



# **KAWARTHA CONSERVATION**

Discover • Protect • Restore



# Lake Dalrymple Working Group Meeting #9

April 25, 2024



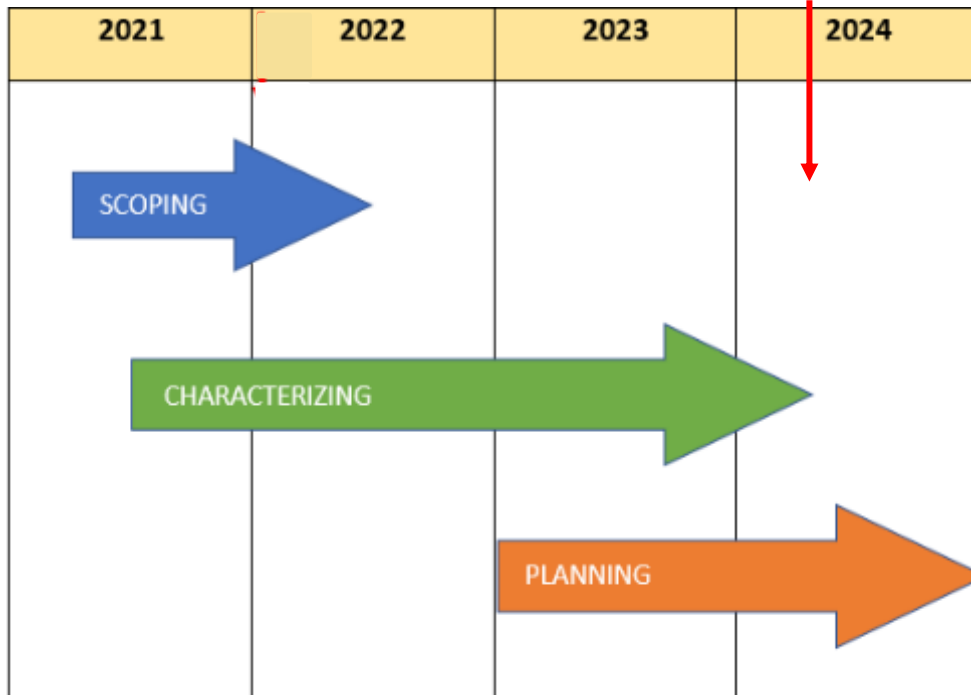
# AGENDA

1. Welcome
2. Roundtable Introductions
3. Brief Project update
4. Watershed Characterization Report: summary of key observations, issues, and info gaps
5. Management recommendations
6. Public engagement summer 2024
7. Other business?
8. Closing – next meeting

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# Workplan Update

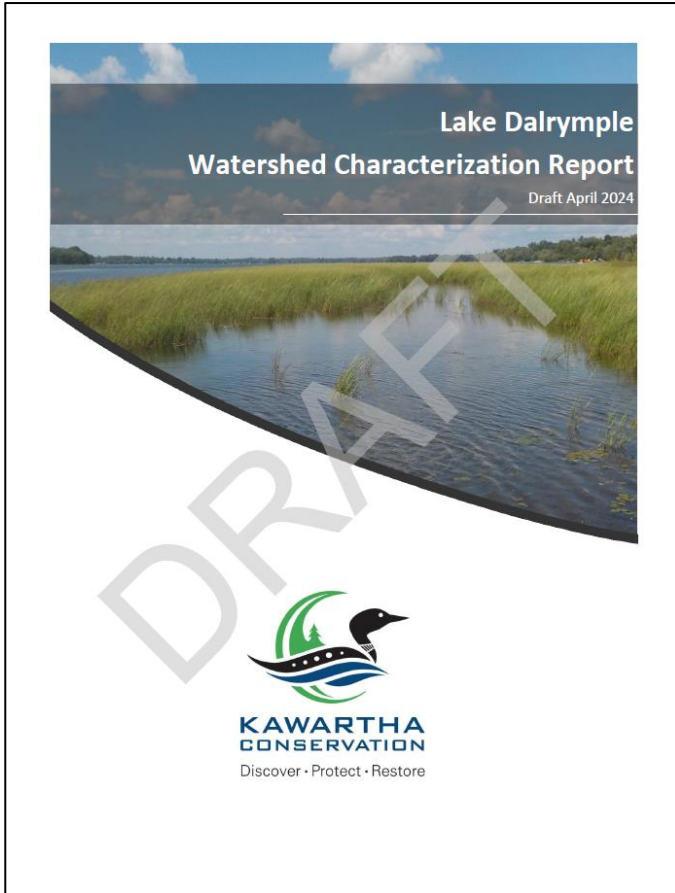


KEY PLANNING COMPONENTS	
<-- Staff / Stakeholder / Working Group input -->	<b>Scoping</b> a. Who are the key stakeholders? b. What are stakeholder's key values/issues/goals? c. What information is available?
	<b>Characterizing</b> a. What are the key lake resources? b. What are the functions (benefits/values) and linkages? c. What are the key management issues? d. What are the information gaps?
	<b>Planning</b> a. What are the outcomes, goals, objectives? b. What are draft management targets? c. What are the proposed management strategies/actions? d. Evaluate alternatives against response/feasibility criteria? e. What are the preferred management actions? f. How will success, change, efforts be tracked?

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4. **Watershed Characterization Report: summary of key observations, issues, and info gaps**
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# Watershed Characterization Report



- ‘technical’ publication, detailed background information on current state of the aquatic and terrestrial ecosystems within the watershed, and community concerns and values.
- summary of key observations, issues, and information gaps, as well as detailed information on:
  - **Land Use and Lake Use**
  - **Water Inputs and Water Levels**
  - **Water Quality**
  - **Sediment Quality**
  - **Aquatic Habitats and Fish**
  - **Landscape Ecology**

## 3.0 Land Use and Lake Use



[Avery Point, Lower Lake Dalrymple, July 18, 2023]

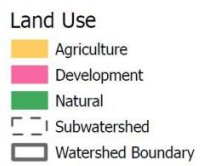
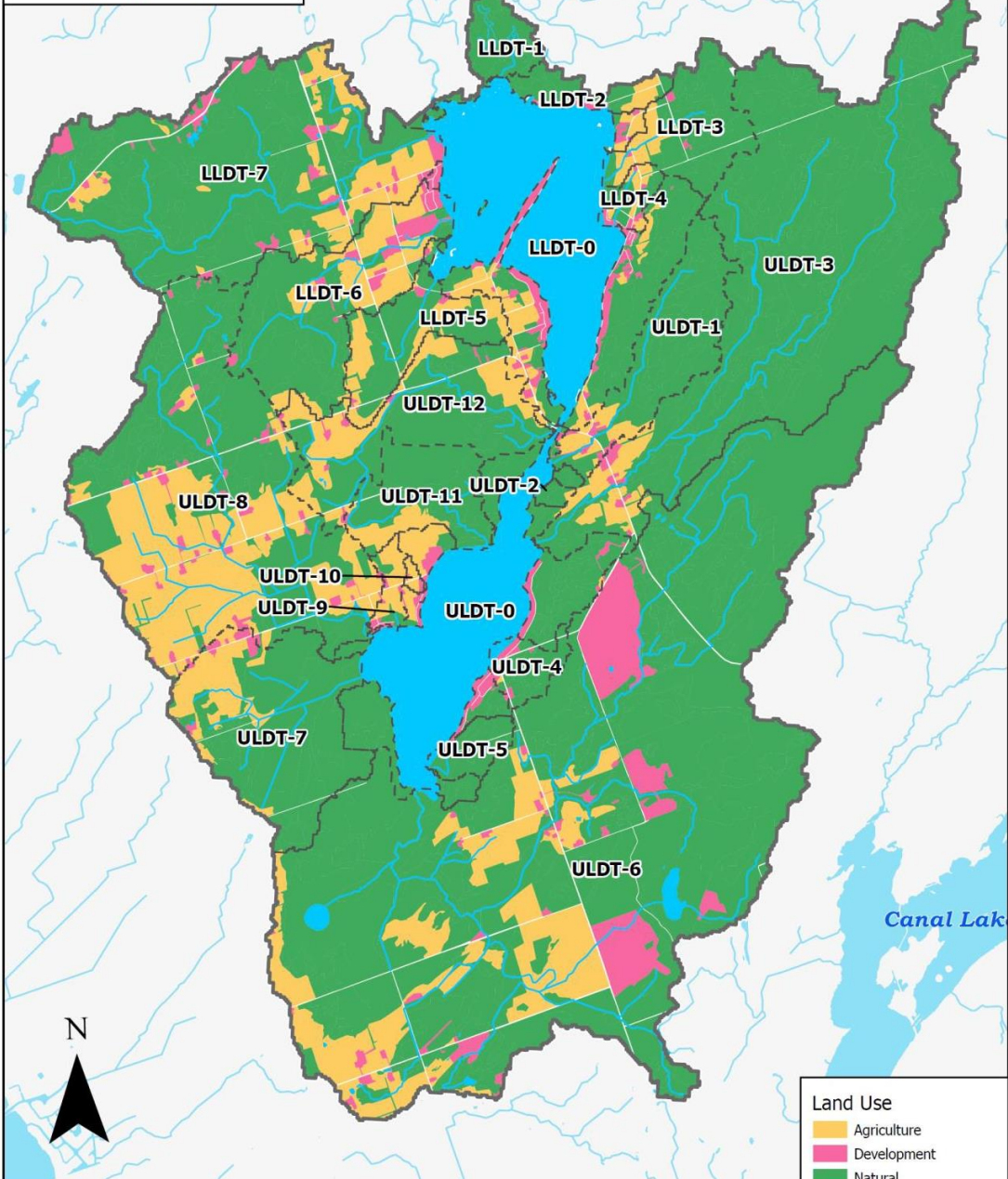


# Land Use and Lake Use

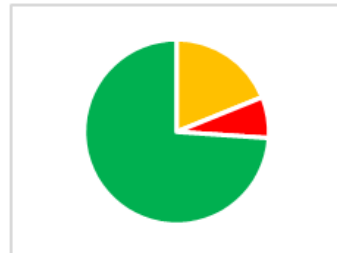
## Key Observations

- The region has a long history of human activity, including **First Nations peoples** and more recently European settlement. The close proximity to the Greater-Toronto-Area makes Lake Dalrymple an **attractive development and recreational location**.
- Land use within the lake watershed is comprised **mostly of natural areas** which includes expansive areas of forests and wetlands and includes the 'Carden Plain' alvar. **Agriculture** is a dominant feature in the landscape, as is **quarry operations**.
- There are **21 distinct 'subwatersheds'** that drain into the lake; 13 of which drain into Upper Lake Dalrymple, and 8 drain into Lower Lake Dalrymple. The largest four subwatersheds are **ULDT-6, ULDT-3, ULDT-8, and LLDT-7, and account for 69 % of the drainage area** in Lake Dalrymple.

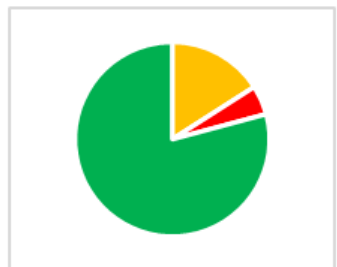
# Lake Dalrymple Land Use



Lower Dalrymple



Upper Dalrymple



# Land Use and Lake Use

## Key Observations

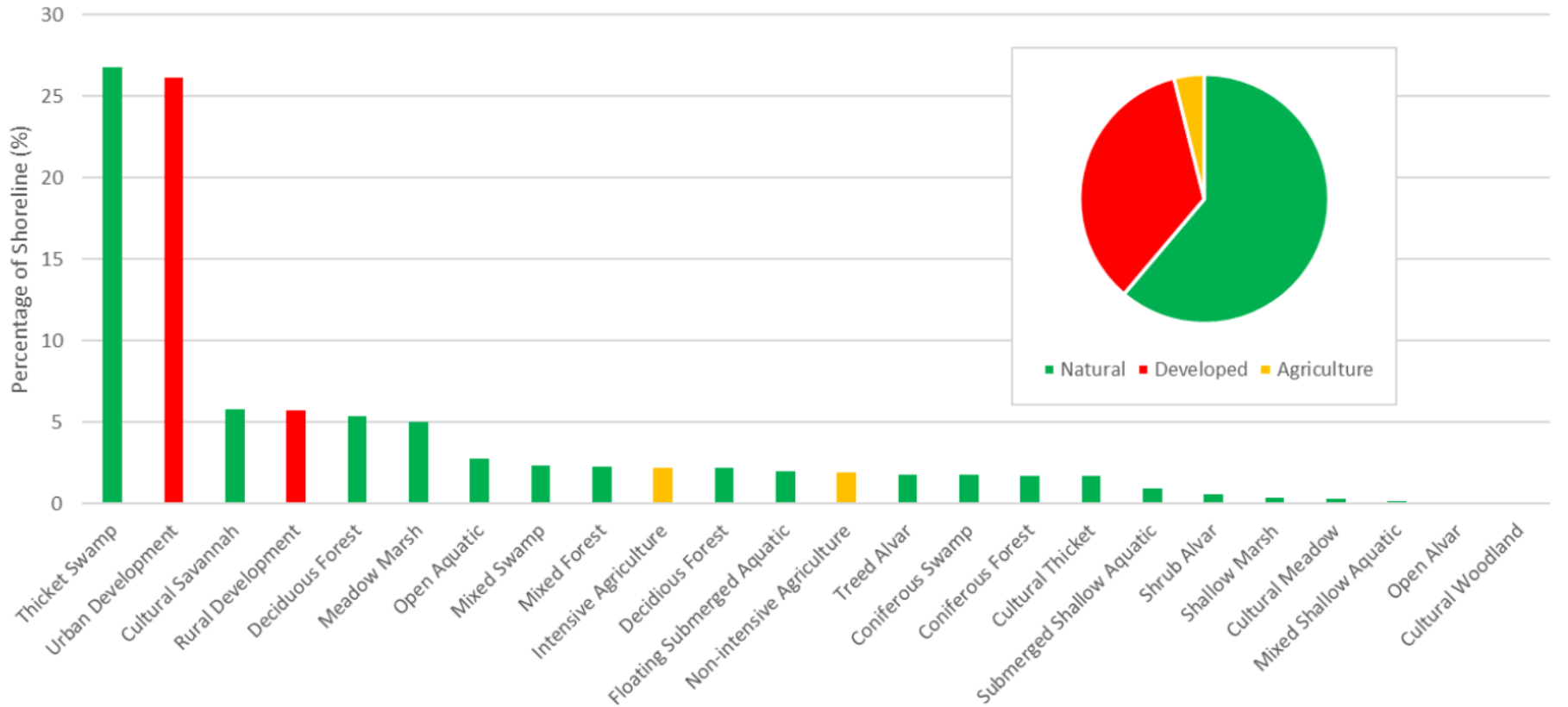
- There are **780 individual lots along the shoreline**, with an approximate ratio of **50:50 seasonal homes to permanent homes**, not including vacant lots. A recreational capacity assessment suggests that the **lake is not over-crowded** based on a 1.6 waterfront lots/ha threshold.
- Fishing is an extremely popular activity on the lake, and fishing pressure is higher on Lake Dalrymple in winter months than on other lakes within the Kawarthas. The Ministry of Natural Resources and Forestry advises that there is **no concern regarding the lake being 'overfished'**.

