Little Hatchet Creek Treatment Weirs

Newnans Lake Improvement Initiative, Phase 2

Tasks 1, 2, and 3

July 2021

Newnans Lake Improvement Initiative (NLII)

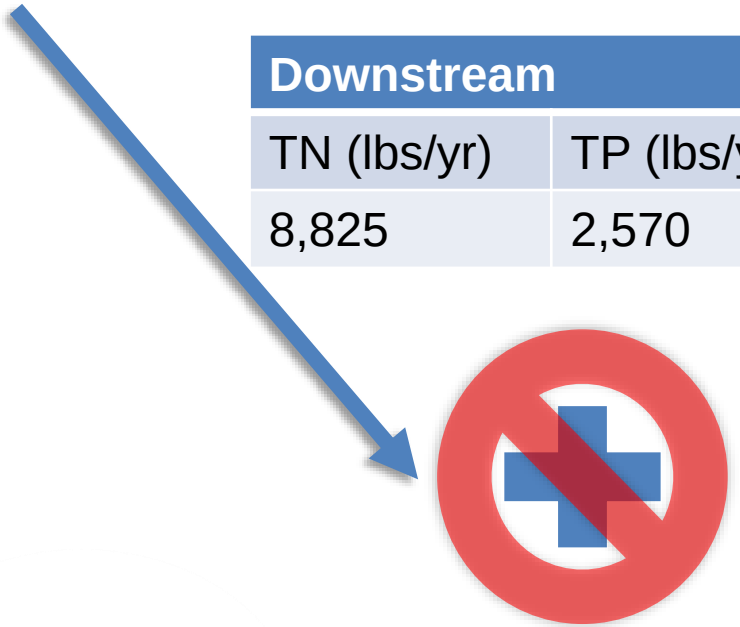
- Made to reduce TP and TN loading to Newnans Lake
- Phased approach
- Permeable weir project (Phase II) focus is phosphorous removal

Upstream	
TN (lbs/yr)	TP (lbs/yr)
6,518	453

Before Impacted Segment

Downstream	
TN (lbs/yr)	TP (lbs/yr)
8,825	2,570

After Impacted Segment



Swamp	
TN (lbs/yr)	TP (lbs/yr)
14,390	1,226

Newnans Lake required TP reductions and credits (lbs-TP/yr) by jurisdiction

From: Orange Creek BMAP Amendment

Jurisdiction	Total Developed Land Use Reduction	First 5-Year 50 % Developed Land Use Reduction	Education Credit	Project Credits	Remaining Developed Land Use Reduction with a Target Date of 2023	Second 5-Year 50 % Developed Land Use Reduction	Total Septic System Reduction with a Target Date of 2028	Total Reduction to be Achieved with a Target Date of 2028*
Alachua County	465	233	33	42	158	232	198	588
FDOT, District 2	93	47	4	525	-483	46	0	0
Gainesville	461	231	33	259	49	230	16	185
Waldo	27	14	1	0	13	13	0	26
Total	1,046	525	71	826		521	214	799

