In Search of Sustainable and Responsible Recreational Fisheries

Steven J. Cooke, PhD, FRSC

Canada Research Professor in Fish Ecology and Conservation Physiology

Carleton University, Ottawa, Canada

@SJC_Fishy

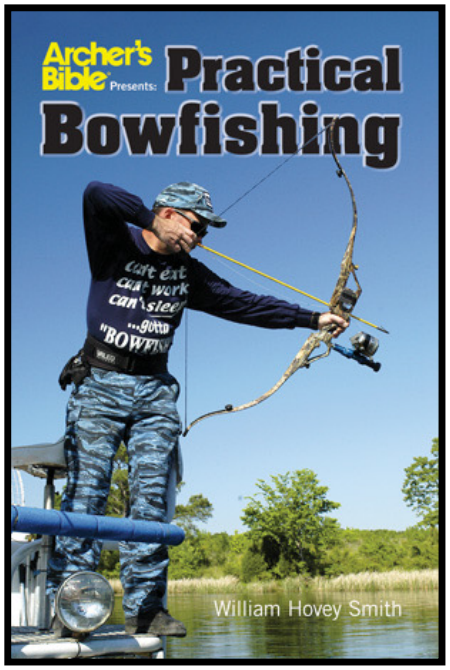
WWW.FECPL.CA

About Me (and my biases)


SIMRAD
MERCURY
ODYSSEY
Yellowfin

Definitions

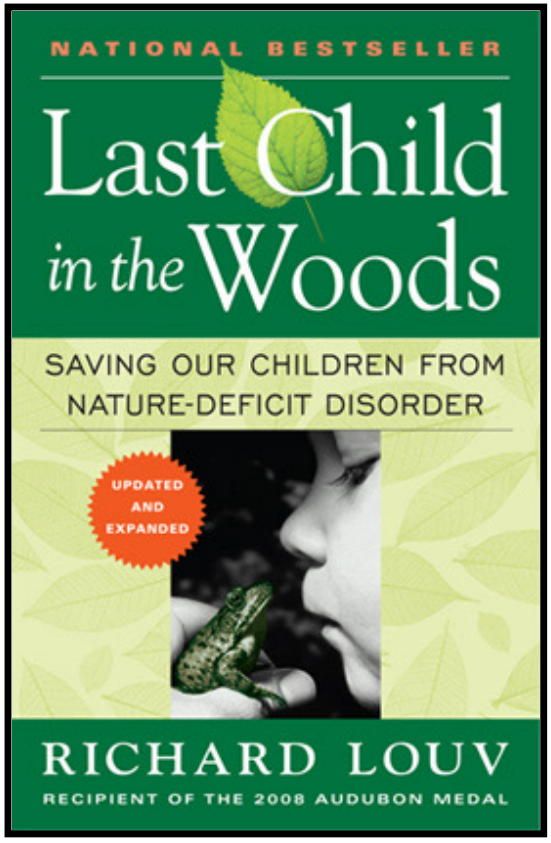
What is Recreational Fishing? (*UN FAO 2012*)
fishing of aquatic animals that do not constitute the individual's primary resource to meet nutritional needs and are not generally sold or otherwise traded on export, domestic, or black markets (fishing for fun & leisure)



Recreational fishing is the primary fishing sector targeting inland fish stocks in industrialized countries *Arlinghaus et al. FAF 2002*

Benefits of Recreational Angling

- Economic (regional and national) – Expenditures = $190 B/yr
- Social bonding (family), satisfaction, quality of life
- Psychological stress relief, reduced negative emotions
- Reduction in crime propensity of young people
- Education about nature and wildlife
- Local “organic” food source
- Important for conservation (empowered and engaged environmental citizens)



Status of Rec Fisheries

- **Globally, ~11% of the total population (average)**
- **Little global monitoring of recreational fishing participation although evidence of growth in emerging economies (e.g., Brazil, India)**
- **Even less known about catch and harvest**

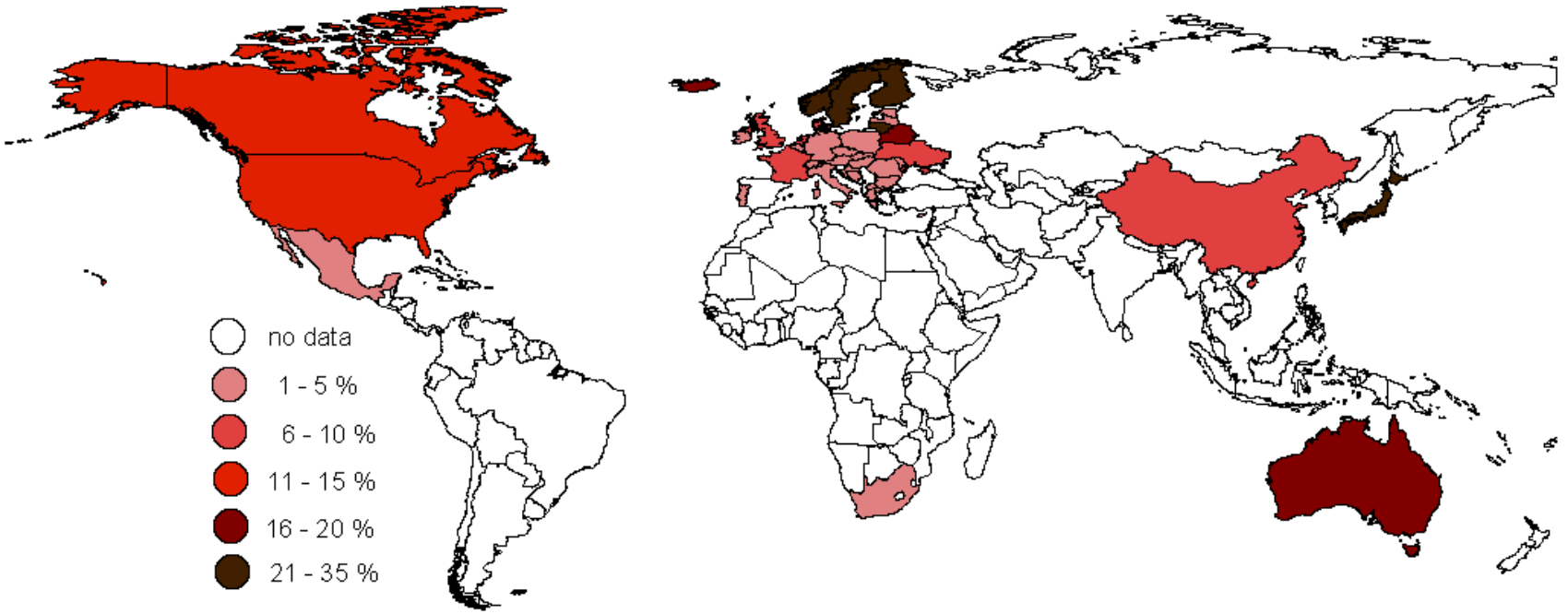


Figure from Arlinghaus & Cooke 2008 Blackwell Sci Book.

Extrapolations from Canada to the World

Using data from DFOs 2000 Survey of Recreational Fishing in Canada

- recreational capture rates = 47 billion fish
- 36% or 17 billion fish are harvested
- harvested weight = 10.86 million tonnes
- as many as 30 billion fish are potentially released!

