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Windermere Wetland: A Recent History

Contamination, Remediation,
Restoration, Monitoring and
Management

May 2023





Potential Transformation?

History:

Wetland used as sediment trap, full in 2000, end of design life

Challenge:

‘We have been working on improving this environment for years. What makes you think this time will be different?’



Project Environment – Discovery Phase



Policy and Community

Hamilton Wentworth Regional Office for RAP Report Stage 2

Public Advisory Group Bay Area Restoration Council

Constraints

-
- Environment • CSO, Sediment, Water Quality
 - Constructability • Geotechnical
 - Health Risks • Human Health
 - Ecosystem Design • Ecological Health
 - Urban Environment
 - Open System
 - Invasive Species
 - Re-establish Native Species

Anticipated Outcomes



Reality Check



Wildlife & Aquatic Survey

Wildlife Survey

- The Basin is home to 3 nesting colonial water bird species: ring-billed gulls, common tern, and black-crowned night heron
- Four species of duck make use of the open water in the Basin year-round: Scaup, Mallard, Black Duck, Ruddy Duck



Aquatic Survey

- Fish caught in the Basin included: common carp, largemouth bass, common shiner





Water Quality Assessment

To provide a general indication of the water quality characteristics of the Basin under two scenarios:

- Low flow / dry event conditions (end of summer/early fall)
- High flow/storm event conditions when the Combined Sewer Overflow (CSO) is discharging into the Basin





Sediment & Water Quality Conclusions

- Sediments exceed the SEL, PWQO or CCME guidelines
- Risks associated with the sediment and water quality were investigated through human health and ecological risk assessment
- Opportunities to mitigate conditions through the design process





Planning – Design Charette

Broad Discussion – Open Palette

- **Manage contaminated sediment**
- **Source water**
- **Sediment transport**
- **Wetland Features**
- **Vegetation**
- **Nesting Birds**
- **Other Wildlife**
- **Fish**
 - Community type
- **Invasive Species Management**
 - Vegetation
 - Fish species

Competent
Multidisciplinary
Team



Implementation Then: Pre-Restoration



8 June 2010
File # 2u4q4056

Remediation & Restoration

Channel construction nearing completion

Isolate wetland
from CSO

Channel objectives

- Isolate wetland from treated effluent
- Provide sediment transport





Remediation & Restoration Activities





Reconfigured 2010 - 2011

Features

- Finger Dykes
- Tern Islands
- Fishway



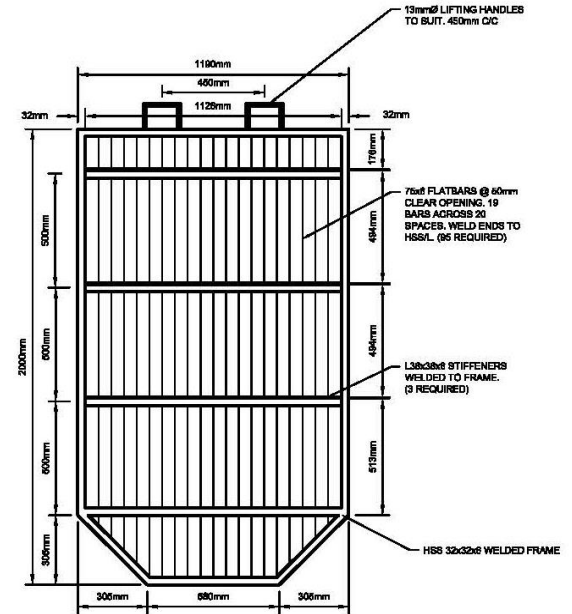


Fishway Adaption





Fishway Design – Carp Exclusion



FISH GRATE DETAIL - 50mm CLEAR OPENING
N.T.S.



