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Existing Stormwater Management Facilities



15,000

Municipal Stormwater Management Facilities

2/3

Constructed after 1999

Source:



Statistics
Canada

Statistique
Canada



TARGETED VEGETATION PLANTINGS

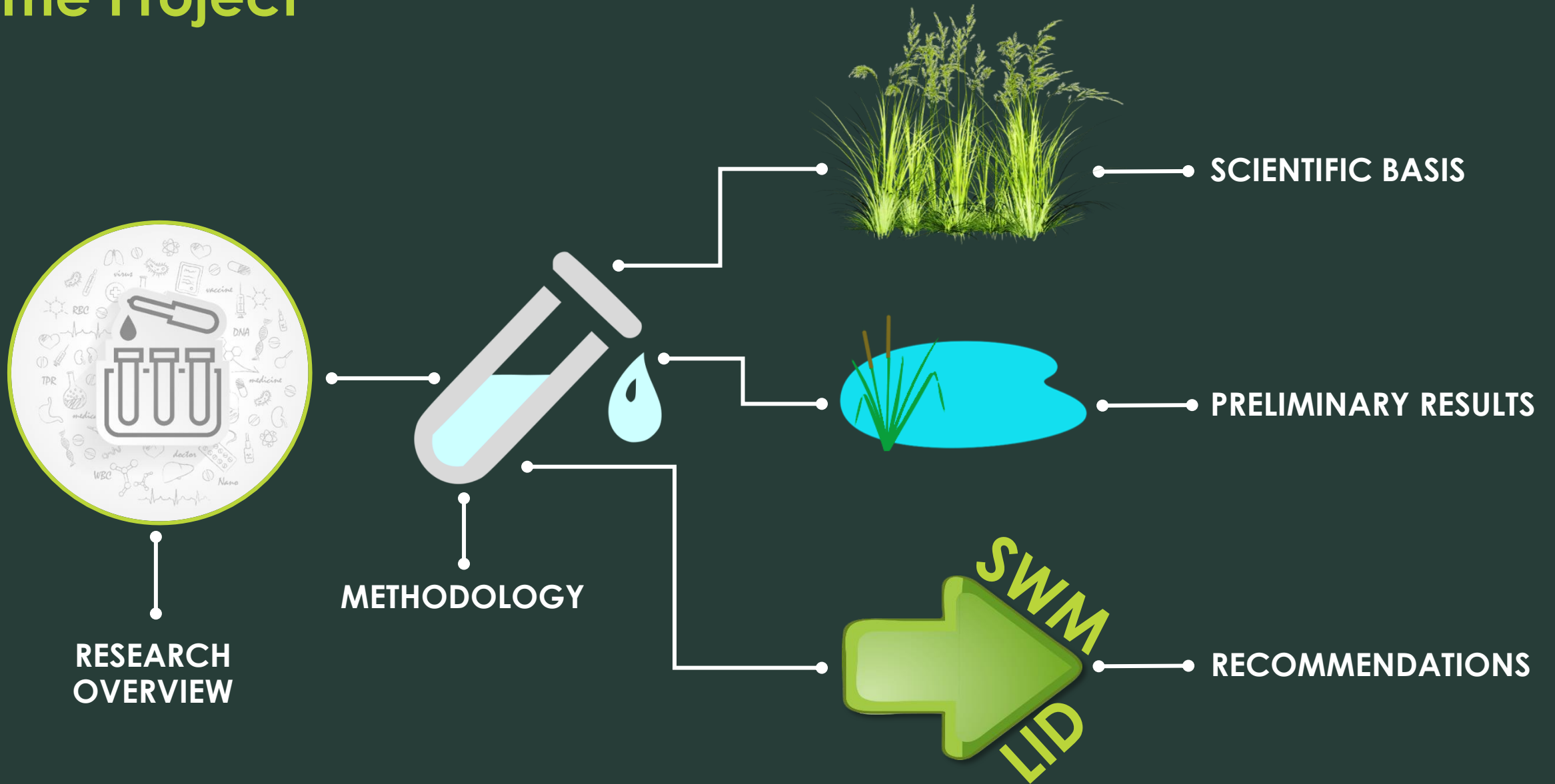
To Enhance Function in Stormwater Management Facilities

TRIECA CONFERENCE - MARCH 21, 2019

Dr. Kevin Stevens | Wilfrid Laurier University

Nick Mocan, M.Sc., P.Eng. | Crozier & Associates Consulting Engineers

The Project



The Team



Dr. Kevin Stevens



Nick Mocan, M.Sc., P.Eng.