Cooke & Cowx 2004. BioScience

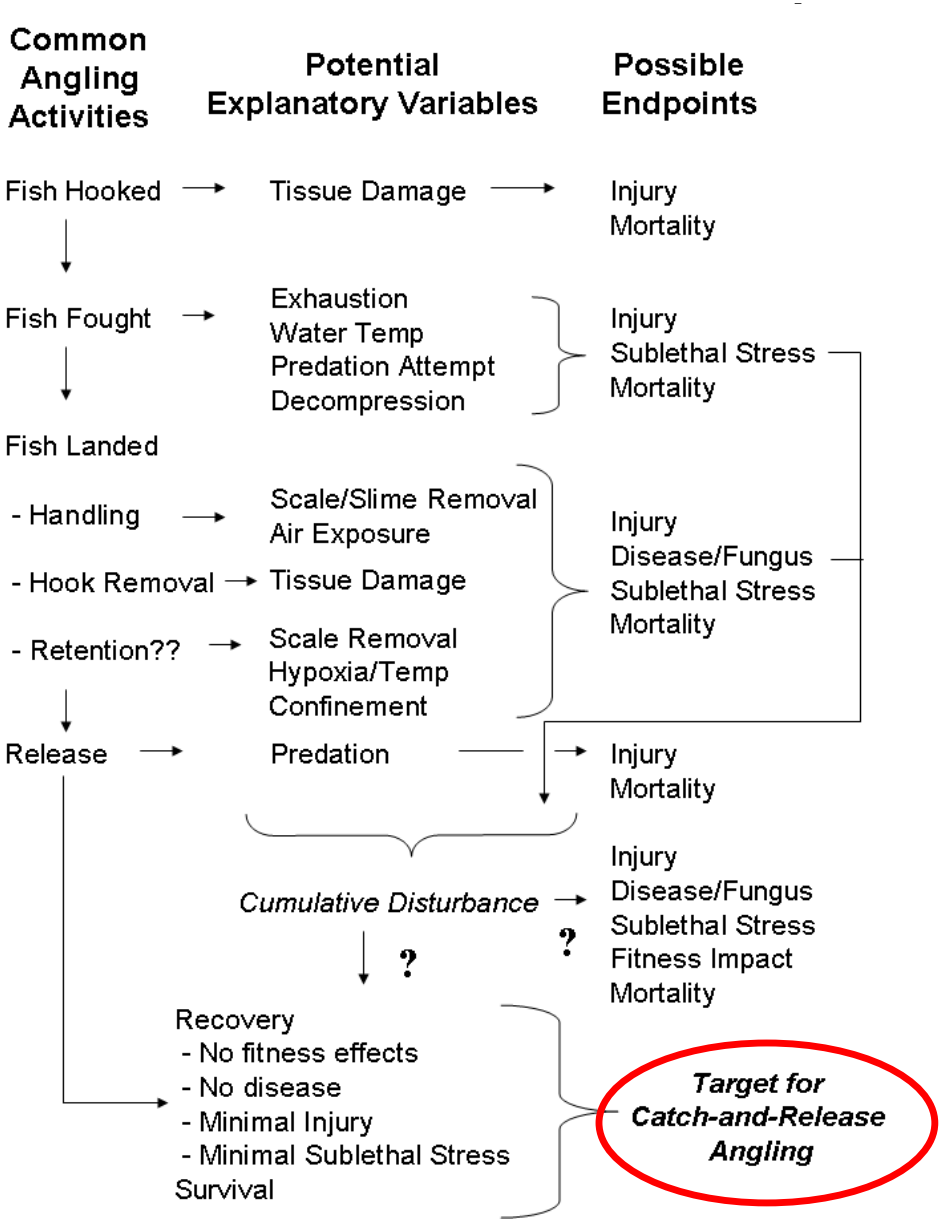
Release Rates Highly Variable

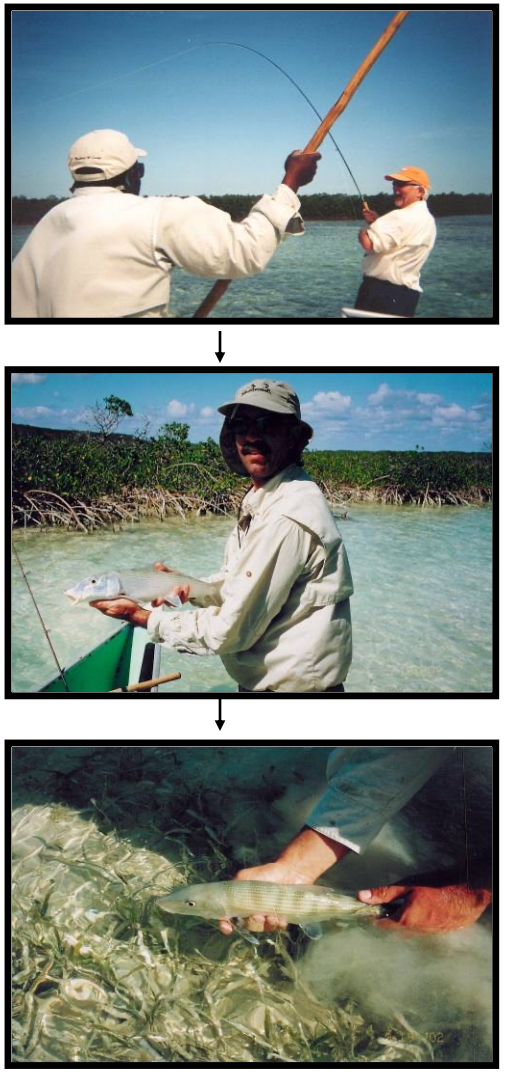
Catch and Release

Catch-&-Release Angling

- Mandated
- Voluntary
- Discouraged
- Verboten

C&R Schematic





Cooke & Philipp. 2007. CRC Book

What do we know?

- ~425 catch-and-release studies to date
- Many fish are released and some die… (mort from 0.1% to near 100% - <10% is common and considered “low”)
- Sublethal effects also possible
  - injury, disease, fitness, stress, behaviour, growth, etc

- Outcome of angling event influenced by…
  - biology of fish (size, species, sex, life-stage)
  - environment (temp, depth, predators)
  - *angler behaviour (air exposure, handling)*
  - *gear choice (hook type, line strength)*
  - *angler experience and knowledge*

Integrative and Comparative Biology

Integrative and Comparative Biology, volume 55, number 4, pp. 554–576
doi:10.1093/icb/icv088

Society for Integrative and Comparative Biology

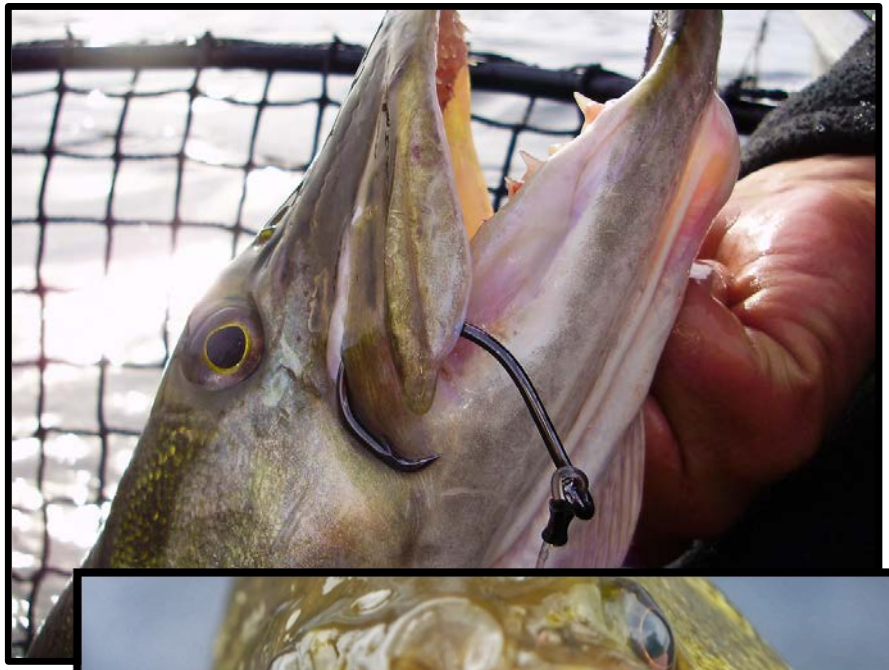
SYMPOSIUM

Fishing for Effective Conservation: Context and Biotic Variation are Keys to Understanding the Survival of Pacific Salmon after Catch-and-Release

Graham D. Raby,[1,*] Michael R. Donaldson,[†] Scott G. Hinch,[†] Timothy D. Clark,[†,‡] Erika J. Eliason,[*,†] Kenneth M. Jeffries,[§] Katrina V. Cook,[†] Amy Teffer,[†,¶] Arthur L. Bass,[†] Kristina M. Miller,[||] David A. Patterson,[#] Anthony P. Farrell[**] and Steven J. Cooke[*]

- So - context and biotic variation matter…
- But angler behaviour (including gear choice) is mediator

Over 100 C&R Studies



FISH and FISHERIES

FISH and FISHERIES, 2013, 14, 439–457

Voluntary institutions and behaviours as alternatives to formal regulations in recreational fisheries management

Steven J Cooke[1], Cory D Suski[2], Robert Arlinghaus[3,4] & Andy J Danylchuk[5]

