LSC SPDES Phosphorus Offset compliance and NYSDEC Watershed Best Management Practice Tool

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A note about this presentation

Discussion of BMP's evaluated, timeline of regulations and impacts

Not discussing the permitting process and calculations of cooling loads

This photo by Disney

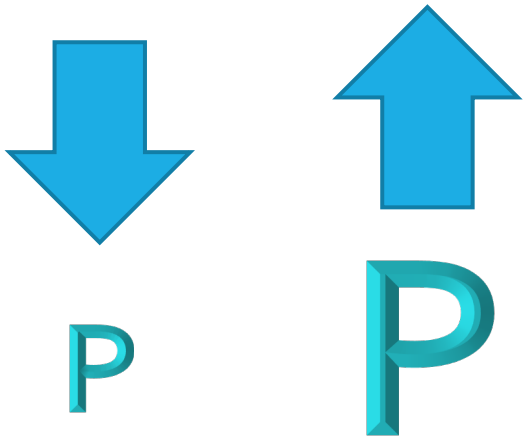
Demonstration of tool provided by NYSDEC

Kara Bugis, P.E., Sr. Water Compliance Specialist

THE UNIVERSITY OF MEMPHIS
Herff College of Engineering

CELEBRATING 50 YEARS
of the
CLEAN WATER ACT

The Lake Source Cooling SPDES permit was modified in June 2020 to contain a special condition for phosphorus offsets of all new loads.

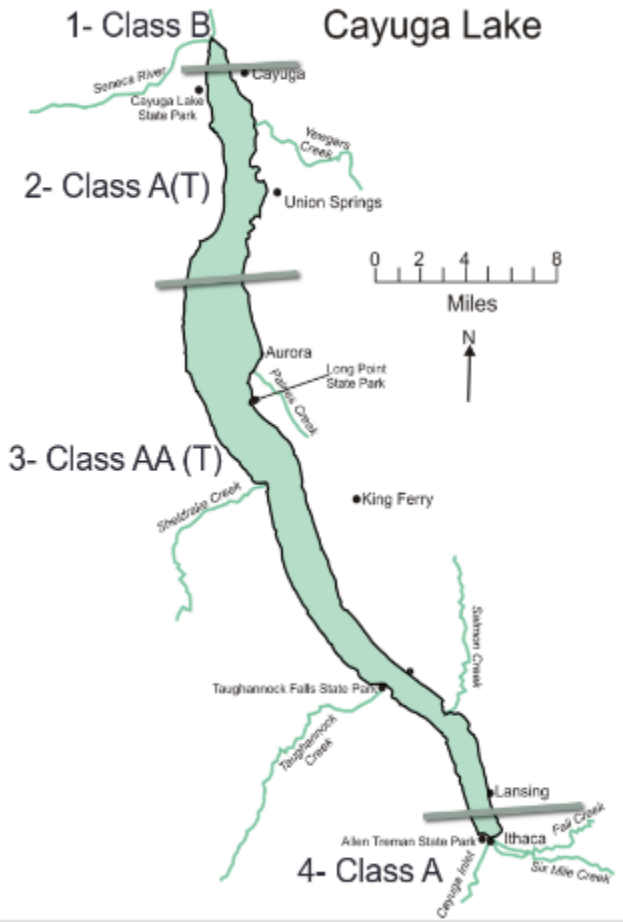


2:1 offset to connection loading when utilizing a watershed BMP

Must be on University owned property or with a legally binding contract

Stormwater offsets must be in addition to what is required by the SPDES Construction General Permit

