

# Using Time-of-Year Dredging Windows for Protecting Fishery Resources

## Some New Hampshire Examples

- **Examples of some diadromous fish in Great Bay/Piscataqua River Estuary**
- **Discussion of Fishery Data in New Hampshire**
- **Impacts Associated with Dredging**
- **Use of Time-of-Year Dredging Windows (why, when and where)**
- **Where do we go from here?**



# Fishery Resources in the Piscataqua River and Great Bay Area

- Area designated as Essential Fish Habitat (EFH) for 17 species, including Atlantic salmon, winter flounder, windowpane flounder, and bluefish.
- Supports a number of diadromous fishes, including blueback herring, alewife, rainbow smelt, American shad and American eel.
- Supports bivalves and crustaceans, including softshell clams, American oysters, blue mussels, razor clams, surf clams, quahogs, and American lobsters.

# Fishery Resources in the Piscataqua River and Great Bay Area

- ELMR (Estuarine Living Marine Resources Program) data identifies 21 common, abundant, or highly abundant species found in either “tidal fresh” (0 - 0.5 ppt) or “mixing” (0.5 – 25.0 ppt) zone of the Great Bay Estuary.
- 10 of these species are found in the “tidal fresh” zone.

# General Life History of River Herring

(alewife and blueback herring)

- Adults begin migration into rivers and streams to spawn in April-May
- Alewife tend to spawn 3-4 weeks earlier than blueback herring
- Bluebacks prefer to spawn in main stems of rivers and streams; alewife prefer quieter streams and ponds
- **Eggs are demersal/semi-demersal**
- Adults out-migrate from rivers and streams in May-July
- Juveniles out-migrate from rivers and streams in late-October-November

# Life History of Winter Flounder

- Adults generally move into (or remain in) the shallow inshore areas in the fall/early winter before spawning
- Spawning occurs in the winter (starting in January) in southern waters, and spring (as late as May) in northern waters
- Adults spawn in river mouths and estuaries, from brackish to freshwater
- **Demersal eggs**
- Egg development occurs from February-May
- Larvae and juveniles generally occur in the area where they were spawned
- Adults and juveniles move into deeper areas of the bays and estuaries as water warms in the summer

# Some Impacts Associated with Dredging:

- Alters/degrades benthic habitat (e.g., SAV, shellfish beds) (e.g., Barr 1987; Newell et al. 1998; Thayer et al. 1997; Wilber et al. 2005)
- Entrain and kills fish and invertebrate eggs and larvae (Nightingale and Simenstad 2001)
- Increases suspended sediments that interferes with the respiration, growth, feeding, and metabolism of aquatic organisms (e.g., Nightingale and Simenstad 2001; Wilber et al. 2005; MacKenzie 2007)

# Some Impacts Associated with Dredging:

- Siltation/sedimentation can kill or stress demersal eggs of winter flounder, alewife, blueback herring, and rainbow smelt (e.g., Berry et al. 2004; Klein-MacPhee et al. 2004; Wilber et al. 2005)
- Dredging equipment noise and suspended sediments can interfere with the migration of diadromous fish (Feist et al.)
- Contaminants can adhere to suspended sediments released during dredging, degrading water quality and adversely effect the health of the aquatic ecosystem (USEPA 2000; Nightingale and Simenstad 2001)