Engage Grant



The Site



LOCATION

- ✓ Subdivision
- ✓ Coldwater Creek
- ✓ CVC Watershed



SAMPLING

- ✓ Wet Pond
- ✓ Vegetation Survey
- ✓ Hydraulic Monitoring
- ✓ Water Quality Sampling



ANALYSIS

- ✓ Removal Efficiencies
- ✓ Key Observations
- ✓ Recommendations

The Source

Three main ways phosphorus enters watersheds:

#1



Urban Runoff

#2



Agricultural Runoff

#3

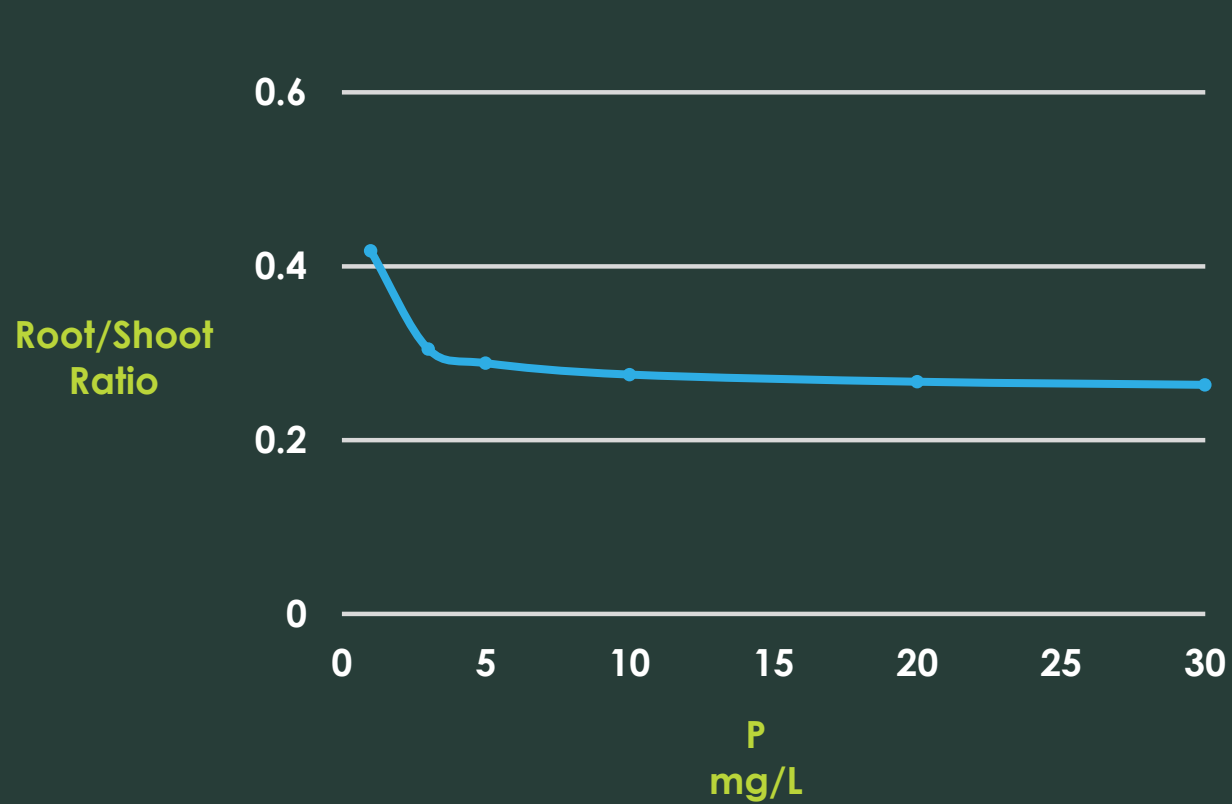


Wastewater Treatment
Plants

The Impacts



The Impacts



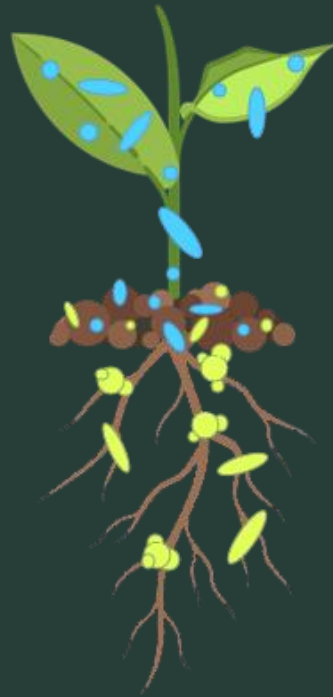
Source: Adapted from Kim & Li, 2016.