Monitoring Approach

- Spring
 - Coincide with spawning periods for fish species found in Redhill Creek
- Fall
 - Coincide with the onset of winter conditions when fish might move from the wetland to Redhill Creek



Common White Sucker, *Catostomus commersonii*



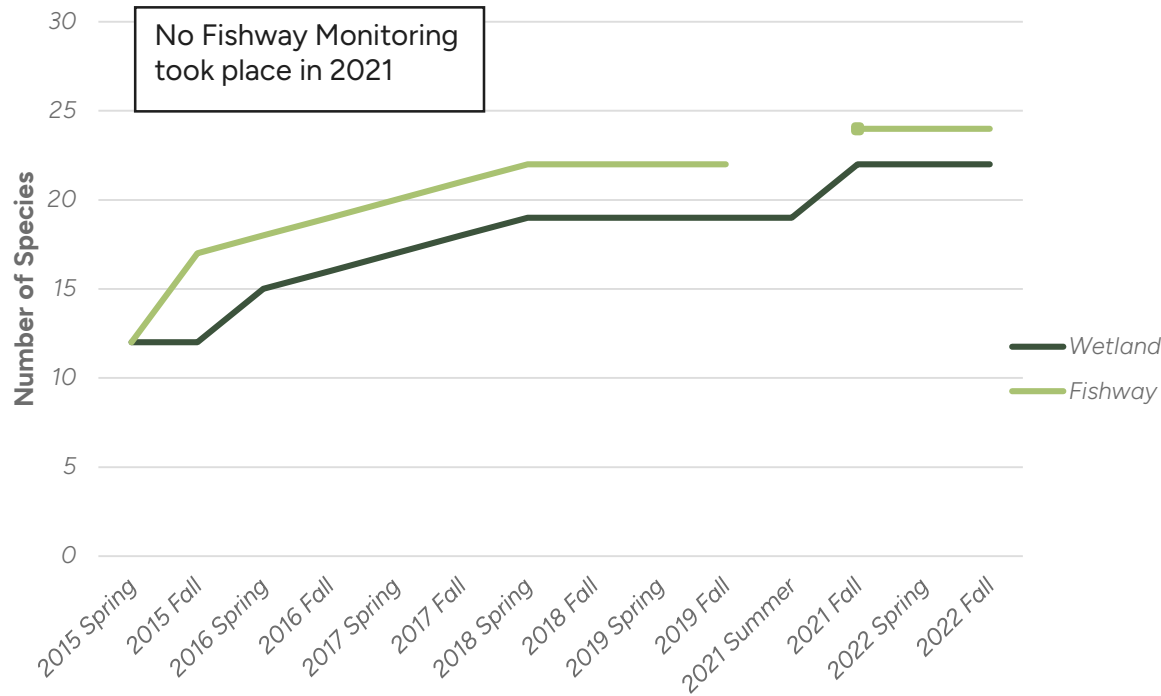
White Perch, *Morone americana*



Fathead Minnow, *Pimephales promelas*



Cumulative Number of Species Captured During Sampling Events 2015 - 2022

