Freshwater Conservation Canada

Arctic Grayling Conservation in the Upper Pembina

Ken Monk

Northern Lights Fly Fishers Chapter

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Trout Unlimited
CANADA

Northern Lights Fly Fishers
CHAPTER

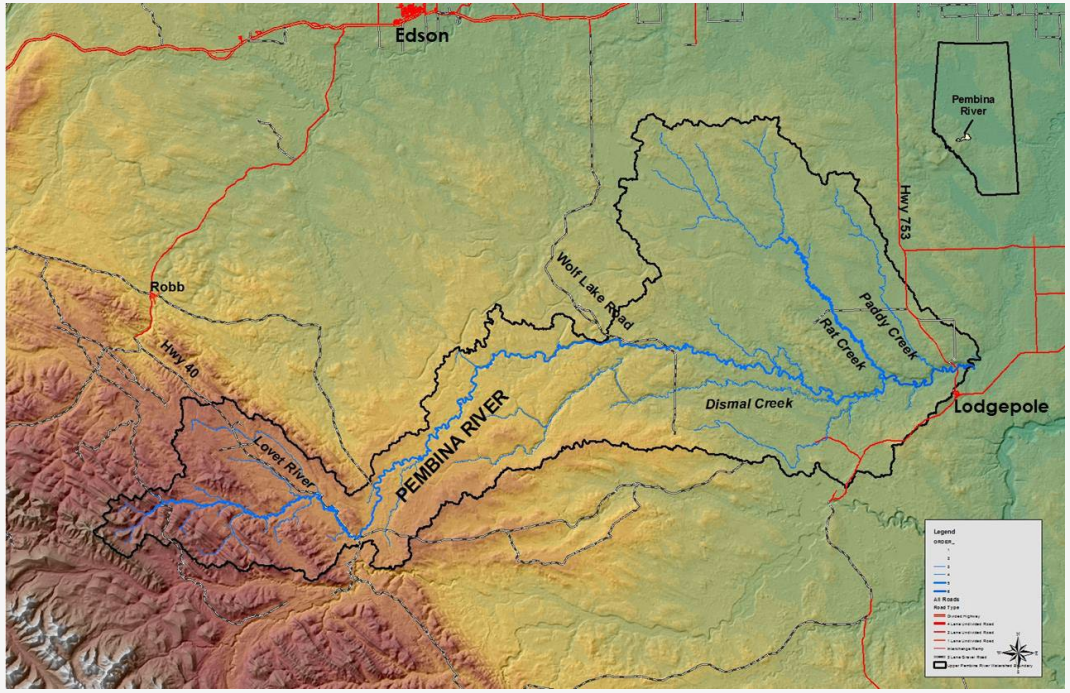
Northern Lights Fly Fishers Chapter
Freshwater
Conservation
Canada

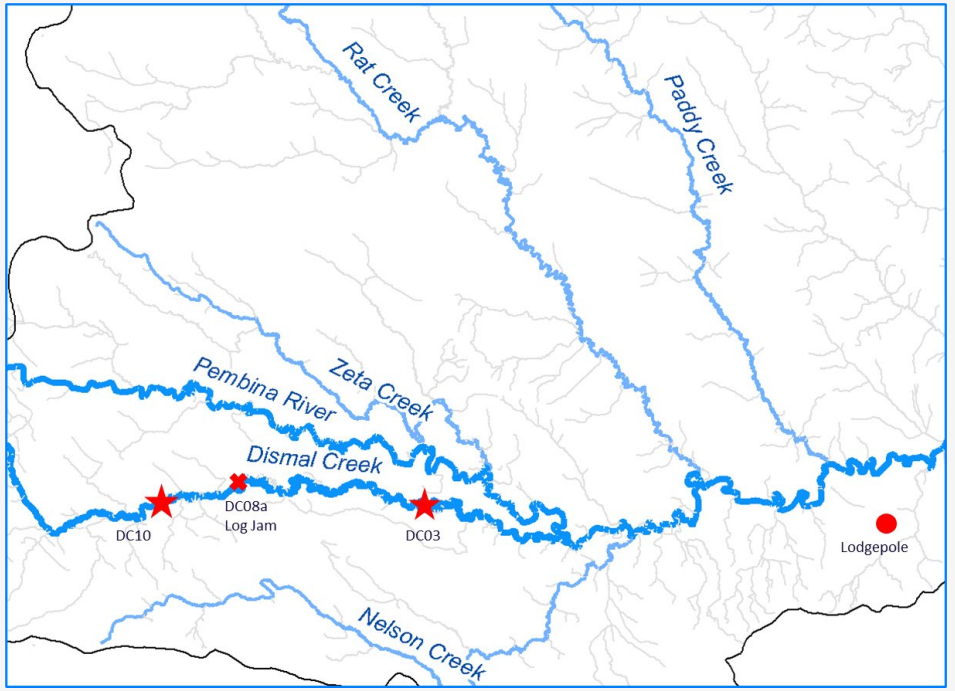
Mission: To conserve, protect and restore Canada's freshwater ecosystems and their coldwater resources for current and future generations.

