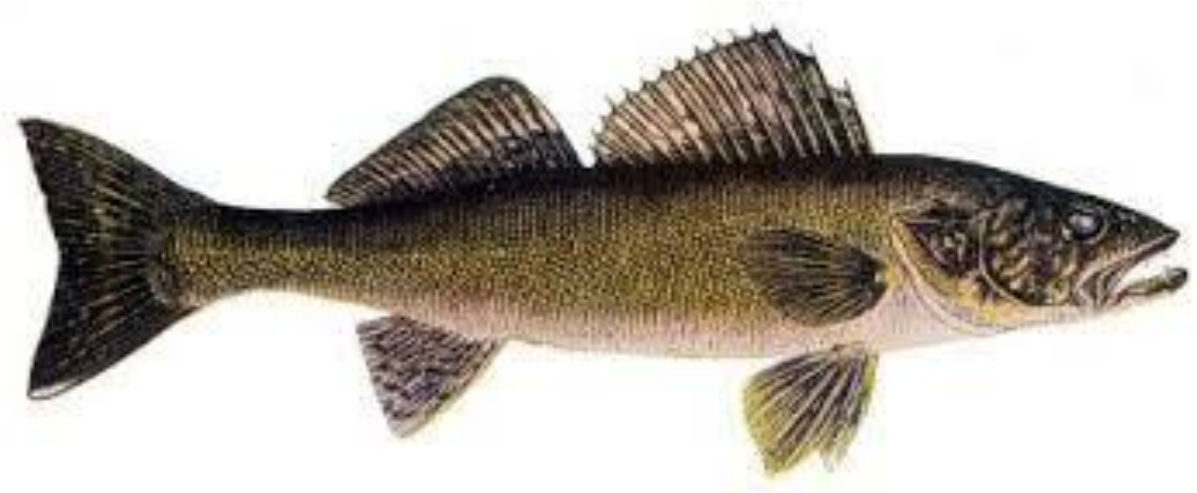
Walleye
Fish Sustainability Index 2013



Assumptions and Thresholds

General Assumptions

- **Data Timeliness how old is data?**
  - Rank 1: >20 yrs
  - Rank 2: 16-20 yrs
  - Rank 3: 11-15 yrs
  - Rank 4: 6-10 yrs
  - Rank 5: <5 yrs

- **Data quality and quantity were ranked based on the amount of sampling conducted in a lake and the type of sampling conducted (e.g. standardized FWIN netting vs. non-standardized netting or angling). For example:**

Adult density

Methods

- Pulled Fall Walleye Index Netting (FWIN) data from FWMIS
- Rank was determined from the latest FWIN survey from each lake
- >440 mm TL was classified as a mature WALL
- Only used nets set 19-30h to determine CUE, removed nets >30 hrs from the analysis. Unknown's and YOY's classified as immature.
- Only used full-nets in analysis and eliminated non-standard FWIN meshes.
- Top 5 walleye lakes were averaged to determine the score of 5 and then thresholds followed AESRD 2012 risk criteria.

FSI Score	Adult CUE (walleye/net night)	Risk (AESRD 2012)
5	>29	Low Risk
4	20-29	Low Risk
3	15-19.9	Moderate Risk
2	6-14.9	High Risk
1	<6	Very High Risk

Assumptions:

- FWIN data entered into FWMIS was done so correctly.

Data Quality & Quantity

- Standardized FWIN surveys always received a '5'.
- In the absence of FWIN, test netting, beach seining, commercial fisheries records, sample angling and other

Juvenile density

Methods

- Pulled Fall Walleye Index Netting (FWIN) data from FWMIS
- Rank was determined from the latest FWIN survey from each lake
- Only used nets set 19-30h to determine CUE, removed nets >30 hrs from the analysis. Unknown's and YOY's classified as immature.
- <440 mm TL was classified as a immature WALL
- Only used full-nets in analysis and eliminated non-standard FWIN meshes.
- Top 5 walleye lakes were averaged to determine the score of 5 and then thresholds followed AESRD 2012 risk criteria.