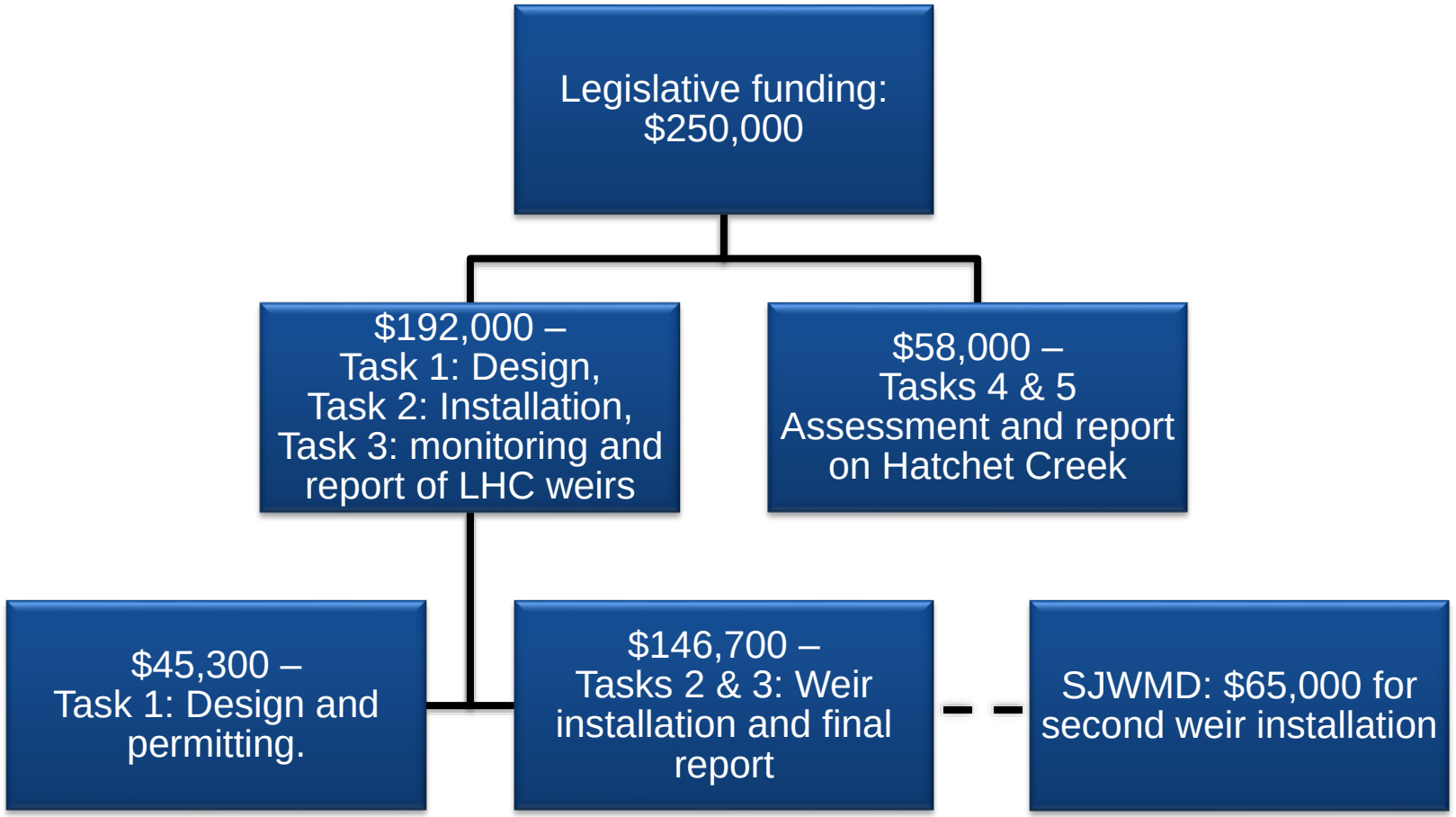
Phosphorous Sources

- The source of the phosphorus is from exposed portions of the Hawthorne Group.