The Science

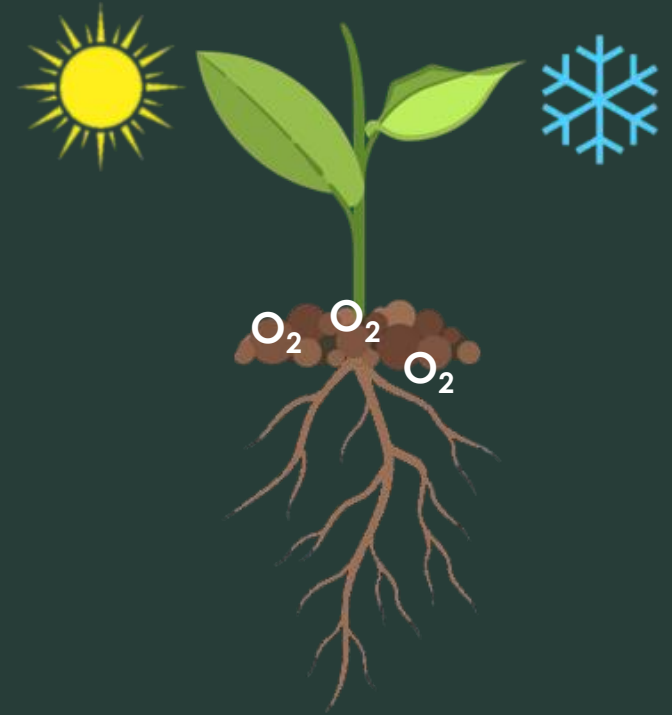
Directly uptake
nutrients



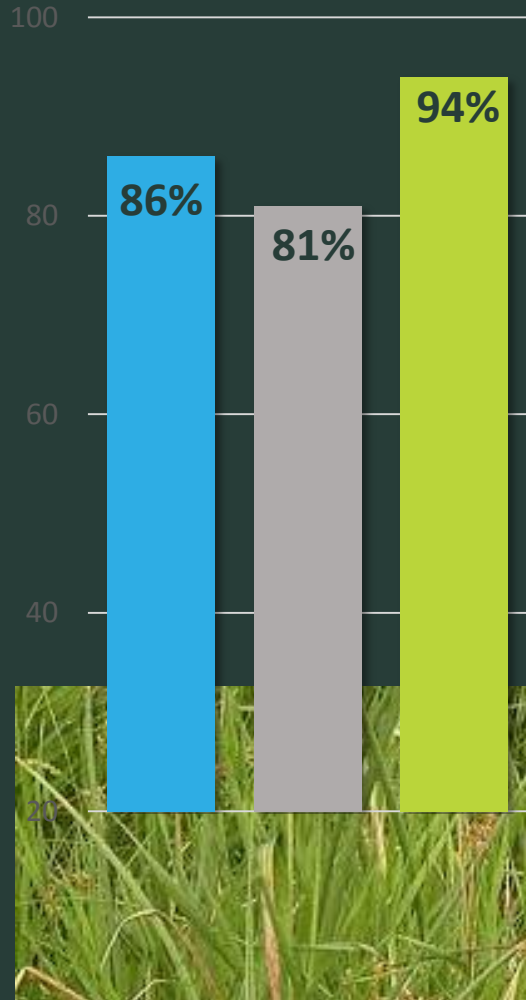
Provide a haven
for microbes