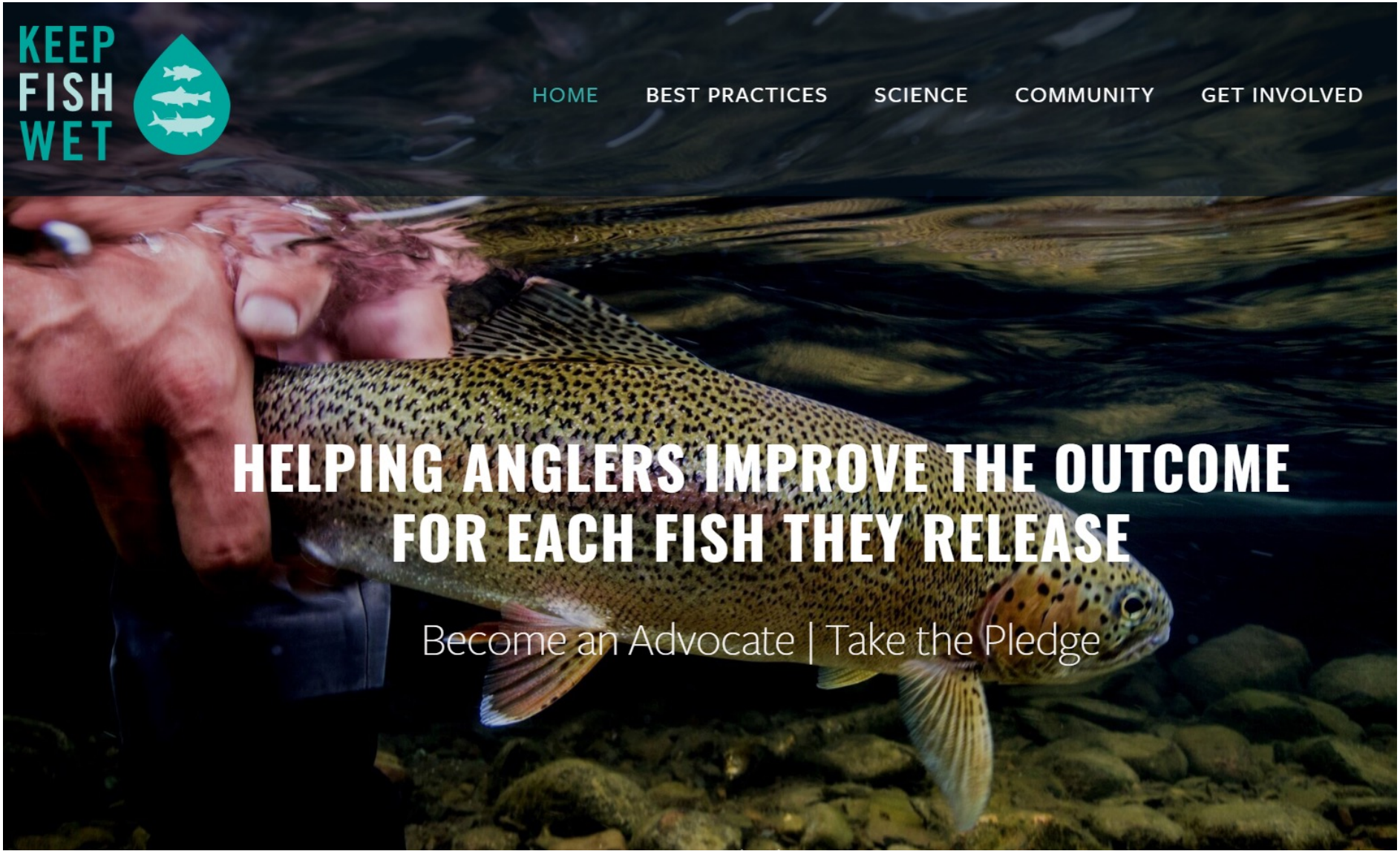
Empower anglers to modify their behaviours

Depends on IDENTIFYING best practices and SHARING them effectively with anglers

We are part way there…

Carleton University

#Keepfishwet



Three SIMPLE Principles (with scientific basis)

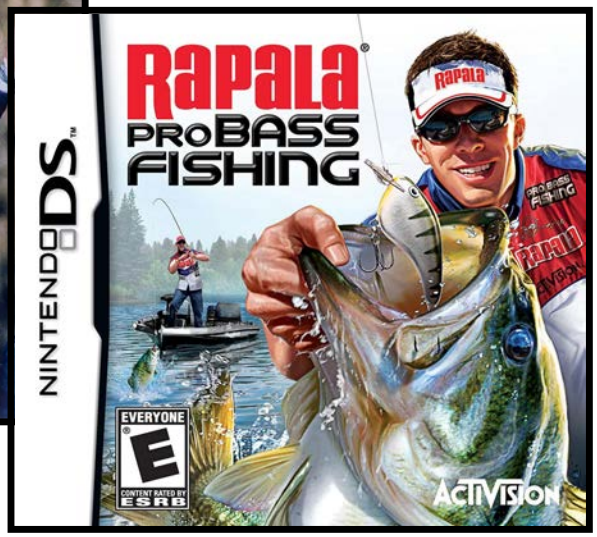
KEEP FISH WET

1. Minimize air exposure

2. Eliminate contact with dry surfaces

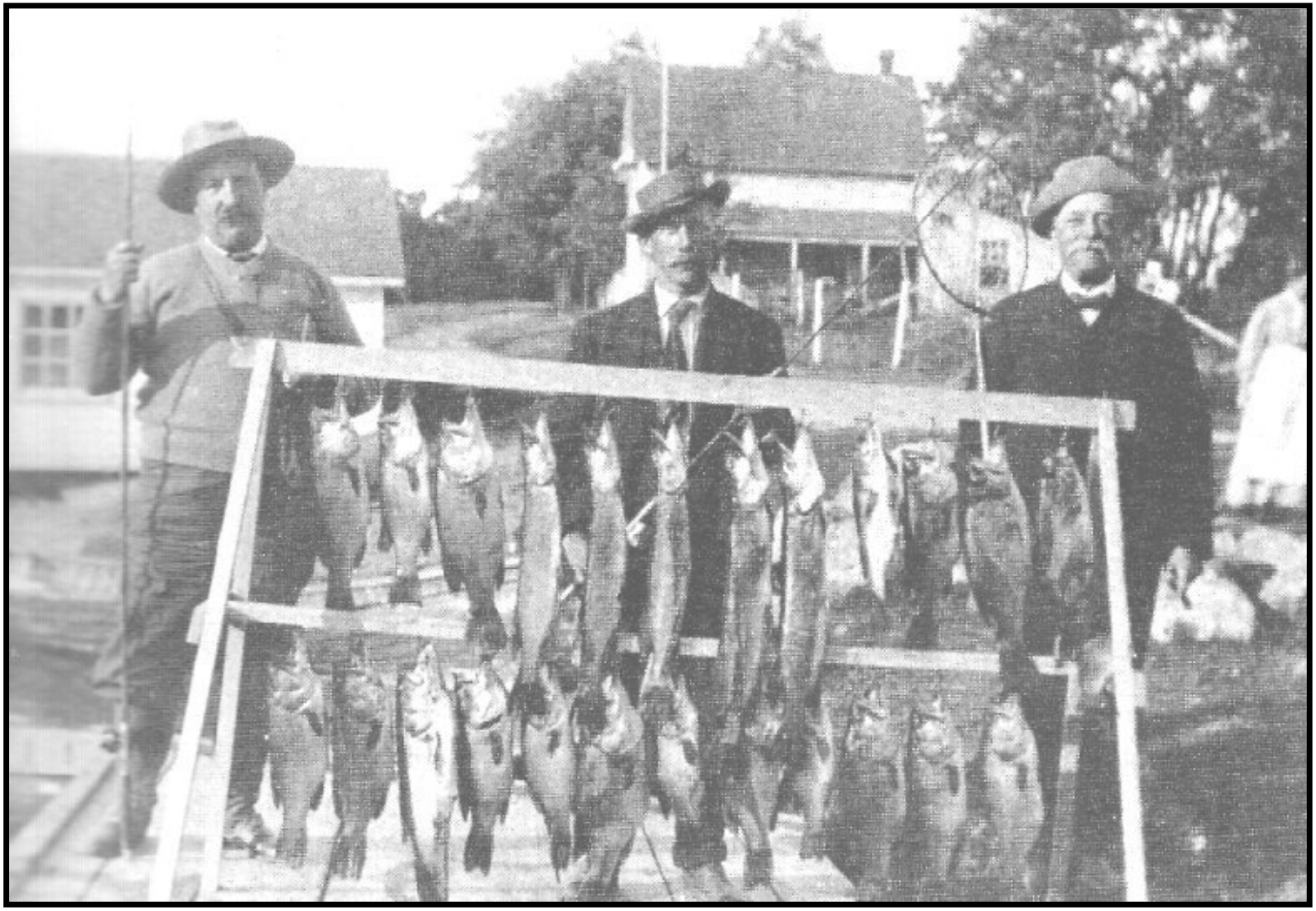
3. Reduce handling

Black Bass Fishing VERY Popular



- **$32+ Million USD for BASS Masters Classic**
- **177 Bass Pro Shops that generate $8 Billion USD in revenue**
- **2nd most popular fish in Ontario**