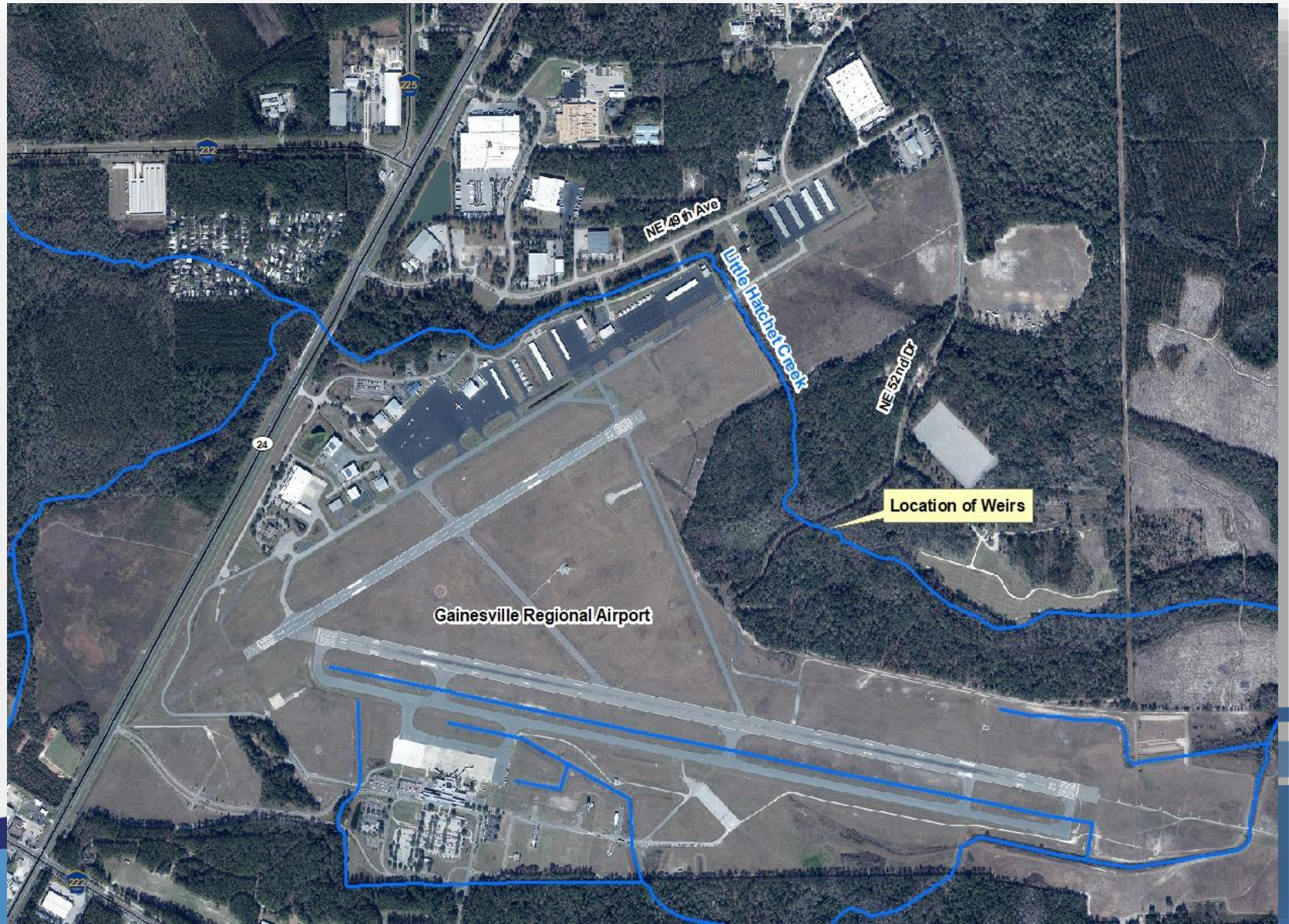
- The Hawthorne Group is phosphate rich and has been exposed due to channelization and erosion.