FSI Score	Immautre CUE (walleye/net night)	Risk (AESRD 2012)
5	>18	Low Risk
4	13-17.9	Low Risk
3	9-12.9	Moderate Risk
2	4-8.9	High Risk
1	<4	Very High Risk

Assumptions:

- FWIN data entered into FWMIS was done so correctly.

Data Quality & Quantity

- Standardized FWIN surveys always received a '5'.
- In the absence of FWIN, test netting, beach seining, commercial fisheries records, sample angling and other data was used.

Ecological Integrity: Predators/Prey/Competitors

- **Predator**
  - Rank 1: Cases of 'voracious new predators'
  - Rank 2: New predator is becoming more common or native predator becoming rare
  - Rank 3: Mostly same predators, but anthropogenic landscape alterations and angling pressure has altered species abundances
  - Rank 4: Same predators, but anthropogenic landscape alterations and angling pressure has moderately altered species abundances
  - Rank 5: No changes
- **Prey**
  - Rank 1: Cases where WALL have 'lost native prey'
  - Rank 2: Different prey, but some still native
  - Rank 3: Mostly the same prey, but anthropogenic landscape alterations and angling pressure has altered species abundance
  - Rank 4: Same prey, but landscape alterations and angling pressure has moderately altered species abundance
  - Rank 5: No changes
- **Competitor**
  - Rank 1: Cases where new species completely outcompetes WALL
  - Rank 2: Different competitors, but some still native
  - Rank 3: Mostly the same competitors, different abundances
  - Rank 4: Same competitors, but anthropogenic landscape alterations and angling pressure has likely altered species abundance
  - Rank 5: No changes

Ecological Integrity: Predators/Prey/Competitors

Data Quality & Quantity

- Score of 3 : if there was one adequate set of data (generally test net or FWIN) for one year.
- Score of 4 : if there were two good years of data
- Score of 5 : for places like Lac La Biche where they actually knew with some certainty how the populations were changing/interacting. Lakes where all fish had been extirpated also got a 5.

Threat Mitigation: Exotics

- **Exotics**
  - Rank 1: Severe threat of exotics, in system now (e.g., Prussian Carp)
  - Rank 2: High threat of exotics (in closely connected system)
  - Rank 3: Moderate threat (in distantly connected system)
  - Rank 4: Low threat (in area, but not in a connected system)
  - Rank 5: No significant threats (possible but none currently in area or species present but not considered a threat)

- **Assumptions:**
  - Prussian carp, crayfish act as exotic threats to walleye

- **Resources:**
  - Historical stocking and measured fish query for distribution and abundance data of exotics
  - Pers. Comms. with biologists regarding exotic presence and distribution
  - Qualitative assessment of fishing pressure (road density, proximity to settlements and campgrounds) and land use (road density, satellite imagery)

Genetic Integrity - Hybridization

- Rank 1 and 2: All or mostly hybrids within the lake
- Rank 3: Some hybrids reported or presence strongly suspected
- Rank 4: No hybrids reported, but proximity to stocked walleye causes concern
- Rank 5: No hybrids in system

- **Monitoring quality/quantity**
  - Rank 2/3: record of walleye stocking occurring, but no genetic analysis
  - Rank 4: no record of walleye being stocked, and no significant chance of hybrids
  - Rank 5: Genetic sampling occurred
- **Resources:**
  - Measured fish, and stocked fish FWMIS queries
  - Historic commercial fishing records to determine presence prior to stocking (if applicable)
  - L. Burke thesis and reports

