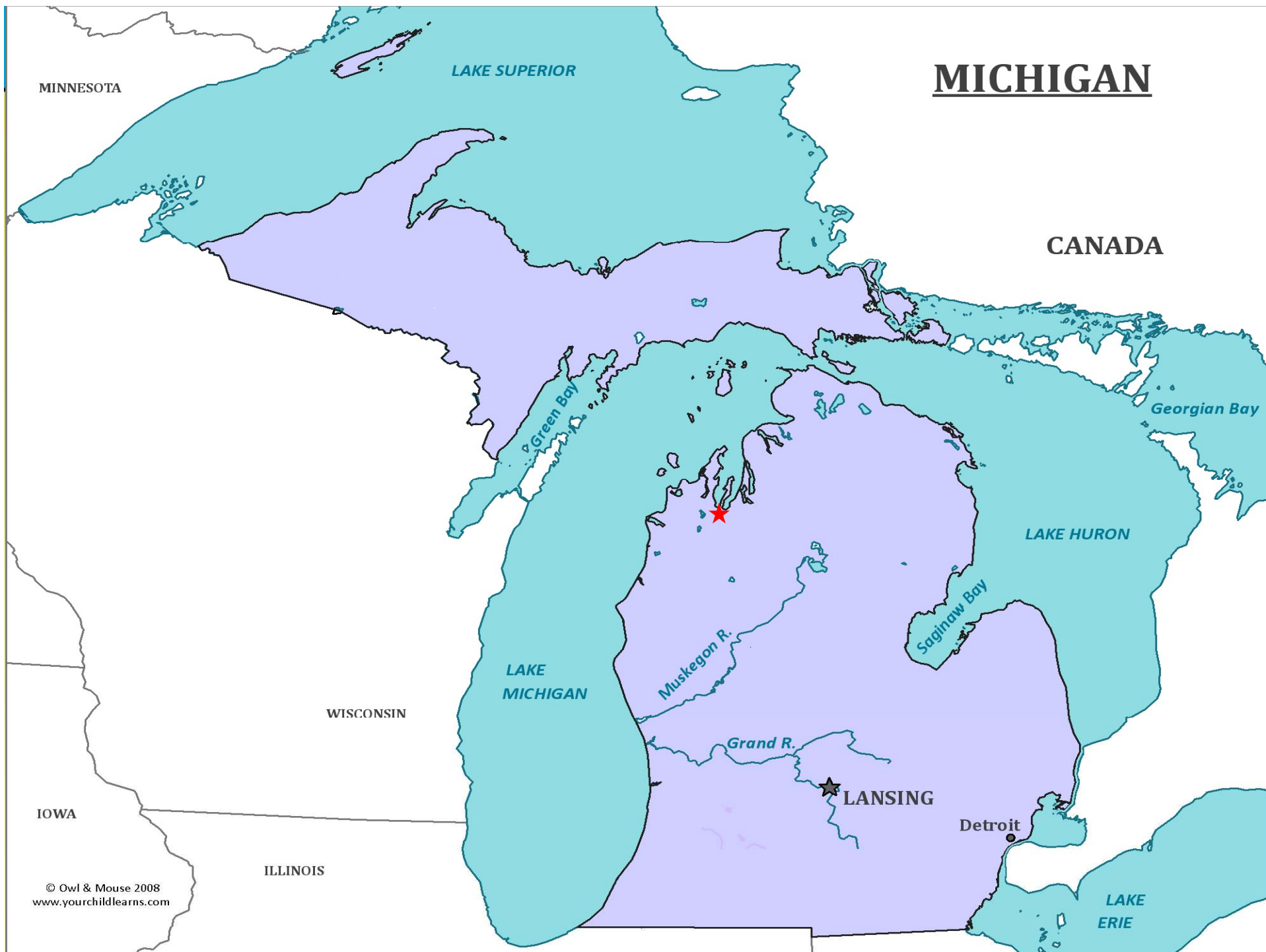


Ecology and Management of Fish in New Hampshire's Lakes

September 2, 2020



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Inland Fisheries Division
NH Fish and Game Department







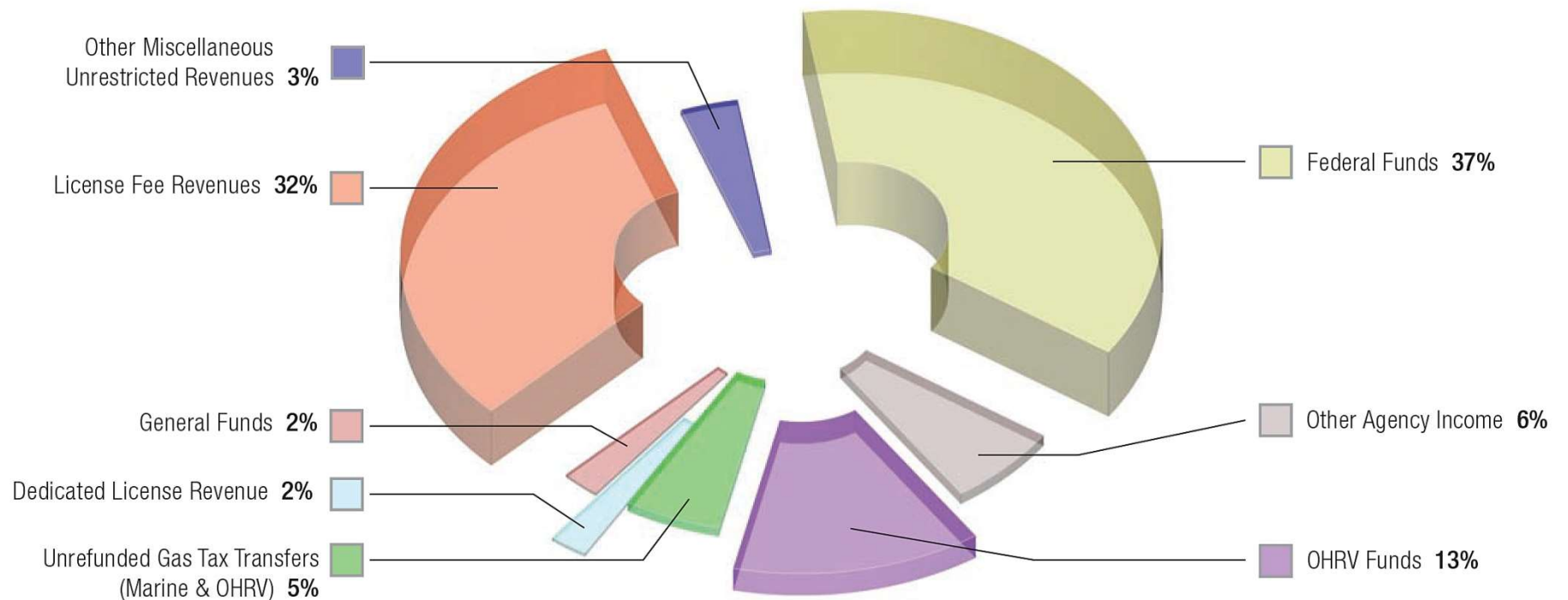
Public Waters

RSA 271:20 I. All natural bodies of fresh water situated entirely in the state having an area of **10 acres** or more are **state-owned public waters**, and are **held in trust by the state for public use**; and no corporation or individual shall have or exercise in any such body of water any rights or privileges not common to all citizens of this state; provided, however, the state retains its existing jurisdiction over those bodies of water located on the borders of the state over which it has exercised such jurisdiction.