Northern Lights Fly Fishers is now the Edmonton based chapter of Freshwater Conservation Canada.

Pembina River Grayling Project
2011 - 2025

Study Area


Edson
Pembina River
Hwy 753
Wolf Lake Road
Robb
Hwy 40
Rat Creek
Paddy Creek
Dismal Creek
Lodgepole
Lovet River
PEMBINA RIVER


Rat Creek
Paddy Creek
Zeta Creek
Pembina River
Dismal Creek
DC08a
Log Jam
DC10
DC03
Lodgepole
Nelson Creek

Historic Grayling Streams
Upper Pembina River Watershed

- Historical notes on 10 or more grayling streams in the UPR (upstream from Lodgepole), plus the main Pembina River
- They ranged in size from small tributaries used seasonally (spawning, summer feeding), to larger streams holding fish all year
- In the 60's UPR populations started to decline
- By the 70's some had disappeared; trend continued in the 80's and 90's, to the present day
- To the best of our knowledge, only two (maybe three tributary spawning stocks remain)
- And these populations are vulnerable and at risk of being extirpated!

Historic Grayling Streams – Upper Pembina River Watershed (cont'd)

Factor	Comments
High Road Density	Oil & gas activity, logging
Forest Removal	Logging, well-sites, pipelines, resource roads
Overfishing	Huge increase in access + grayling easily captured = population declines
Habitat Fragmentation	Poorly designed/maintained culverts
Increased Sediment Input	Poorly designed/maintained road crossings
Altered Stream Flows/Temperatures	Intensified land use, changing climate
Illegal Harvest?	Catches above & beyond regulations
Catch & Release Mortality?	Incidental mortality following release

Activities and Outcomes

- Activities
  - Volunteer Angling
  - Temperature data loggers
  - Fish Trap
  - PIT tagging
  - Tree planting
  - UAV videography
  - DNA / eDNA
  - Compliance Monitoring
  - Water Quality
  - Backpack Electrofishing
- Outcomes
  - Temperature data
  - DNA analysis
  - Angling closure / recovery indicators
  - Water withdrawals
  - FMA plans
  - Bridge replacement
  - Public Awareness (Lets go outdoors, CHED radio)

2011-2025 Volunteer Angling

2013 – Fish Trap

Fish Trap Installation Dismal Creek

Log Jam downstream of the fish trap

PIT Tagging

In-stream PIT tag array

- 32% of the Arctic Grayling tagged in Dismal Creek were detected by the in-stream arrays.
- It took as little as two days to travel 25 km between arrays.
- Over half of the grayling tagged on Dismal Creek made their way through the log jam.