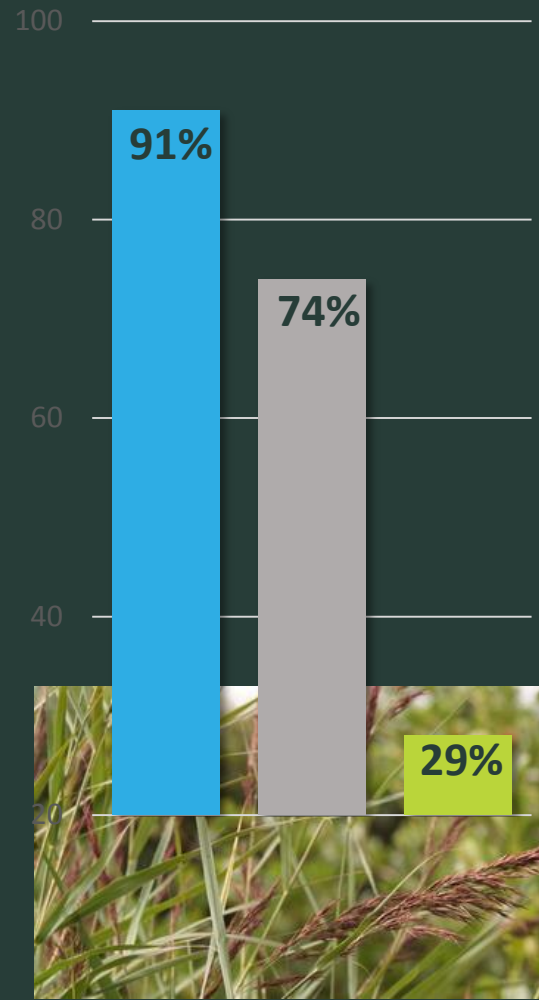
Re-oxygenate soils
(all seasons)



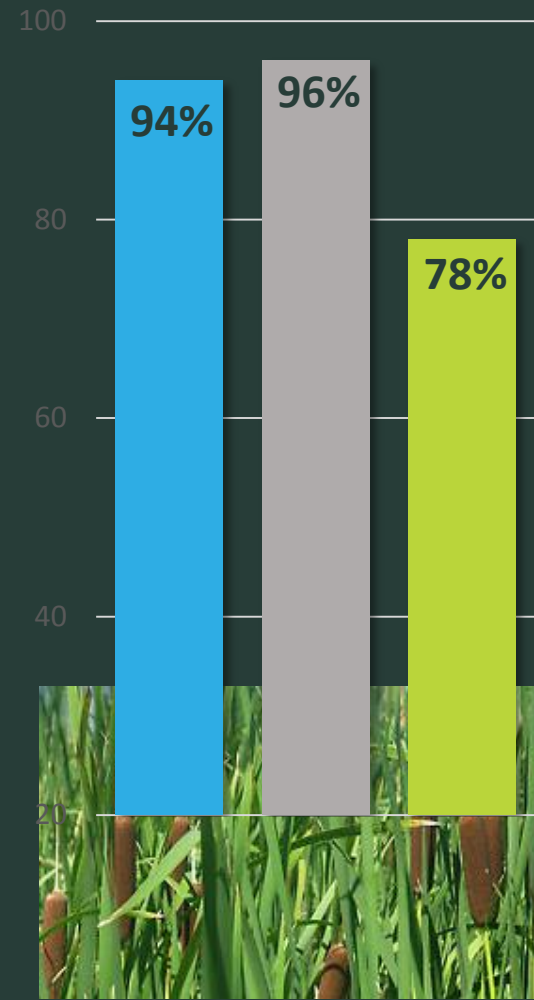
The Science



Scirpus Validus
(Bulrush)



Phragmites Communis
(Common Reed)