# Some Impacts Associated with Dredging:

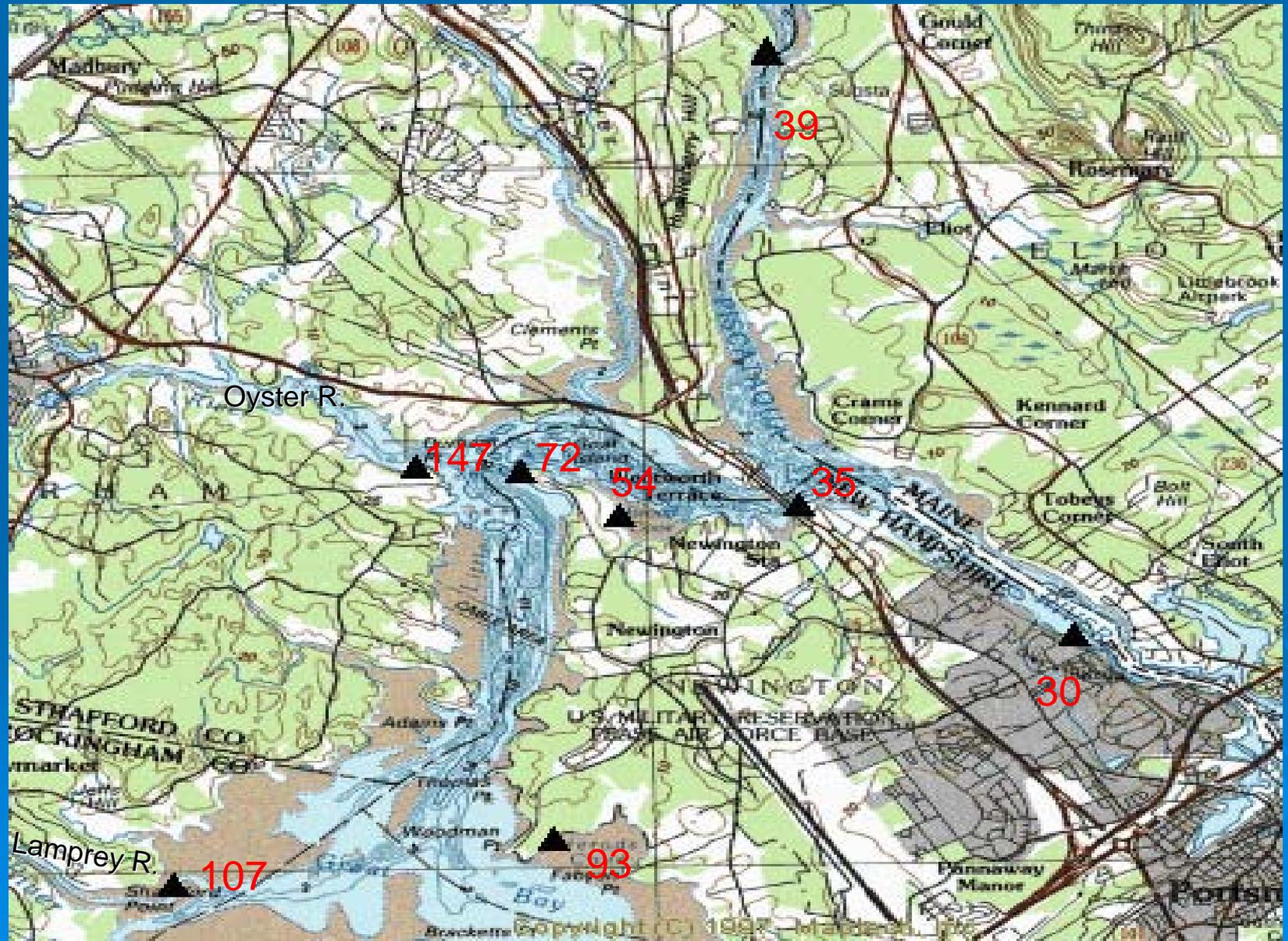
- Dredging is one of many perturbations that adversely effect fisheries (e.g. alteration of urban watersheds, nonpoint source and point source pollution affecting water quality/quantity, alteration of riparian and benthic habitats, and restrictions to migration)
- Dredging can add to the cumulative adverse impacts on coastal aquatic organisms and habitats



# New Hampshire Fish and Game Department Estuarine Survey of Juvenile Finfish

- Annual survey began in 1997
  - Fixed station seine samples collected June-November.
  - 3 stations in Little Harbor, 4 in Hampton/Seabrook Estuary, 3 in Piscataqua River, and 5 in Little Bay/ Great Bay Estuary
  - Primarily targets juvenile finfish, lobster and some bivalves
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# NHFGD Juvenile Finfish Survey Sampling Sites