# Land Use and Lake Use

## Key Issues and Info Gaps

- **Shoreline development is a priority concern for lake management.** Developed areas are concentrated along the shoreline, with approximately 35 % of the shoreline being developed.
- A development capacity assessment was undertaken but unfortunately the model did not predict water quality, therefore it remains unclear the relationship between water quality and development. However, the Ministry of Environment, Conservation and Parks advises that **Lake Dalrymple may have already exceeded its capacity.**
- There are several activities associated with human use that could negatively impact the health of Lake Dalrymple, including **vegetation removal and grading, aggregate extraction, building construction, roads, use of septic systems, human occupation, recreation** (e.g., boating, fishing, hunting, etc.), **agriculture, and climate change.**

## Shoreline Land Use (120m inland, from waters edge)



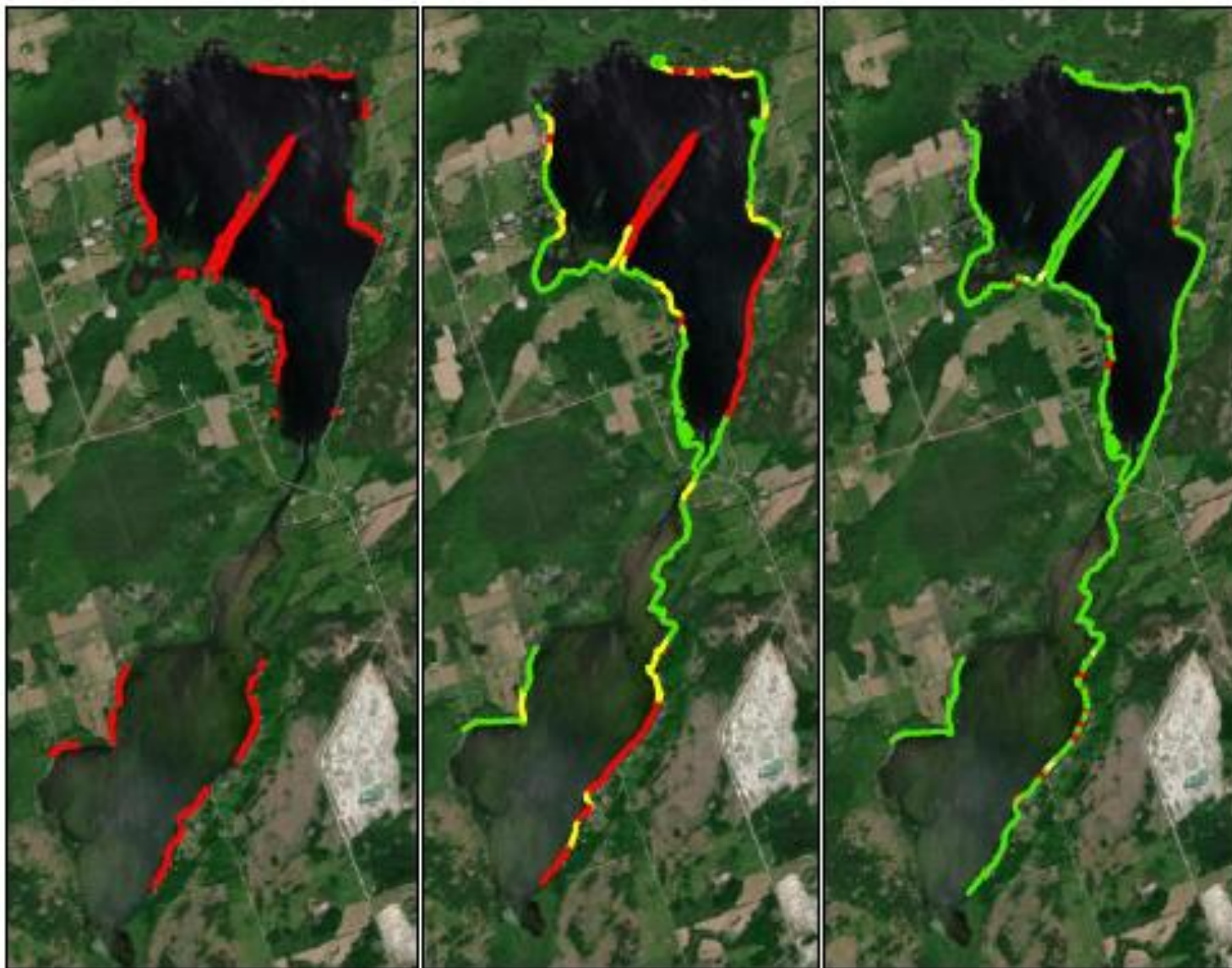


Figure 3.5. Shoreline survey results: manicured lawn (left), slope (center), and artificial (right).

## 4.0 Water Inputs and Water Levels



[Lake level monitoring gauge at the 'narrows', Kirkfield Road bridge, May 25, 2021]

# Water Inputs and Water Levels

## Key Observations

- Lake Dalrymple **is composed of two waterbodies**: The upper lake, which is relatively shallow receives 77% of overland drainage, drains into the lower lake which then drains into the Head River to the north.
- Much of Lake Dalrymple's catchment area sit atop the Carden Plain, and **area known to exhibit Karstic features**.
- With so much of the sub-watersheds under natural cover, it is **not anticipated that land use disturbance has had much of an effect on the hydrology** of the Lake Dalrymple watershed.



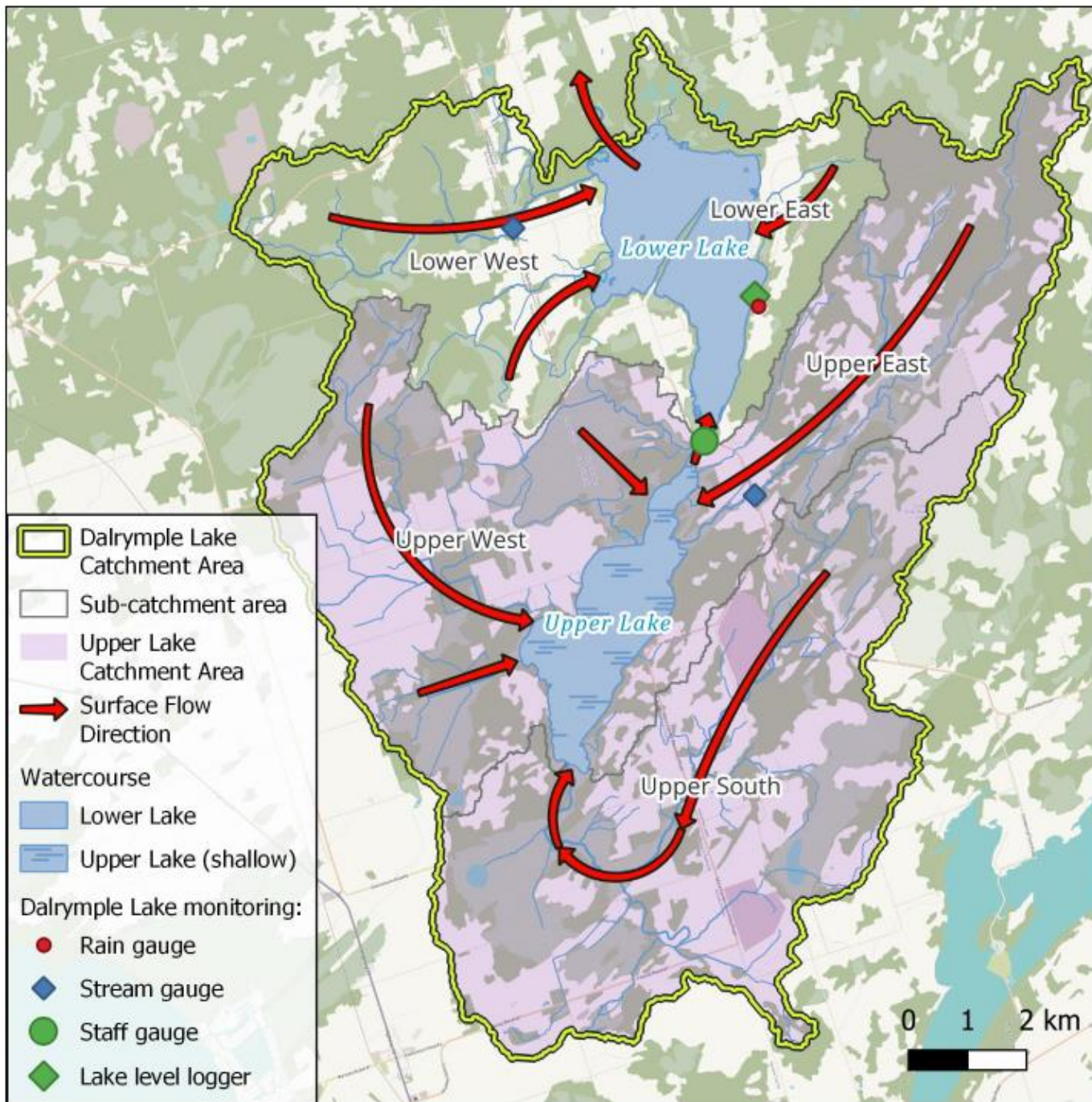


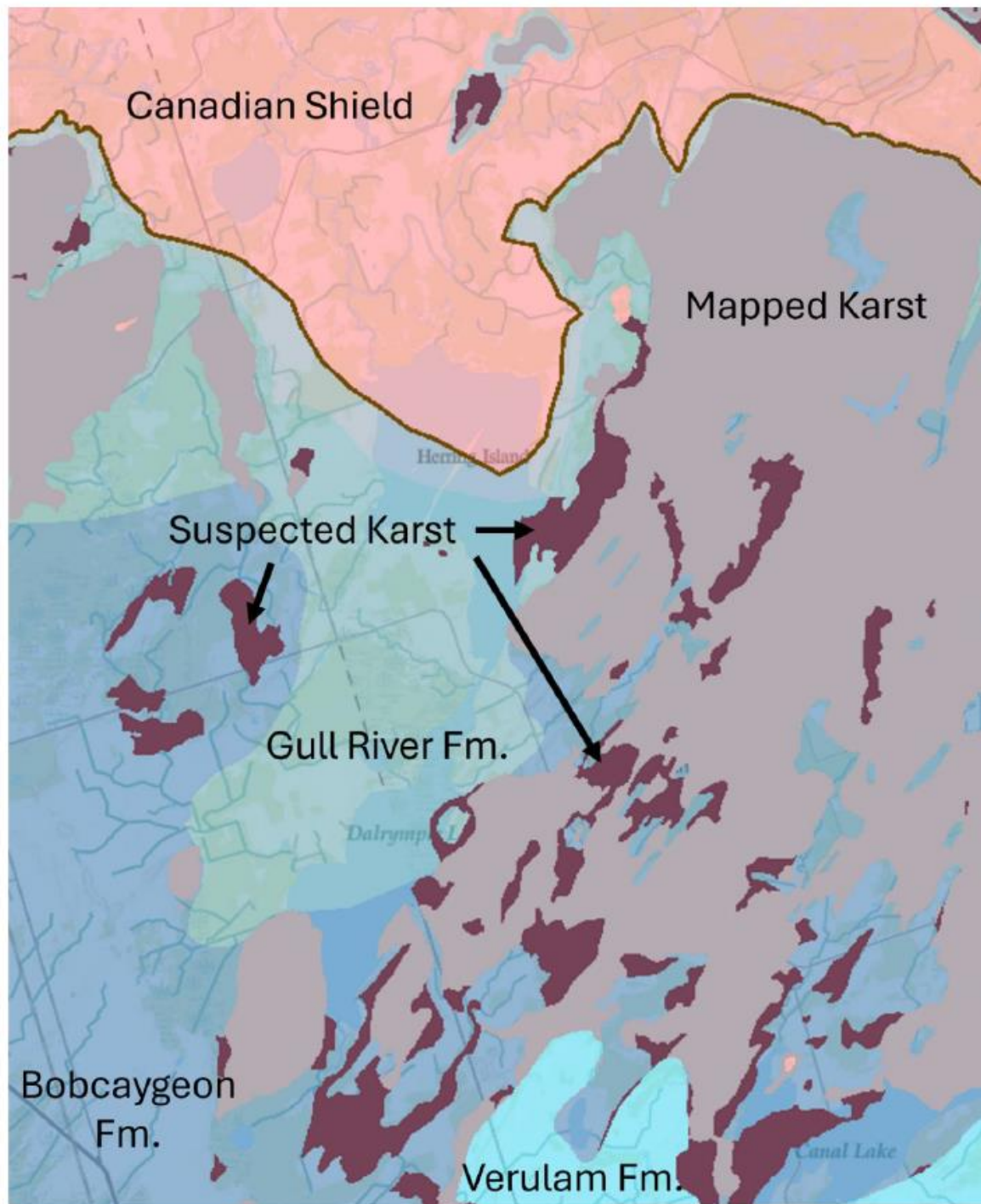
# Water Inputs and Water Levels

## Key Observations

- It is suspected that **groundwater inflow (i.e. baseflow) directly into the lake may be a notable input** to Lake Dalrymple.
- Over the 2021-2023 monitoring period, **the lake levels generally stayed the same** and the water inputs and outputs to the lake are assumed to remain balanced.
- Both **precipitation and air temperature are projected to increase** in the Lake Dalrymple region **under a changing climate**—the impact this will have is uncertain.