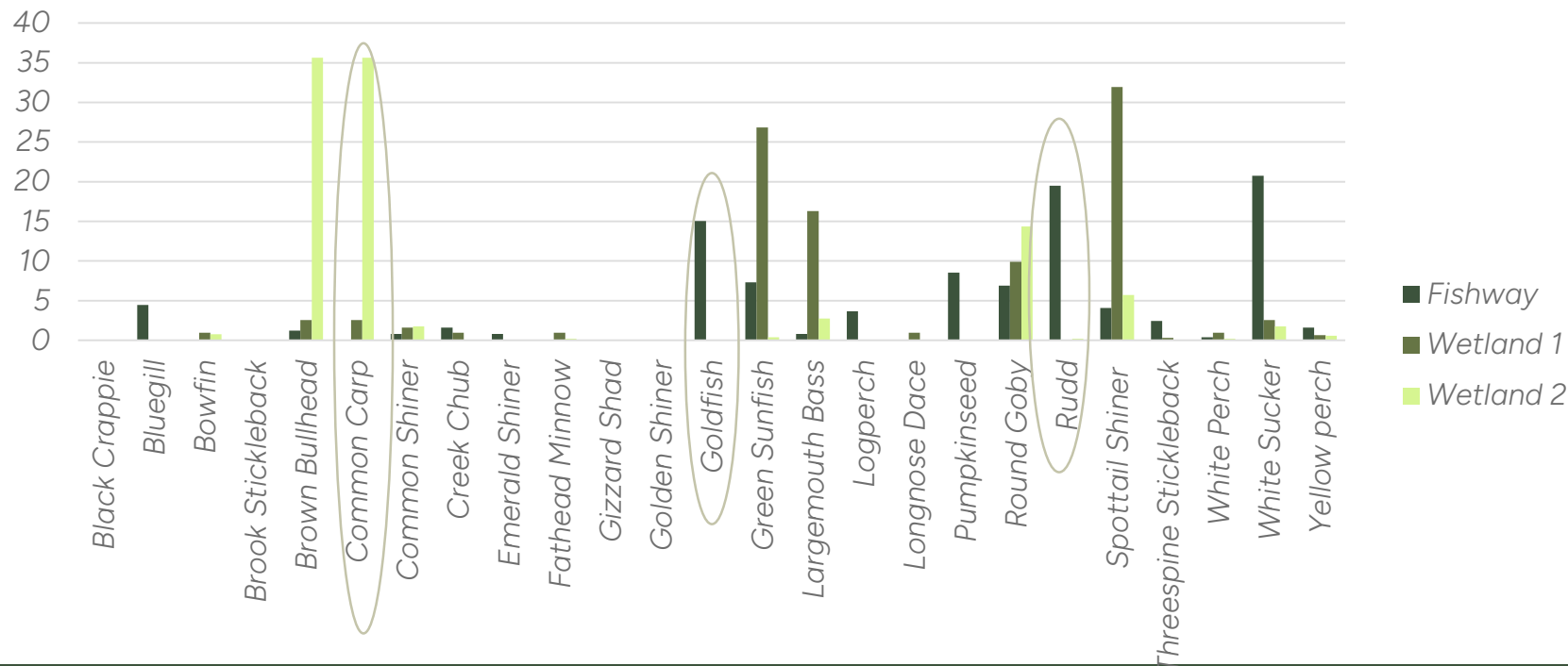


Fish Collections, Spring and Fall: 2015 - 2022



Invasive Species

2018 Percent Species Composition
(excluding Fathead Minnow)





Management – the long game

Common Carp

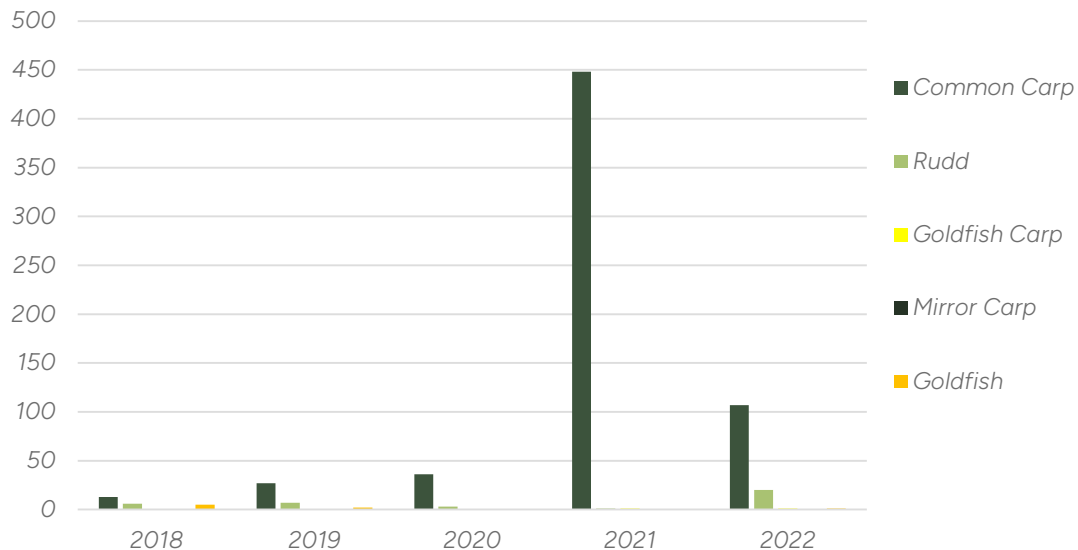
- By 2018 numerous adult carp observed in the wetland
- Two approaches were used to remove common carp:
 - Manual removal, netting
 - Electrofisher removal