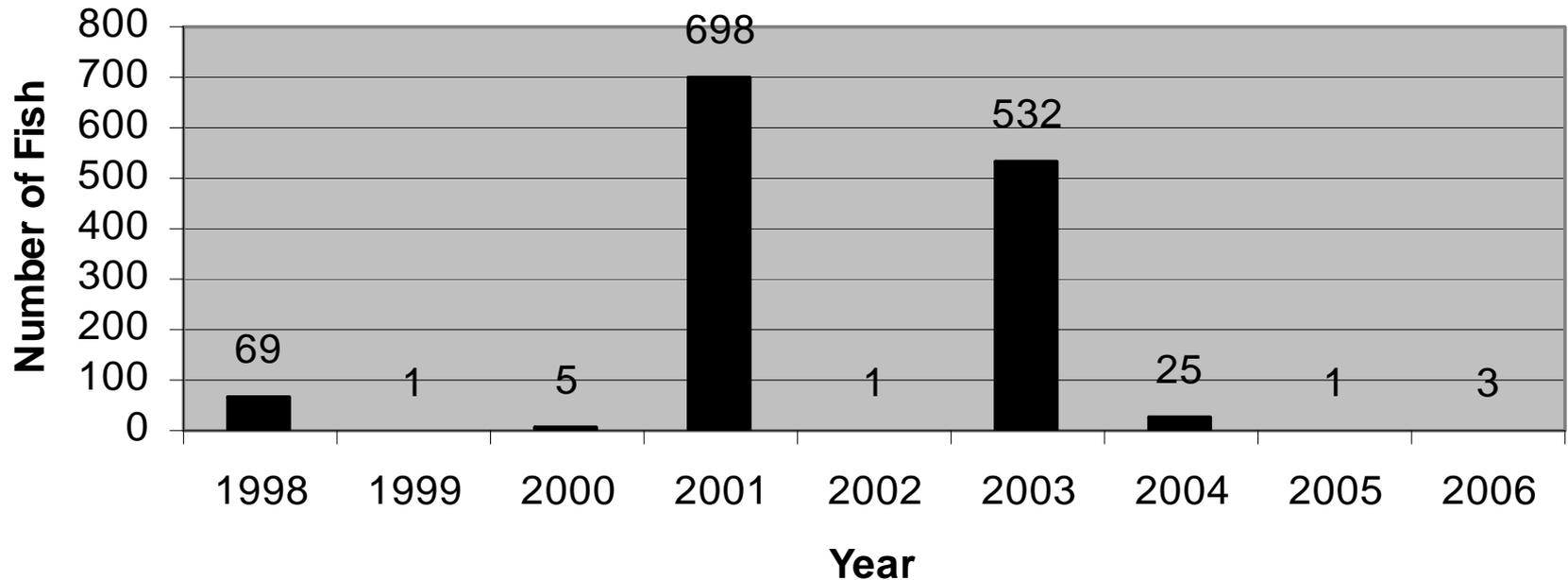
# NHFGD Juvenile Finfish Survey

## Geometric Mean Catch Per Haul Seine, 2006\*

Estuary	Station #	Species					
		Alewife	Blueback Herring	Winter Flounder	Atlantic Menhaden	Atlantic Silverside	Rainbow Smelt
<b>Little Bay/ Great Bay</b>	54	0	0	0.7	0	88.12	0.12
	72	0.12	1.35	0.98	0.2	97.08	0.2
	93	0.62	0	0.12	0	11.06	0.51
	107	0	0.26	0	1.52	5.42	0
	147	11.28	2.77	0.41	3.71	28.65	1.57
<b>Piscataqua River</b>	30	1.02	1.49	0.82	1.34	7.46	0.47
	35	0.12	0.12	1.74	2.17	64.42	3.24
	39	0	0.35	0.12	8.58	10.09	0.59

\*One seine sample taken per station, June-November

## Little Harbor Blueback Herring Catches 1998-2006\*



- Beach seine samples at three fixed stations in Little Harbor
- Samples collected from June-November 1995-2006
- Mean fish lengths = 7.8 cm (YOY)
- High interannual variability of catches
- Why? Schooling nature of species, sampling artifacts contribute.

\*Source: NHFGD Juvenile Finfish Survey

# New Hampshire Fish and Game Department Diadromous Fish Evaluation

- Diadromous fish passage at seven NHFGD fish ladders monitored (some since 1972)
- Hand and electronic counts conducted at Cocheco, Exeter, Oyster, Lamprey, Taylor and Winnicut Rivers
- Data used to monitor alewife, blueback herring, and American shad spawning runs