Water Temperature Monitoring

Water Temperature Monitoring

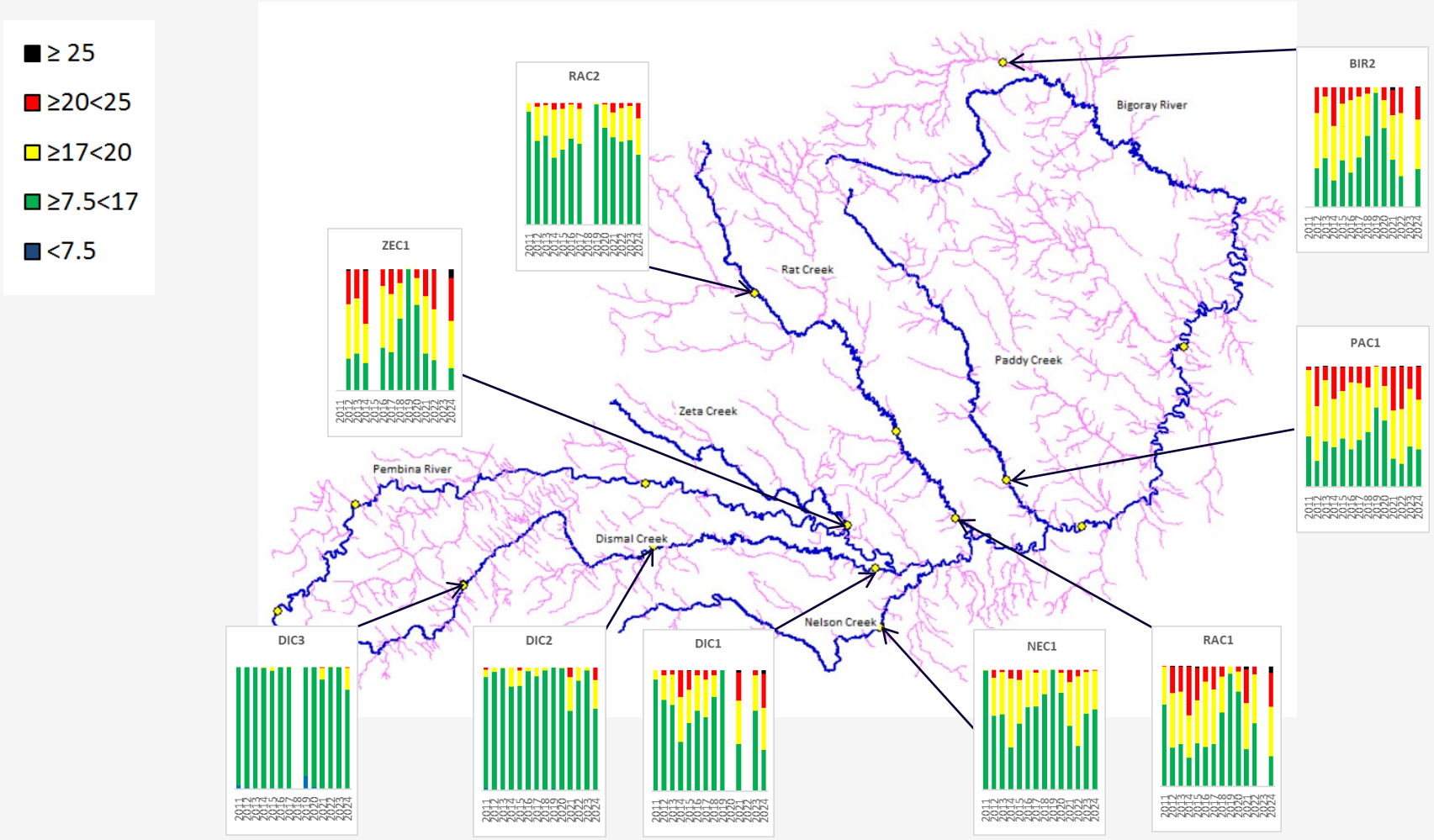
- NLFF and EPA/Edson have monitored water temperature since 2011, on 11 tributaries and 7 sites on main Pembina River.
- 23 water sensors and 4 air sensors
- General observations:
  - Large differences in temperatures (maximum and average), between and within, individual streams.
  - Dismal Creek was considerably cooler than other streams/sites in lower TUC-NLFF study area
  - Bigoray River, Paddy Creek and in the lower Pembina sites were considerably warmer than other sites.

Water Temperature Data – 2021

- ≥ 25
- ≥20<25
- ≥17<20
- ≥7.5<17
- <7.5

Location	Monthly Average				Max. Temp. Recorded (°C)
	June	July	August	September	
Bigoray-2	17.50	20.00	16.10	10.70	27.60
Dismal-1	16.90	19.50	16.40	10.40	29.00
Dismal-2	14.50	17.20	14.50	9.00	25.20
Dismal-3	12.30	14.80	12.30	7.70	23.30
Nelson-1	15.30	18.30	15.20	10.20	24.90
Paddy-1	17.80	20.30	17.50	11.30	25.80
Pembina-0	19.50	22.30	19.10	12.50	30.30
Pembina-1	18.60	21.30	18.10	11.80	29.80
Pembina-2	17.00	19.80	16.70	10.30	30.00
Rat-1	17.90	20.20	16.50	10.70	28.60
Rat-2	16.50	17.30	14.10	11.00	26.50
Zeta-1	17.10	19.60	16.60	11.70	24.00

