-	28	43	71
Micanopy	31	-	-	-	31	-	31
Reddick	12	-	-	-	12	-	12
Waldo	-	-	27	-	27	-	27
Gainesville	-	-	458	16	458	16	474
Total Reduction Developed Land Use and Septic Systems	502	223	722	215	1,262	438	1,700

Does not include project credits.



Reductions for Total Nitrogen

Jurisdiction	Newnans Lake Developed Land Use TN Reduction lbs/yr	Newnans Lake Septic System TN Reduction lbs/yr	Total Developed Land Use TN Reduction (lbs/yr)	Total Septic System TN Reduction (lbs/yr)	Total Reduction TN lbs/yr
Alachua County	4,107	1,447	4,107	1,447	5,554
FDOT, District 2	813	-	813	-	813
Waldo	236	-	236	-	236
Gainesville	4,130	113	4,130	113	4,243
Total Reduction Developed Land Use and Septic Systems	9,286	1,560	9,286	1,560	10,846

Does not include project credits.



Small Loadings Newnans Lake

- Jurisdiction loading as percent of watershed developed land use loading.

Jurisdiction	Watershed	Developed Land Loading TP or TN lbs/yr	Percent of Loading
Alachua County	Newnans Lake TP	550.2	44.2%
FDOT, District 2	Newnans Lake TP	102.7	8.3%
Gainesville	Newnans Lake TP	559.5	45%
Waldo	Newnans Lake TP	32	2.6%
Alachua County	Newnans Lake TN	4,895.7	44%
FDOT, District 2	Newnans Lake TN	975.2	8.8%
Gainesville	Newnans Lake TN	4,973.2	44.7%
Waldo	Newnans Lake TN	283.5	2.5%



Small Loadings Orange Lake

Jurisdiction	Watershed	Developed Land Loading TP lbs/yr	Percent of Loading
Alachua County	Orange Lake TP	67.6	7.2%
FDOT, District 2	Orange Lake TP	25.3	2.7%
FDOT, District 5	Orange Lake TP	172	18.2%
Marion County	Orange Lake TP	556.2	59%
McIntosh	Orange Lake TN	48.5	5.1%
Micanopy	Orange Lake TN	53.4	5.7%
Reddick	Orange Lake TN	20.2	2.1%



Questions

- What do we do about jurisdictions with small contribution to overall loading?
- What are their responsibilities for the BMAP?
 - Inventory jurisdictions for potential projects.
 - Reevaluate status in 5 years.



Basin Attenuation

- Reductions in downstream loading from upstream reductions.
- Important for Orange Lake.
- Address in second 5 year cycle of reductions.
- Add column to summary tables to account for upstream attenuation.



Education

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

Jurisdiction	Credit for Educational Activities as Percent	Newnans Lake Stormwater Loading TP lbs/yr	Newnans Lake TP Education Credit lbs/yr	Newnans Lake Stormwater Loading TN lbs/yr	Lake Newnans Lake TN Education Credit lbs/yr	Orange Lake Stormwater Loading TP lbs/yr	Orange Lake TP Education Credit lbs/yr
Alachua County	6.00%	550.2	33	4895.7	294	67.6	4
FDOT, District 2	2.00%	102.7	2	975.2	20	25.3	1
Gainesville	6.00%	559.5	34	4973.2	298	-	-
Waldo	-	32.0	0	283.5	0	-	-
Marion County	5.50%	-	-	-	-	556.2	31
McIntosh	-	-	-	-	-	48.5	0
Micanopy	-	-	-	-	-	53.4	0
Reddick	-	-	-	-	-	20.2	0
FDOT, District 5	0.50%	-	-	-	-	172.0	1
Total Developed Land Loading and Education Credits		1244.3	69	11,127.6	612	943.2	36

Note: Highlighted city partially covered by Alachua County ordinances.



Projects and Timelines

- Still time to add projects or revise loading calculations.
- Most projects already completed.
- Studies and planning underway to identify restoration strategies.
- Adoption of Supplemental Report June/July.
- Draft Report and draft Lochloosa allocation end of April early May.
- BMAP meeting late May early June.

The background of the slide is a photograph of an empty lecture hall. Rows of blue plastic seats are visible, arranged in a tiered fashion. The seats are facing away from the camera towards a white wall at the front of the room. The text "Any comments or questions???" is overlaid in the center of the image in a large, bold, yellow font.

• Any comments or questions???