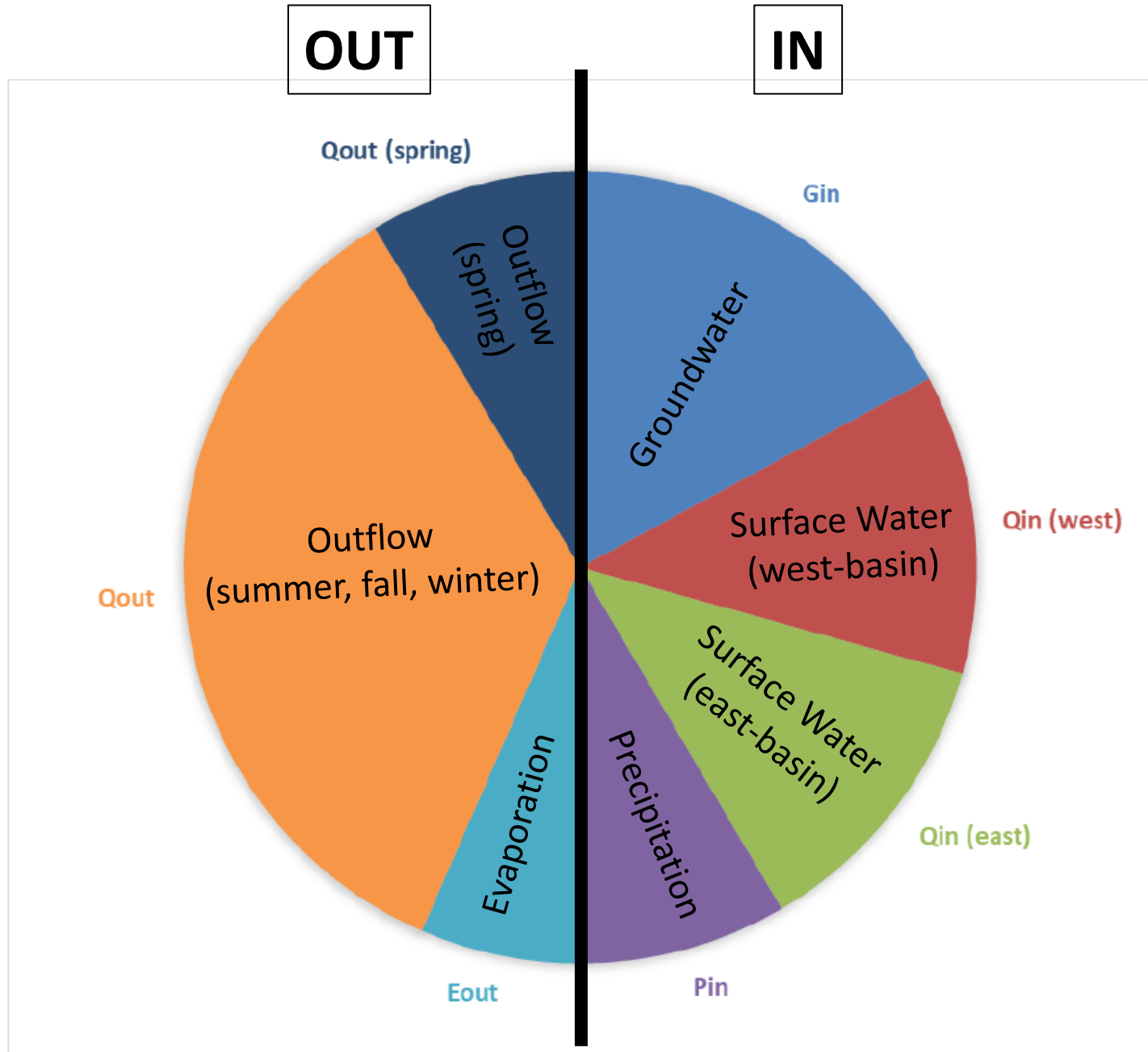


Figure 4.10. Proportion of water budget components.

# Water Inputs and Water Levels

## Key Issues and Gaps

- No long-term gauges bring **large uncertainty to the results**. Due to logistical difficulties, there was no gauge placed at the outlet of Lake Dalrymple; this can be the main source of error in water balance estimation.
- The **eastern stream** monitoring location had some technical issues in 2022 such that **large parts of the flow record are missing**.
- Inflows to the lake have only been measured at two streams that cover 17% of the Lake Dalrymple catchment area—**much of the catchment is ungauged**.
- **No groundwater measurements** have been made in this study.



## 5.0 Water Quality

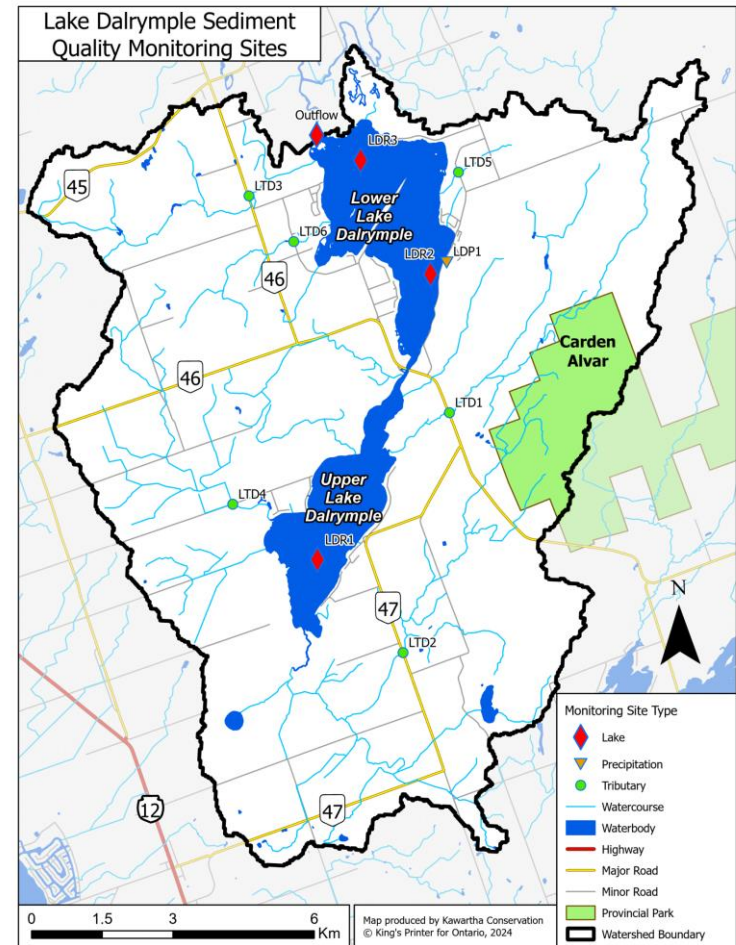


[Water quality sampling, August 2021]

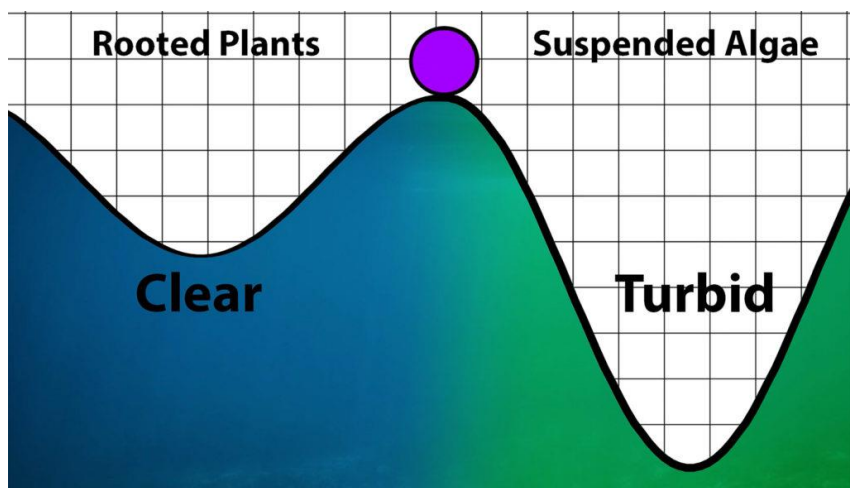
# Water Quality

## Key Observations

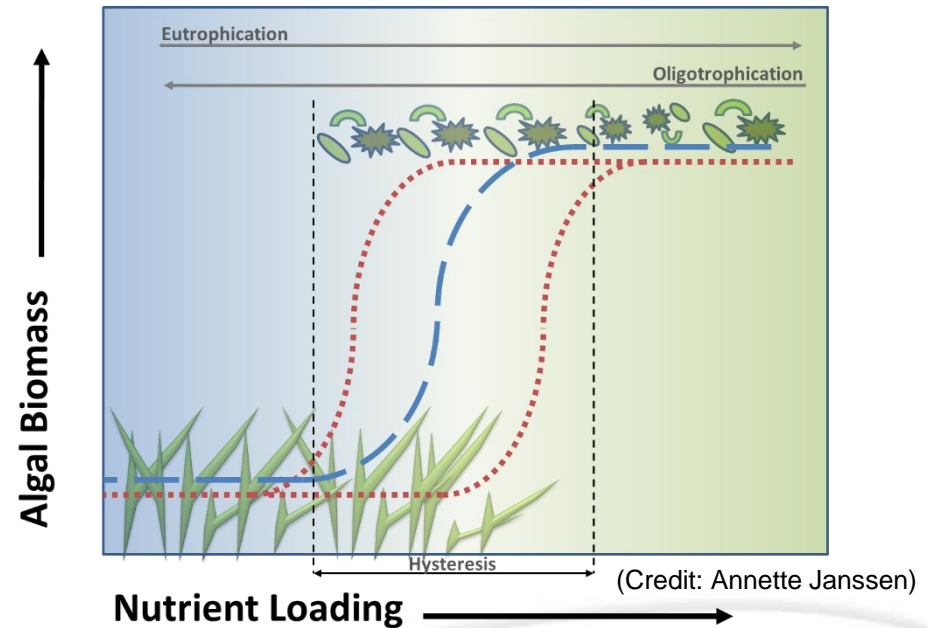
- From 2021 to 2024, Kawartha Conservation staff conducted a water quality monitoring at **10 sites across the Lake Dalrymple watershed** with 4 sites within the lake and 6 sites on its streams.
- **Lake Dalrymple and some of its streams exhibits good water quality** for water clarity, dissolved oxygen, nutrients (phosphorus and nitrogen), pH, and chloride...
- Phosphorus is the limiting nutrient (compared to nitrogen) and is predominately input through subwatersheds with **much of the phosphorus entering the lake through shoreline septic systems...**
- Internal loading from thermal stratification does occur in Lake Dalrymple and was calculated and represents only 2% of the phosphorus budget.
- Chloride levels in the lake and in the tributaries have **increased since 1972** owing from salt usage during the winter period, but chloride levels have not reach the CWQG of 120 mg/L.