Invasive Species

Invasive Species Capture



2022 Common Carp Captured per event:

- June 3rd: 36
- August 11th: 20
- October 21st: 39

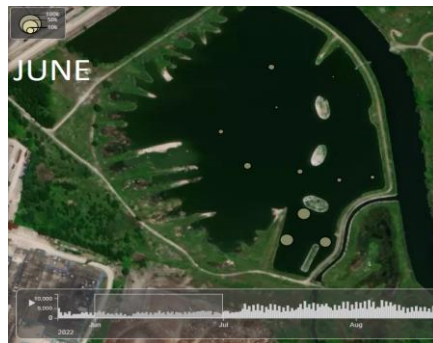


Invasive Species: Innovative Management





Invasive Species Management: Innovative Management



N=10





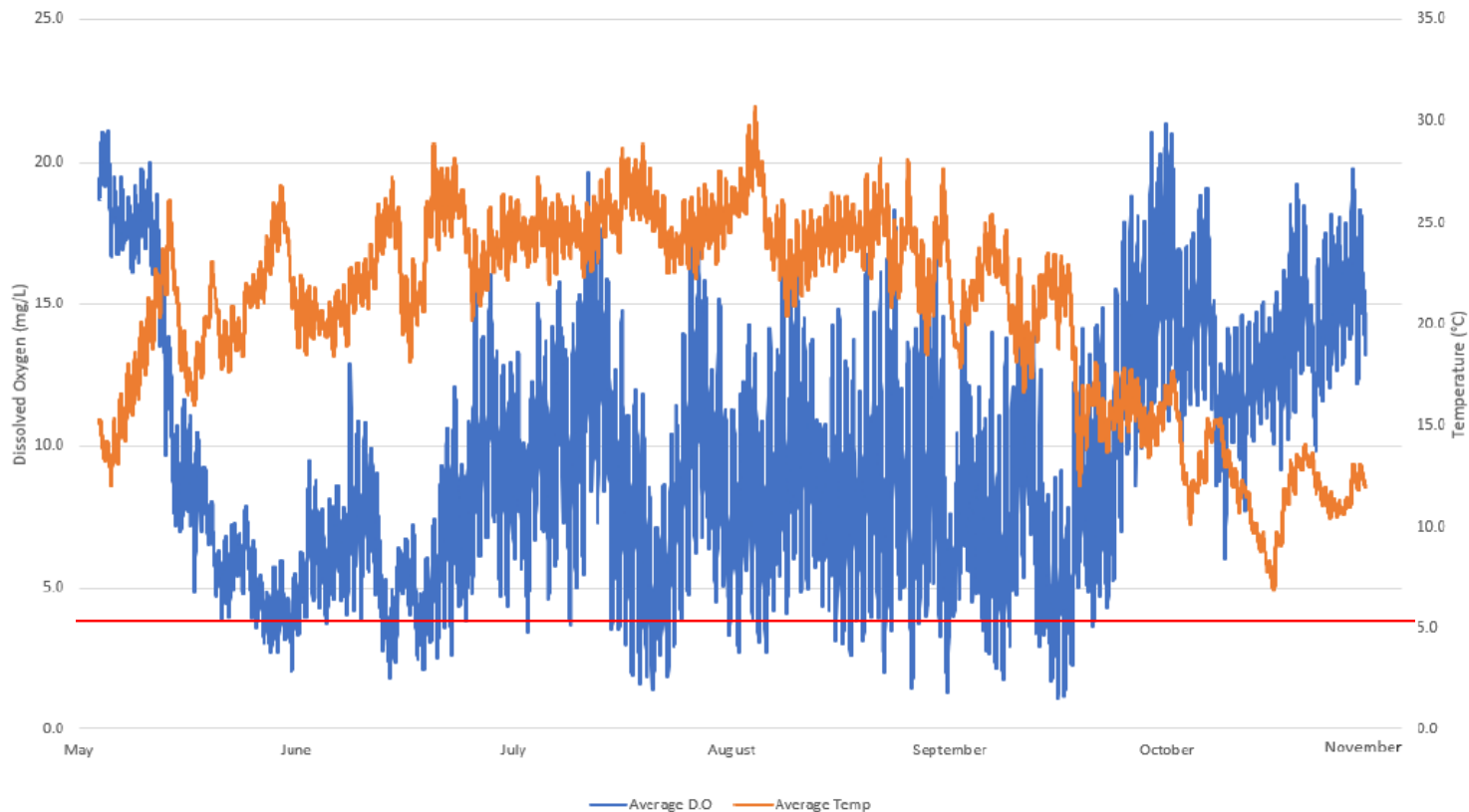
Aquatic Vegetation





Management – Water Quality

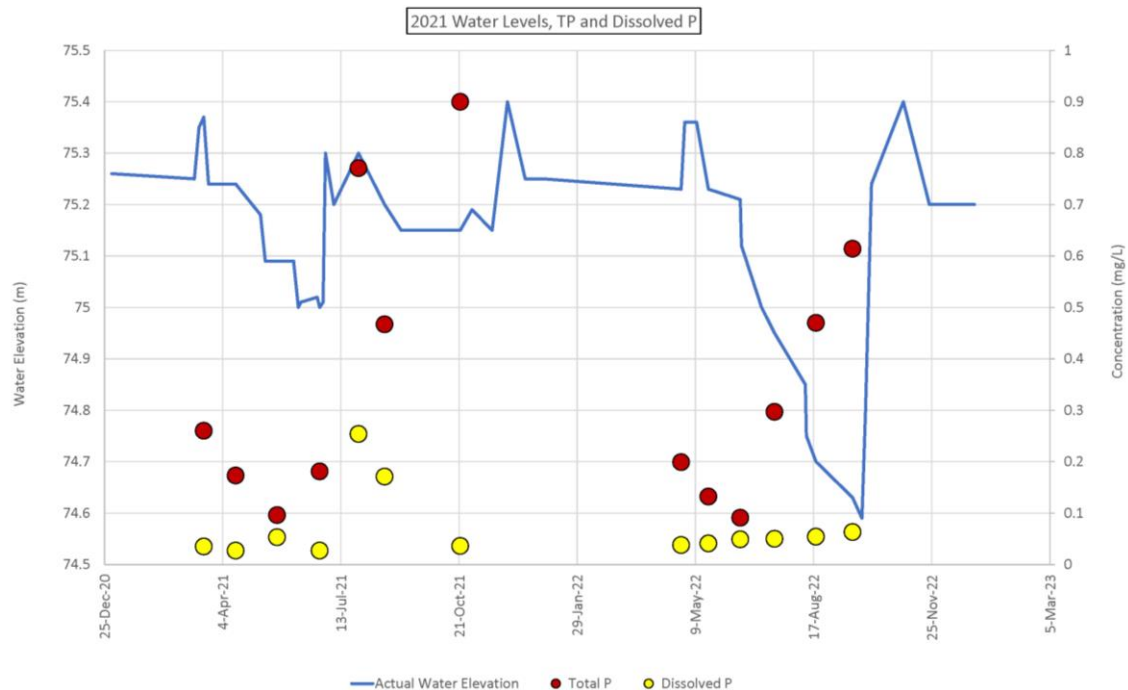
Windermere Wetland: Dissolved Oxygen & Water Temperature