New Hampshire Fish and Game Department

Source of Funds

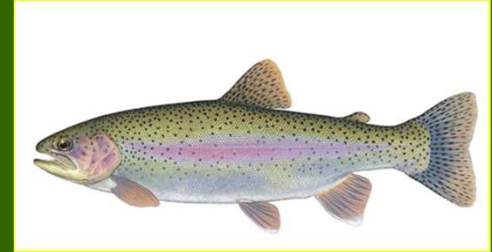




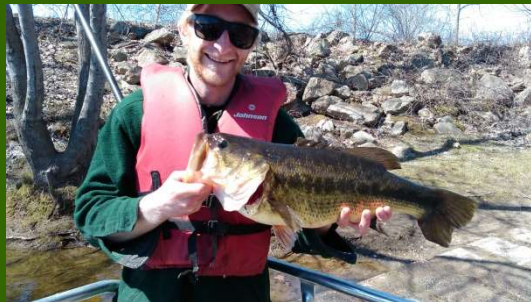
Federal Funding

- **Sportfish Restoration Act of 1950 (Dingell-Johnson)**
- **Excise taxes on sport fishing equipment, electric motors and sonar**
- **Provides reimbursement of up to 75% federal funding, 25% required from non-federal sources**
- **Apportionment based on #licenses sold and land area in each state**
- **Projects restoring, conserving, managing, and enhancing sport fish having material value for sport or recreation and aquatic education**
- **\$3,697,251 apportioned in FY2020**

Freshwater Fishes of NH — 55 species



“Coldwater”



“Warmwater”



Brook Trout





Brook trout

(*Salvelinus fontinalis*)

- Native – NH's "State Fish"
- Found in a variety of habitats (cover-oriented)
- Distribution temperature limited ($< 70^{\circ}$ F)
- Fall spawner (late Oct. – early Nov.)
- Food: macroinvertebrates, fish
- Most tolerant of low pH (4.0 – 9.5)
- SR: 9 lbs. 25.5 in. (Pleasant Lake, New London, 1911)

Brown Trout





Brown trout

(Salmo trutta)

- Introduced in 1885 (Loch Leven or Von Behr)
- Generally inhabits low to moderate gradient streams (and lakes w/ high #'s forage fish)
- More tolerant of warmer and nutrient-rich streams than brook or rainbow trout
- Fall spawner (Oct. – Dec.)
- Food: macroinvertebrates, fish important (>12 in.)
- Close relative of Atlantic salmon
- SR: 16 lbs. 6 oz., 32.5 in. (Connecticut River, Pittsburg. 1975)

Rainbow Trout





Rainbow Trout

(*Oncorhynchus mykiss*)

- Introduced in 1878 (from California)
- Prefers fast flowing, riffle habitat in streams
- Has migratory urge, very mobile
- Spring spawner
- Least tolerant of low pH
- Food: macroinvertebrates, some fish
- Becoming a popular “large lake fishery”
- SR: 15 lbs. 7.2 oz., 35.5 in. (Pemigewasset River, Bristol. 1996)

Lake Atlantic Salmon





Lake Atlantic Salmon

(Salmo salar)

- AKA “landlocked salmon”
- Introduced in 1866 (from New Brunswick, CAN)
- Annually stocked in 14 lakes (>50% total lake acreage)
- Fall spawner (Oct – Nov)
- Food: heavy reliance on smelt, invertebrates
- SR: 18 lbs 8 oz., 34.5 in. (Pleasant Lake, New London, 1914, 1942)

Lake Trout





Lake Trout

(Salvelinus namaycush)

- Native (7 lakes)
- Currently self-sustaining in 15 lakes
- Prefers large, deep, cold lakes with abundant fish forage
- Fall spawner (early Oct. – early Nov.)
- Long-lived, slow grower
- SR: 28 lbs. 8 oz., 39.5 in. (Newfound Lake 1958)

Largemouth Bass





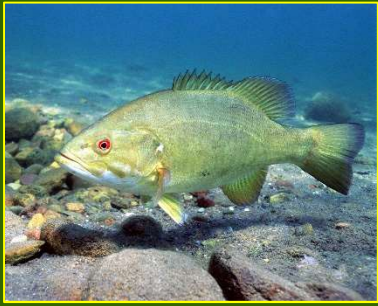
Largemouth Bass

(Micropterus salmoides)

- Introduced
- Thrives in warm, shallow, weedy, mud-bottomed lakes, ponds, and sluggish streams
- Spawn in spring with water temps from 60-64 °F
- Male builds nest and guards it aggressively
- Preys on almost anything it can catch – Fish, frogs, crayfish, invertebrates, mice, and snakes
- SR: 10 lbs. 8 oz., 25.8 in. (Lake Potanipo, Brookline. 1967)

Smallmouth Bass



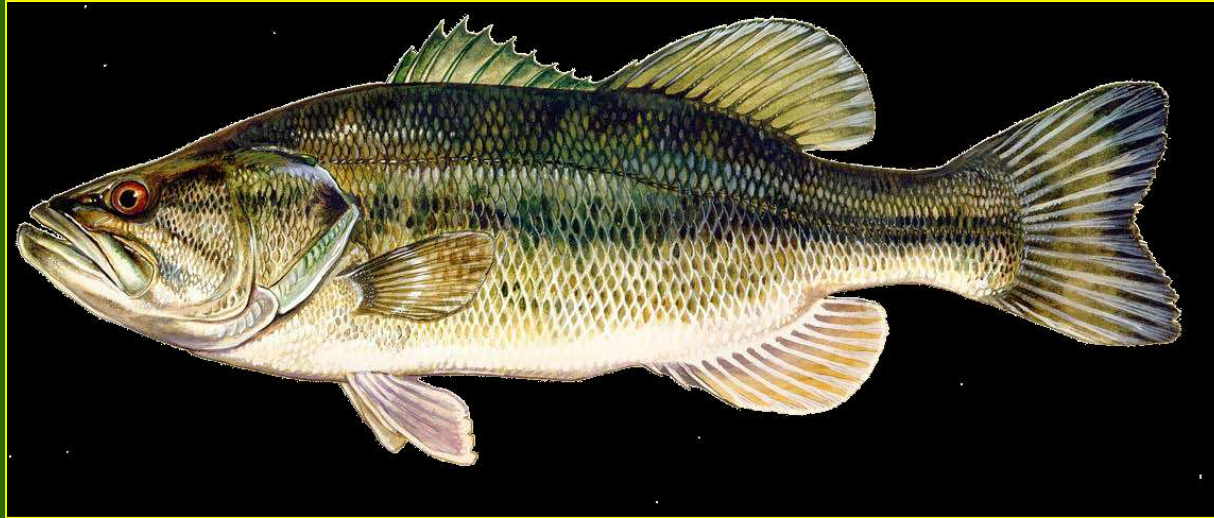


Smallmouth Bass

(Micropterus dolomieu)

- Introduced 1860's
- Prefers lakes and rivers with cool, clear water with gravelly or rock bottom and scant vegetation
- Spawn in spring with water temps from 59-65 °F
- Male builds nest and guards it aggressively
- Preys on crayfish, invertebrates, and fish
- SR: 7 lbs. 14.5 oz., 23.25 in. (Goose Pond, Canaan. 1970)

Largemouth vs Smallmouth



Largemouth Bass



Smallmouth Bass

Pumpkinseed





Pumpkinseed

(Lepomis gibbosus)

- Native to NH
- One of the most numerous fish in NH and is found in most of our streams, ponds, and lakes
- Prefers quiet or slow moving water with good growth of aquatic vegetation
- Spawn from early June through early August
- Male builds nest and guards it aggressively
- Preys on invertebrates and small fish
- SR: 13.6 oz., 10 in. (Lake Winnepesaukee, 2011)

Bluegill





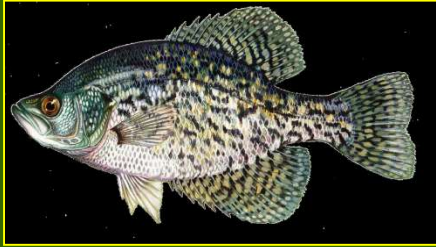
Bluegill

(*Micropterus salmoides*)