Proportion of time in each thermal category



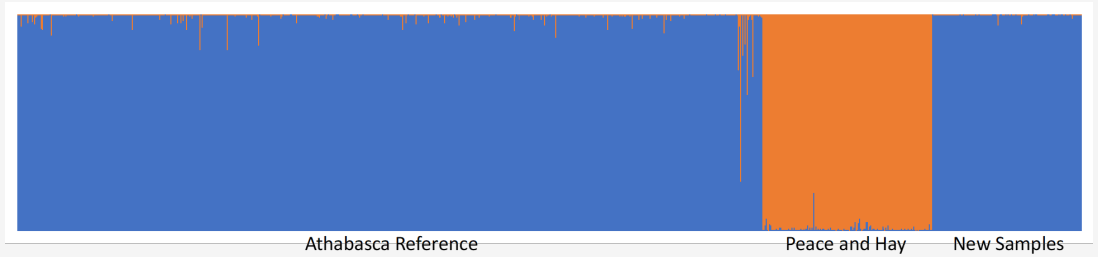
Non-Compliant Angling

Aerial Videography

After remediation

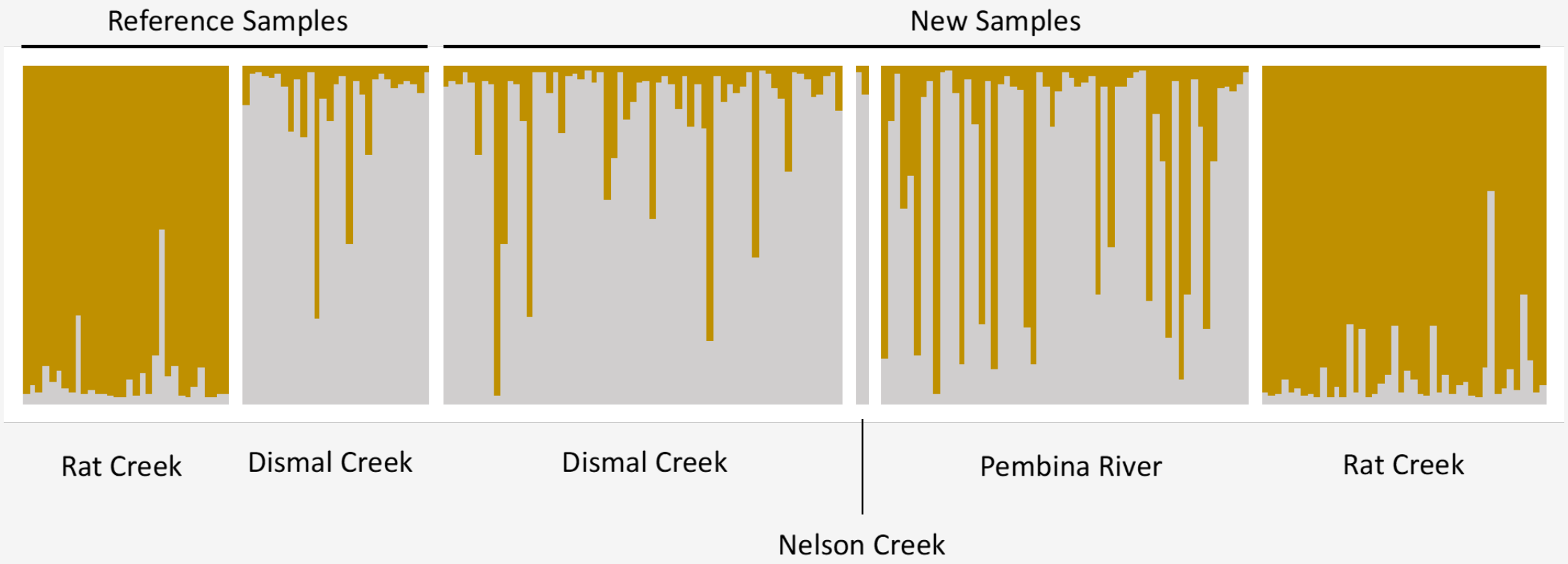
Erosion at Dismal Creek Site

DNA Analysis



- New Samples: 182 individuals collected from Rat Creek, Dismal Creek, and Pembina River
- Reference Samples: 1,116 collected from throughout the province
- All assessed at 9 microsatellite loci