Water Quality Summary

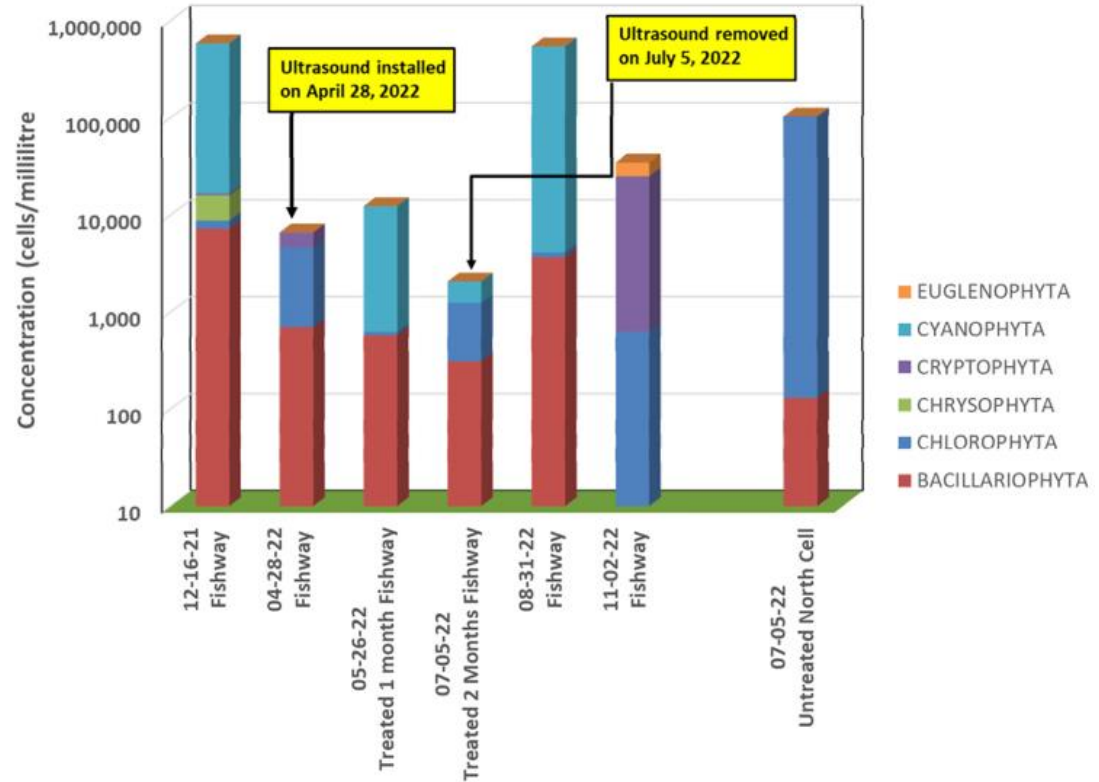
- Phosphorus generally very high
- Meso-trophic condition is 0.010-0.030 mg/L for TP
- Phosphorus declined from April to June, then increased without water inputs





Ultrasound Trial – Phytoplankton Analysis

- Phytoplankton concentration 100 time greater in control location in July
- Concentration in test area when ultrasound was removed



Species Detection

Environmental DNA, eDNA

- Early Detection
 - Species at Risk
 - Early invasive species
- Other wildlife, cryptic species
 - Amphibians
 - Reptiles





Review

Discovery Phase

- Reality check
- Resolve competing objectives
- Competent multidisciplinary team

Planning

- Broad based input
- Aim high – resist temptation to say too soon: ‘that’s impractical’

Implementation (Construction)

- Expect surprises

Management – Long term

- Annual meeting
- Sharing information
- Reporting
- Results-based activity planning
- Innovation
- Pilot studies and follow-up



Making
Sustainability
Happen

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No Fishway Monitoring
took place in 2021

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