Black Bass C&R

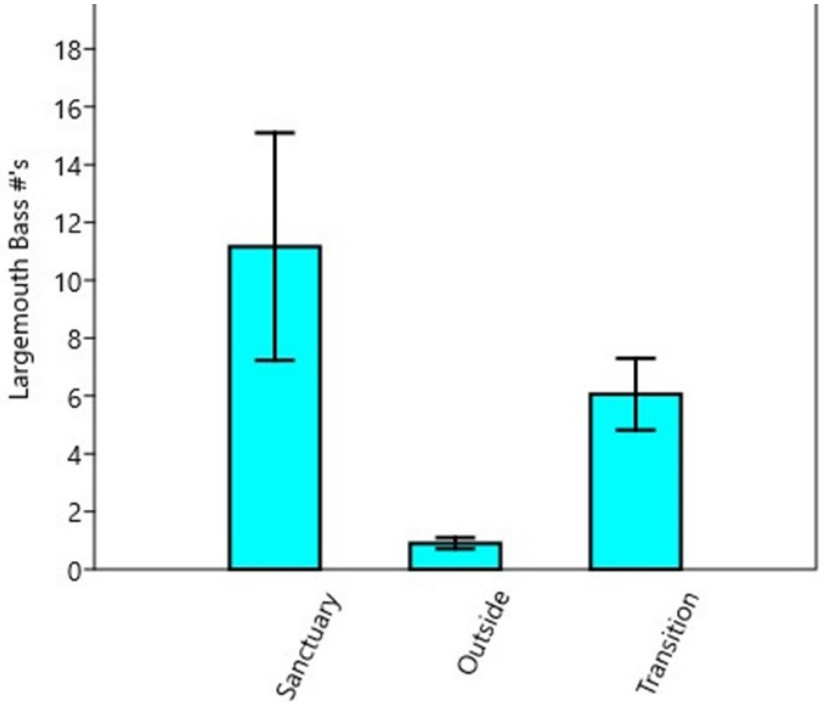


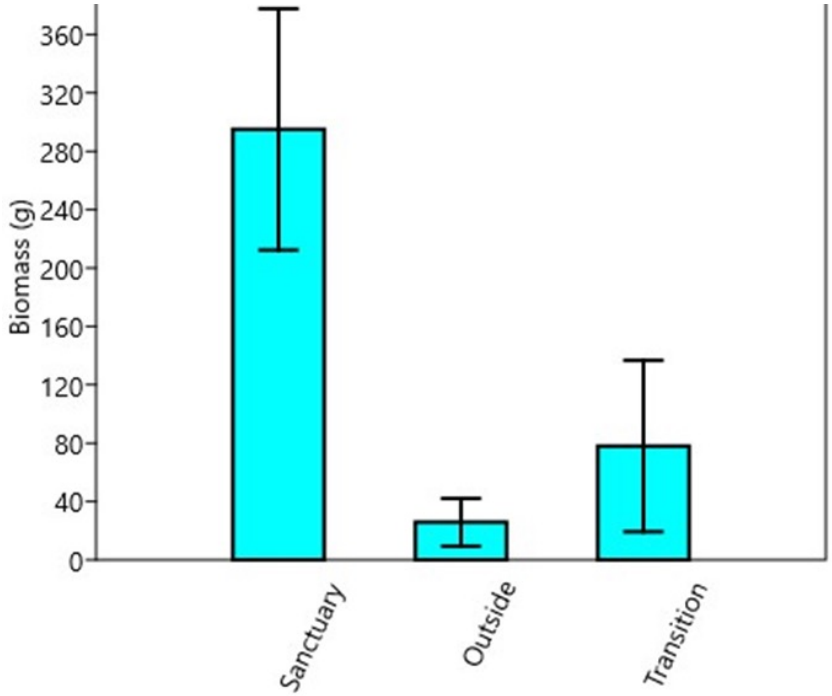
Sanctuaries

- Fish sanctuaries instituted in the 1940s by Min of Lands and Forests to “protect bass”
- Opinicon (x2), Big Rideau (x2), Sand, Charleston, Newboro (x2), Whitefish
- MUCH research on MARINE protected areas – little known about FW

- Do adult bass spend their entire lives in sanctuaries?
- Are sanctuaries a net source of production for other parts of the lake?
- What if anything is different about fish in the sanctuaries?
- Do sanctuaries benefit other species?
- Are sanctuaries a useful approach for fish conservation?

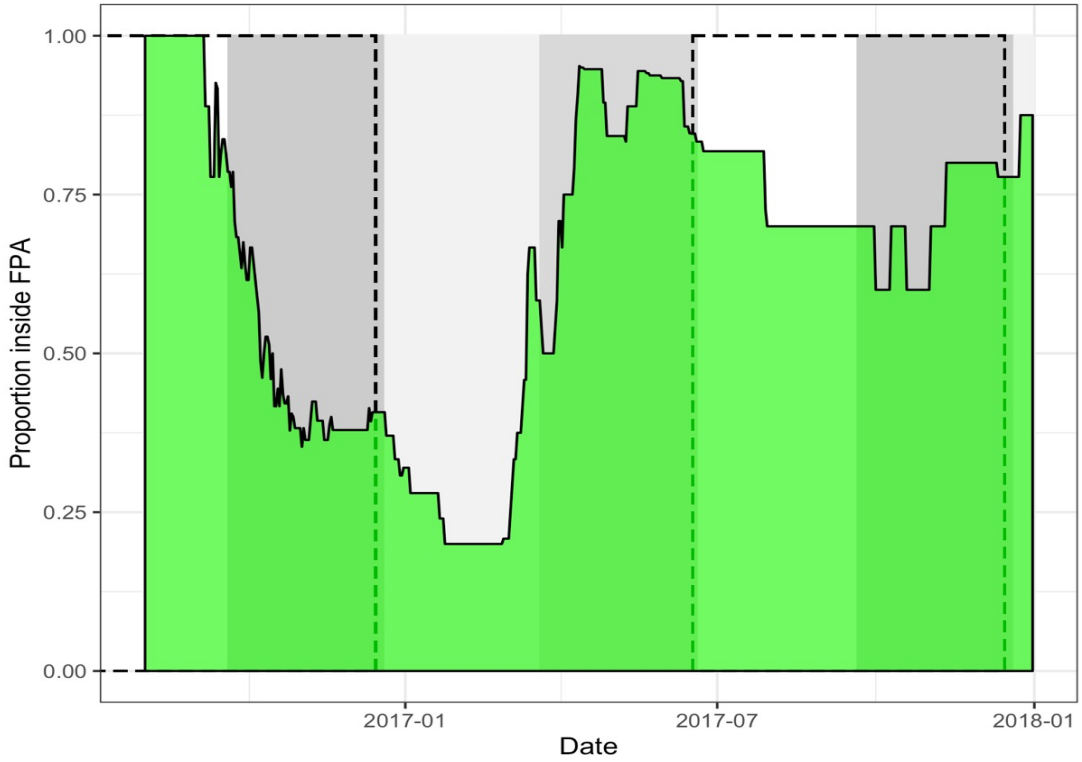
Sanctuaries





Abundance and Biomass of Largemouth Bass in Big Rideau Lake
Based on N=20 snorkeling transects in similar habitat types per zone

Sanctuaries



- Temporal occupancy pattern of the BR FPA by largemouth bass (tended to leave in fall/winter and return in spring)
- Biggest fish had the highest level of residency
- Recent work reveals that the “bass sanctuaries” have an umbrella protection effect for non-fish taxa

Today the vast majority of black bass are released

Estimates for our Area

Lake	Bass Caught	Bass Kept	Release %
Big Rideau Lake	196215	21358	89.3%
Newboro Lake	133097	10228	92.5%
Opinicon Lake	61345	8467	86.8%
Sand Lake	63587	8560	87.4%