Little Hatchet Creek Erosion

Project Budget and Financial Contributions

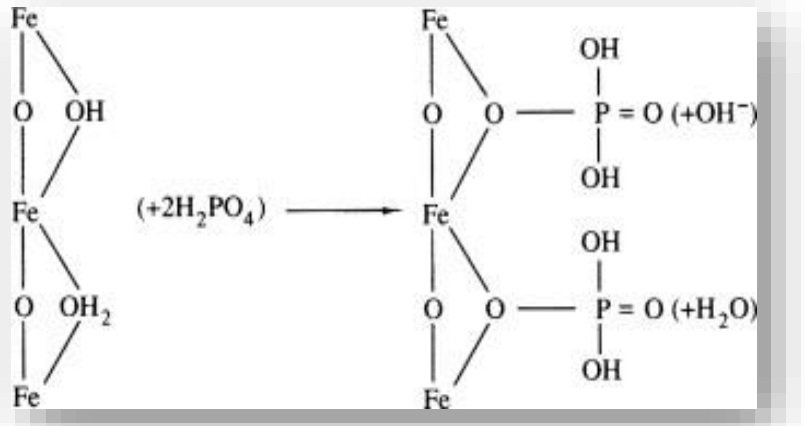


Project Location

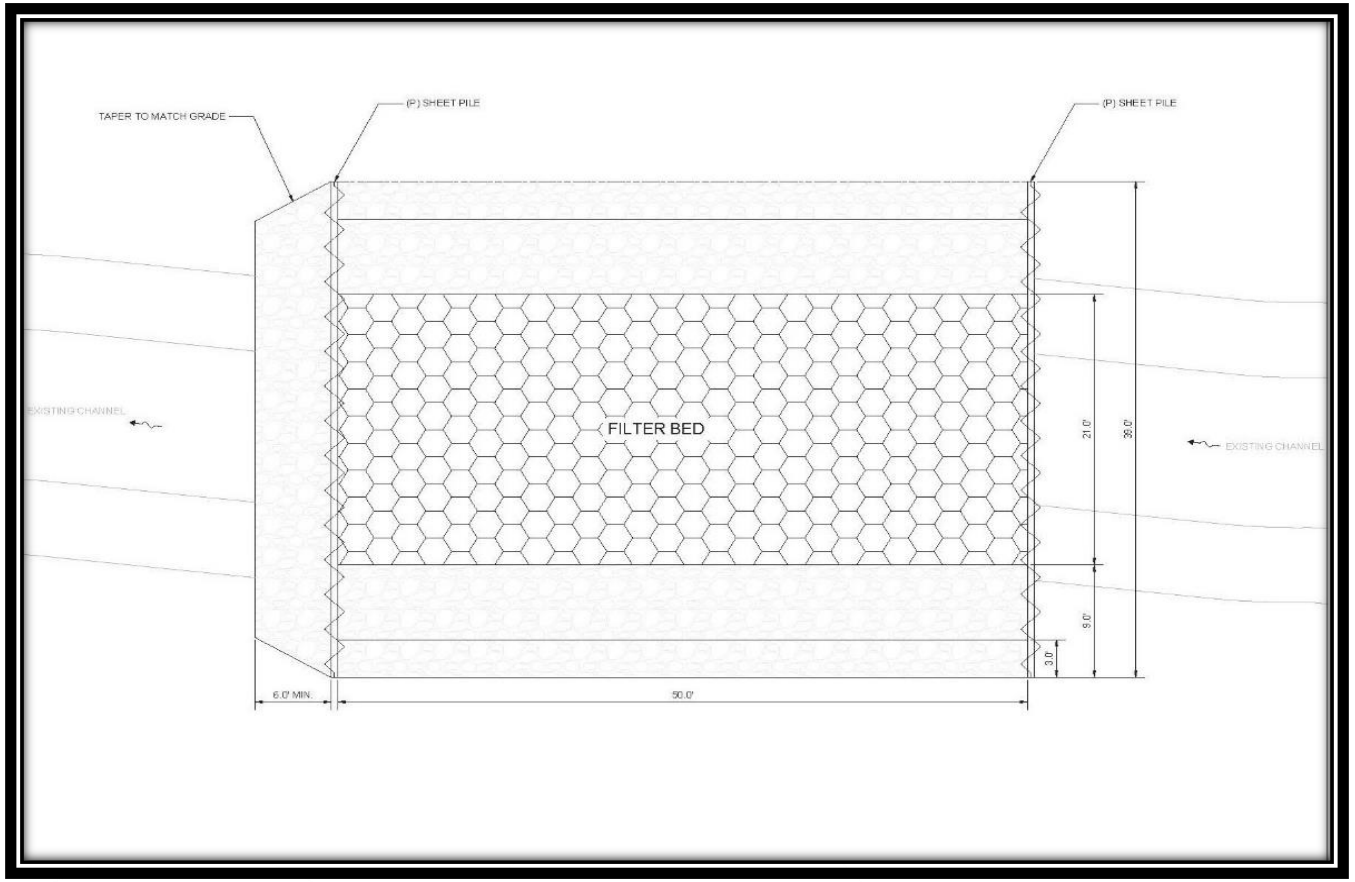


Weir Project Concept

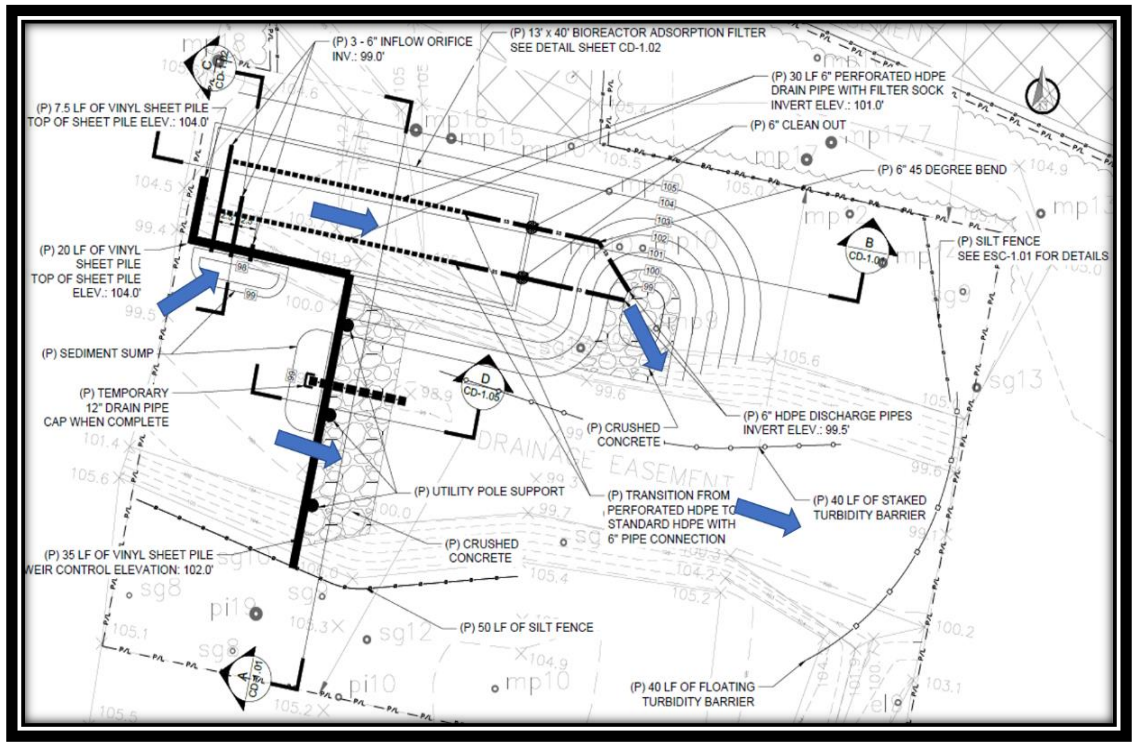
- Treatment concept based on phosphorous adsorption with metals such as Fe and Ca