Waterbody Type	Station	WQI Category	Failure Rates (%)								
			pH	Turbidity	Dissolved Oxygen	Chloride	Nitrate	Ammonia	Phosphorus	Suspended Solids	Secchi
Lake	LDR1	GOOD	47.1	0	6.2	0	0	0	25	0	0
	LDR2	GOOD	11.1	0	5.9	0	0	0	22.7	0	0
	LDR3	GOOD	16.7	0	5.9	0	0	0	10	0	0
	Outflow	GOOD	0	0	9.1	0	0	0	25	0	0
Tributary	LDT1	FAIR	0	0	19.4	0	0	0	17.1	4.9	
	LDT2	FAIR	2.7	0	16.7	0	0	0	2.4	0	
	LDT3	GOOD	0	0	10.8	0	0	0	2.5	0	
	LDT4	MARGINAL	0	21.4	74.1	0	0	3.4	89.7	6.9	
	LDT5	FAIR	0	3.4	7.1	0	0	0	12.9	0	
	LDT6	GOOD	0	6.2	0	0	0	0	100	0	



(Credit: Ramsey-Washington Metro Watershed District)



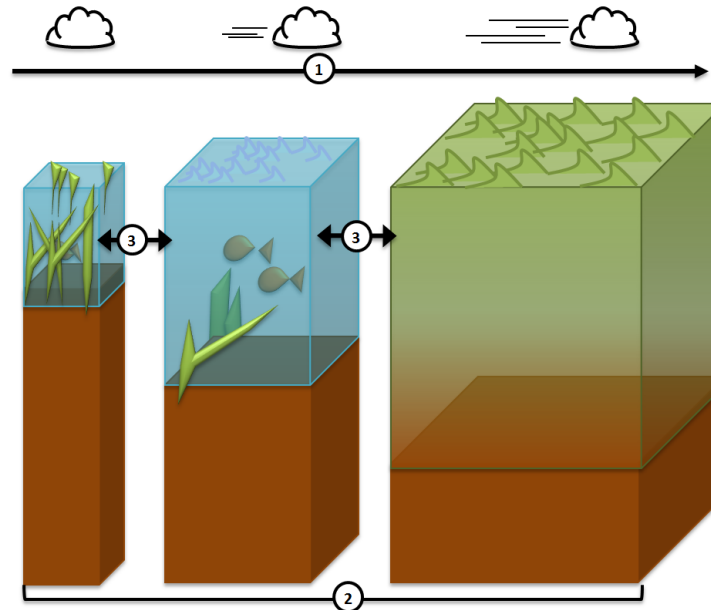
(Credit: Annette Janssen)





# Phosphorus of Other Lakes

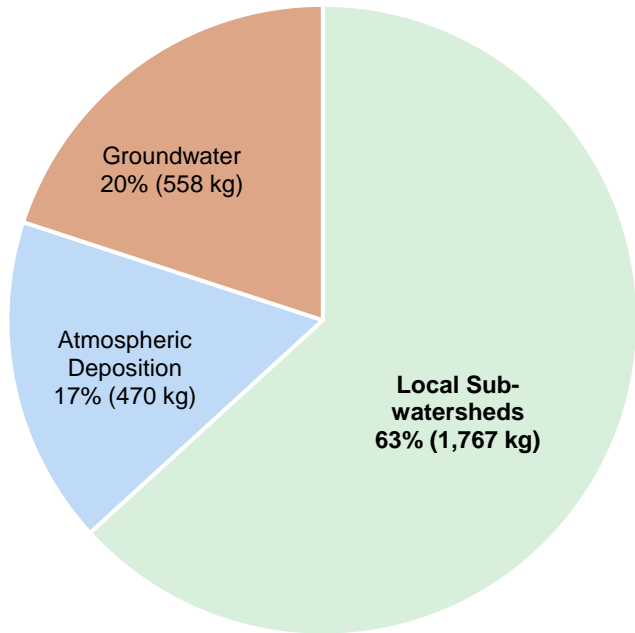
Lake	Count	Mean	Median	PWQO	Ex. %	Size (km2)
Canal Lake	153	0.025	0.014	0.02	17.6	9
Mitchell Lake	62	0.032	0.014	0.02	22.6	3
<b>Lake Dalrymple</b>	<b>74</b>	<b>0.022</b>	<b>0.016</b>	<b>0.02</b>	<b>23</b>	<b>14</b>
Sturgeon Lake	87	0.017	0.015	0.02	25.3	47
Pigeon Lake	80	0.049	0.016	0.02	26.3	57
Lake Scugog	174	0.018	0.018	0.02	37.4	68



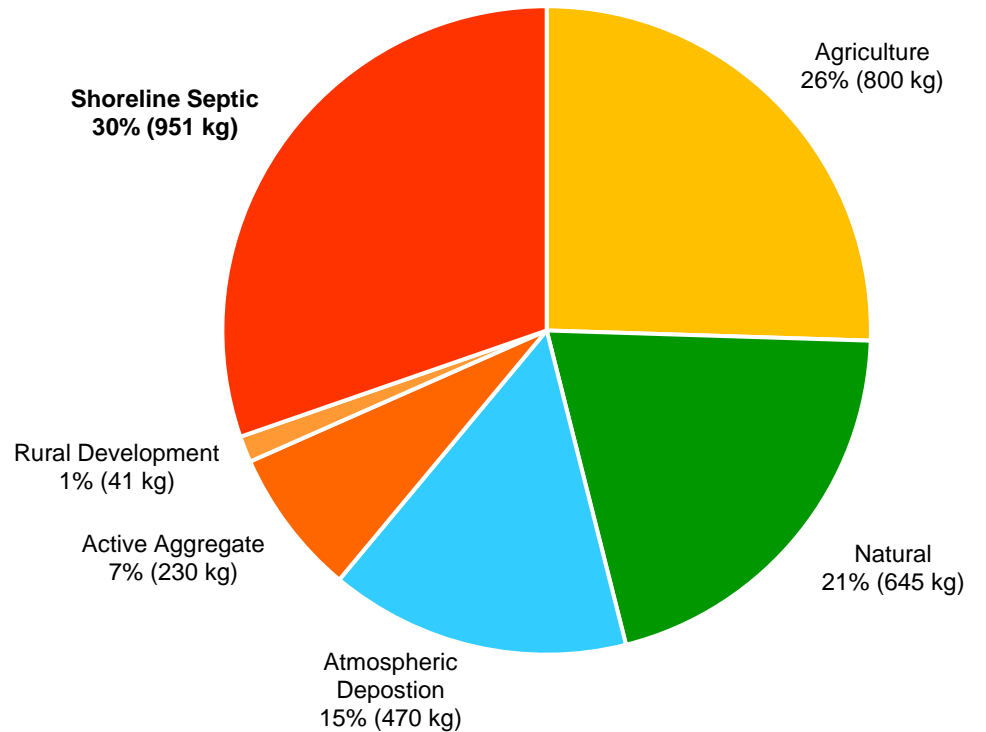
(Credit: Annette Janssen)

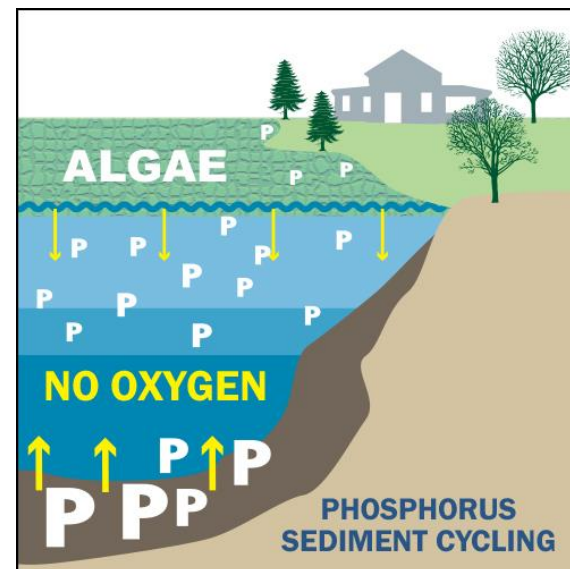
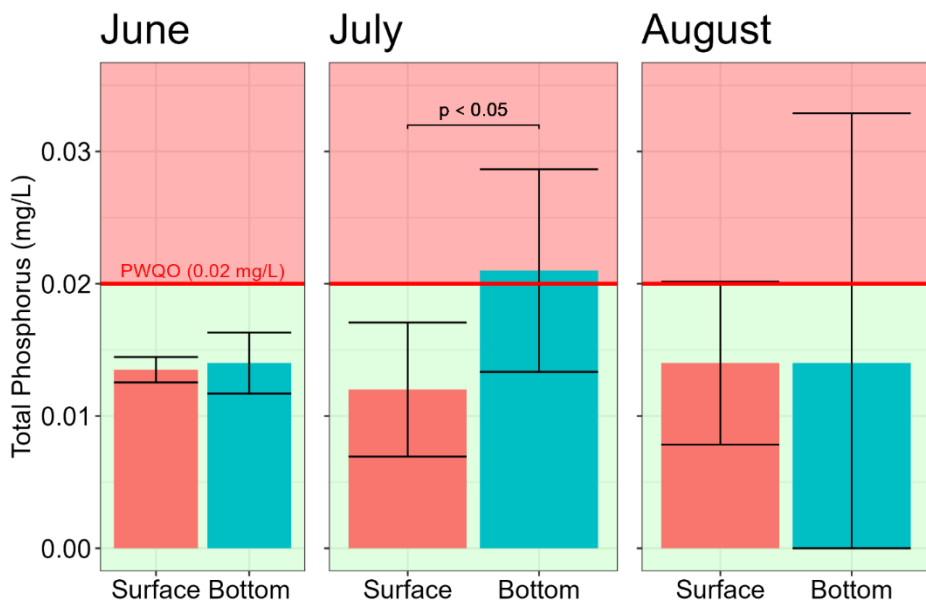
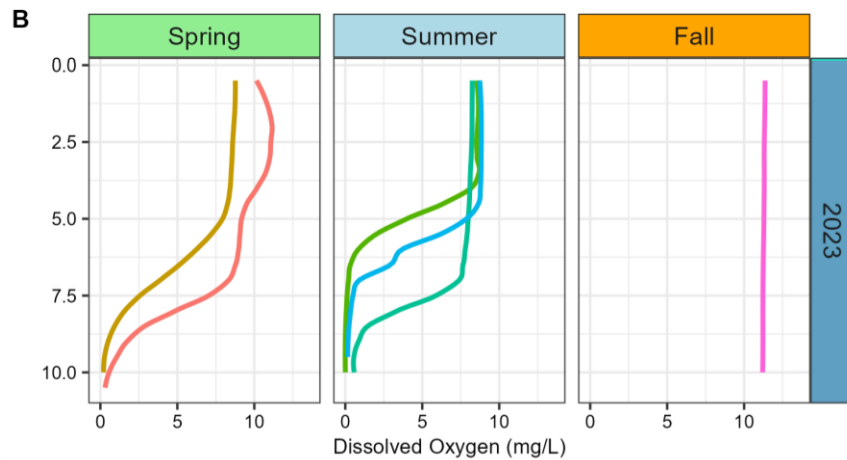
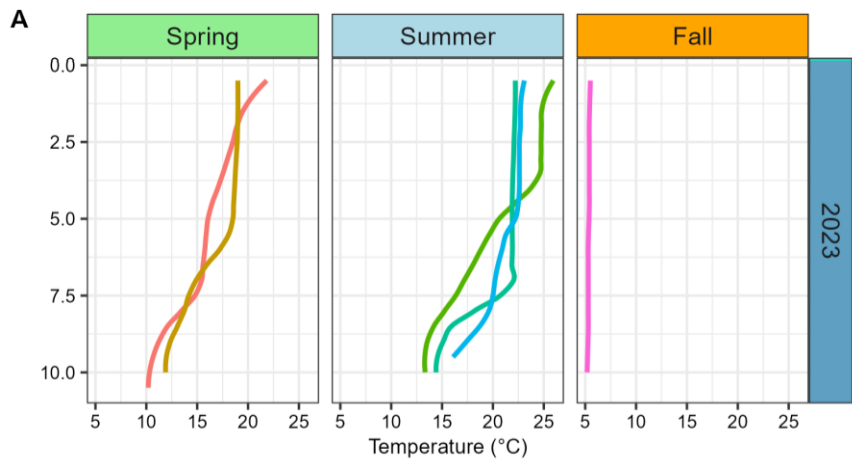
# Phosphorus loads (kg) and percentage input by:

## Major water source

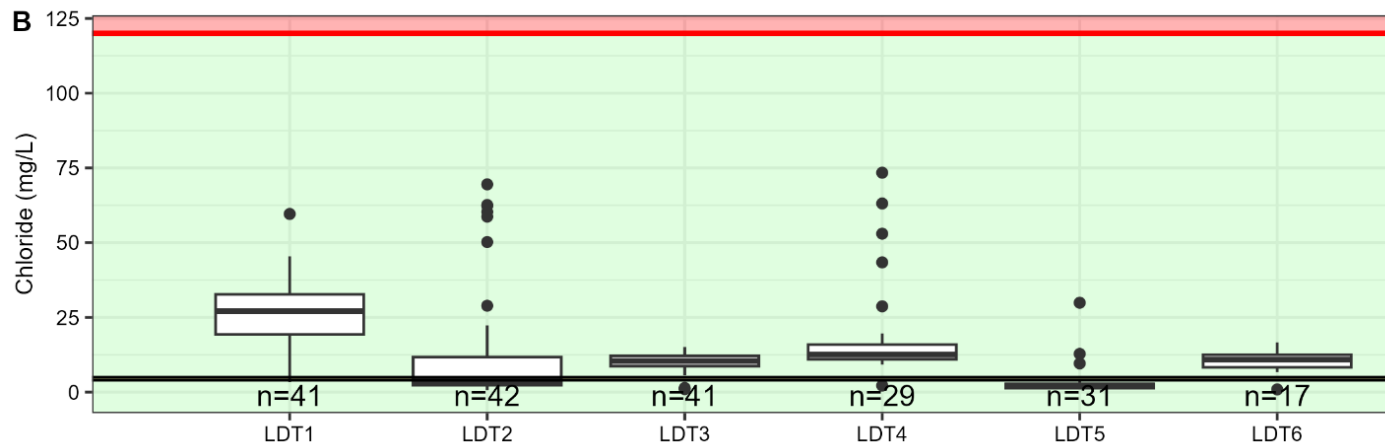
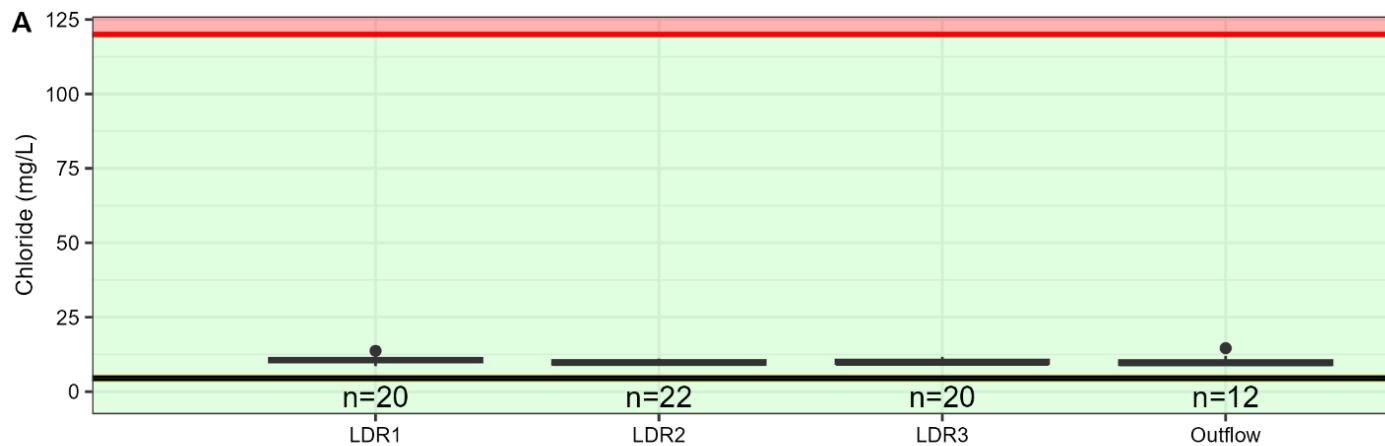