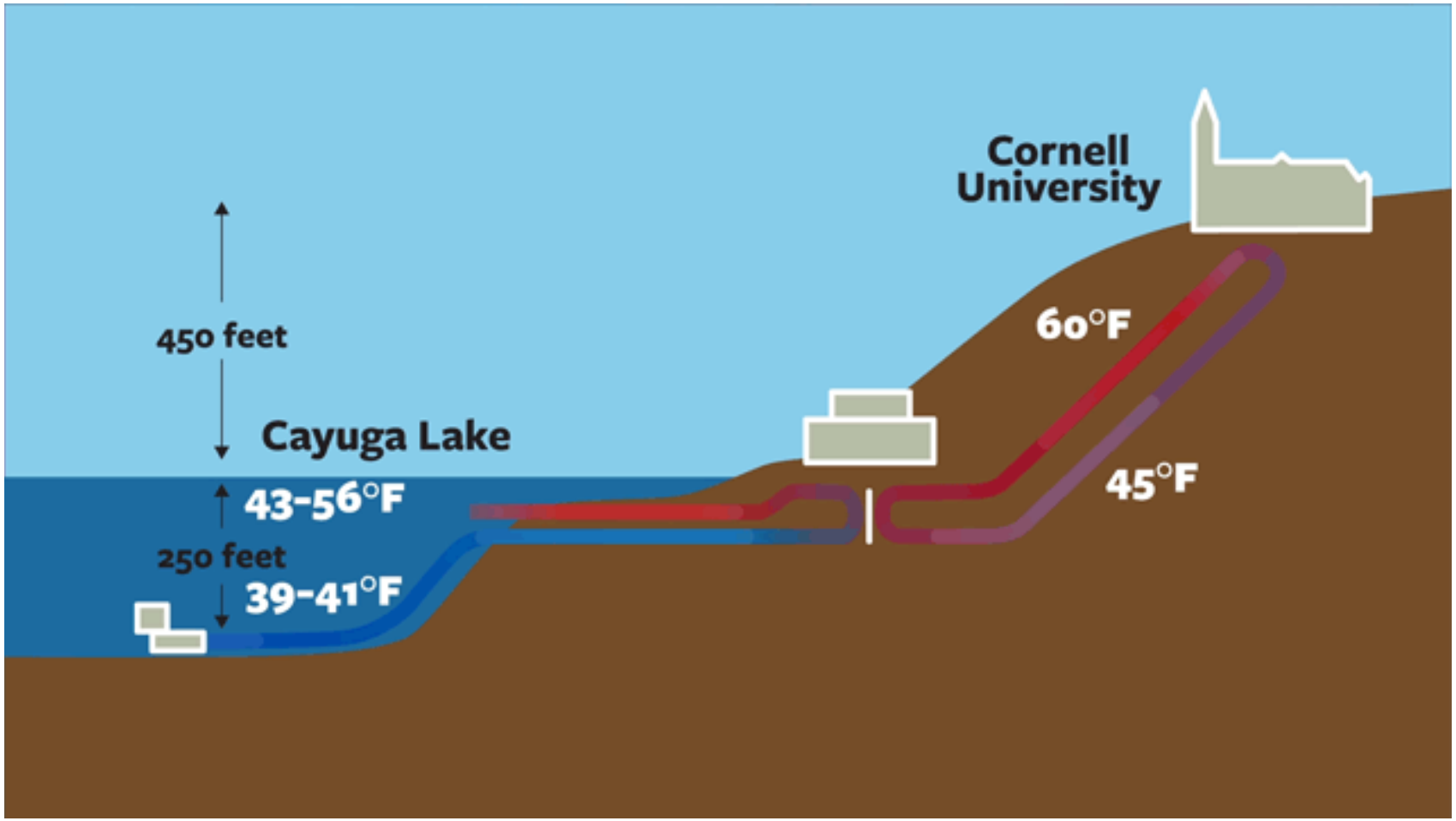
Why is Phosphorus being regulated?