- Introduced
- Prefers quiet, warm, weedy lakes and ponds
- Spring spawner, build nests, guard fry
- Food: Aquatic insects, fish eggs, small crustaceans, vegetation
- Can tolerate very high water temperature
- SR: 2 lbs 0.64 oz, 11.25 in (Goodwin's Pond, Acworth, 1992)

Black Crappie





Black Crappie

(Pomoxis nigromaculatus)

- Introduced
- First sampled by NHFGD in 1938 in Horseshoe Pond, Merrimack
- Currently inhabit over 120 waterbodies in NH, mostly through illegal transfers
- Spawn in spring with water temps from 58-64 °F
- Male builds nest and guards aggressively
- Preys on invertebrates and small fish
- Highly prized as table fare
- SR: 2 lbs. 15.84 oz., 17.0 in. (Great East Lake, Wakefield. 2016)

Yellow Perch





Yellow Perch

(Perca flavescens)

- Native to NH
- A schooling fish that is generally found around weedy areas of lakes and slow moving parts of rivers and larger streams
- Spawn in spring just after ice-out in shallow water
- Gelatinous ribbons of eggs are strung over vegetation and fallen tree branches
- Prey on invertebrates and fish
- Highly prized as table fare
- Important forage for game species
- SR: 2 lbs. 6 oz., 15.5 in. (Head's Pond, Hooksett. 1969)

White Perch





White Perch

(Morone americana)

- Introduced to inland waters, native to the coast
- Prefers shallower, mud bottom areas of lakes
- A schooling fish
- Spawn in spring with water temps from 55-60 °F
- Broadcast spawners in groups with several males to one female
- Prey on invertebrates and fish
- Highly prized as table fare
- SR: 3 lbs. 11.5 oz., 17.2 in. (Lake Winnepesaukee, 1986)

Chain Pickerel





Chain Pickerel

(Esox Niger)

- Native to NH
- Occurs everywhere there is suitable habitat in NH
- Prefers quiet, shallow water with mud bottom and abundant aquatic vegetation but can be found in deeper water
- Spawn shortly after ice-out in shallow back water areas over vegetation with no parental care to follow
- A voracious carnivore that mainly consumes fish but will also eat snakes, frogs, and mice
- SR: 8 lbs., 26 in. (Plummer Lake, Sanbornton. 1966)

Brown Bullhead





Brown Bullhead

(Ameiurus nebulosus)

- Native to NH – “hornpout”
- Prefers muddy bottoms of small lakes, ponds, and backwaters of rivers and streams
- Spawn in late spring when water temps rise above 65°F
- Male and female build nest and care for the eggs
- Omnivorous feeder consuming insect, snails, small fish, crayfish, plant material, and also scavenges on anything edible
- SR: 3 lbs. 4.8 oz., 17.95 in. (Merrimack River, Merrimack. 2005)

Rock Bass





Rock Bass

(*Ambloplites rupestris*)

- Introduced
- Prefers rocky shorelines and rocky streams near aquatic vegetation. Sometimes suspend over structure in deeper water
- Spawn in late spring when water temps rise between 60-70°F
- Male builds nest and care for the eggs
- Feeds primarily on aquatic insects, crayfish, small fish. Can compete with Smallmouth Bass
- SR: 1 lb. 8 oz., 13.5 in. (Island Pond, Stoddard. 1982)

Forage Fish



Fisheries Management

“Fisheries management consists of the interrelated process of planning and taking actions to manipulate fish populations, fish habitat, and people to achieve specific human objectives” – McMullin and Pert (2010)



Inland Fisheries Programs

- Large Lakes Fisheries
- Warmwater Fisheries
- Coldwater Fisheries
- Fisheries Habitat
- Fisheries Conservation

Lake related

Fin clipping landlocked salmon



New Hampshire Landlocked Salmon Fin Clips/Age by Year

<u>Age</u>	<u>Year Stocked</u>	<u>Fin Clip – Water Body</u>
7	2012	NC - statewide AD/RV - 1,2 Conn.; Francis
6	2013	LV - statewide
5	2014	AD - statewide
4	2015	RV - statewide AD/RV - fall stock (select lakes e.g. Big Squam)
3	2016	NC - statewide
2	2017	LV - statewide
1	2018	AD - statewide