## Sector





(Credit: Vertex Aquatic Solutions)



<b>Lake</b>	<b>1972</b>	<b>This study</b>	<b>Stream</b>	<b>1972</b>	<b>This study</b>
Min	3	8	Min	4	0.7
Max	6	14.8	Max	5	73
Mean		10.1	Mean		14.5



# Water Quality

## Key Issues and Info Gaps

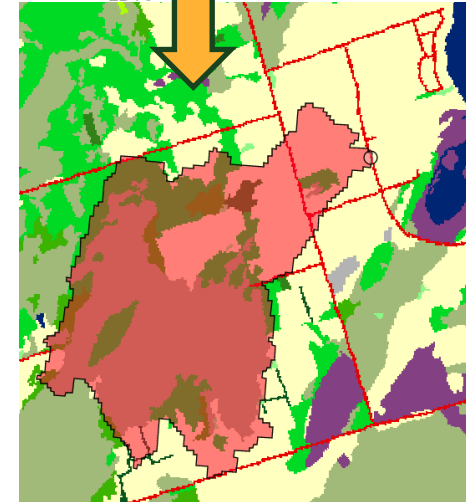
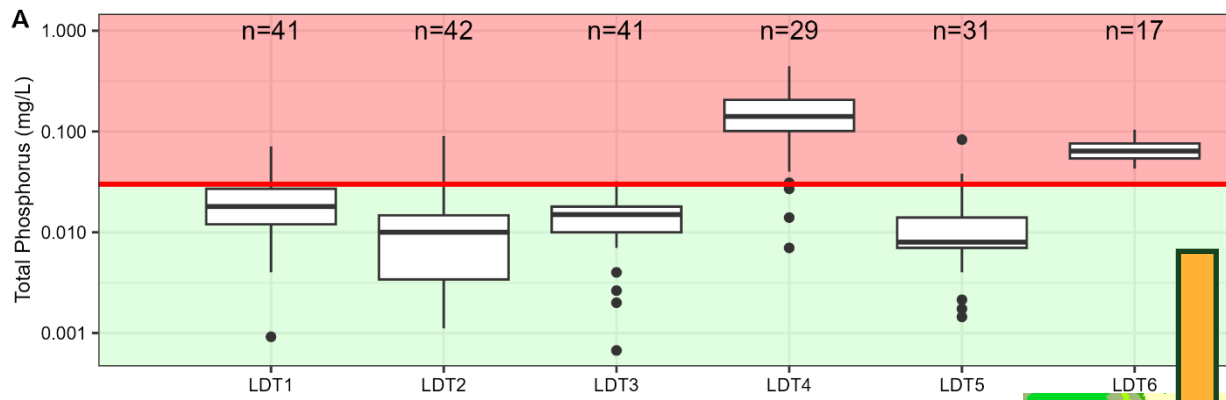
- **Site LDT6** had 100% failure rate for phosphorus when compared to the PWQO.
- Other tributaries Dalrymple show some signs of degradation as 3 sites are classified as fair. **One site 1 site (LDT4) can be classified as marginal but is mis-represented and acts more like a wetland** than a stream/river. Future water quality efforts should focus on upstream of the wetland to get a better representation of the watershed.
- Shoreline septic represents a large portion 30% of the estimated phosphorus input into the lake.
- **Winter conditions**, i.e., internal load, anoxic, etc, are unknown to Lake Dalrymple.

# Water Quality

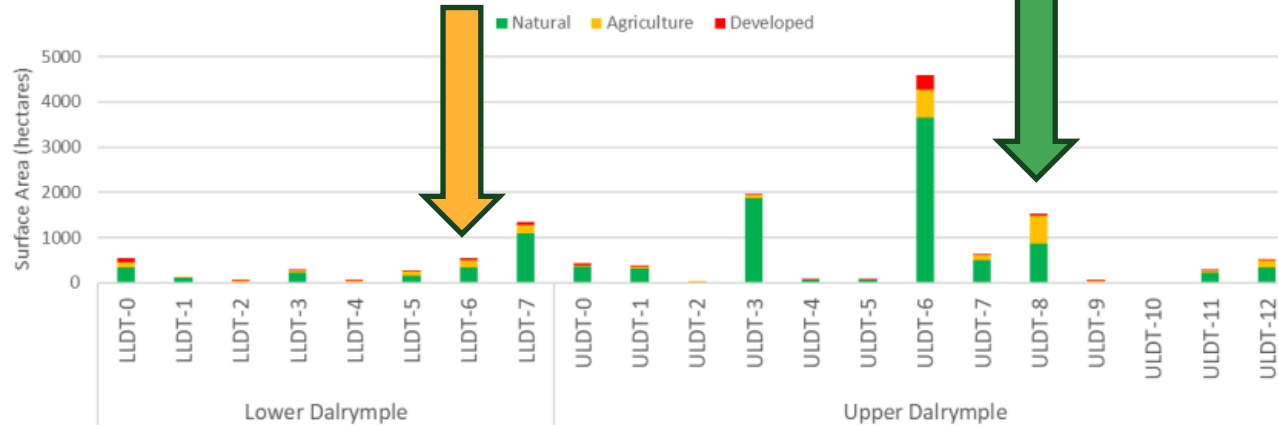
## Key Issues and Info Gaps

- **Fecal indicator bacterial** was measured in 1972 and its current level is still unknown. Historical records indicate that higher bacterial was found at the outlet of LDR4 in Upper Dalrymple and at Loon Drive in Lower Dalrymple.
- **Groundwater quality** is unknown in the area.
- Lake Dalrymple has **many subwatersheds and were not able to be monitored through this study**, an effort should be made to collect some water quality data from other sites.
- Our best effort of a reference condition site was LDT2, however, it does exhibit some water quality exceedances, thus **true reference condition site for water quality is unknown**. A reference condition site can be used to determine *background* condition used in the CWQG.





Land Use  
(by Subwatershed, draining into the lake)



## 6.0 Sediment Quality



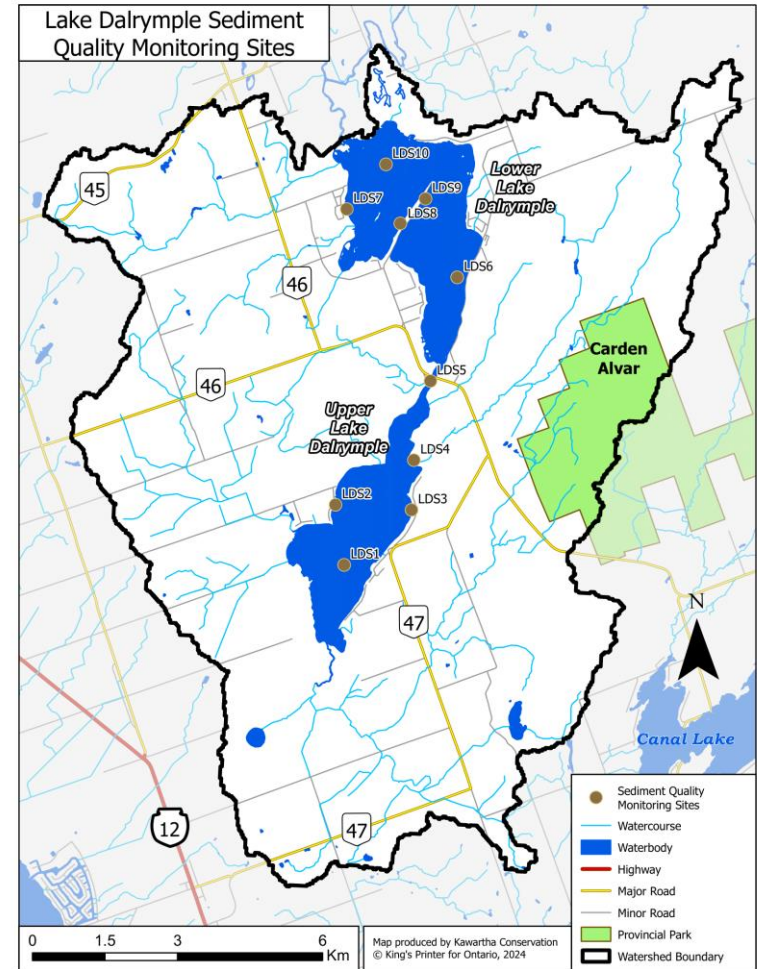
[Lake sediment sampling, September 2023]



# Sediment Quality

## Key Observations

- In 2022, Kawartha Conservation staff conducted a sediment survey at **10 sites across Lake Dalrymple**. The sites were chosen based on previous water quality and fisheries monitoring, as well as input from the Dalrymple Working Group.
- Sediment quality for nutrients is representative of the shallow and productive nature of Lake Dalrymple. The presence of an **abundance of plants supports the enrichment of carbon, nutrients, and phosphorus found within the sediment**.
- The majority of metal species were **reported results are below the Provincial Sediment Quality Guideline's Lowest Effect Level or the Canadian Sediment Quality Guideline's Interim Sediment Quality Guidelines**.
- Most species of polycyclic aromatic hydrocarbons **being below the detection limit**.



# Sediment Quality

## Key Issues and Info Gaps

- Exceedances occurred for 10 species of polycyclic aromatic hydrocarbons, with the majority found at site LDS5, the **public boat launch on Osprey Lane**.
- Some exceedances of parameters were found; however, **it is unknown if Lake Dalrymple has naturally higher levels of those parameters**, thus background values for those parameters are needed.
- Sources of heavy metals, such as Cd, Ni, Pb, may originate from atmospheric deposition (dry or wet, or both), or local soils. **Soil and precipitation quality information will help determine sources of metals**.
- An intensive sediment survey should occur at the site **to determine the extent of the PAH contamination**, the PAH variability within the site, and the risk to organisms. Only after a proper management decision can be made.



## 7.0 Aquatic Habitats and Fish



[Emergent aquatic plants (wild rice) on Upper Lake Dalrymple, August 2023]

# Aquatic Habitats and Fish

## Key Observations

- **Aquatic habitat conditions are different between Upper Lake Dalrymple and Lower Lake Dalrymple**, with Upper Lake Dalrymple providing shallower, and more productive aquatic habitats because it is dominated by shallow marsh wetland conditions.
- Lake Dalrymple is considered a **warmwater lake**. The deep basin on Lower Lake Dalrymple remains deep enough to **provide coldwater habitat in the summer at depths >6 m**, but temperature and **dissolved oxygen conditions are limiting available habitat for resident coldwater fishes**.
- There were **19 types of aquatic plants found in the lake, occupying 64% of surface area** of Lake Dalrymple in the summer. Upper Lake Dalrymple is **heavily vegetated with wild rice**, an intolerant plant that is **important culturally and for fish and wildlife habitat**.