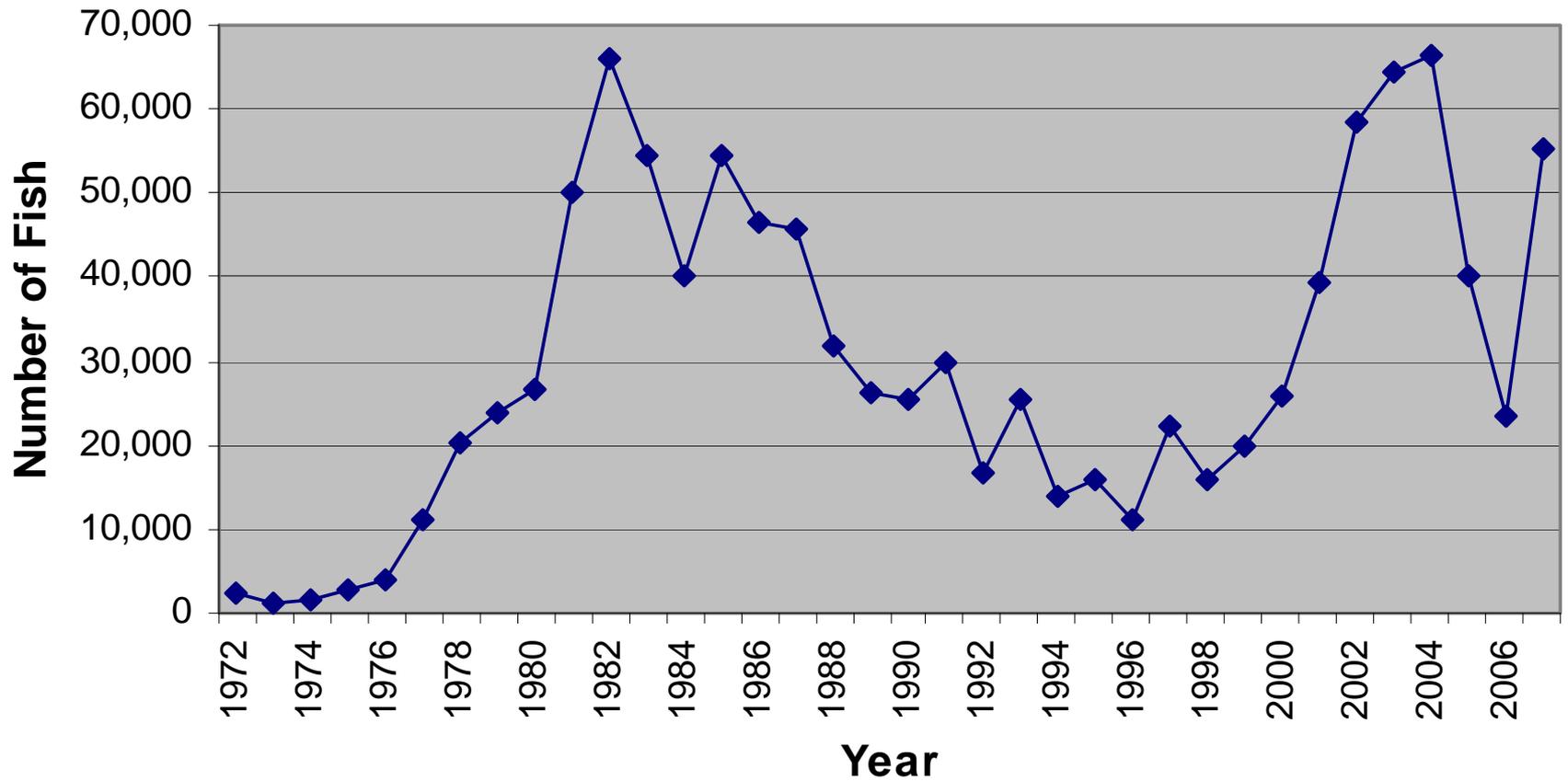
# Summary Data for River Herring Spawning Runs for Coastal New Hampshire Rivers, 2006\*

RIVER	RIVER HERRING RUN		TEMPERATURE (°C)			Return Numbers	Count Method
	START	END	MIN.	MAX.	PEAK		
COCHECO	4/21/2006	6/5/2006	9.0	21.0	12.0	4,318	H
EXETER	5/4/2006	6/19/2006	10.0	25.0	14.0	16	H
OYSTER	5/5/2006	6/29/2006	8.0	28.0	13.0	6,035	E, H
LAMPREY	4/20/2006	6/5/2006	10.0	22.0	11.0	24,471	E, H
TAYLOR	5/6/2006	6/27/2006	8.0	20.0	20.0	147	E, H
WINNICUT	5/20/2006	6/23/2006	13.0	26.0	24.0	822	E, H