- Suggested media included limestone (Ca)
- Cost effective solution at reducing phosphorous loading to Newnans Lake and Gum Root Swamp

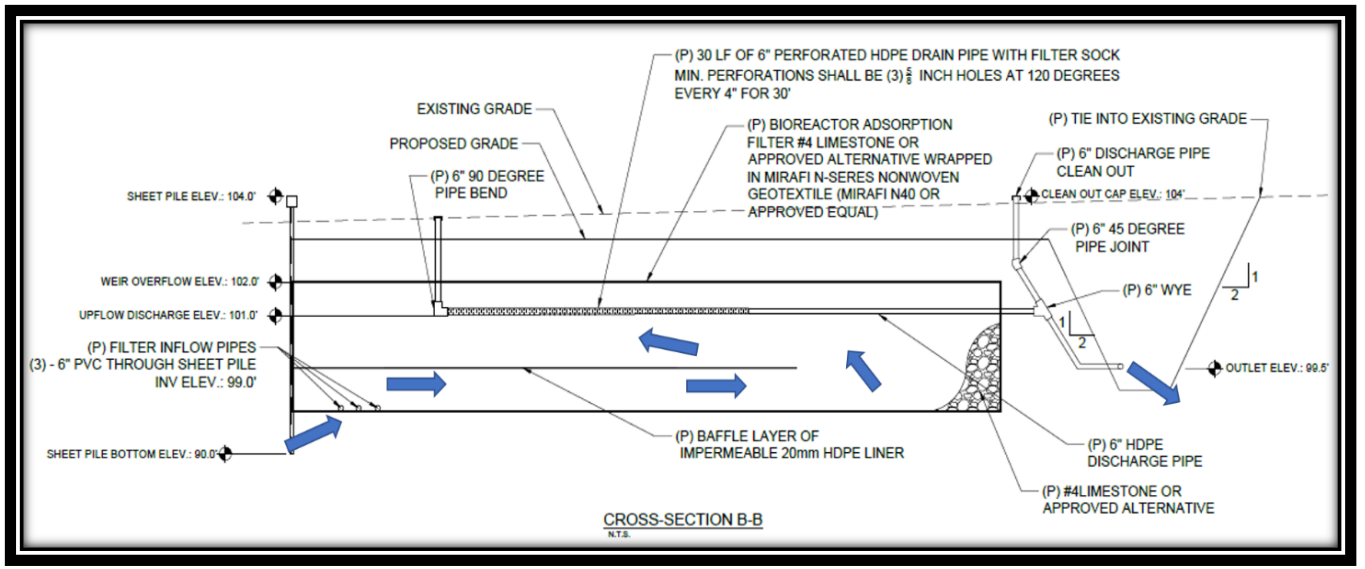


Design and Permitting



Design and Permitting





	Original Deadlines	Revised Deadlines
Weir completion	March 31, 2019	December 31, 2020
Final report	December 31, 2019	July 31, 2021