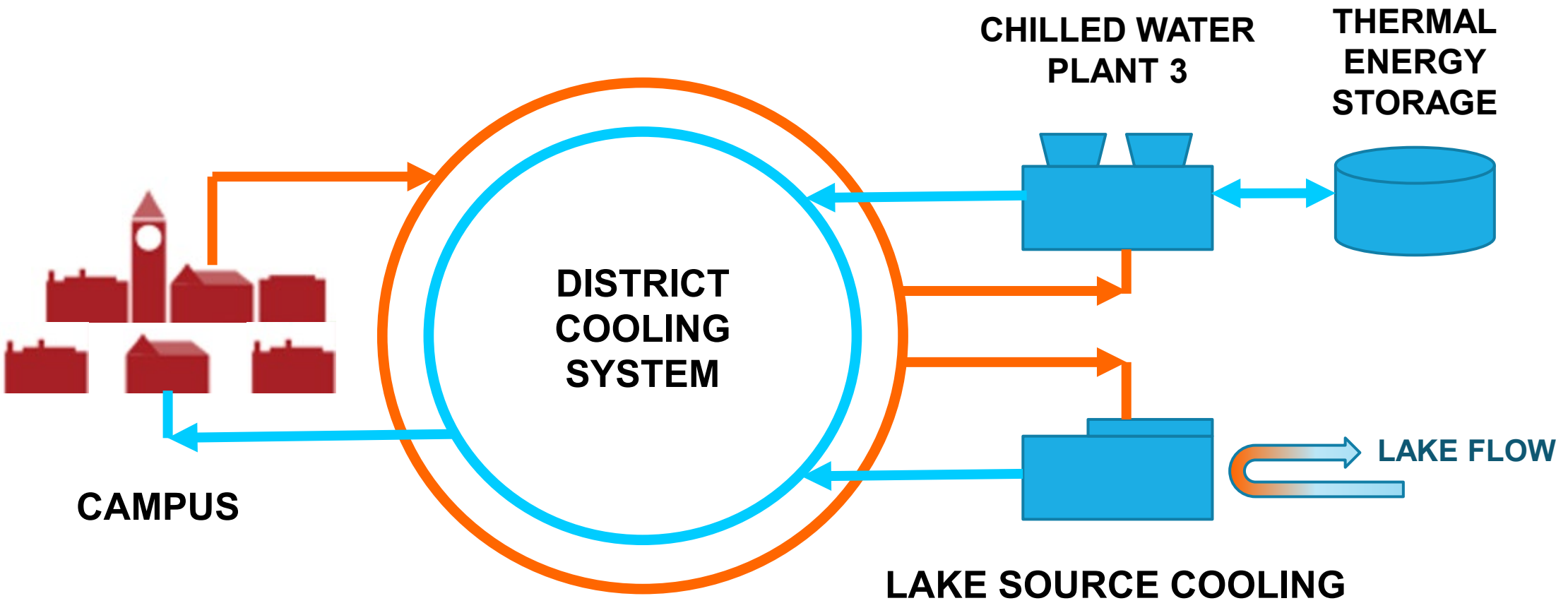
DEC classifies Cayuga Lake in four segments, depending on "best use"

Segment 4 on Part 1 of 303(d) list since 2002- excessive phosphorus, silt/sediment – requires TMDL

How is Total Phosphorus (TP) Involved in Cooling?