# Aquatic Habitats and Fish

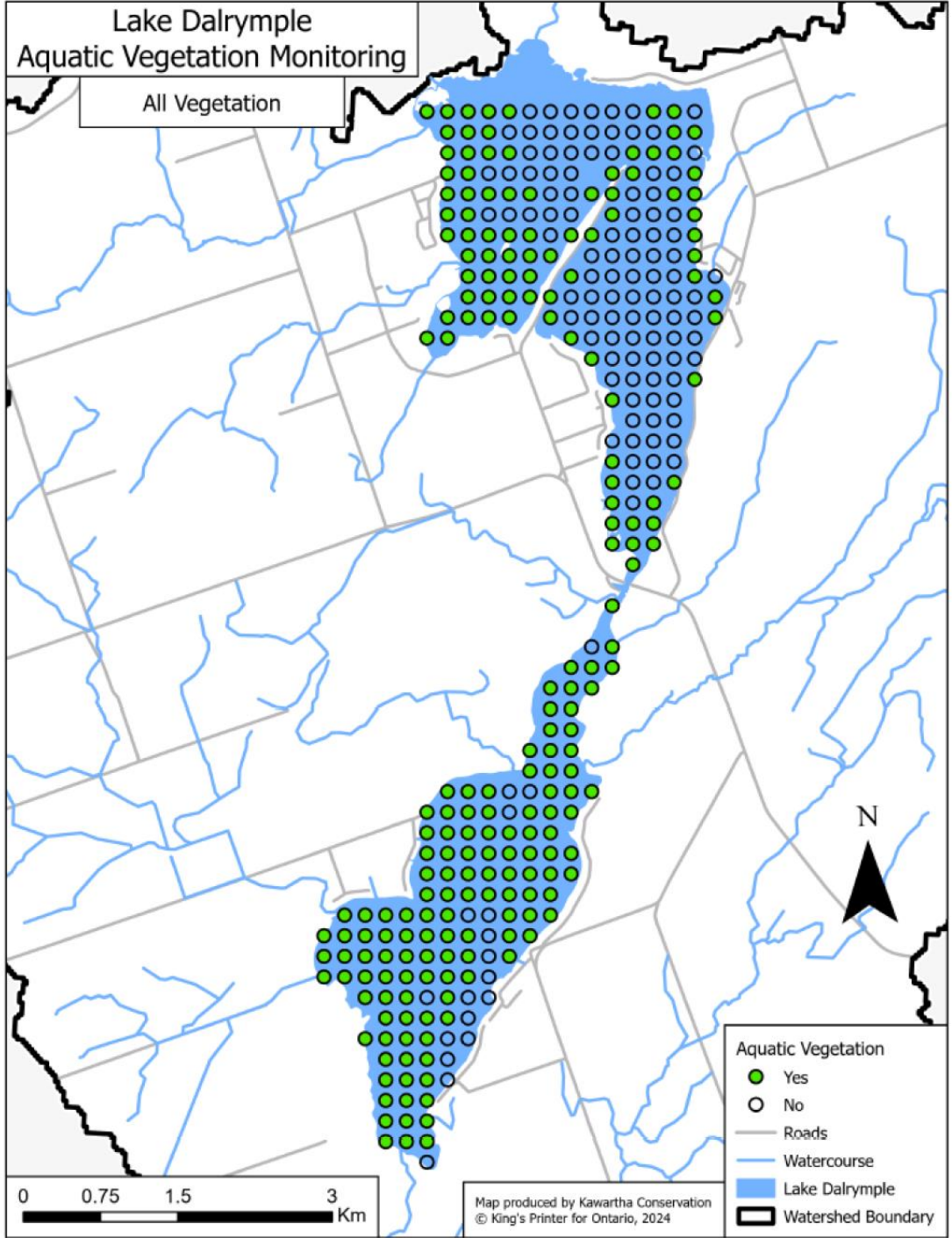
## Key Observations

- **Streams** flowing into Lake Dalrymple **provide important habitat corridors** for aquatic life. The outlets are biodiversity hotspots. There is at least one **sensitive coldwater stream** that drains into the north-east shoreline of Lower Lake Dalrymple.
- Approximately **38 fish species** have been found within the Lake Dalrymple Watershed, many of which support a **popular open water and winter fishery**. The fish community is characteristic of other warmwater lakes in the Kawarthas, but the lake does have **some unique fishes** given its hydrological connection to Black River. The **warmwater fish community has started to increase its overall representation of the fish community**, which is consistent with much of Southern Ontario's fish communities and is **expected to continue with climate change**.



# Lake Dalrymple Aquatic Vegetation Monitoring

All Vegetation



**Aquatic Vegetation**

- Yes
- No

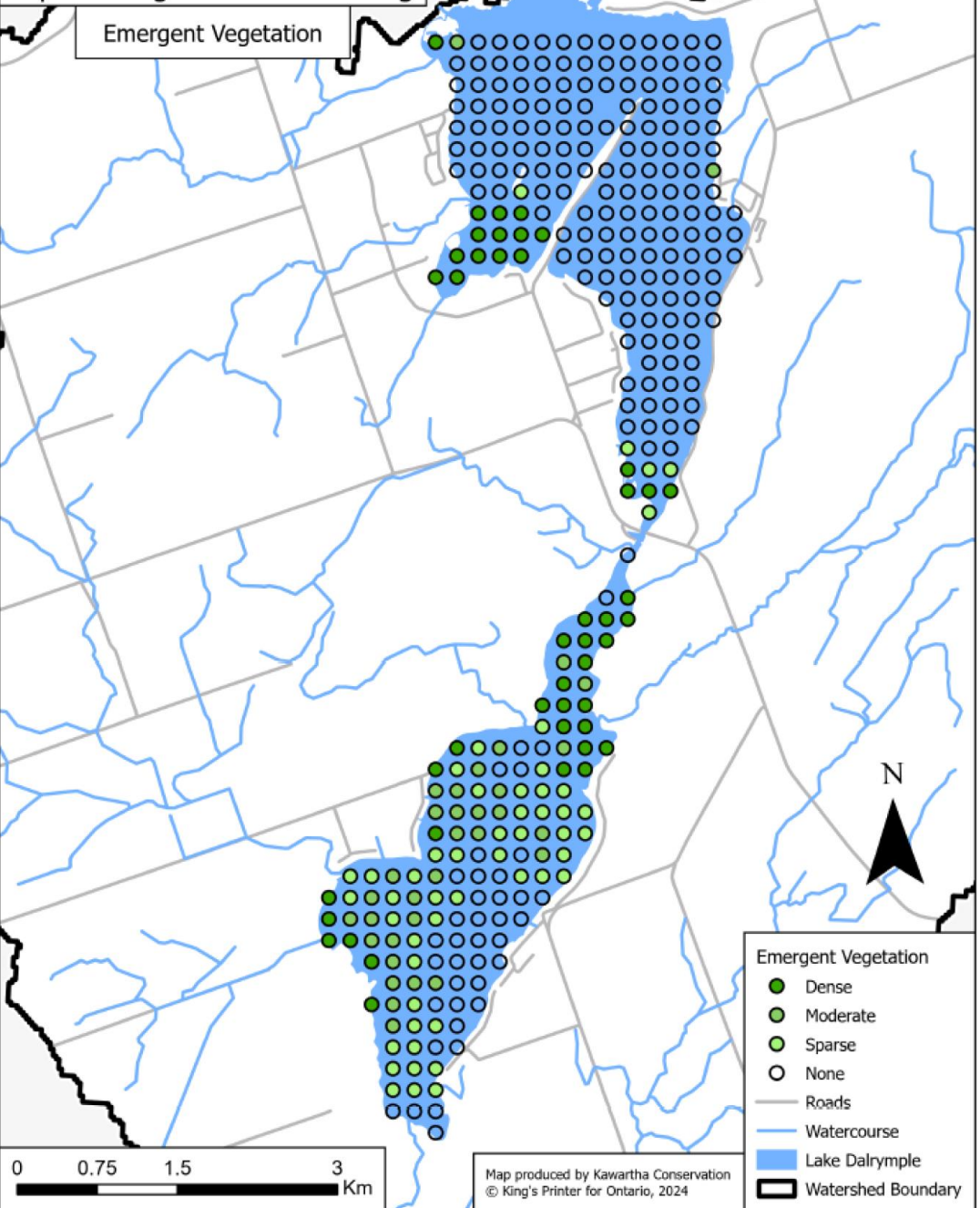
**Legend**

- Roads
- Watercourse
- Lake Dalrymple
- ▬ Watershed Boundary

0 0.75 1.5 3 Km

Map produced by Kawartha Conservation  
© King's Printer for Ontario, 2024

# Lake Dalrymple Aquatic Vegetation Monitoring



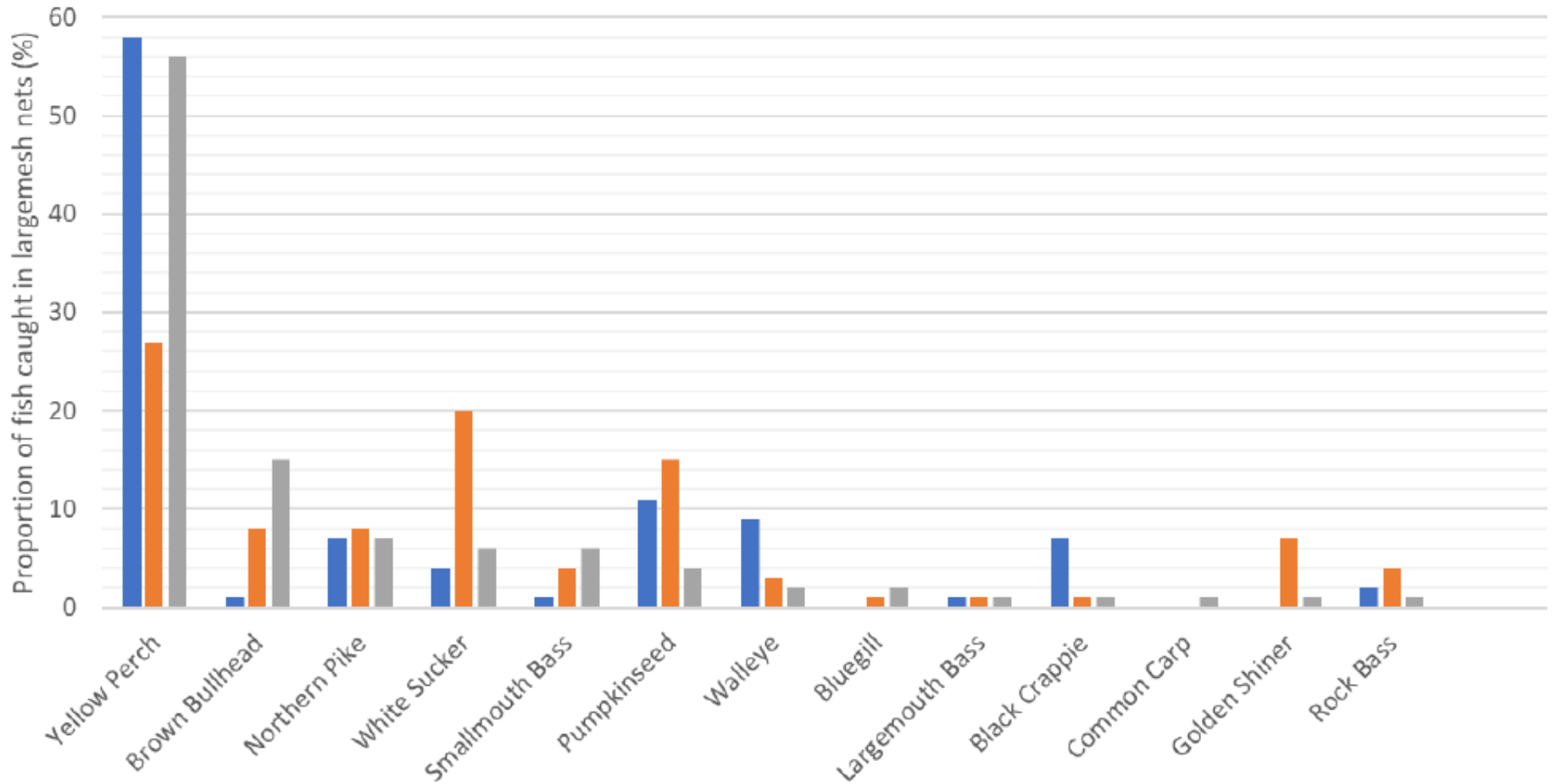
Wild Rice  
(Manomin)



Bulrush

# Lake Dalrymple Fish Abundance Broad-scale Monitoring Program (2008 to 2018)

■ 2008 ■ 2013 ■ 2018





# Aquatic Habitats and Fish

## Key Issues and Info Gaps

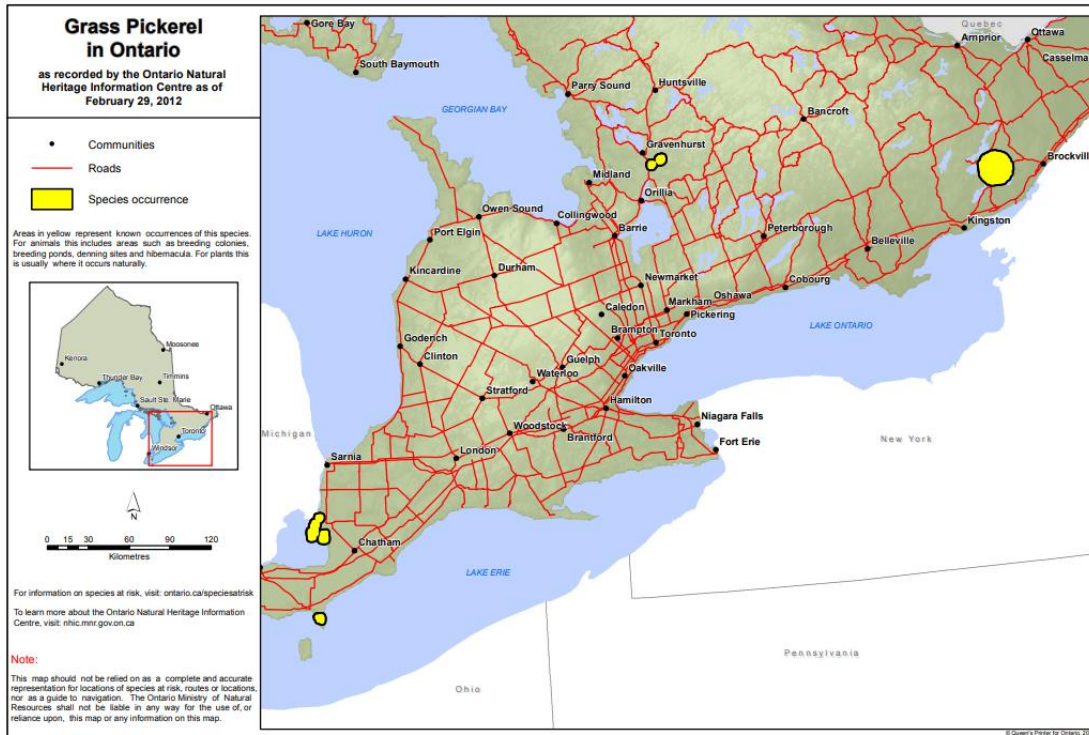
- There are at least **three perched culverts that provide seasonal impediment** to the free movement of fishes in streams and to the lake.
- There is a historical **record of grass pickerel** being caught in the lake, which is a fish **species of conservation concern**. Given this fish has not been detected since, it is currently **unknown whether this fish has been misidentified** or if it no longer exists.
- Fish **spawning habitat locational information is dated, and limited** in geography, especially for connected streams. The status of **muskellunge populations is also not well understood**.
- Although **most streams meet minimum recommended guidelines for aquatic habitat conditions**, those within subwatersheds **ULTD-8, LLDT-3, and LLDT-6 do not meet these guidelines**. They have large sections lacking natural vegetation that flow through croplands.
- There are at least six **aquatic invasive species** in the lake. These organisms, once established, are nearly impossible to eradicate and **can cause large-scale shifts** in aquatic habitat conditions.