*Data derived from DFO/MNRF National Rec Fishing Survey

Tournaments

~120,000 competitive angling Events/yr in N Am

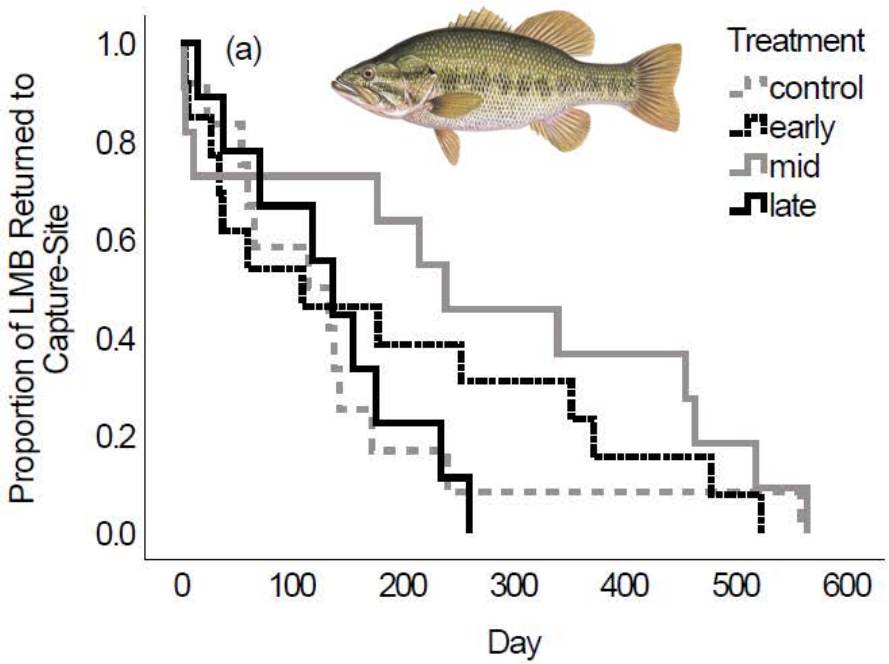
Tournament Displacement

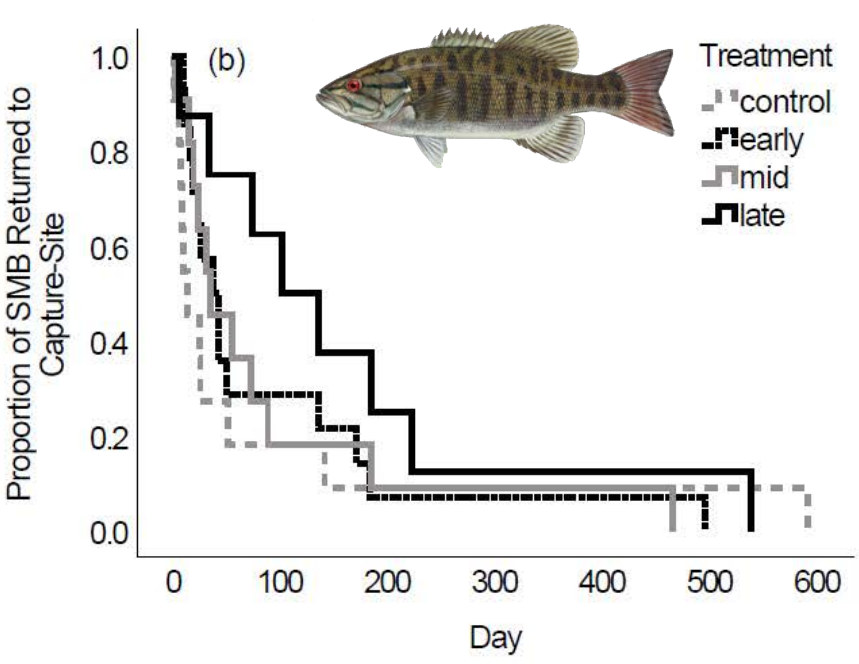
- Do bass disperse from tournament releases sites?
- If they do return to their site of capture, how long does it take?
- Does this vary depending on the season when the tournament is held?

Telemetry Study
(funded by BRLA & RLEF)

- Tagged 60 smallmouth and 60 largemouth bass
- Controls from prior to season opener + tournament fish from late June, Aug, Oct
- Fish released at common site adjacent to weigh-in

Tournament Displacement





- **Displaced bass DO make it home but it takes a while…**
- **Tournament mortality tends to be very low…**
- **None of the fish in this study died within 1 month of release**

Abrams, Cooke et al. 2021. NAJFM.

But mortality CAN occur

Bass Tournament Organizer Fined $9,000 For Not Following Licence Conditions

November 23, 2020
Natural Resources and Forestry

Common Issues

- Poor water quality mgmt (livewells & weigh-in)
- Water temperature
- Use of ice (chlorinated)

The Weigh-In Revisited

Catch
Weigh
Release

Catch
Measure
Release

Eliminates
- **livewell retention**
- **weigh-in stress**
- **displacement**

Reduces
- **Launch crowding**

Sources of Conflict between Cottagers and Tournament Anglers (on Big Rideau Lake)

Displacement	0.9%
Frequency of Events	6.5%
Bass mortality/ Harm	11.2%
Early Morning Noise	17.8%
Intrusion in "Private Space"	**100.0%**

***Based on social science survey (N=380)**

Estimates for our Area

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Assume 10 tournaments/year with 100 boats X 3 days
= 3000 tournament fishing days including practice fishing

Assume 10 fish (double limit) per day X 3000 fishing days = 30,000 bass

- Telemetry study on Big Rideau revealed 0% mortality across three events
- Our recent tagging work reveals post weigh-in mortality of <1%
- Mortality rate from literature = 3% = **900 dead bass**

What Kills Bass?

The biggest driver of mortality for C&R = hooking location

Novice anglers and use of live bait = deep hooking

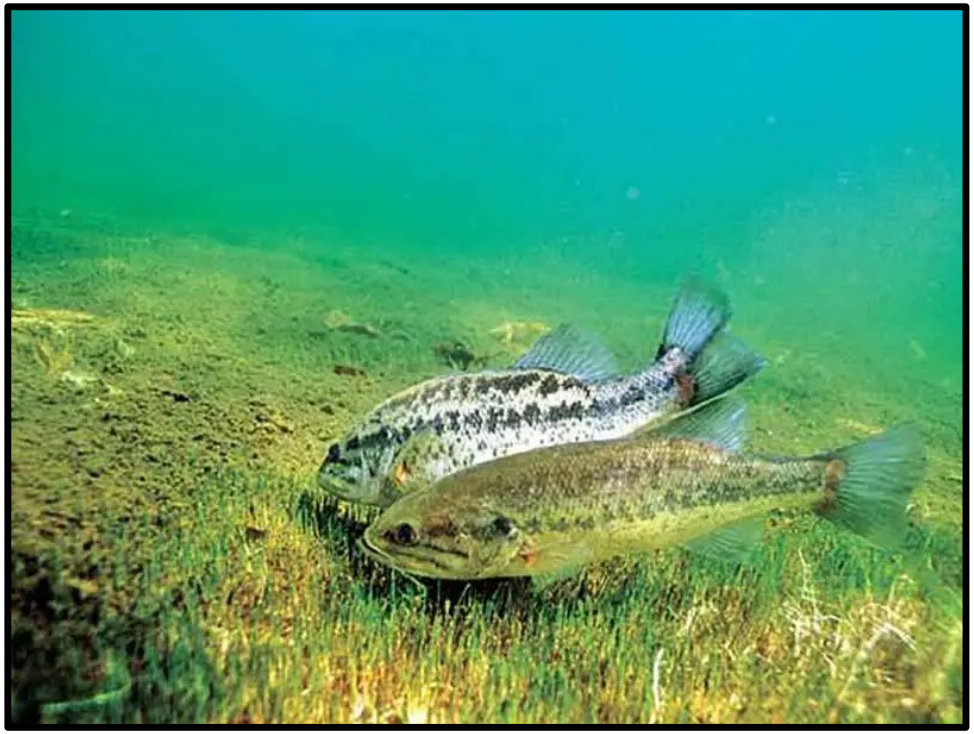
What is Biggest Threat to Bass?