DNA Analysis



Measuring Up – genetic evolution

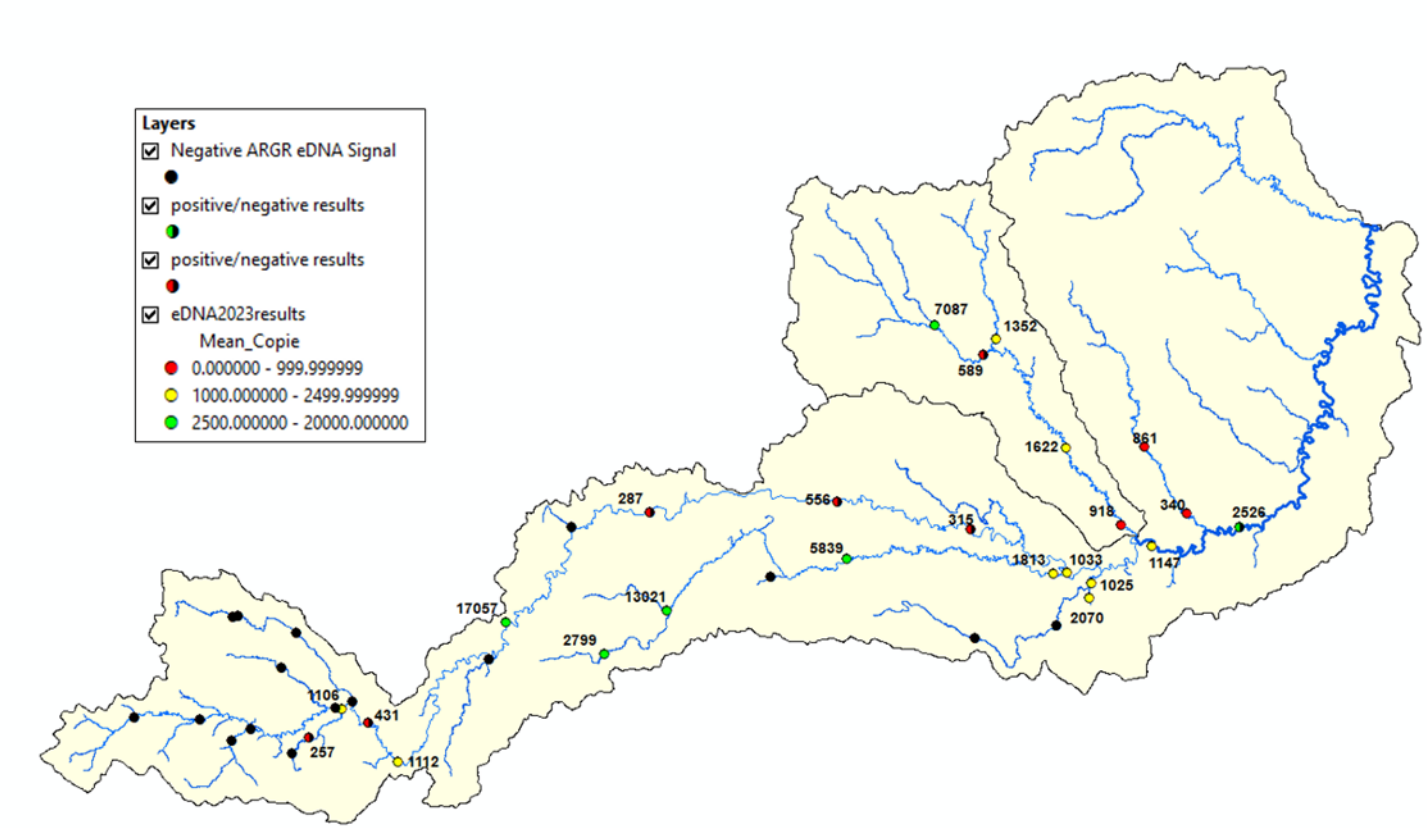
eDNA

- What is eDNA?
  - Environmental DNA is the cellular material shed into the water from skin, excrement, mucous, gametes and decomposition.