Perched culverts

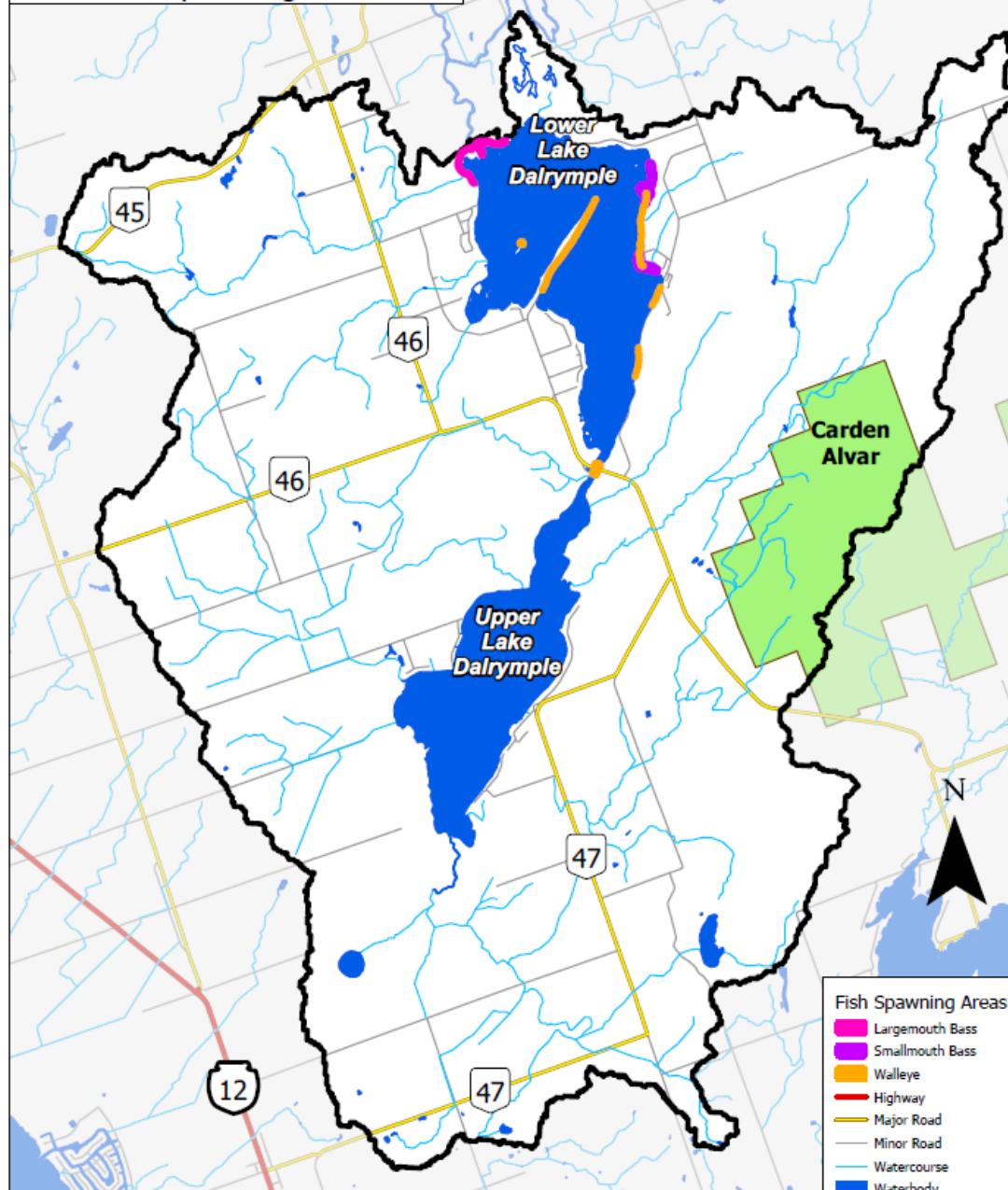
# Grass Pickerel?

(*Esox americanus vermiculatus*)



found in wetlands, ponds, slow-moving streams and shallow bays of larger lakes with warm, shallow, clear water and an abundance of aquatic plants.

# Lake Dalrymple Fish Spawning Sites



Map produced by Kawartha Conservation  
© King's Printer for Ontario, 2024

### Fish Spawning Areas

- Largemouth Bass
- Smallmouth Bass
- Walleye
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbody
- Provincial Park
- Watershed Boundary

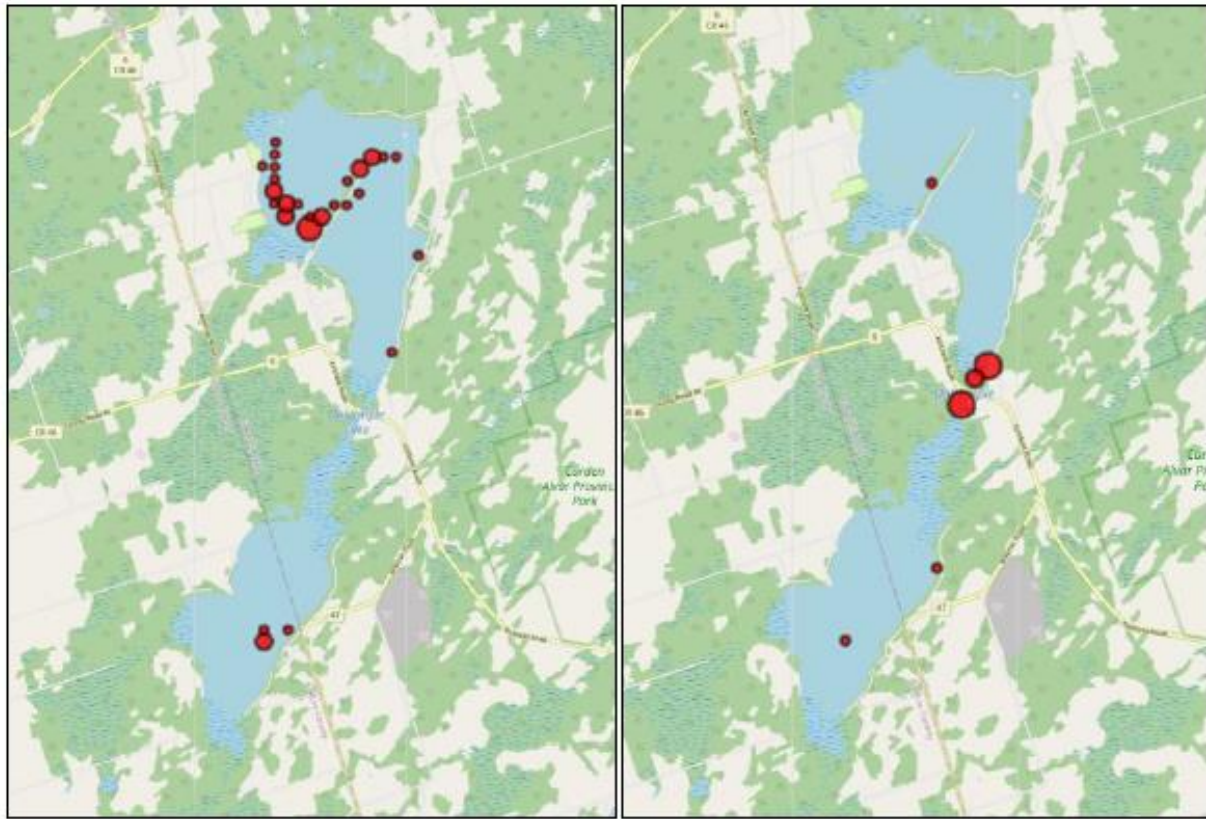
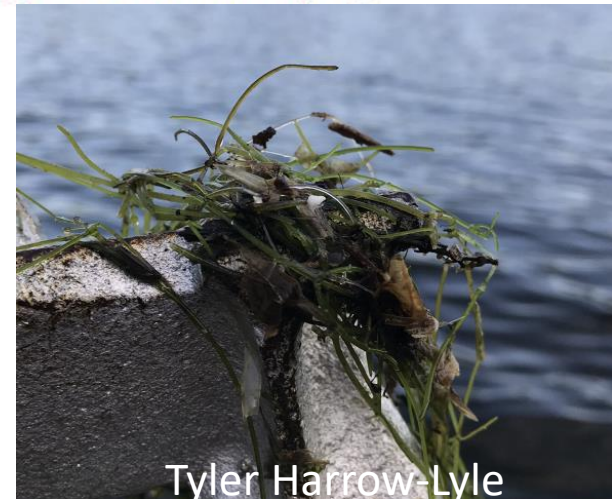


Figure 7.13. Location of known invasive aquatic plants in 2023, including Eurasian watermilfoil (left), and starry stonewort (right).



Tyler Harrow-Lyle

# 8.0 Landscape Ecology



[North-west shore of Lower Lake Dalrymple, August 2021]

# Landscape Ecology

## Key Observations

- The Lake Dalrymple Watershed contains **extensive natural heritage systems supporting both healthy and diverse terrestrial and aquatic ecosystems**. The areas around Lake Dalrymple contain large tracts of forest, wetland and alvar and have **benefitted from Couchiching Conservancy, the Nature Conservancy of Canada and the formation of the Carden Alvar Provincial Park** and their combined efforts to set aside lands for protection and stewardship.



# Landscape Ecology

## Key Observations

- The Lake Dalrymple Watershed **has an abundance of wetlands, the majority being swamp**. Wetlands serve several functions within a watershed, especially functioning to improve water quality. Swamps often contain dense forests, which act to slow the movement of water through watersheds and act as groundwater recharge areas.
- **Wetlands are particularly important for providing fish and wildlife habitat**, for example providing the source flow (headwaters) of the coldwater stream in the north-east. **Marsh type wetlands** are abundant in the lake, **and help to reduce erosion** around lakes and provide habitat for numerous fish, bird, reptile, amphibian, mammal, and invertebrate organisms.