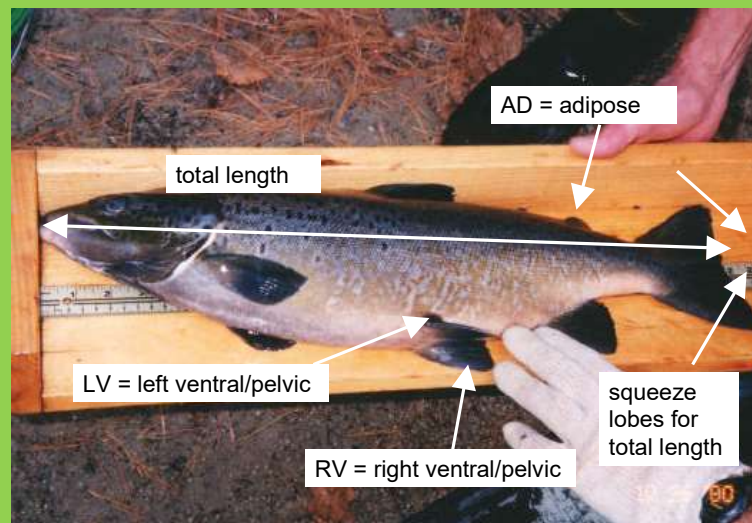
Fin Clip Key

AD = adipose

LV = left ventral/pelvic

RV = right ventral/pelvic

NC = no fin clips



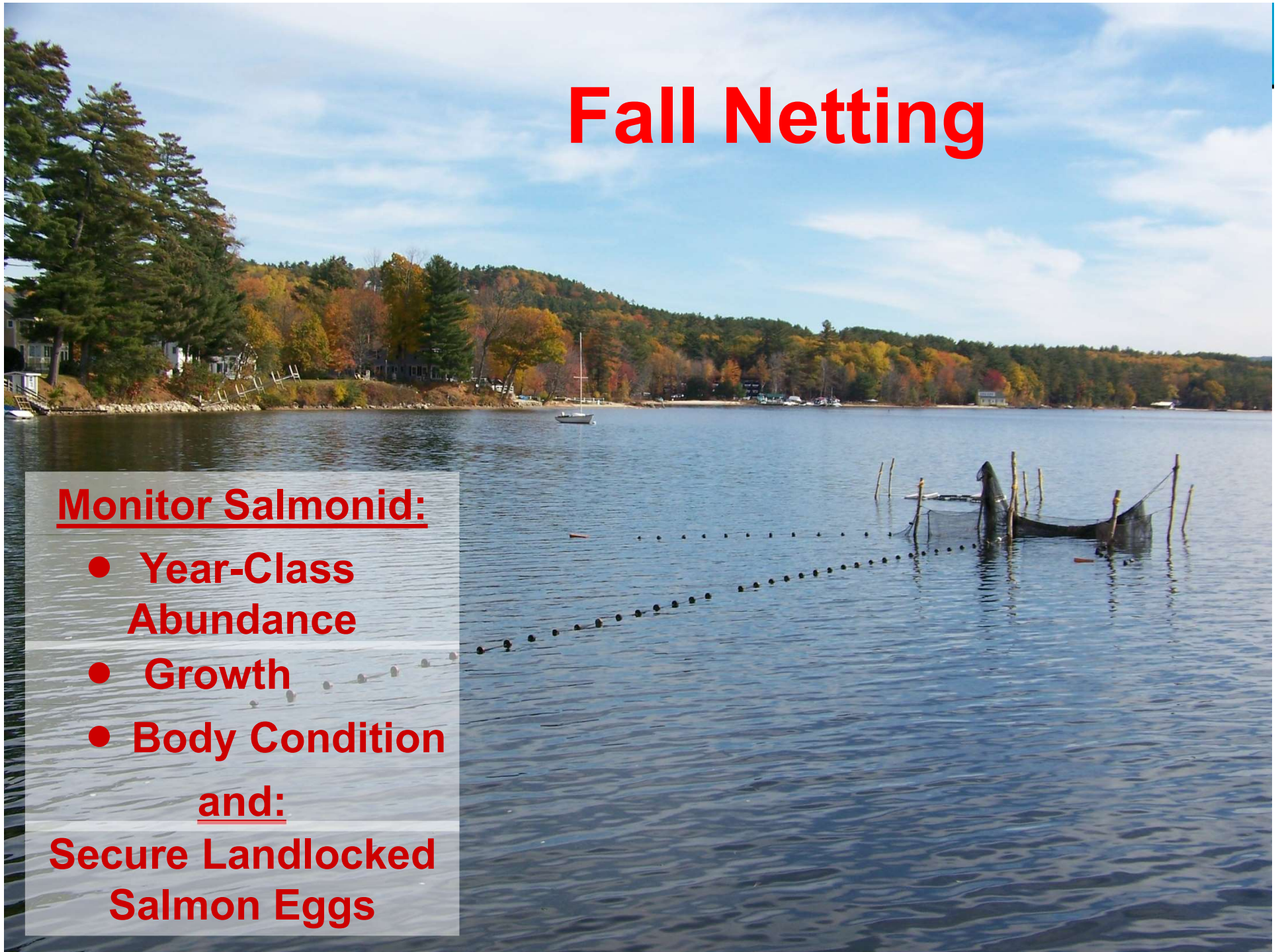
Fall Netting

Monitor Salmonid:

- Year-Class Abundance
- Growth
- Body Condition

and:

Secure Landlocked
Salmon Eggs

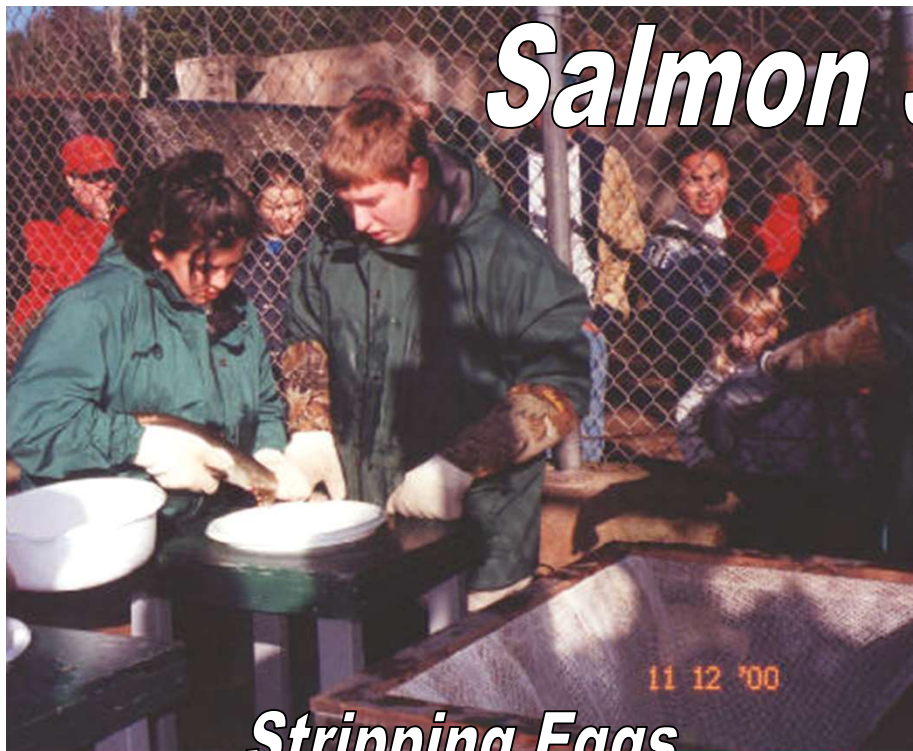








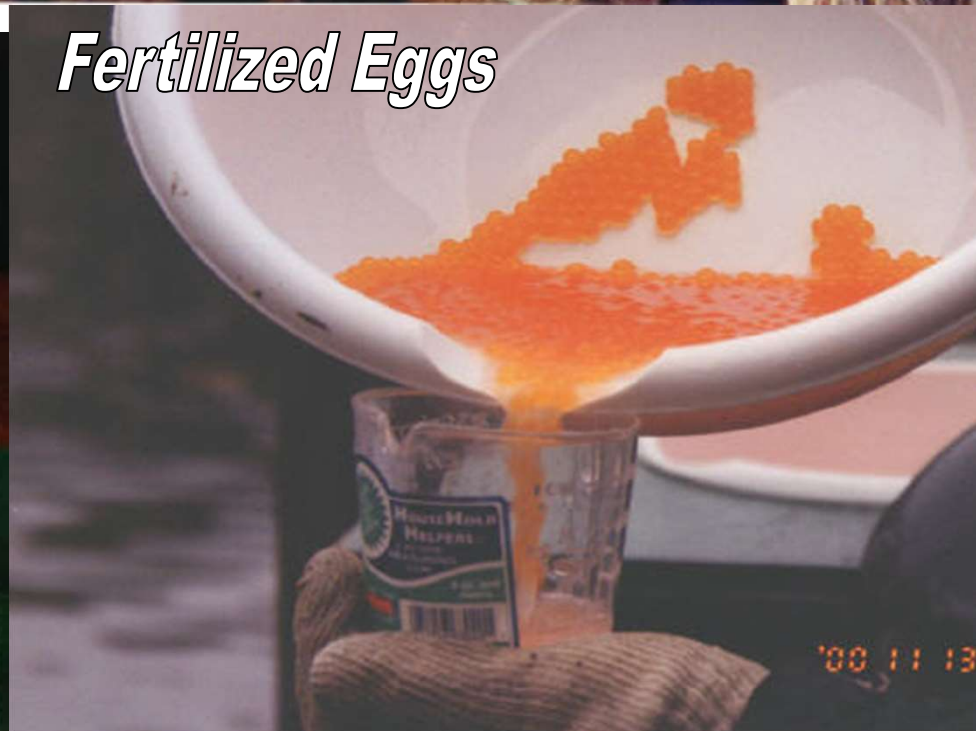
Salmon Sunday



Stripping Eggs

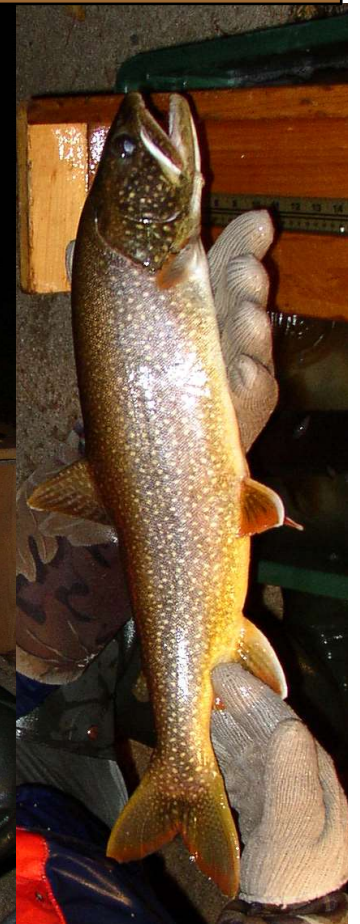


Fertilized Eggs





Lake trout gill netting



Lake Trout

- Sample spawning reefs in late fall after dark
- Gill nets
- Length, weight, condition, sex ratio