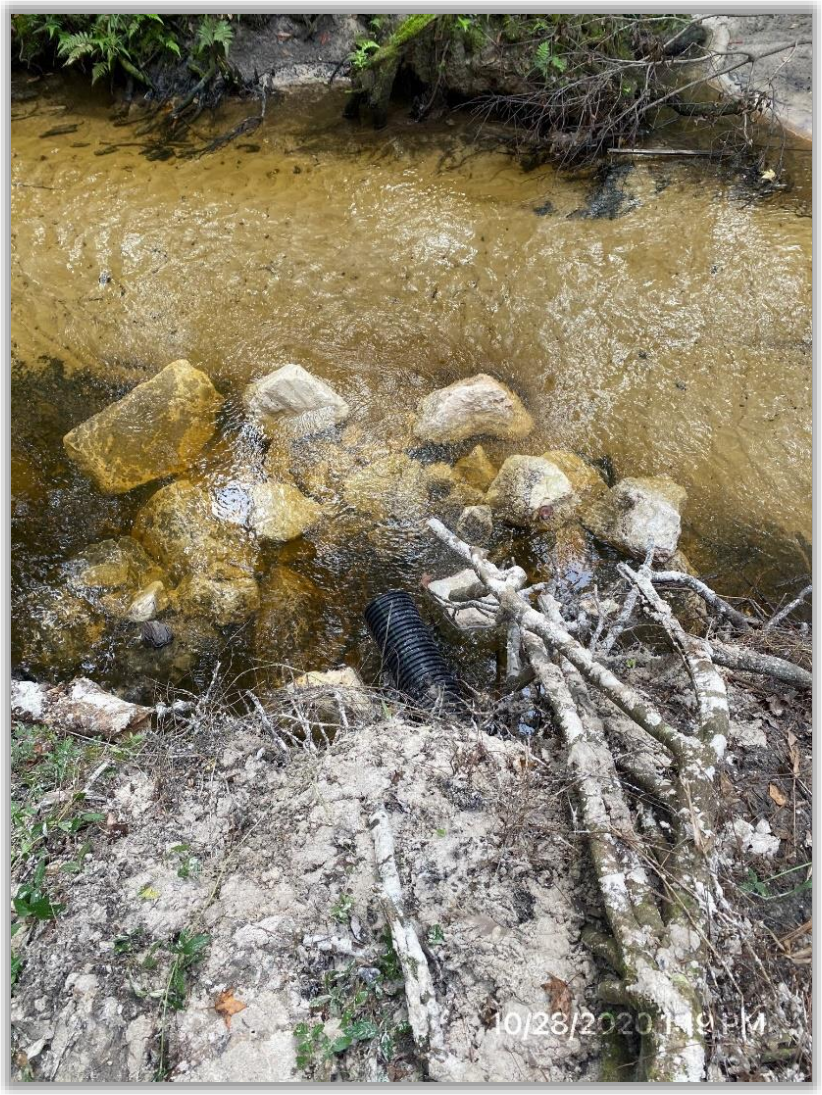
*Weir installation: end of September 2020-mid November 2020, 6 weeks

Weir Installation


09/30/2020 11:27 AM


10/28/2020 1:19 PM


11/04/2020 1:16 PM


10/28/2020 1:19 PM

Completed Weirs

Downstream Weir Damage

Impact of Damage to Downstream Weir

- Breach allows most flow to bypass the reactor.
- Orthophosphate discharge from the reactor significantly rose compared to the creek immediately upstream.
- County expects to repair the weir in fall of 2021.