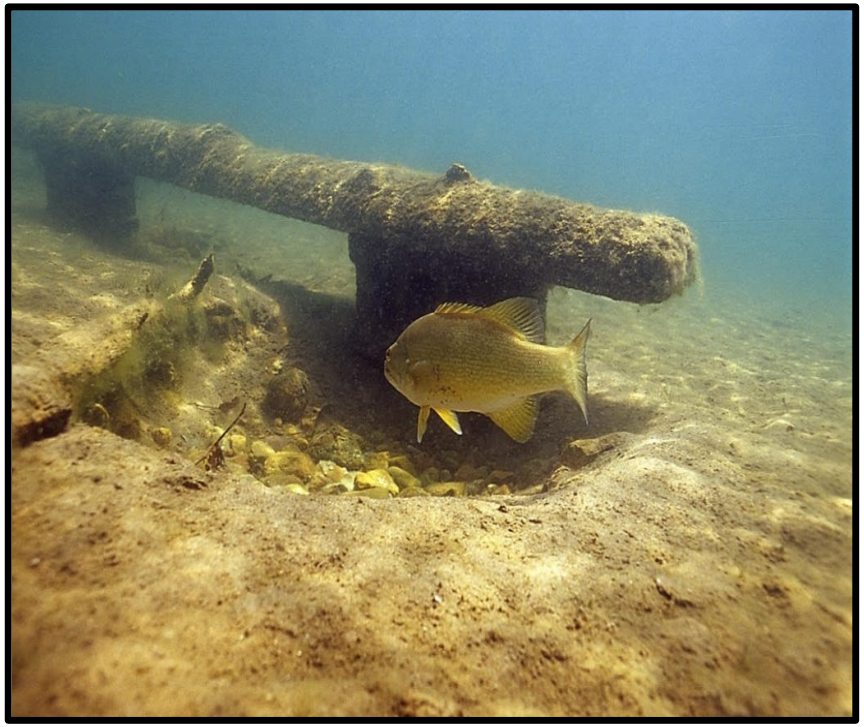
We depend on natural reproduction of wild fish… there is ZERO bass stocking by govt in ON which is a GOOD THING!

So need to give bass an opportunity to reproduce… 30+ years of research in the Rideau Lakes by Dr. Dave Philipp & Team reveals why…

Bass Reproductive Biology

- Sole paternal care for up to 6 wks which is energetically demanding (few feeding opportunities)
- Iteroparous but take reproductive holidays
- EXTREMELY vulnerable to angling given their focus on nest defence
- Seasonal closure intended to “protect” nesting bass BUT…





Empirical Field Assessment

- One boat, two anglers
- Fished 500M shoreline in 30 min
- Angled bass, clipped UC fin and released
- Snorkeled to assess % of nesting bass captured