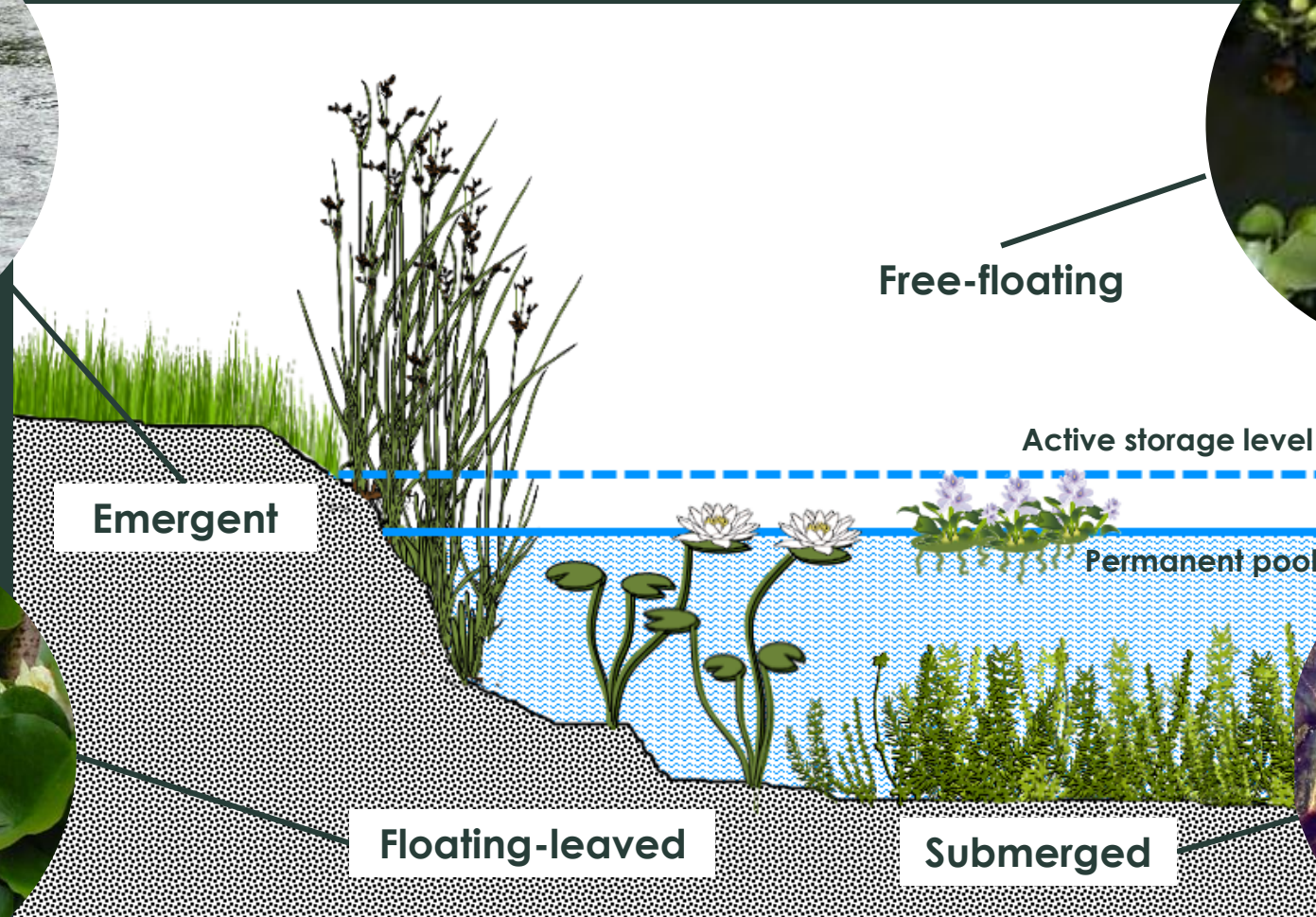


Typha Latifolia
(Cattail)



Source:
Gersberg et al. 1986

The Science



The Methodology

Vegetation Survey

- ✓ Vegetation sampled Fall 2018
- ✓ Identification using Michigan Flora



Hydraulic Monitoring

- ✓ Water depth: HOBO water level data logger (up to Dec 18)



Water Quality Sampling

- ✓ Water samples collected at inlet & outlet
- ✓ pH, salinity, conductivity, K, NH₃, NO₃⁻, NO₂⁻, N₂, TP, O₄P-3, Cl⁻, TSS



ANALYSES: YSI Professional Plus Multiparameter Meter, Hach SR3900 Spectrophotometer, Gravimetric: Total Suspended Solids

The Species

Alismataceae

Alisma subchordatum

Apiaceae

Daucus carota

Asteraceae

Erigeron strigosus
Euthamia graminifolia
Eutrochium maculatum
Lactuca sp.
Solidago canadensis
Symphotrichum ericoides
Symphotrichum lateriflorum
Symphotrichum novae-angliae

Cornaceae

Cornus stolonifera

Cyperaceae

Eleocharis obtusa
Scirpus atrovirens
Shoenoplectus tabernaemontani

Fabaceae

Securigera varia
Trifolium hybridum

Juncaceae

Juncus tenuis

Lythraceae

Lythrum salicaria

Poaceae

Echinochloa muricata
Leersia oryzoides
Panicum capillare
Setaria viridis
Phragmites australis