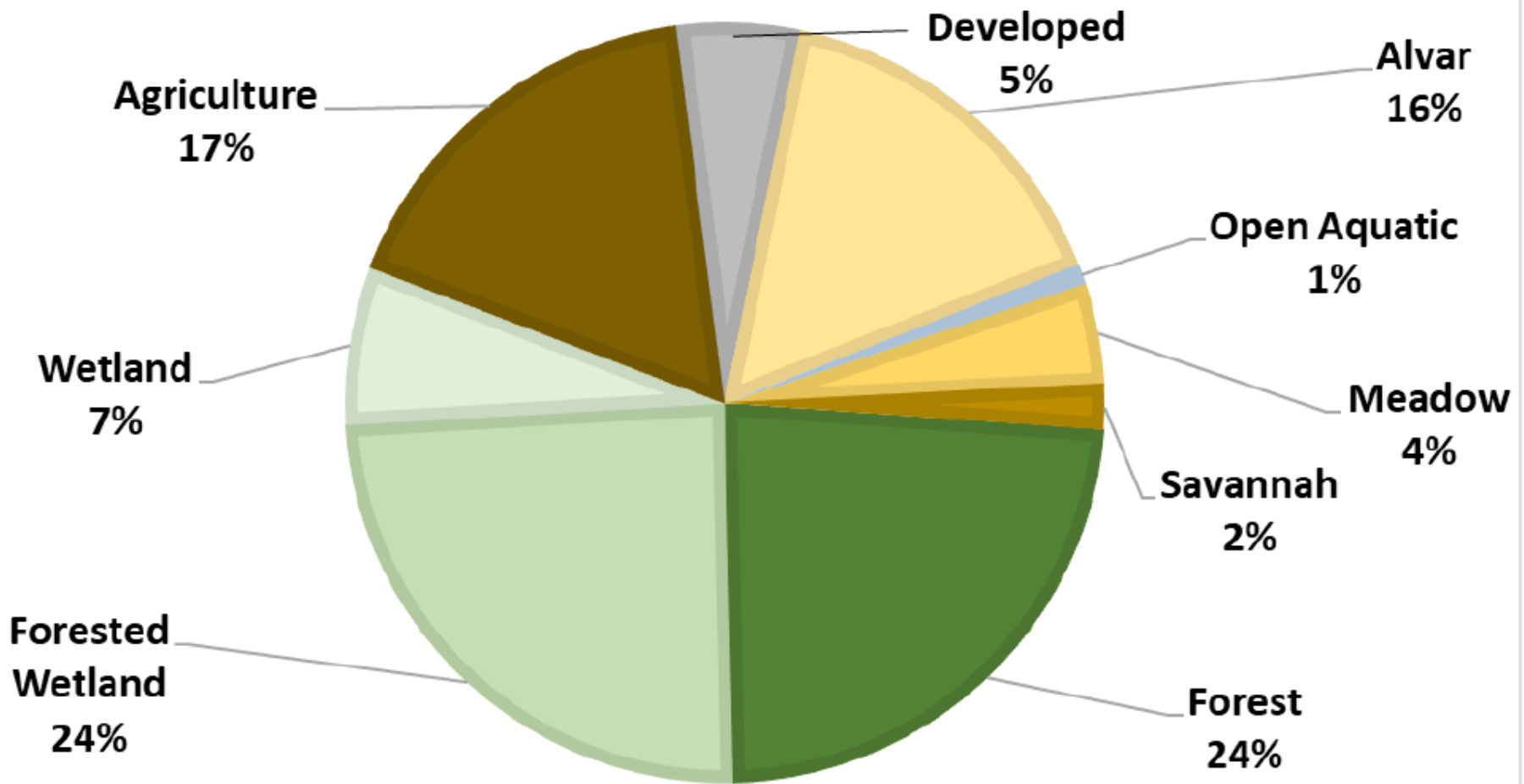
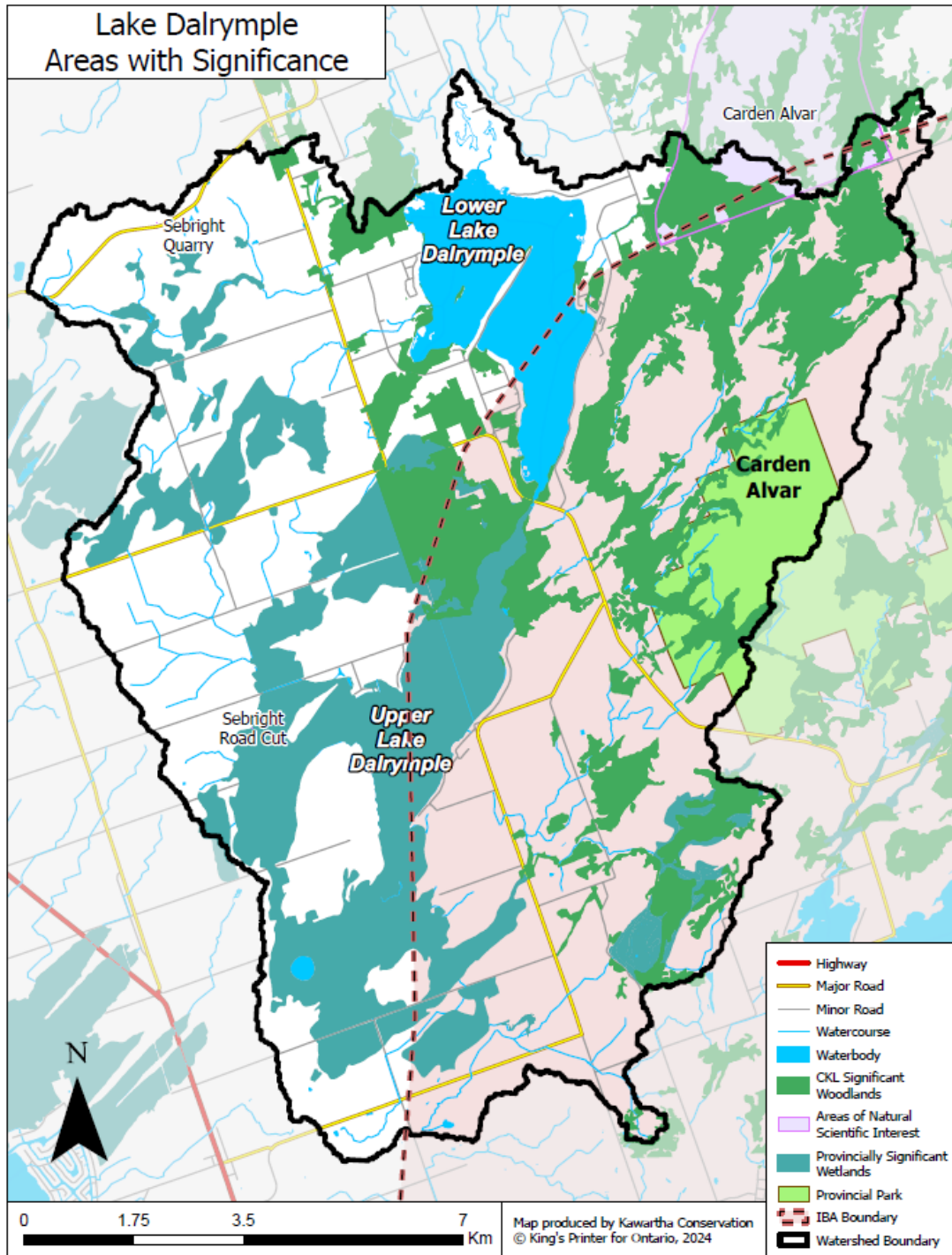
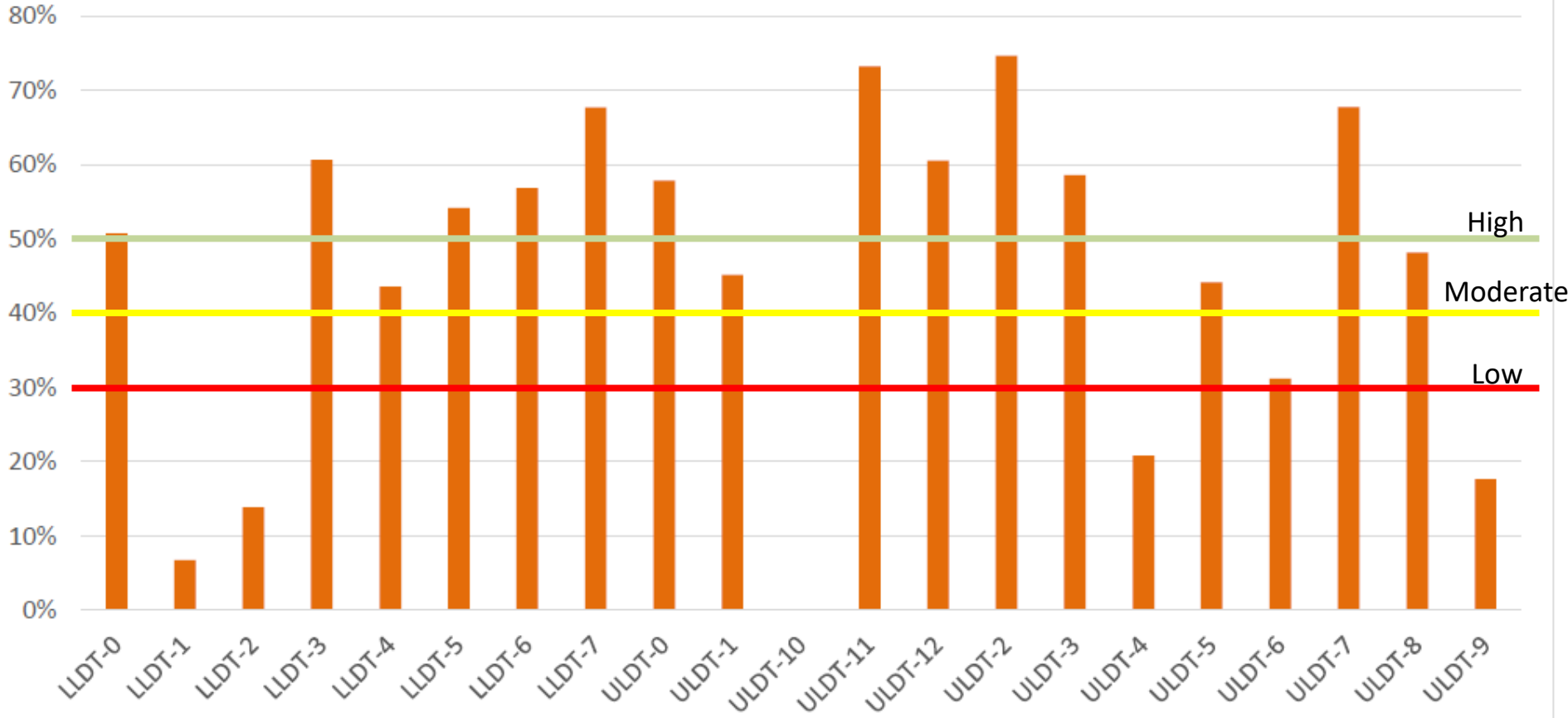


Figure 8.1. Lake Dalrymple Watershed Land Cover Based on Ecological Land Classification.

# Lake Dalrymple Areas with Significance



### Forest Cover % by Watershed



# Landscape Ecology

## Key Issues and Info Gaps

- **Thirty-six species of conservation concern** have been identified in the Lake Dalrymple study area. More information on the location and habitats is required to properly protect and potentially restore healthy populations of each species.
- Development in and adjacent to natural features is not common in the Lake Dalrymple watershed. However, **the incremental pressure on these areas over time leads to portions of forests and wetlands being removed to make room for houses and cottages.** Lakeshore properties continue to be sought after for development and less desirable areas such as swamps are targeted.

**Eastern Whip-poor-will**

**Eastern Wood-pewee**

**Field Thistle**

**Golden-winged Warbler**

**Grasshopper Sparrow**

**Great Plains Ladies'-  
tresses**

**Horned Clubtail**

**Jelly-strap Lichen**

**Least Bittern**

**Loggerhead Shrike**

**Midland Painted Turtle**

**Mottled Darner**

**Neglected Milk-vetch**

**Northern Threetooth**

**One-sided Rush**

**Pine Imperial Moth**

**Prairie Dropseed**

**Prairie Warbler**

**Purple Crystalwort**

**Shaly Tarpaper Lichen**

**Short-stalked**

**Chickweed**

**Snapping Turtle**

**Soil Ruby Lichen**

**Western Chorus Frog -**

**Great Lakes - St.**

**Lawrence - Canadian**

**Shield population**

**Wood Thrush**

**Yellow Rail**

Terrestrial species of conservation concern

# Landscape Ecology

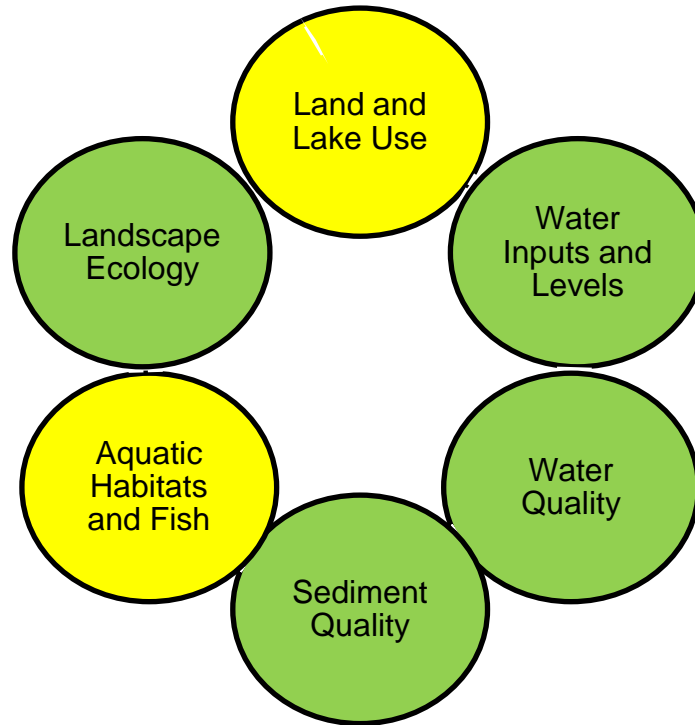
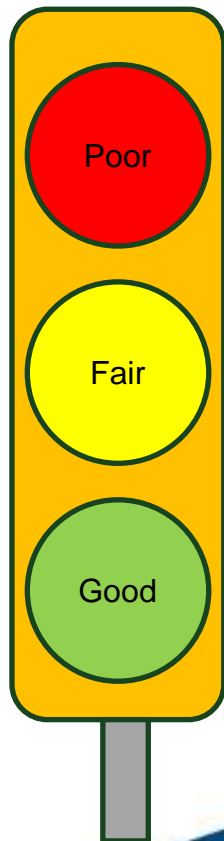
## Key Issues and Info Gaps

- Climate change alters terrestrial ecosystem conditions. The impacts of climate change will emanate from well beyond the watershed, but they can affect physical and biotic attributes and ecological functions within the watershed. Forests, already stressed by invasive plant and insect species, will continue to degrade due to climate change pressures. **Without healthy natural heritage systems, diversity will decline, and species will be less resilient to the changes that occur to them.**
- **Limited understanding of the health and quality of terrestrial ecosystems.** The terrestrial ecosystems have not been inventoried in detail to determine their health. No assessment of the resiliency of the terrestrial ecosystem to climate change has been completed.



# Characterization Report Summary

## State of the lake



# AGENDA

1. Welcome
2. Roundtable Introductions
3. Brief Project update
4. Watershed Characterization Report: summary of key observations, issues, and info gaps
5. **Management recommendations**
6. Public engagement summer 2024
7. Other business?
8. Closing – next meeting



# Management Recommendations

## Management Strategies



Protection



Enforcement



Rehabilitation



Communication



Monitoring

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# Public Engagement 2024

Purpose: present the draft Management Plan

- Educate public on management priorities for the lake
- Receive feedback

## 1. Open House

- Thursday August 22, evening (7-9pm)
- Saturday August 24, morning (10-12pm)

## 1. Online feedback survey (August - September)

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# Closing

**Thank you!**

## **Lake Dalrymple Management Plan Webpage**

<https://www.kawarthaconservation.com/en/environmental-sciences/lake-dalrymple-management-plan.aspx>

## **Examples of Lake Management Plans**

<https://www.kawarthaconservation.com/en/environmental-sciences/lake-and-environmental-management-plans.aspx>

## **Contact Us!**

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