Nubanusit Lake – 42” ~ 30 lbs

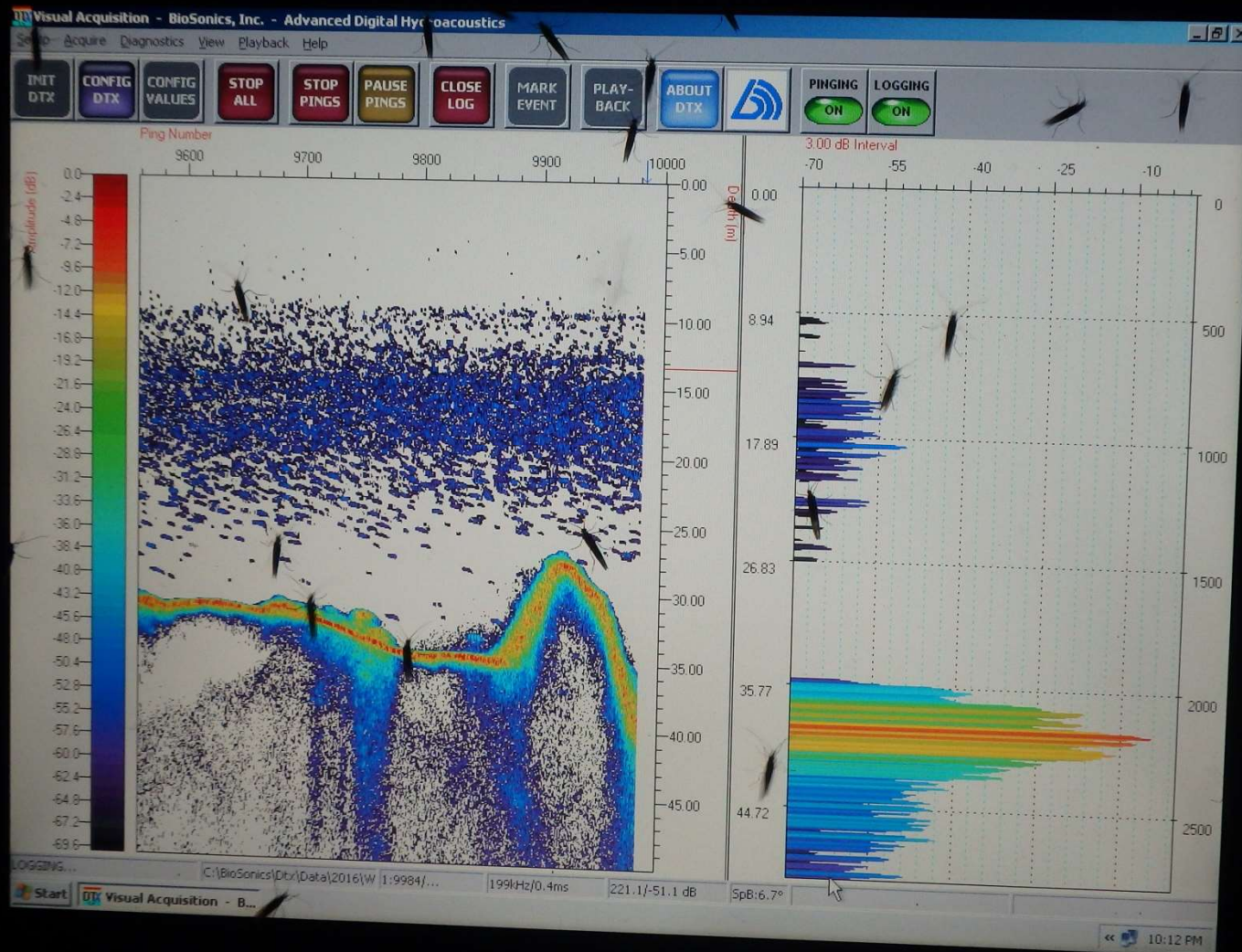




Hydro-acoustic Forage Fish Assessments











In 2019, most lakes
sampled showing above
average density of pelagic
forage fish – a good thing!



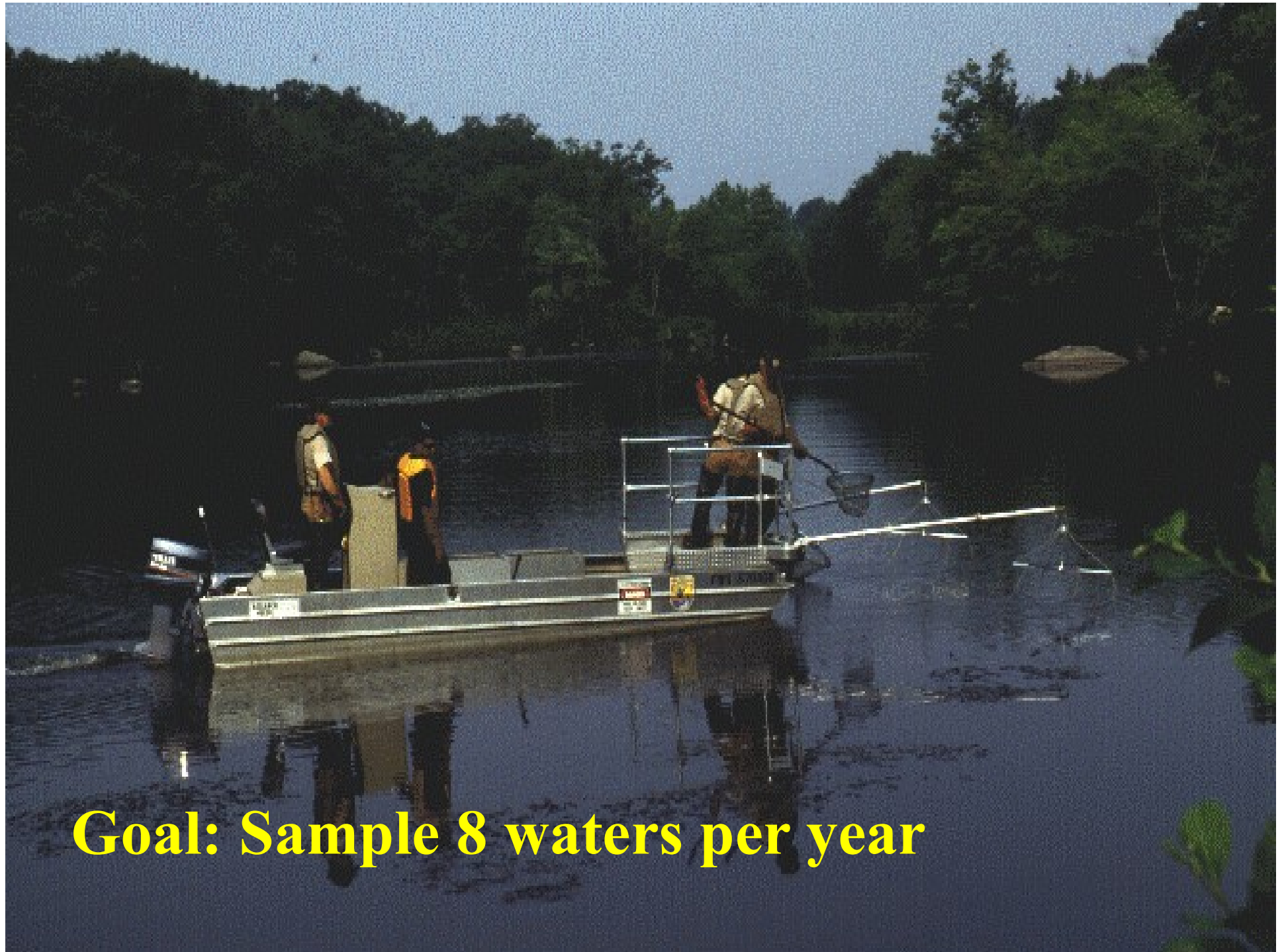
Warmwater Program Objectives- Bass

■ Short-Term

- Conduct state-wide population assessments
- Monitor bass tournament data (short and long-term)

