Multi-State Collaborative to Develop and Implement a Conservation Program for Rainbow Smelt

Maine, Massachusetts, and New Hampshire are collaborating to collect scientific information and create a regional plan

In 2004, the National Oceanic and Atmospheric Administration listed the rainbow smelt as a federal Species of Concern. The rainbow smelt is a small fish that lives in estuaries and offshore waters, and spawns in shallow freshwater streams each spring. Its numbers have dropped dramatically during the last fifteen to twenty years for reasons that are not well understood.

The state governments of Maine, Massachusetts, and New Hampshire are collaborating on a scientific program to investigate the rainbow smelt's status and threats, and to plan a regional conservation effort for the species. Because loss and degradation of spawning habitat appears to be a major factor in the population decline, scientists from state agencies are studying human impacts on rivers and streams where rainbow smelt currently spawn or may have in the past. Based on the scientific findings, the states will develop a conservation plan to address the impacts and promote recovery of this imperiled species.

Lead Partners

Maine Department of Marine Resources
Massachusetts Division of Marine Fisheries
New Hampshire Department of Fish and Game
National Oceanic and Atmospheric Administration

Scientific Research Program

Spawning Locations

Which rivers and streams are used presently by rainbow smelt for spawning?

State agencies in Maine, Massachusetts, and New Hampshire have surveyed streams to identify potential spawning sites and assess which of those are currently used by rainbow smelt. We combine and map the data to show where rainbow smelt are currently known to spawn.

Historical Data

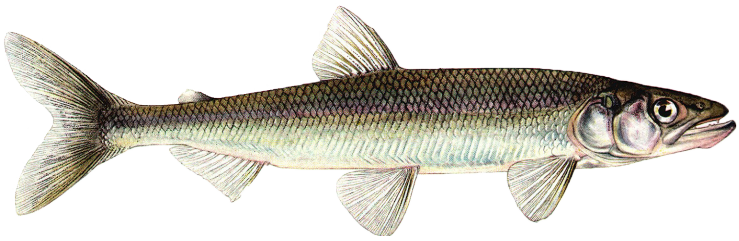
How abundant were rainbow smelt in the past, and where did they spawn?

We are compiling historical datasets on smelt abundance and spawning locations. We are analyzing the datasets to understand long-term changes in the rainbow smelt population.

Movement

How often do rainbow smelt enter and leave streams and rivers?

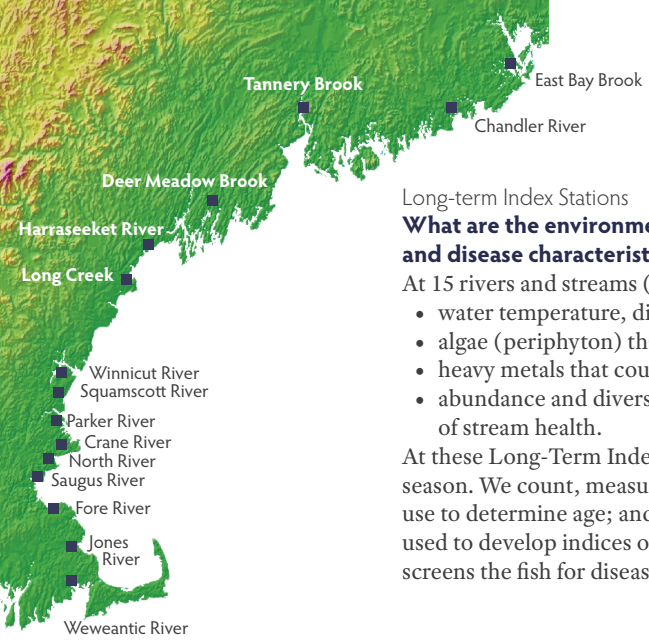
Using small radio tags and an antenna system, we track the movements of rainbow smelt in estuaries. We are finding that many of them return to spawning areas each night on the incoming tides.



The rainbow smelt (above) is a small fish that lives in coastal waters of New England and migrates into rivers and streams during the spring to spawn. Scientists are conducting research (below) to understand why the rainbow smelt has declined in abundance over the last 15 to 20 years.

Claire Enterline

State and local governments, community groups, and individual citizens can take immediate action to resolve some of the threats and to restore the rainbow smelt as an icon of spring in New England.



Long-term Index Stations

What are the environmental conditions at spawning sites? What are the demographic, genetic, and disease characteristics of rainbow smelt at these sites?