CORNELL DISTRICT COOLING SYSTEM

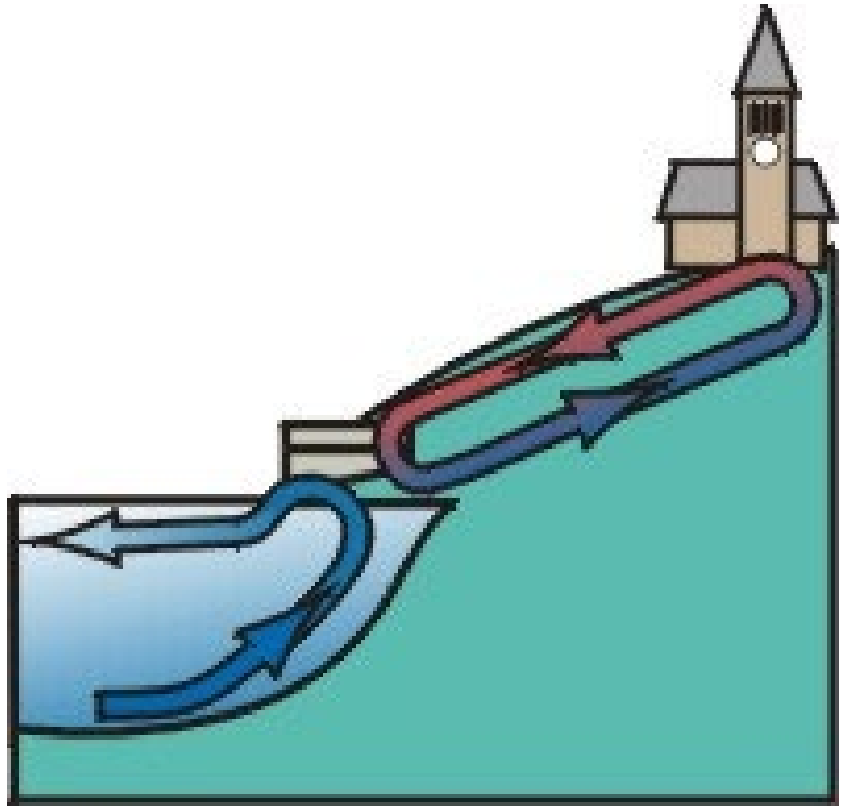


Two ways to obtain P offsets

1. Ancillary Changes" - Any change in production, physical assets or operationally, that reduces lake water flow through LSC.

2. P Offset project

- Property owned/operated and maintained by Cornell, are property Cornell has documented legal rights of use.
- BMPs that remove or divert P from subwatershed tributary to the impaired waterbody segment (segment 4) or the intake waterbody segment (segment 3)
- Stormwater BMPs above the minimum required may be submitted as a P offset.



A Timeline of Compliance Requirements

January: Renewed SPDES Construction GP

June: Lake Source Cooling SPDES Permit modified to include Phosphorus Offset Special Conditions

2020

2021

June: Cayuga Lake Phosphorus Impairment Draft TMDL issued

February: Renewed SPDES MS4 Draft General Permit issued for Review

September: DEC provides CU with spreadsheet with calculations for offset banking and ledger

October: Draft Stormwater Design Manual Issued for review

2022

2025

Est January: Renewed SPDES Construction GP, any TMDL that is final prior to renewal will be included and required to include enhanced phosphorus removal

Choices of Watershed Offsets

Large, Focused Projects

- Streambank restoration
- Golf Course Infiltration/runoff reduction
- Agricultural BMPs – Riparian grass or forest buffers
- Green upgrades to parking and other paved areas
- Land Acquisition

Small Stormwater "Upgrades"

- Until the TMDL is final, the DEC will give a 50% credit to stormwater infrastructure for projects over 1 acre designed in accordance with the NYSDEC Stormwater Management Design Manual, Chapter 10.
- Any project under 1 acre that is designed within standard stormwater designs will get credit for any BMP

STORMWATER INFRASTRUCTURE

Underground Sand Filter

Used in many spaces on campus: AHDC, Weill, NCRE, more

Completely underground, can be under a parking lot or a courtyard

53% phosphorus removal credit

Lifespan estimate of 50 years

No current campus cost estimate of this technology.