■ Long-Term

- Categorize populations based on assessments
- Identify populations that may require new regulations
- Evaluate any new regulations
- Monitor selected populations for baseline data to develop a time-series of information
- Interact and be responsive to anglers' desires for management direction







Fyke Netting



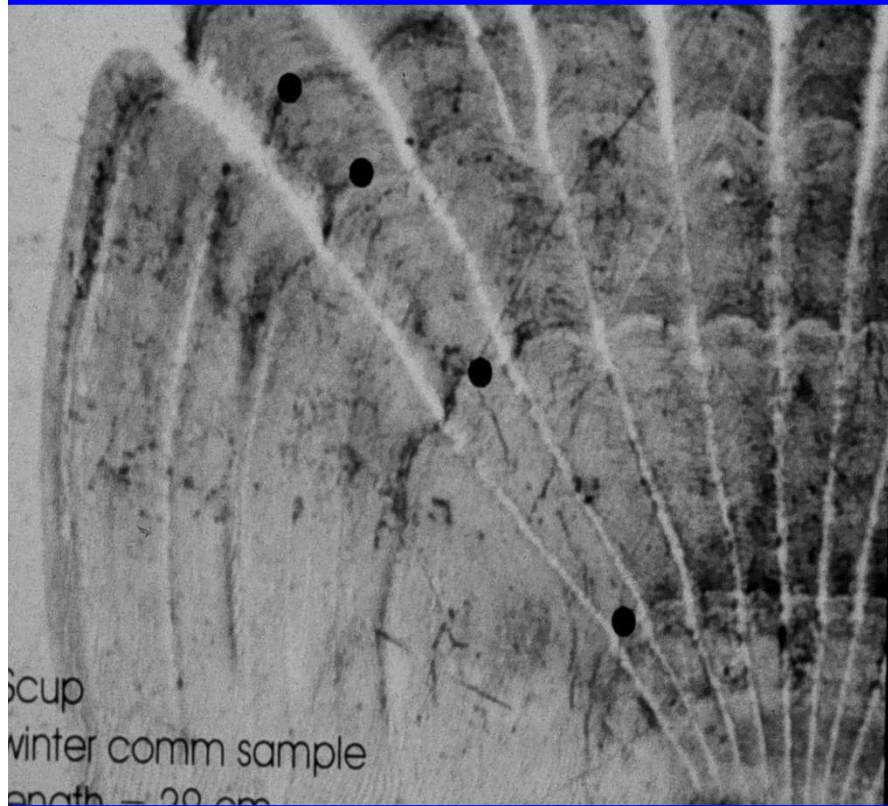
Data we examine

- CPUE (fish/hour)
- Relative weight
- PSD (size distribution)
 - <40 too few large fish; >60 too few small fish
- Community fish structure/abundance
- Age and growth

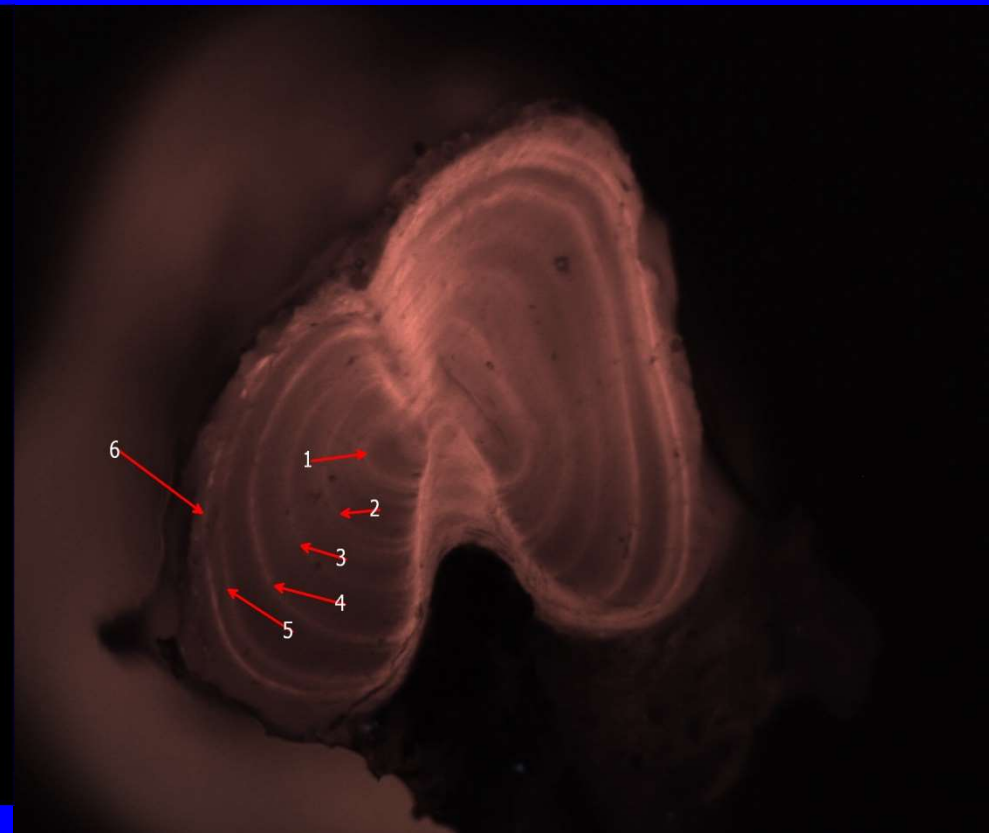
Age and Growth

Average NH bass takes 4 years to reach 12"