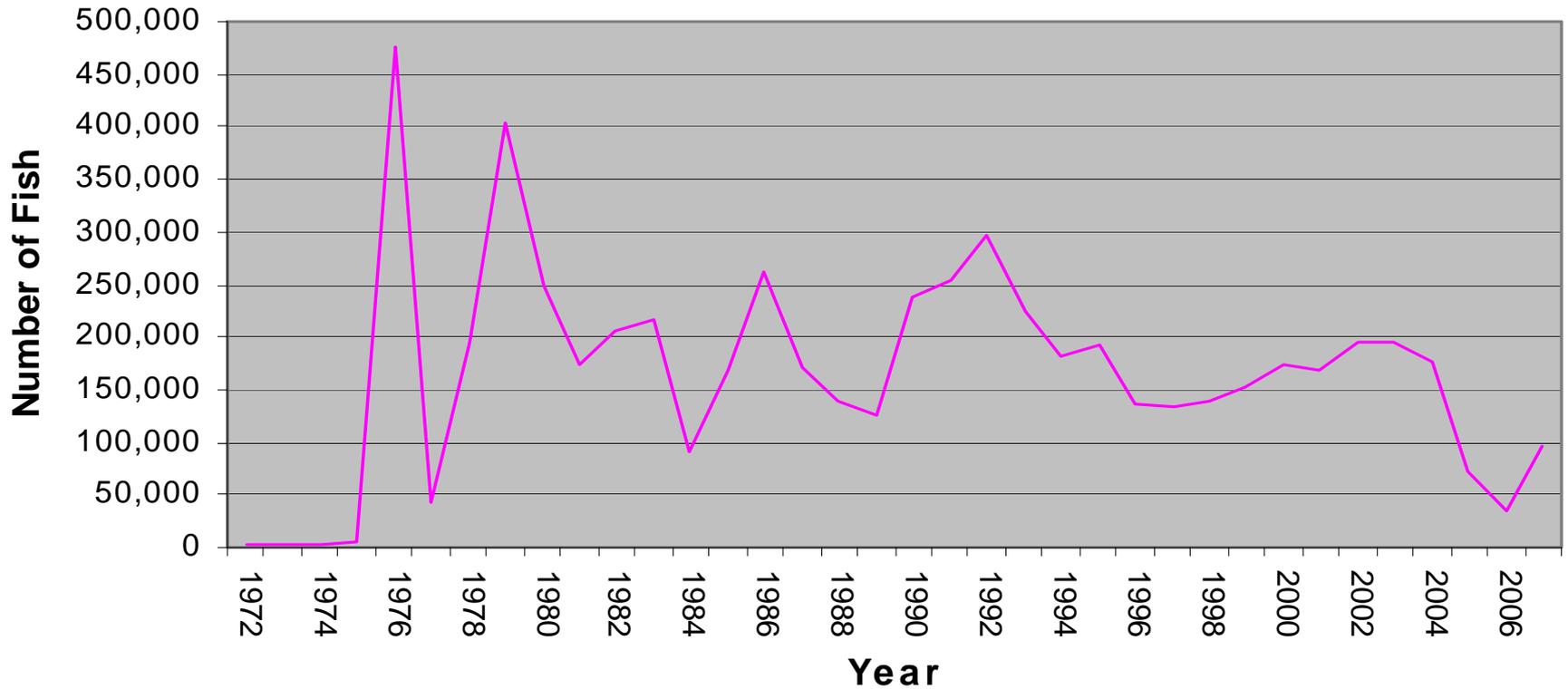
\* Source: NHFGD Fish Ladder Return Data

H=Hand Count; E= Electronic Count

# River Herring Returns at Lamprey River Fishway 1972-2007



# Statewide River Herring Returns at all Sampled Fishways, 1972-2007



# Time of Year Dredge Windows

## Why, When, and Where?

- Why?
- Minimizes entrainment of fish eggs, larvae, and juveniles
- Minimizes suspended sediments and turbidity during spawning and early life history development and migration
- Minimizes release of buried contaminated sediments during these sensitive life history periods
- Does not avoid impacts to resources, only minimizes impacts during most sensitive time of year