Polygonaceae

Persicaria hydropiper
Polygonum tenue

Rosaceae

Rumex crispus
Spirea alba

Salicaceae Typhaceae

Salix* sp.** ***Typha latifolia



28

Species

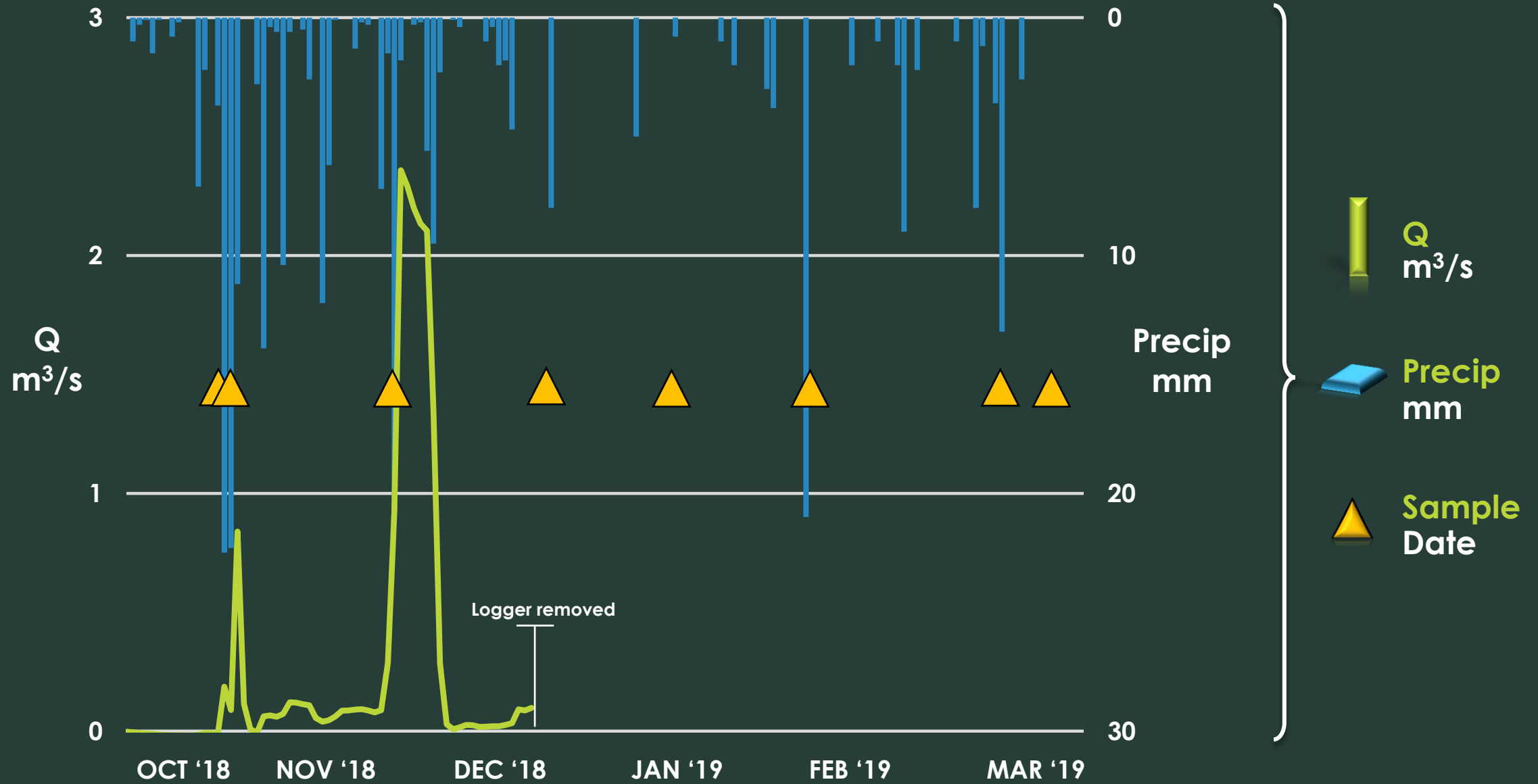
13

Families

7

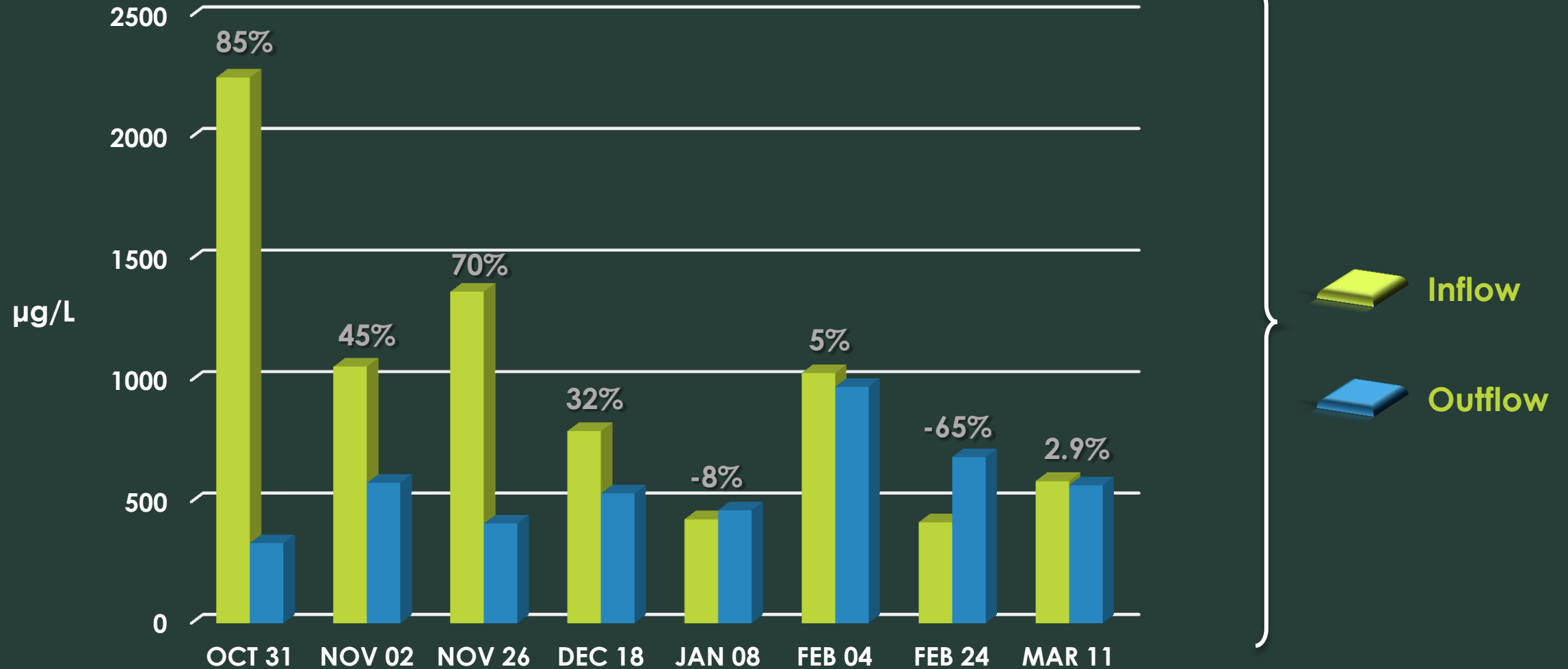
Introduced Species

The Monitoring



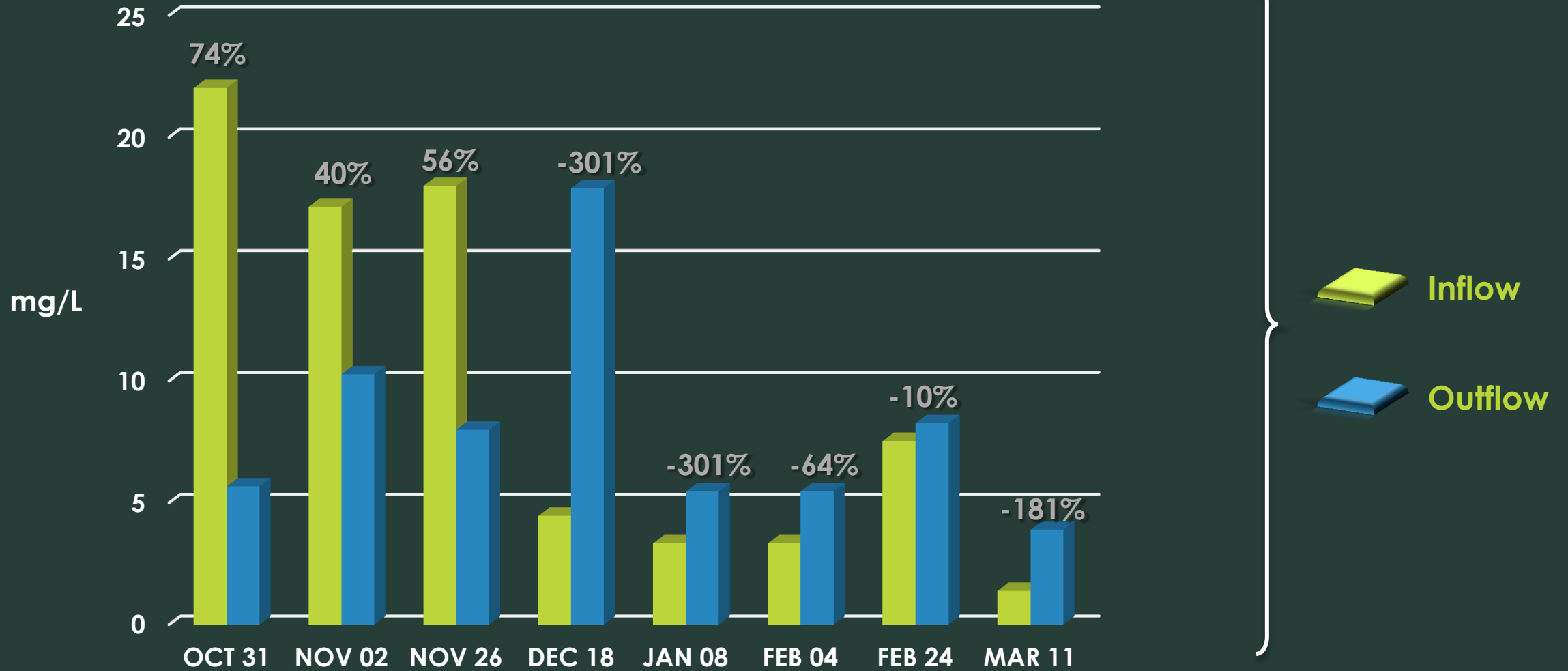
The Phosphorus

Total Phosphorus Concentration, $\mu\text{g/L P04 3-}$