eDNA

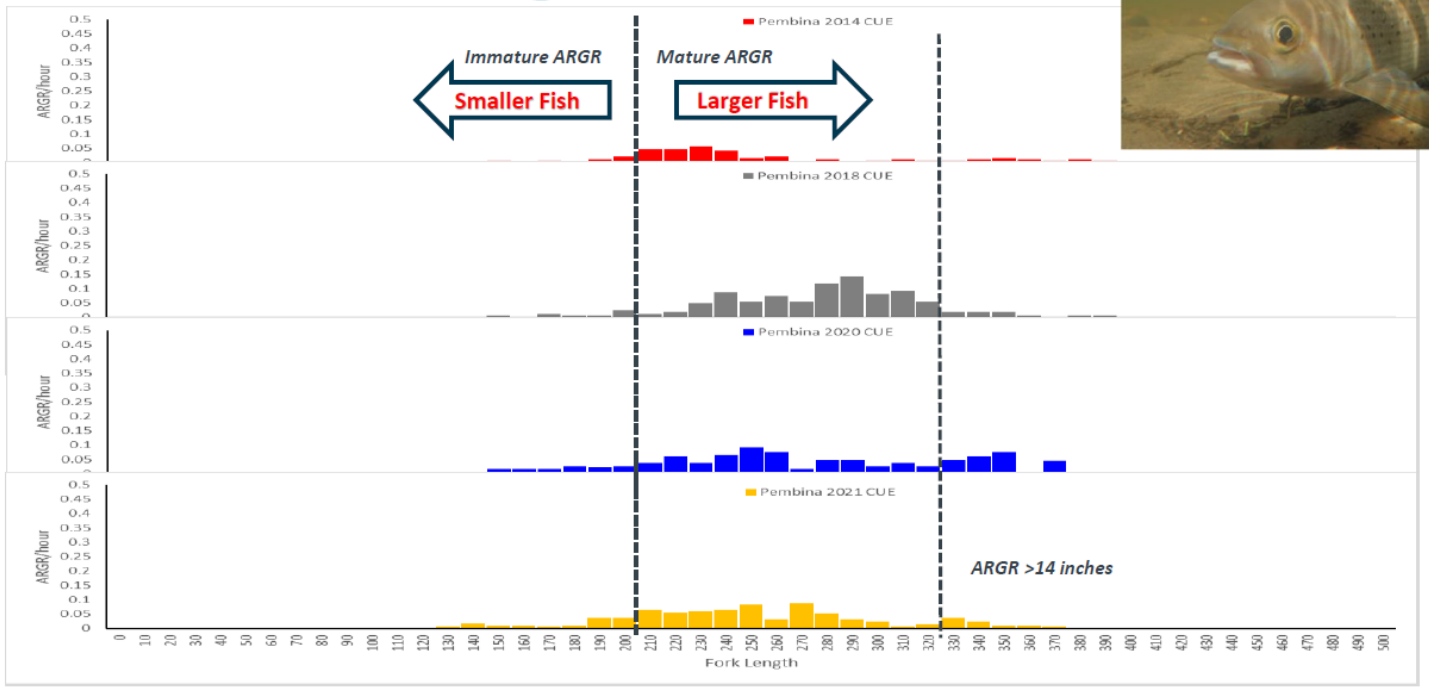
- How is eDNA useful?
  - Differences in DNA building blocks can be used to identify species, populations and individuals.
  - In our context, eDNA is a non-invasive way to determine if a species exists in a given waterbody.
  - Much less field work that angling, efishing or other techniques.