Prefabricated Structures

- Proprietary (Jellyfish Filter)
- Jellyfish Unit and Install - $60,000
- Treatment Area=8230 sqft, 0.19 acres
- 59% phosphorus removal
- Life span of 50 years (excluding maintenance cost)
- = $8,000 /lb/yr cost

https://www.conteches.com/stormwater-management/treatment/jellyfish-filter?utm_term=&utm_campaign=Stormwater+DSA&utm_source=adwords&utm_medium=ppc&hsa_acc=5689733370&hsa_cam=8774016693&hsa_grp=91140834849&hs

Bioretention

- Actual Cost from NCRE
- ~$45k for a filter that treated almost ½ acre of impervious or ¾ acre total drainage
- 59% phosphorus reduction
- Gets some runoff reduction credits
- 20-30 year life span
- =$4,200 /lb/yr

Stormwater Practices as Offsets

Pros

- Established steps and processes for compliance
- DEC readily will accept a model if it is within the NYSDEC Stormwater Design Standards
- Longevity of well maintained systems

Cons

- Difficult to achieve enhanced phosphorus design without significant runoff reduction of either permeable pavement, often with an underground sand filter required because of low infiltration rates in soils on campus
- Larger footprint for projects and unable to redevelop that area for future buildout without significant design work
- Infeasible once TMDL is final

Need to create a Cornell Design Standard for Stormwater Structures

- Note, these estimates for cost were from studies prior to 2019 and don't include maintenance.

Practice	Total Phosphorus Reduction	
	Average Reduction (%)	Expected reduction range ($/lb.)
Bioretention	59%	$1,300-$3,400
Dry Pond	16%	$10,600-$40,000
Infiltration System	66%	$100-$3,400
Level Spreader-Filter Strip	38%	$3,700-$4,800
Permeable Pavement	61%	$12,500-$32,100
Proprietary Structure	46%	$7,600-$43,800
Riparian Buffer	48%	$100-$400
Sand Filter	53%	$4,500-$22,200
Stormwater Wetland	48%	$300-$6,700
Stream Restoration	No Data	N/A
Treatment Swale	44%	$1,600-$2,900
Wet Pond	44%	$1,600-$2,900