The TSS

Total Suspended Solids Concentration, mg/L



The Results

Vegetation Survey

- ✓ **Plant Diversity**
Species richness higher than anticipated due to “volunteer” species



Hydraulic Monitoring

- ✓ **Water Depth**
Year round functioning of SWM



Water Quality Sampling

- ✓ **Phosphorus:**
seasonal effects
- ✓ **Total Suspended Solids:** seasonal effects



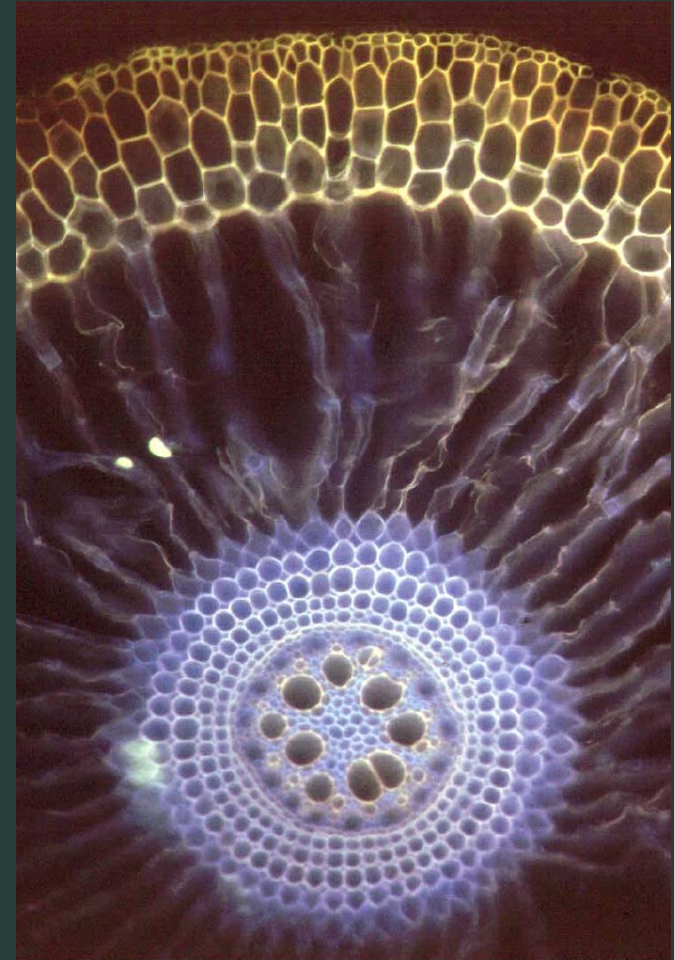
The Enhancements

Cold tolerant species



The Enhancements

Sediment Oxygenation



The Future



RESEARCH

Climate change
Winter rainfall
Chloride levels



MONITORING

Rainfall gauges
Continuous chemistry
Multiple seasons



SITES

Wetlands
Varied climates
Aging facilities



PARTNERS

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QUESTIONS



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