24/36 sites tested positive

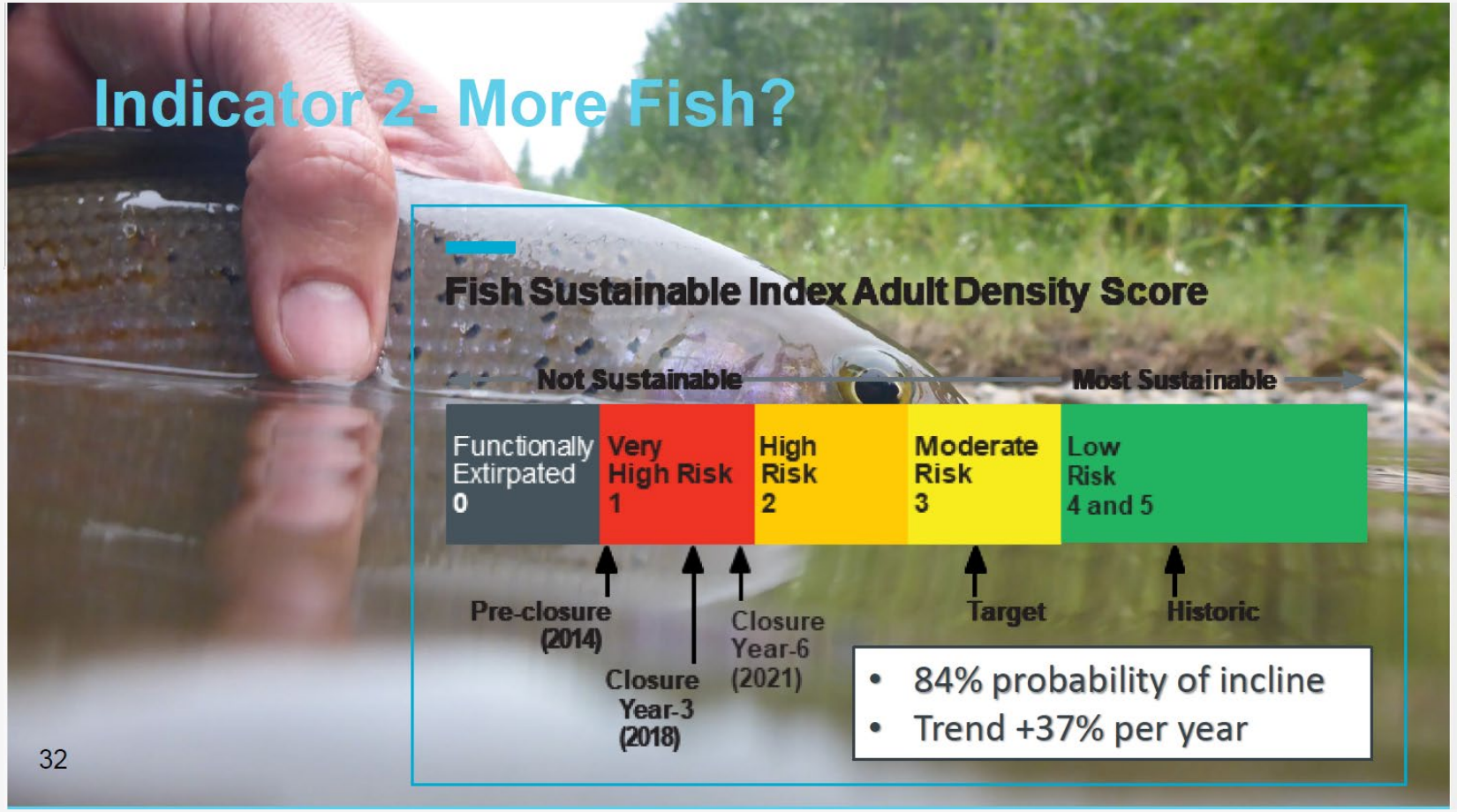


EPA Recovery Indicator: Larger Fish

Indicator 1- Larger Fish?