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RESULTS

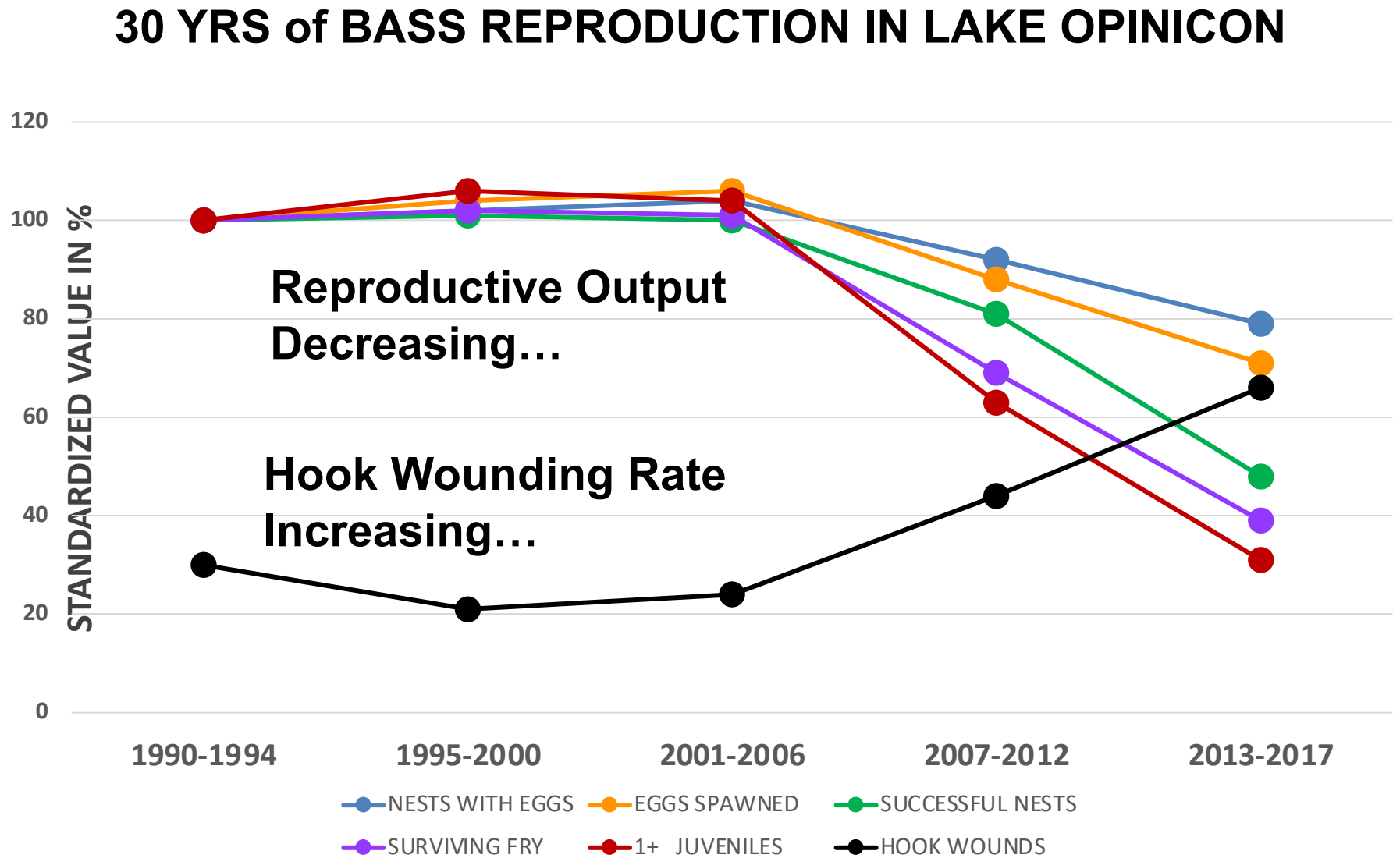
CAPTURED 49% NESTING LMB

CAPTURED 62% NESTING SMB

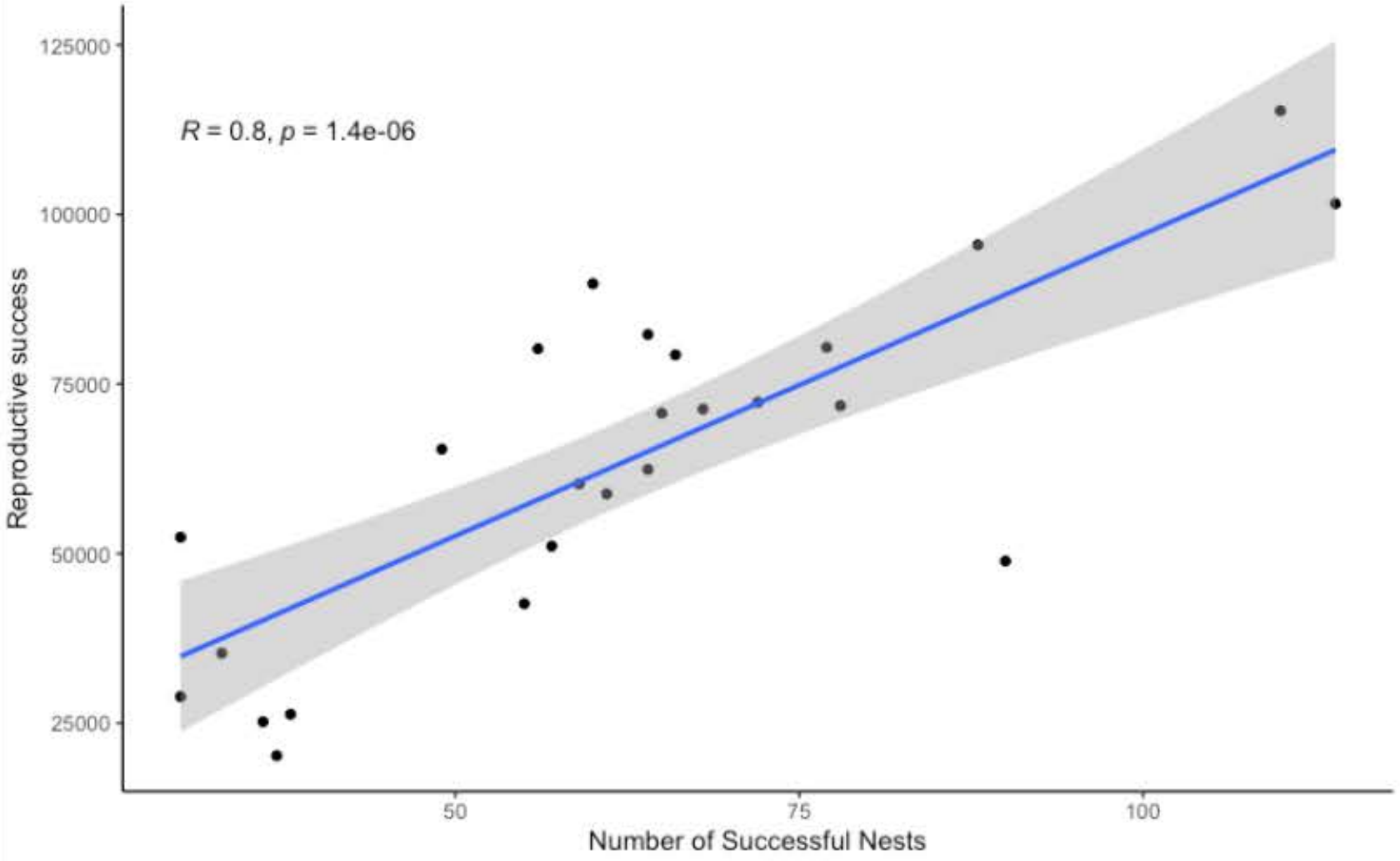
Consequences

- **Angling nesting SMB to exhaustion leads to physiological disturbance and extends nest absence durations by 4X relative to briefly angled fish** *(Kieffer et al. 1995)*
- **While absent from the nest, predators often consume offspring (variable among systems) which can lead to abandonment** *(Philipp et al. 1997; Steinhart et al. 2004)*
- **Nesting LMB that are caught and released guard with 40% less vigor than prior to angling** *(Cooke et al. 2000)*
- **Air exposure duration is one of the biggest determinant of return time** *(Philipp et al. 1997)*

Consequences



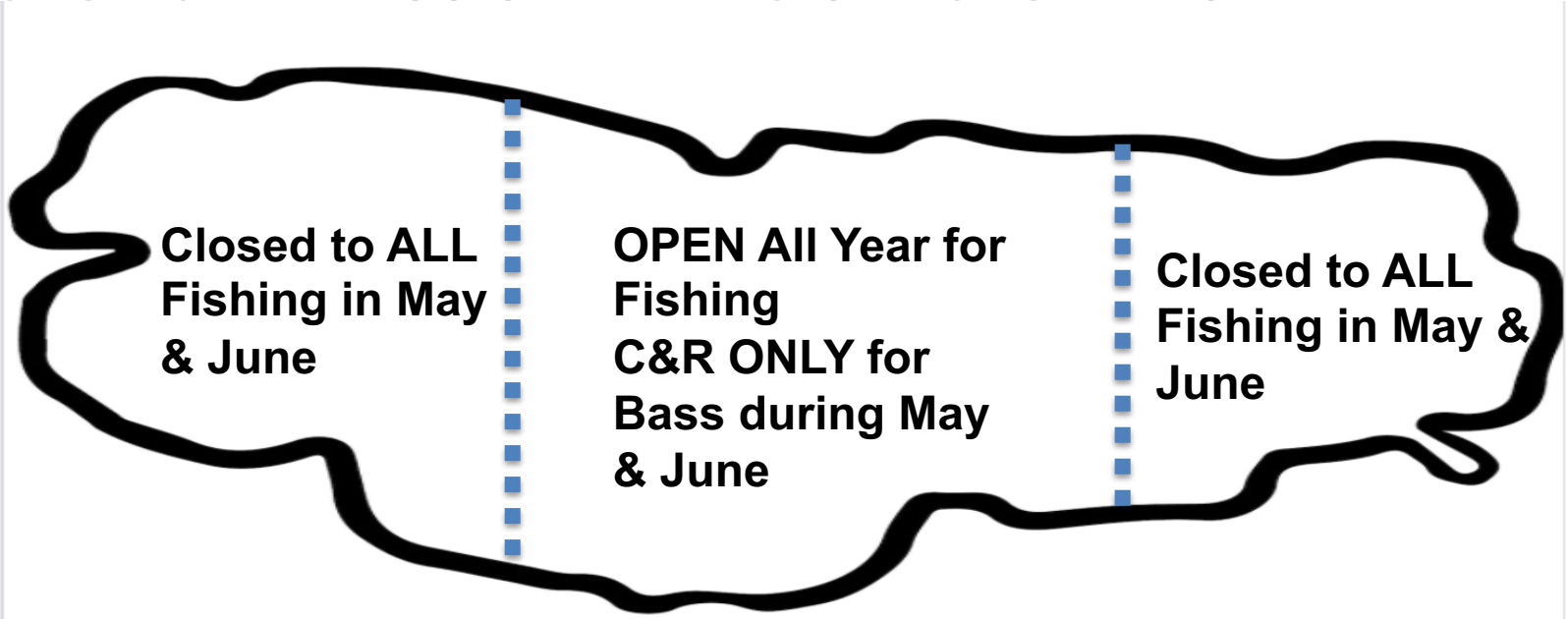
More successful bass nests = more bass!



A Solution!

Current regulations to protect nesting bass are NOT working…

SOLUTION = BASS SPAWNING SANCTUARIES



A give and take… Allowing a bass C&R season (which essentially occurs anyways) in part of the lake while eliminating ALL fishing pressure during the nesting period for the other part of the lake

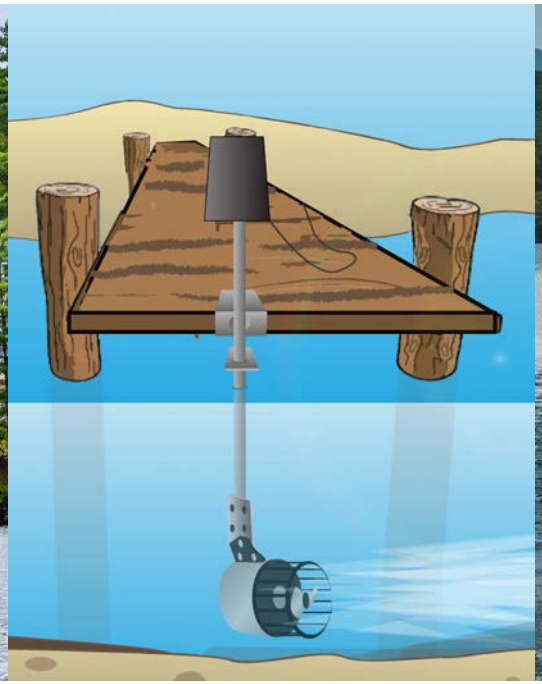
Proposal in to MNRF to roll this out on Opinicon and Charleston

Habitat Matters Too…

Bass also depend on good nesting habitat… which is in the hands of waterfront property owners