Eco Logic Report, 2022

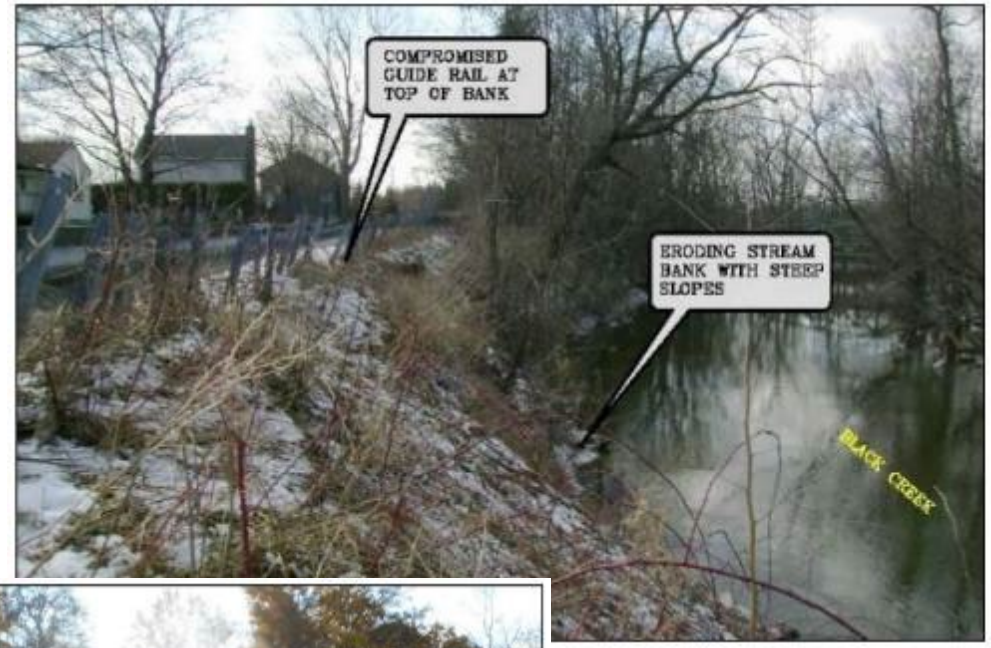
PHOSPHORUS OFFSET PROJECTS

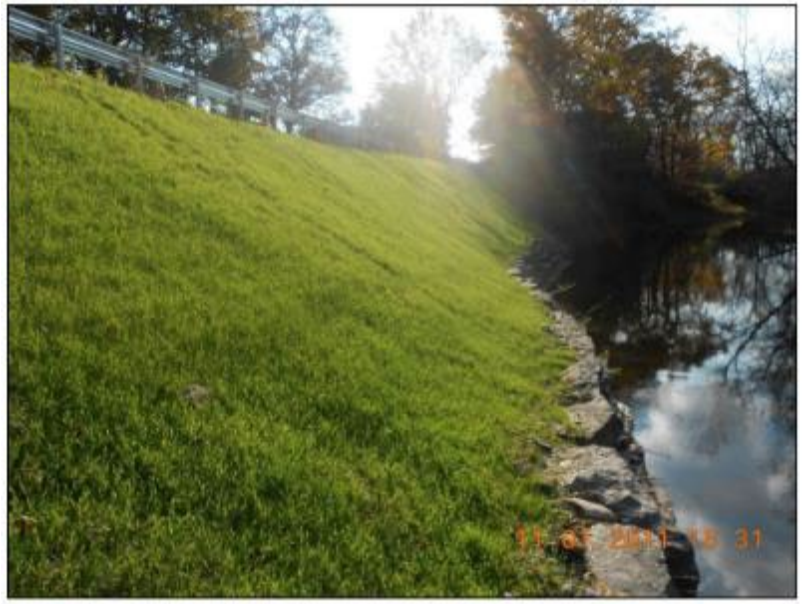
Stream Bank Restoration

This example – 125 ft of stream bank restored in 2011 at a cost of $75k, $30 funded by grants.

Assuming 2x the cost now, the cost per lb of phosphorus would be ~$1,500/lb/yr based on the project implementation lasting for 10 years.

https://www.glc.org/work/sediment/apply-2022





http://blackcreekwatershed.org/docs/BCWC_Article_GLC_Project_2011.pdf

Land Acquisition and Conversion – Cornell Lands

Riparian Buffer Strip - Forest Conversion

Grass Buffer Strip

Grants available

https://www.dec.ny.gov/pubs/115920.html#Land_Acquisition_Project_Documents

Other Project Possibilities on Campus

- Golf course infiltration and irrigation, in discovery phase
- Wetland rehabilitation and connection, a passion of the Botanic Gardens with carbon sequestration potential
- Campus-wide watershed model for stormwater modeling and project planning
- Bioretention amendments with drinking water treatment residuals

Current Projects Under Consideration

For reference, we currently forecast the need for offset by 2024 to be as much as 32 lbs per year.

Project Name	Type of Project	Phosphorus Offset lb/yr	Cost of Project	Secondary Benefit
CIS Enhanced Stormwater	Stormwater	0.71	Unknown	N/A
Baseball Field Wet Pond upgrade	Stormwater	0.51 Or 0.27	Est $250k Or Est $50k+	Carbon sequestration (?)
Fall Creek Streambank (250 ft)	Capital Project	17	Est $300k+	Drinking Water Source Protection
Golf Course Enhanced Phosphorus	Capital Project	26.6	Unknown	Irrigation for Golf Course
CHESS-NEH Infiltration upgrade	Stormwater	0.25 up to 6.3 if drainage is sufficient	Unknown, in discovery	N/A

Operation and Maintenance Compliance

- Mimic inspections and report required by the Town of Ithaca OMRA and CAFO permit reports.
- The university utilizes "Maximo" as their maintenance and asset management system
- In process of creating a whole stormwater asset management program which will include LSC offsets

Next Steps

- For projects under consideration, submit a design document for NYSDEC approval.
- Understand how the stormwater infrastructure might be affected by municipal approvals
- Finding the funding
- Finding the resources
- Campus-wide watershed model