Genetic Integrity- Similarity to Original Stock

- Rank 1: Isolated and Genetic Bottleneck
  - Isolated by man-made barriers and…
  - <50 spawners (population has declined because of human activities)
- Rank 2: Isolated or Genetic Bottleneck
  - Isolated by man-made barriers and has low or declining abundance or…
  - <50 spawners (population has declined because of human activities)
- Rank 3: Isolated
  - Isolated by man-made barriers and has moderate to high abundance
- Rank 4: Selection Pressure
- Assumptions
  - “50 spawners” threshold based on the ‘50/500 rule’, wherein an effective population size of 50 is required to prevent loss of diversity due to inbreeding
  - Must consider the “effective distance” of barriers
- Resources
  - Anecdotes of historic population trends
  - FWIN and FWMIS stocking records
  - Campgrounds, distance to human settlements, road density used as supporting evidence for fishing pressure

Genetic Integrity- Genetic Distinction

- Rank 1: One population in lake and it is isolated by a natural barrier, or has unique habitat/life history
- Rank 2: Multiple populations in lake, and many are isolated by natural barriers, or have unique habitats/life histories
- Rank 3: One population out of many in the lake is isolated due to natural barriers or has unique habitat/life history
- Rank 4: The lake contains multiple populations, or one population, that are somewhat isolated from each other or from those in neighbouring lakes due to reproductive behaviour, distance, or partial/temporary barriers.
- Rank 5: The lake contains a population that continues into adjoining lakes and there are no known movement barriers.
- Assumptions
  - If applicable genetic analysis is available, a population is defined as a group of fish that have >90% self-assignment rates
  - Local bios will need to consider if any habitat or life histories in their area are “unique”
- Resources
  - L. Burke thesis and reports
  - ArcGIS (stream order, waterfall layers)

Productive Potential-Natural Limitations

Qualitative ranks for individual lakes were assigned using a variety of information. Specifically:

- Lake morphometry data
- Available water quality and quantity data
- Anecdotes from area biologists, anglers and traditional knowledge regarding the historic quality of the fishery
- Historic commercial fishing record catches
- Growing degree days (derived from climateWNA) to infer lake productivity. Where:
  - <1000 GDD= low productivity (rank of 1)
  - 1000-1200 GDD=moderate productivity (3)
  - >1200 GDD=high productivity (5)

Productive Potential-Anthropogenic Limitations

Qualitative ranks for individual lakes were assigned using a variety of information. Specifically:

- GIS layers showing anthropogenic land disturbance (e.g. campgrounds, roads, agriculture, industrial activity)
- Reports of fish kills or algae outbreaks
- Available water quality and quantity information
- Golder (2008) GIS analysis of surrounding tertiary watersheds using INFI criteria

Threats

- **Habitat Protection Need**
  - Rank 1: Protection badly needed, severe and imminent threats e.g. Privately owned land, knowledge of large industrial projects
  - Rank 2: Significant need for protection. Severe threats but not imminent. e.g privately owned land and heavy land use on any crown land
  - Rank 3: Normal threats, neither severe nor imminent
  - Rank 4: Minimal threats, additional protection could be afforded but not a priority e.g crown land with little land disturbance, HUC has some large provincial parks
  - Rank 5: No significant threats. E.g. Federal Parks, Wilderness Areas (e.g., Willmore, Whitegoat)
- **Habitat Protection Availability**
  - Rank 1: Privately owned or FN/metis land
  - Rank 2: Provincial crown land
  - Rank 3: Contains Class A waters
  - Rank 4: Provincial Parks and Protected Areas
  - Rank 5: Federal Parks, Willmore WA

Threats

- **Overharvest Protection Need**
  - Rank 1: Paved/gravel roads, within 150km of Edmonton or Calgary
  - Rank 2: Paved/gravel roads, within 50km of Lethbridge, Grand Prairie, or Red Deer
  - Rank 3: Paved/gravel roads, but further than 50km from major cities
  - Rank 4: Unimproved roads/truck trails, but further than 50km from major cities
  - Rank 5: No road access (Majority of NPs, Willmore WA)

  Assumption: Paved and gravel roads = 2WD access, need local bios to adjust based on their knowledge of road conditions/access

- **Overharvest Protection Availability**
  - Rank 1: General Regs
  - Rank 2: Specific Bag/Size
  - Rank 3: Tags
  - Rank 4: Catch and Release
  - Rank 5: Complete Closure