New(ish) Partnership

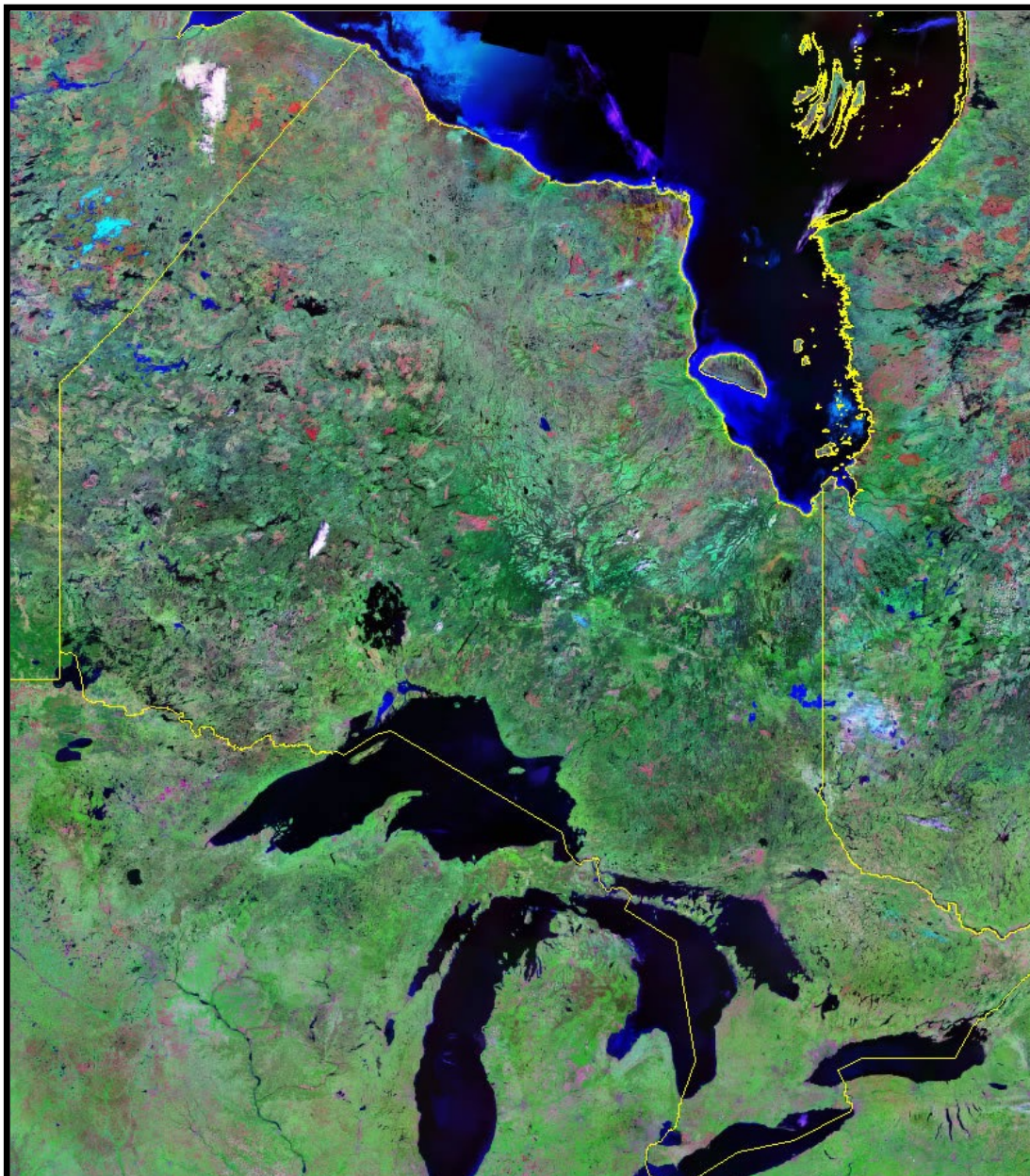
The GOAL of this partnership is to generate usable knowledge to address and mitigate pandemic-related pressures on freshwater ecosystems, which will help ensure that the ecosystem services provided by these aquatic systems remain healthy and managed sustainably



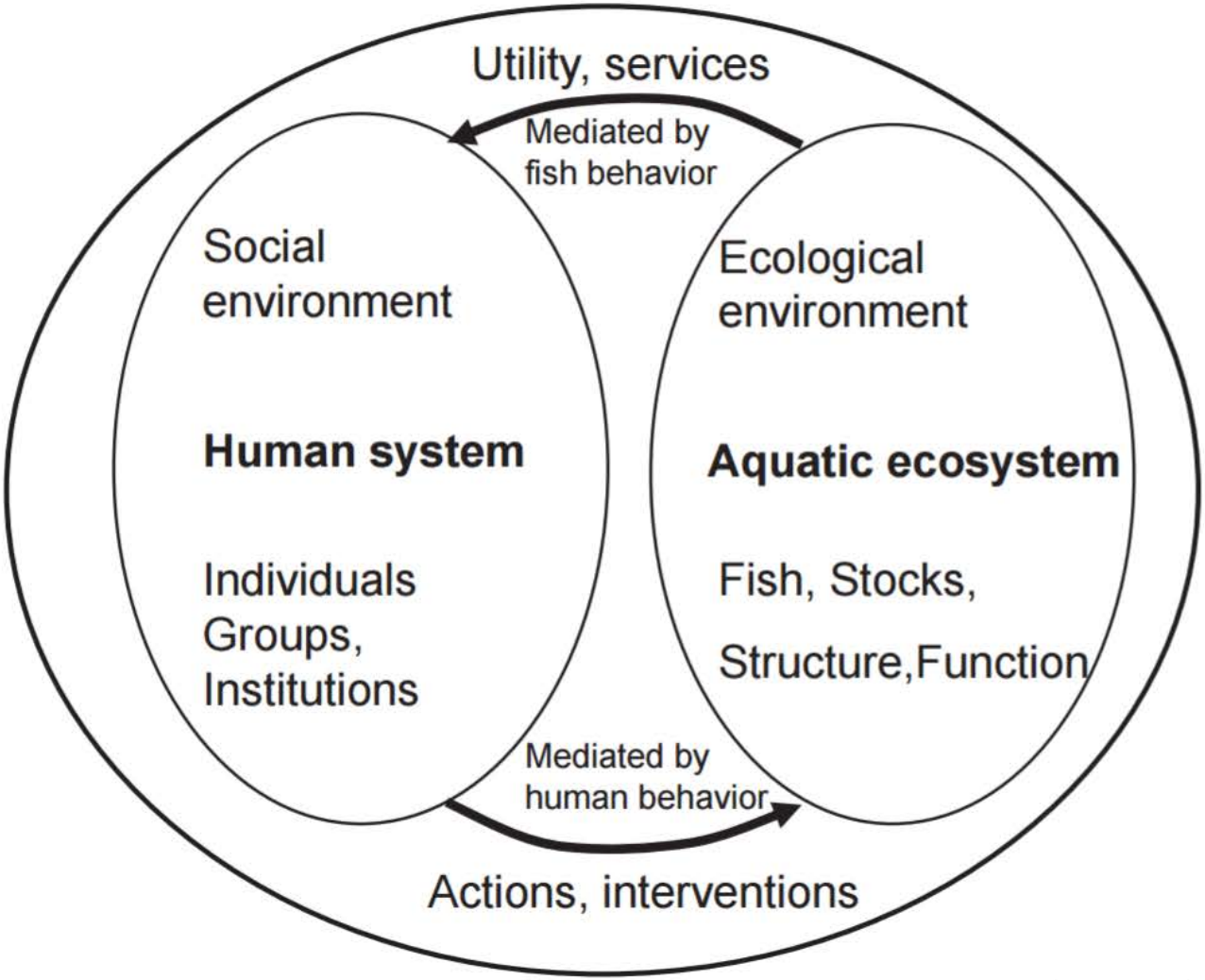
Fisheries Assessment Ain't Easy!

Ontario

- >250,000 lakes and >100,000 kilometres of rivers in the province
- ~250 MNRF Biologists
- Each biologist has to deal with 1000 lakes & 400 km of rivers!
- Stock assessment is difficult and expensive
- Impossible to assess each waterbody and have management actions tailored to a specific waterbody



Recreational Fisheries are Coupled Social-Ecological Systems



Arlinghaus, Cooke & Potts. 2013. FME

Fisheries Management - Three Options...

1. We manage the fish
   -stocking

2. We manage the habitat
   -protection, enhancement and restoration

3. We manage the people
   - harvest regulations (e.g., bag limits/size limits)
   - effort controls (e.g., seasonal closures/FPAs)
   - general EDUCATION on responsible fishing practices

Common Concerns for All Water Users

- Good water quality
- Protection/restoration of habitat
- Protection of aquatic biodiversity (e.g., fish eating birds, turtles)
- Prevention/control of invasive species
- Self-sustaining, healthy and productive fish populations
- Safe and enjoyable time on the water
- Respectful interactions among users

Opportunities to work together on issues of mutual concern/benefit

- Pressuring governments to do x, y and z
- Supporting/doing/funding lake stewardship work
- Being a common voice for the benefits of our shared resources

Conclusions

Sustainability within the recreational fishing sector and its continued persistence (think climate change, anti-fishing sentiment, user conflict, loss of FW biodiversity) requires anglers willing to engage in responsible behaviours

It is all about people!

Fish Ecology & Conservation Physiology Laboratory at Carleton University

@SJC_Fishy
WWW.FECPL.CA
Steven_Cooke@carleton.ca
613-867-6711 (cell)