Scale



Dorsal spine



Radio Tagging Bass



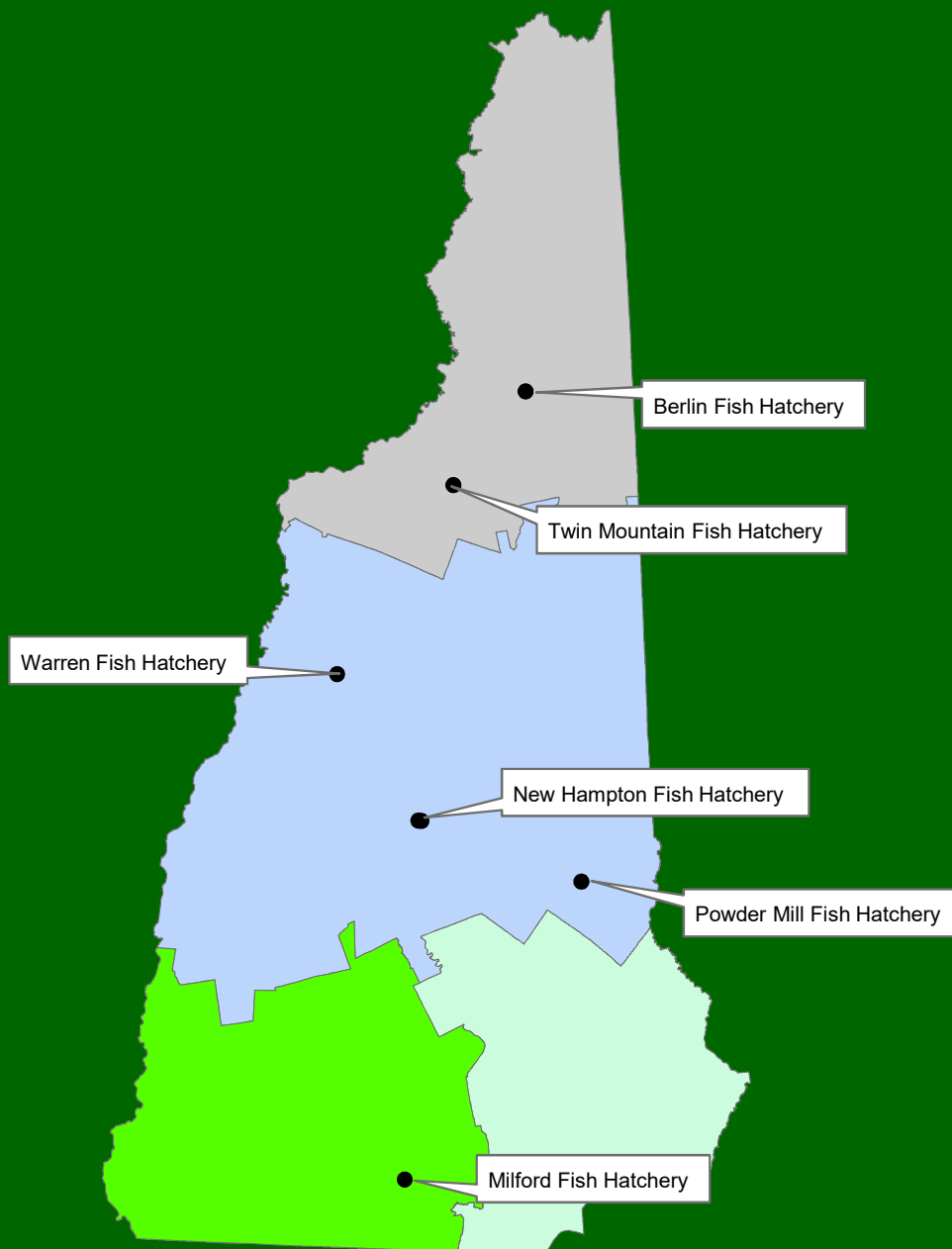
Bass telemetry study – Squam Lake



Stocking Program



2019	LAKES		STREAMS	
	NUMBER	POUNDS	NUMBER	POUNDS
Brook Trout	489,518	73,372	323,340	80,900
Brown Trout	60,895	20,528	238,448	41,759
Rainbow Trout	220,705	75,690	142,122	53,665
Salmon	42,382	5,116	--	--
Grand Total	813,500	174,707	703,910	176,324



Aerial Stocking of Remote Ponds

- ~50 ponds are stocked with brook trout fingerlings every year
- Primarily in the White Mountains and at high altitudes
- Hike in- not accessible by wheeled vehicles





Economic Impact of Freshwater Fishing in NH

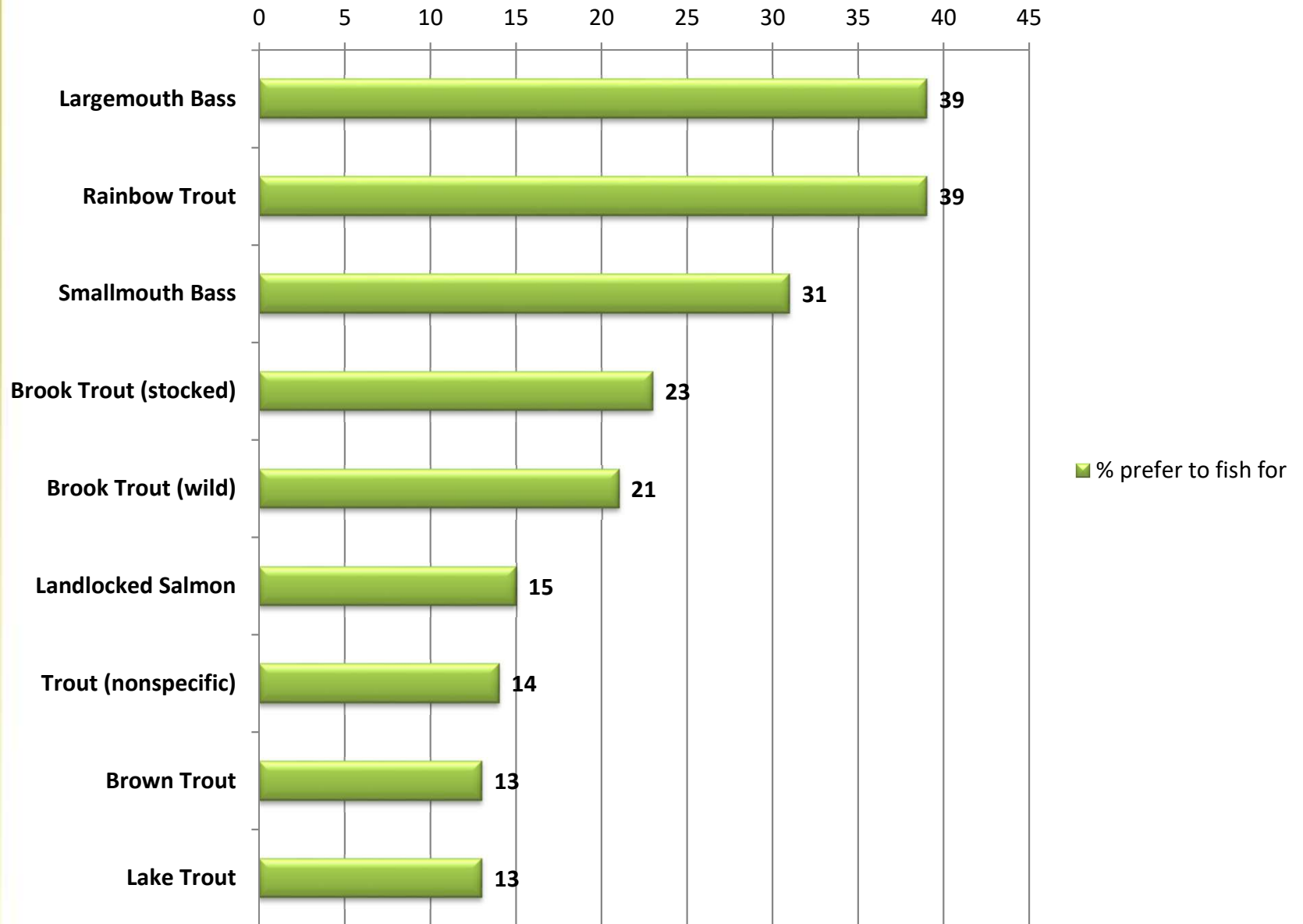
- **\$111.6 M retail sales**
- **2,105 jobs**
- **\$59.2 M wages**
- **\$176.6 M total multiplier effect**