# Time of Year Dredge Windows

## Why, When, and Where?

- When?
- In New Hampshire, the establish dredge windows for most tidal waters is November 15 to March 15
- NMFS and the NHF&G uses fishery landings, fishery dependent and independent monitoring, and known life history requirements of important fishery species that occur in area (e.g., EFH Source Documents)

# Time of Year Dredge Windows

## Why, When, and Where?

- Where?
- Time-of-year dredge window is based upon life history of species that are known to occur, or assumed to occur (based upon habitat characteristics), in the proposed dredging area
- Ideally, fishery assessment data should be spatially and temporally robust, requiring annual, multiseasonal surveys using stratified-random design and repetitive sampling

# Time-of-Year Dredge Windows

- Sampling “snap shots” (single year or season) do not usually provide a complete picture due to variability of fishery data
- Without large expenditures of money, comprehensive, site-specific fishery data for each and every dredging project is unlikely to be available

# Time-of-Year Dredge Windows

- Can compensatory mitigation be used in lieu of TOY dredging windows to offset impacts? (e.g., stock enhancement, habitat restoration/creation)
- Dredging windows typically protect adult spawning (and/or spawning migrations), and egg and larval development. Without them, a portion or all of a year-class recruitment may be lost.

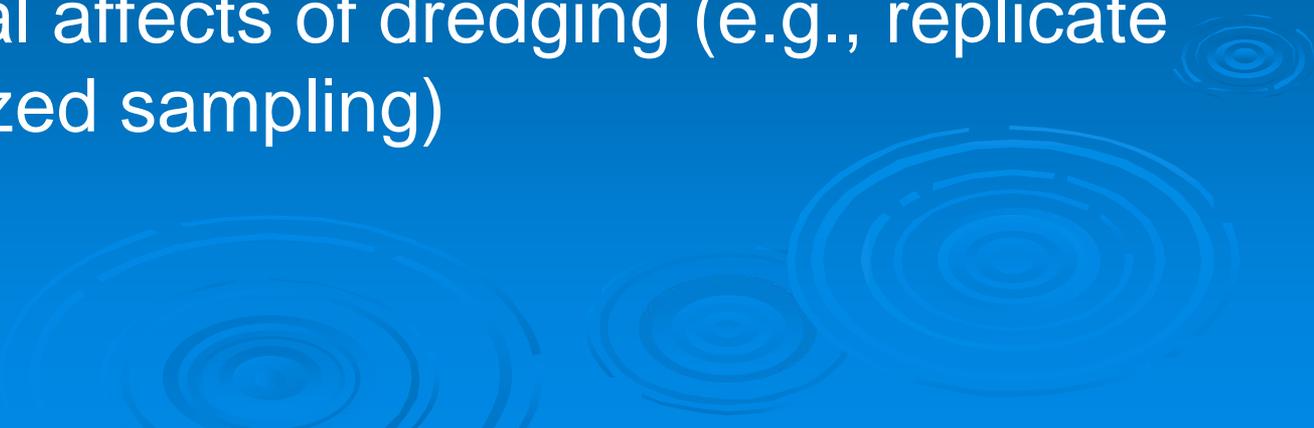
# Time-of-Year Dredge Windows

- For species whose populations are already depressed, this can result in cumulative adverse effects.
- Unless resource managers can be assured that compensatory mitigation will directly offset the loss of the year-class recruitment, avoidance of the impact is usually recommended (i.e., TOY window recommended).

# Where Do We Go From Here?

- Evaluate existing fishery and habitat data
- In the absence of robust fishery data, resources managers should adopt a precautionary, risk-averse approach when reviewing and authorizing dredging projects
- When data support it, modified dredge scheduling can be used (e.g., dredge sequencing-used in Boston Harbor, MA; Cocheco River in Dover, NH)

# Where Do We Go From Here?

- There is a need for research on the affects of dredging on aquatic species, life history stages and different sediment types (e.g., clean versus contaminated sediments, silt versus sand, eggs versus larvae, thresholds for demersal egg sediment loads)
  - Need to increase and improve monitoring of the environmental affects of dredging (e.g., replicate and randomized sampling)
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# Where Do We Go From Here?

- Adaptive management could play a larger role in dredging management (e.g., development of baseline data, establishing clear monitoring objectives, development of impact thresholds, ability to measure changes in the affected resources and analyze the changes, and ability to respond appropriately to the monitoring results)