At 15 rivers and streams (see map at left) known to support spawning by rainbow smelt, we monitor:

- water temperature, dissolved oxygen, nutrients, pH, salinity, and turbidity,
- algae (periphyton) that could smother smelt eggs,
- heavy metals that could lead to egg mortality and impair development of young smelt, and
- abundance and diversity of mussels, insect larvae, and other macroinvertebrates as an indicator of stream health.

At these Long-Term Index Stations, we use large fyke nets to catch rainbow smelt during the spawning season. We count, measure, and identify the sex of the fish; take samples of their scales, which we later use to determine age; and collect samples of their fins for genetic analysis. The size and age data will be used to develop indices of population abundance. The University of Maine Animal Health Laboratory screens the fish for diseases caused by bacteria, viruses, and parasites.

Predictive GIS Model

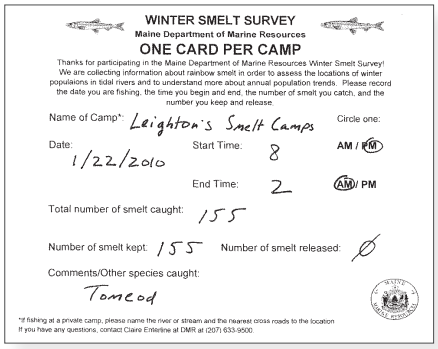
Based on scientific analysis, where could we expect to find suitable spawning habitat for rainbow smelt?

We are analyzing characteristics of coastal watersheds of the Gulf of Maine, such as their proportion of forested land, human population density, and percentage of area covered by pavement and other impervious surfaces. Based on this analysis, we are determining thresholds for urban and agricultural land use, impervious surface, and population density for watersheds that can support rainbow smelt spawning habitat. With this information, we are building a mapping tool to identify other streams that are potentially suitable as spawning habitat for rainbow smelt.

Fishing Pressure

How many rainbow smelt are caught by fishermen?

Each year, state agencies in New Hampshire and Maine conduct surveys of the recreational fishery, collecting information from anglers about the amount of time they spent fishing for rainbow smelt and how many fish they caught. We analyze the data to understand trends in total catch and catch per unit effort (CPUE) for rainbow smelt.



WINTER SMELT SURVEY
Maine Department of Marine Resources
ONE CARD PER CAMP

Thanks for participating in the Maine Department of Marine Resources Winter Smelt Survey! We are collecting information about rainbow smelt in order to assess the locations of winter populations in tidal rivers and to understand more about annual population trends. Please record the date you are fishing, the time you begin and end, the number of smelt you catch, and the number you keep and release.

Name of Camp*: Leighton's Smelt Camps
Circle one:
Date: 1/22/2010
Start Time: 8 AM / PM
End Time: 2 AM / PM
Total number of smelt caught: 155
Number of smelt kept: 155
Number of smelt released: Ø
Comments/Other species caught: Tomcod

*If fishing at a private camp, please name the river or stream and the nearest cross roads to the location
If you have any questions, contact Claire Enterline at DMR at (207) 633-9500

Conservation and Restoration Plan

Using scientific information from our collaborative efforts, the state agencies of Massachusetts, New Hampshire, and Maine are developing a regional conservation and restoration plan for rainbow smelt. Each state is determining the most important threats from water quality, fishing pressure, or habitat alteration facing smelt populations in their area. We are also identifying regional threats, potentially including rising ocean temperature and marine bycatch, and site-specific threats and management recommendations, such as redesigning stream culverts to allow fish passage

When completed, the conservation and restoration plan will present a comprehensive, regional strategy to address the threats and to restore populations of rainbow smelt in the Gulf of Maine. The plan will identify habitat restoration projects and management actions to be pursued as immediate priorities, and it will propose future projects and collaborations.

USDA

Replacement of culvert that blocked smelt from spawning habitat.

Brad Chase

Restoration of spawning habitat in a New England stream.

The regional conservation plan for rainbow smelt may include some or all of the following strategies:

- Replacement of culverts that block fish passage
- Dam removal
- Stock enhancement
- Remediation of stormwater pollution by using pervious pavement, redesigned sewage treatment systems, and other approaches
- Reduction of nutrient inputs to streams
- Mitigation of siltation
- Restoration of spawning habitat, including stream channels, substrates, and stream flow
- Reduction of mortality in fisheries

For more information about rainbow smelt and the NOAA National Marine Fisheries Service (NMFS) Species of Concern Program, visit www.nmfs.noaa.gov/pr/species/fish/rainbowsmelt.htm