Monitoring Plan

- 5 sample points to assess the weir/bioreactor performance:
  - LHCDOWN
  - LHCWEIR2
  - LHCMID
  - LCHWEIR1
  - LHCUP

Monitoring Results: Total Phosphorous and Orthophosphate (mg/L)

Sample Date	LHC Upstream	Bioreactor 1	LHC Between Weirs	Bioreactor 2	LHC Downstream
11/19/2020[1]	0.23	0.12	0.17	0.1	0.12
12/3/2020[1]	0.19	0.17	0.17	0.16	0.18
12/10/2020[1]	0.24	0.23	0.31	0.27	0.3
3/2/2021[1, 2]	0.213	0.171	0.166	0.304	0.174
4/22/2021[1, 2]	0.164	0.141	0.118	0.757	0.164
11/19/2020[1]	0.17	0.16	0.17	0.17	0.16
12/3/2020[1]	0.21	0.2	0.22	0.16	0.17
12/10/2020[1]	0.26	0.25	0.25	0.26	0.27
3/2/2021[1, 2]	0.131	0.145	0.133	0.252	0.131
4/22/2021[1, 2]	0.104	0.153	0.111	0.897	0.101

- Total Phosphorous (mg/L as P)
- Orthophosphate (mg/L as PO4)

1 November and December 2020 sample analyzed by ALS and the March and April 2021 samples were analyzed by Advanced Environmental Laboratories.

2 High flow events in February and March damaged the downstream weir resulting in a breach around the edge of the weir and sediment blockage of the intake

Monitoring Results: Total Nitrogen (mg/L as N)

Sample Date	LHC Upstream	Bioreactor 1	LHC Between Weirs	Bioreactor 2	LHC Downstream
11/19/2020[1]	1	1	1	1.92	1
12/3/2020[1]	1	1	1	1	1
12/10/2020[1]	1	1	1	1	1
3/2/2021[1, 2]	1.2	1.2	0.91	0.88	0.79
4/22/2021[1, 2]	0.588	0.705	0.647	0.775	0.818

1 November and December 2020 sample analyzed by ALS and the March and April 2021 samples were analyzed by Advanced Environmental Laboratories.

2 High flow events in February and March damaged the downstream weir resulting in a breach around the edge of the weir and sediment blockage of the intake

Individual Weir and Bioreactor Performance

- 1st sampling event showed best performance
- Average treatment efficiency for TP is 20% in each bioreactor

Difference in Upstream and Bioreactor Outflow TP Concentration (mg/L as P)						
Sample Date	**LHC Upstream**	**Bioreactor 1**	**Difference**	**LHC Between Weirs**	**Bioreactor 2**	**Difference**
11/19/2020	0.23	0.12	0.11	0.17	0.1	0.07
12/3/2020	0.19	0.17	0.02	0.17	0.16	0.01
12/10/2020	0.24	0.23	0.01	0.31	0.27	0.04
3/2/2021	0.213	0.171	0.042	-	-	-
4/22/2021	0.164	0.141	0.023	-	-	-

Individual Weir and Bioreactor Performance

- Orthophosphate appears to inefficiently adsorbed
  - When orthophosphate is expressed as P, the concentrations are lower than reported in the Phase 1 report.
- Removal appears to be other forms of phosphorus

Difference in Upstream and Bioreactor Outflow Orthophosphate Concentration (mg/L as PO_4)						
Sample Date	**LHC Upstream**	**Bioreactor 1**	**Difference**	**LHC Between Weirs**	**Bioreactor 2**	**Difference**
11/19/2020	0.17	0.16	0.01	0.17	0.17	0.0
12/3/2020	0.21	0.2	0.01	0.22	0.16	0.06
12/10/2020	0.26	0.25	0.01	0.25	0.26	-0.01
3/2/2021	0.131	0.145	-0.014	-	-	-
4/22/2021	0.104	0.153	-0.049	-	-	-

Performance as a Treatment Train

- The idea of installing two weirs and reactors is that they would function as a treatment train.

- The treatment efficiency as a treatment train was lower (10%) than the treatment within an individual reactor (20%).
  - At each sampling event there was flow was bypassing the reactors.
  - All five events. December event where TP increased between weirs heavily influences the treatment efficiency as does damage to the downstream weir.

In Conclusion

- While more data is needed to establish long term treatment efficiency, results to date show 68-100 lbs/yr of TP removed.
- Orthophosphate contributed less to the TP load than expected.
- The creek may not be at base flow conditions very often or the hydraulic capacity of the reactors is less than expected.

Questions