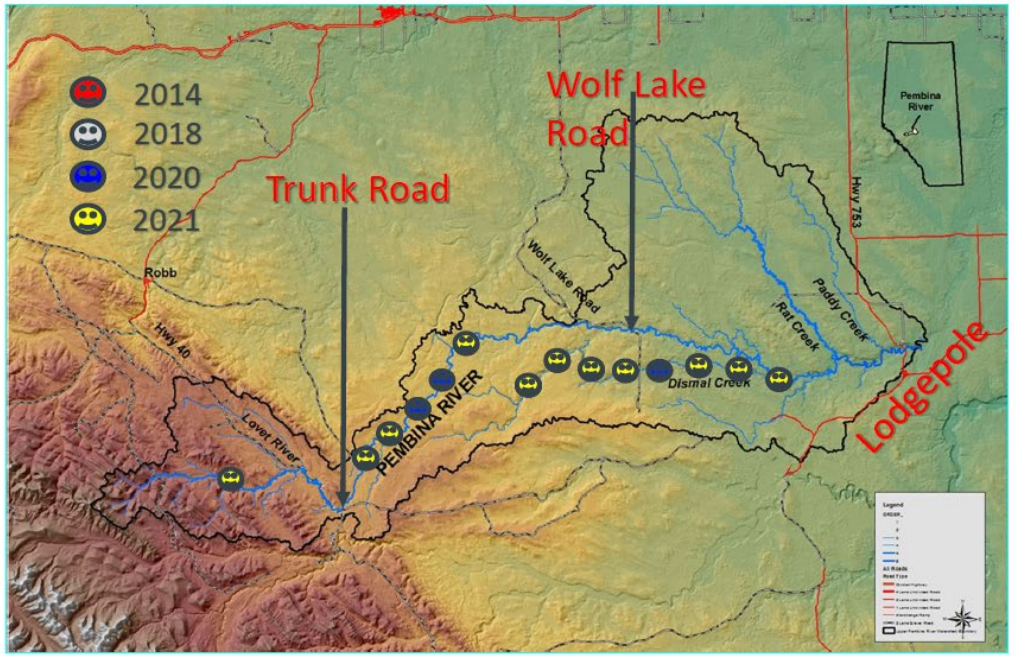
EPA Recovery Indicator: More Fish



EPA Recovery Indicator: Fish in More Places

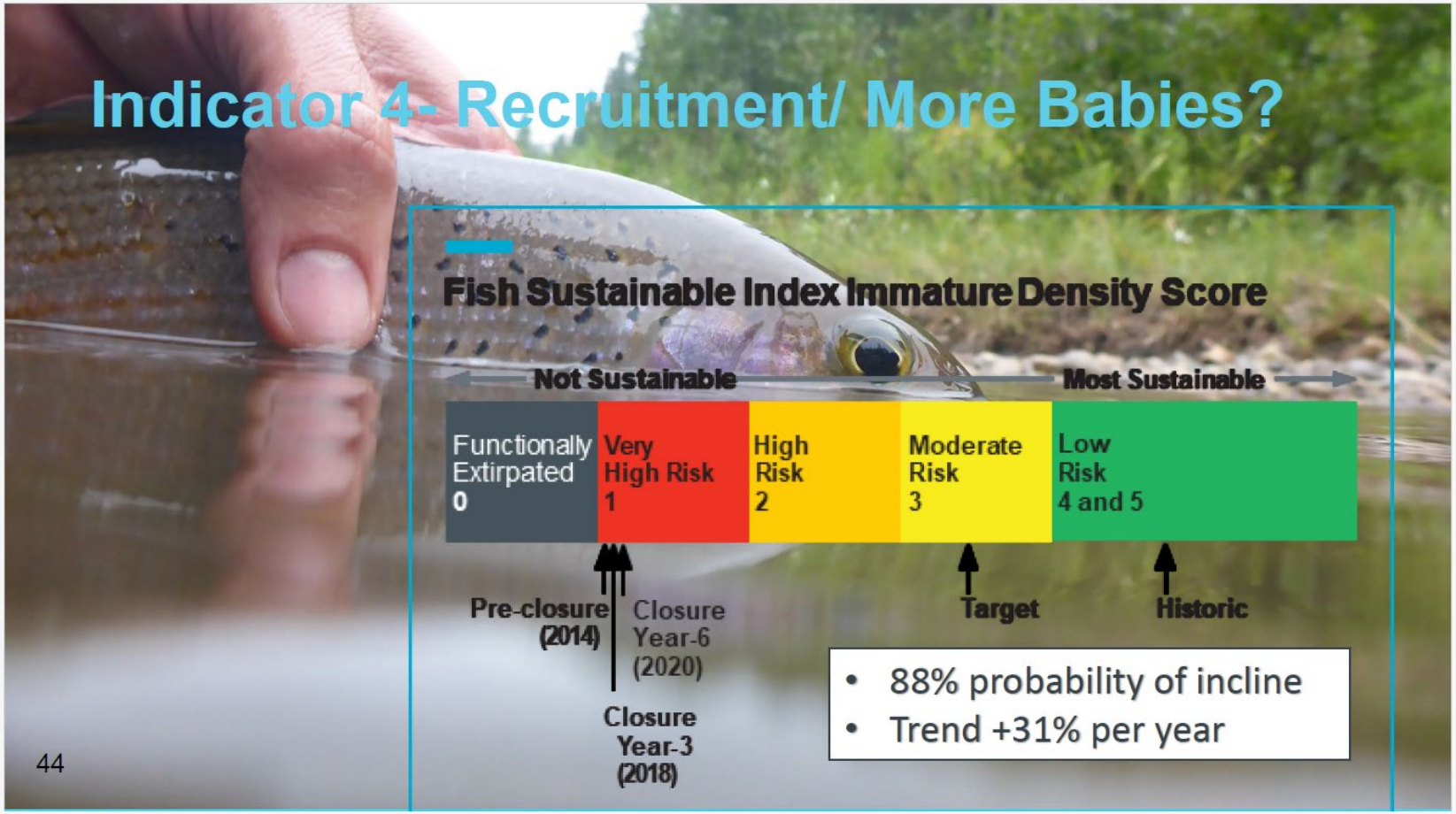
Indicator 3- Fish in More Places?

- 2014- 10/18
- 2018- 11/18
- 2020- 14/18
- 2021- 11/18



Classification: Protected A

EPA Recovery Indicator: Recruitment



Next steps

- Continue temperature monitoring and video inventory
- Additional DNA work

- Evaluate if there was a response in the fish community (Brook Trout, Arctic Grayling, Mountain Whitefish) as we approach year 10 of the fishing closure in the Upper Pembina between Lodgepole and the headwaters of the Pembina River.
- Feasibility assessment for Arctic Grayling translocation

Alberta Conservation Association

This project is financially supported by the Alberta Conservation Association.

Thanks to many volunteers from Northern Lights Fly Fishers www.nlft.org