Source: USFWS/US Dept. Commerce, 2011



New Hampshire Fish and Game Department

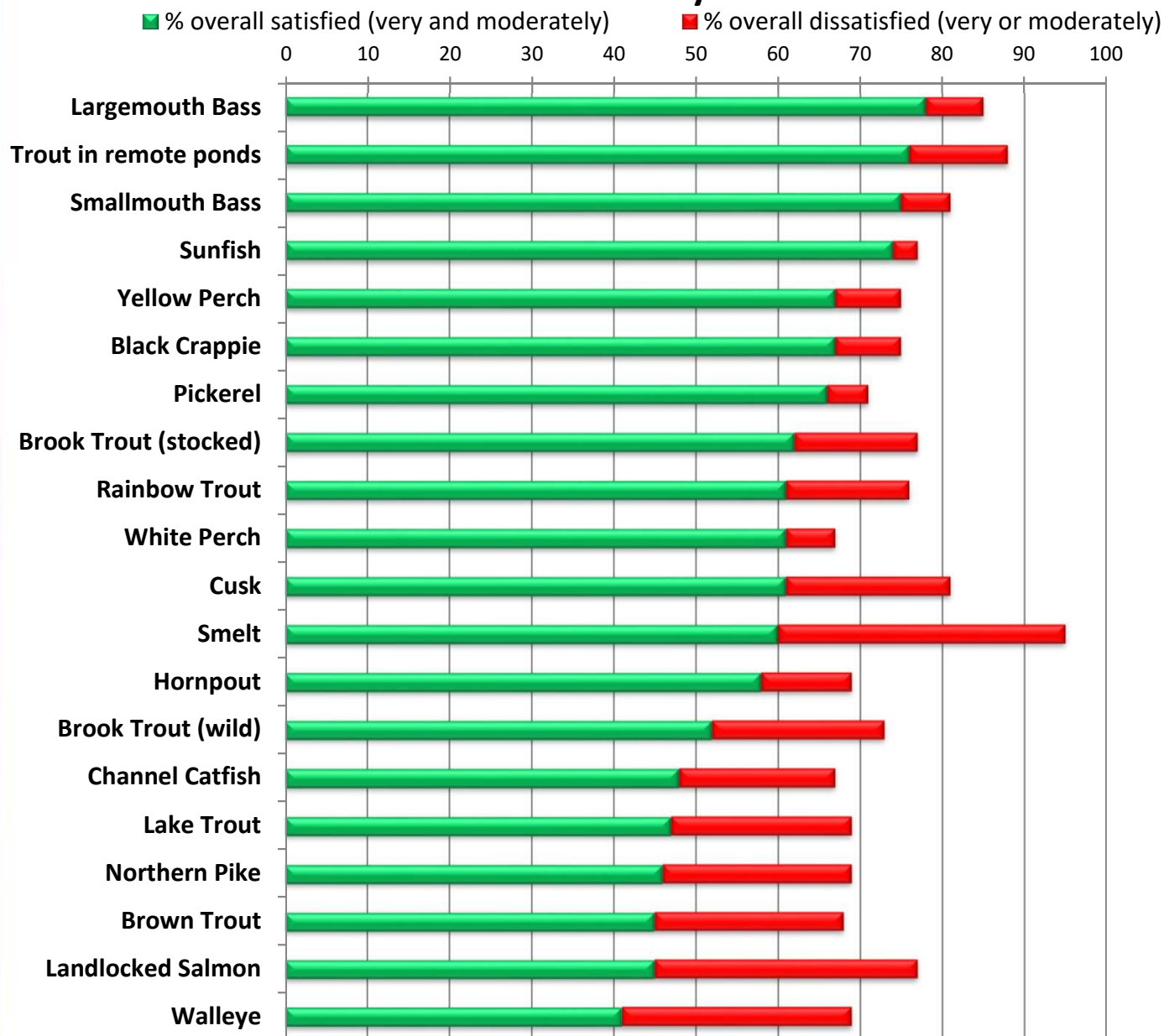
Species Preference - 2015





New Hampshire Fish and Game Department

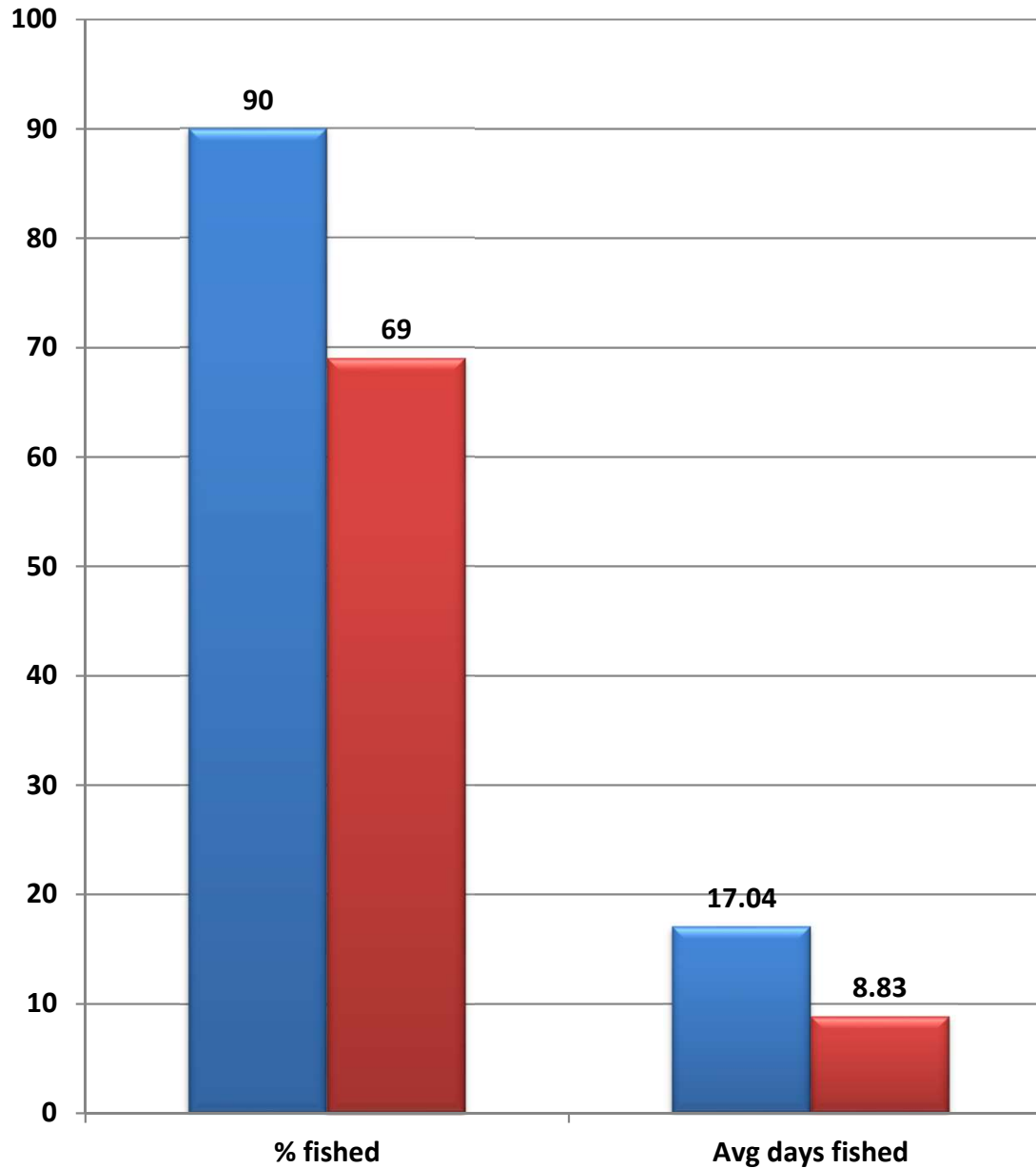
How satisfied are you? - 2015





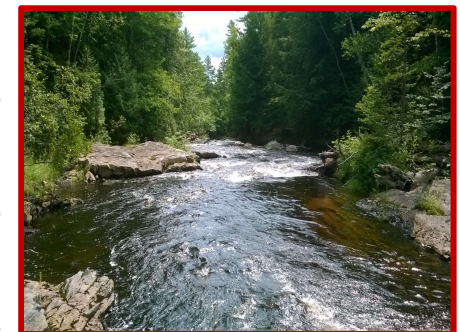
New Hampshire Fish and Game Department

Habitats Fished by NH Anglers - 2015



■ Ponds and Lakes

■ Brooks, Streams, Rivers



Fishing Tournaments





Challenges/Issues





How you can help?

- **Buy a fishing license**
- **Be a good land steward**
- **Prevent exotic species introductions**
- **Report fishing violations — 800-344-4262**
- **Share the resource — lakes belong to everyone!**

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Questions?

Fishnh.com