



Ray-finned Fishes

Rainbow Smelt

Osmerus mordax

Priority 1 Species of Greatest Conservation Need (SGCN)

Class: Ray-finned Fishes (*Actinopterygii*)

Order: Smelts And Allies (*Osmeriformes*)

Family: Smelts (*Osmeridae*)



General comments:

Rainbow Smelt are anadromous fish listed as a Species of Concern under the ESA from Labrador to New Jersey. They face threats from warming waters, habitat degradation, and competition with invasive species. Maine removed their state SC status in 2025.

No Species Conservation Range Maps Available

SGCN Priority Ranking - Designation Criteria:

Recent Significant Declines:	Rainbow Smelt is currently undergoing steep population declines, which has already led to, or if unchecked is likely to lead to, local extinction and/or range contraction. Notes: Recent significant decline: http://www.nmfs.noaa.gov/pr/pdfs/species/rainbowsmelt_highlights.pdf
Regional Endemic:	<i>Osmerus mordax</i> 's global geographic range is at least 90% contained within the area defined by USFWS Region 5, the Canadian Maritime Provinces, and southeastern Quebec (south of the St. Lawrence River). Notes: Recent significant decline: http://www.nmfs.noaa.gov/pr/pdfs/species/rainbowsmelt_highlights.pdf
High Regional Conservation Priority:	Northeast Regional Synthesis (RSGCN): Responsibility: High, Concern: High

Habitat Associations:

Formation: Freshwater Aquatic

Macrogroup: Lotic

* Primary Habitat	Habitat System: Cold Rivers <i>spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (small, medium, and large) on gravel, cobble, boulder, and less frequently sand substrate.</i>
* Primary Habitat	Habitat System: Non-cold Large Rivers <i>spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (small, medium, and large) on gravel, cobble, boulder, and less frequently sand substrate.</i>

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Formation: Freshwater Aquatic

	Habitat System: Transitional Small and Medium Rivers <i>spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (small, medium, and large) on gravel, cobble, boulder, and less frequently sand substrate.</i>
	Habitat System: Unknown Thermal Regime Small and Medium Rivers <i>spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (small, medium, and large) on gravel, cobble, boulder, and less frequently sand substrate.</i>
	Habitat System: Warm Small and Medium Rivers <i>spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (small, medium, and large) on gravel, cobble, boulder, and less frequently sand substrate.</i>

Formation: Intertidal

Macrogroup: Intertidal Mudflat

	Habitat System: Non-Vascular Mudflat <i>assumed feeding habitat</i>
	Habitat System: Submerged Aquatic Vegetation <i>assumed feeding habitat</i>

Macrogroup: Intertidal Sandy Shore

	Habitat System: Sand Flat <i>assumed feeding habitat</i>
	Habitat System: Submerged Aquatic Vegetation <i>assumed feeding habitat</i>

Macrogroup: Intertidal Water Column

★ Primary Habitat	Habitat System: Confined Channel <i>stage in water column before spawning, spawn immediately above head of tide</i>
★ Primary Habitat	Habitat System: Embayment <i>over-wintering area</i>

Formation: Subtidal

Macrogroup: Subtidal Mud Bottom

	Habitat System: Submerged Aquatic Vegetation <i>assumed feeding habitat</i>
	Habitat System: Unvegetated <i>assumed feeding habitat</i>

Macrogroup: Subtidal Pelagic (Water Column)

★ Primary Habitat	Habitat System: Confined Channel <i>stage in water column before spawning, spawn immediately above head of tide</i>
	Habitat System: Nearshore <i>migration, summer habitat</i>

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Formation: Subtidal

Macrogroup: Subtidal Sand Bottom

	Habitat System: Submerged Aquatic Vegetation <i>assumed feeding habitat</i>
	Habitat System: Unvegetated <i>assumed feeding habitat</i>

Threats

Threat Priority Level based on Severity and Actionability		Moderate Severity		High Severity	
	Highly Actionable		Medium-High		High
	Moderately Actionable		Medium		Medium-High
	Actionable with Difficulty		Low		Low

IUCN Level 1 Threat Biological Resource Use

IUCN Level 2 Threat: Fishing and Harvesting of Aquatic Resources

Severity: Moderate Severity **Actionability:** Highly Actionable

Notes: Extraction and mortality rates differ widely among Maine runs. Implementing voluntary conservation measures, such as continuous escapement or not fishing the run during the first week, can help ensure sustainable harvests

IUCN Level 1 Threat Climate Change and Severe Weather

IUCN Level 2 Threat: Changes in Precipitation and Hydrological Regimes

Severity: High Severity **Actionability:** Moderately Actionable

Notes: Increased flooding during the spring can limit upstream swimming ability. Preserving or improving stream buffers could help mitigate high velocity runoff.

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IUCN Level 1 Threat Energy Production and Mining

IUCN Level 2 Threat: Renewable Energy

Severity: Moderate Severity	Actionability: Highly Actionable
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Notes: Some proposed renewable energy projects such as tidal barrages or tide driven turbines may significantly impact smelt by either obstructing or greatly reducing natural migration routes, as well as mortality associated with turbine strikes.

IUCN Level 1 Threat Human Intrusions and Disturbance

IUCN Level 2 Threat: Recreational Activities

Severity: Moderate Severity	Actionability: Highly Actionable
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Notes: Extraction and mortality rates differ widely among Maine runs. Implementing voluntary conservation measures, such as continuous escapement or not fishing the run during the first week, can help ensure sustainable harvests

IUCN Level 1 Threat Natural Systems Modifications

IUCN Level 2 Threat: Dams and Water Management-Use

Severity: High Severity	Actionability: Moderately Actionable
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Notes: Dams at head of tide completely block access to spawning grounds. No fishway design has been proven to effectively pass smelt. Actionability is moderate - proactive dam removal happens infrequently (not a high likelihood or certainty), but new small dam construction is slowing. Spatial extent is entire state.

IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Domestic and Urban Waste Water

Severity: High Severity	Actionability: Moderately Actionable
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Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Likelihood is high and increasing (high certainty), current spatial extent is most severe in Southern Maine, but expanding along coast, so actionability is moderate, i.e. the threat can be minimized in newly developing areas.

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IUCN Level 1 Threat Residential and Commercial Development

IUCN Level 2 Threat: Housing and Urban Areas

Severity: High Severity

Actionability: Moderately Actionable

Notes: Residential and urban development has been statistically correlated with depleted smelt runs. The specific causes of impact are increased non-point source pollution (heavy metals and nutrient inputs), water withdrawals, disturbance of stream corridor and tree canopy over stream. Likelihood is high and increasing (high certainty), current spatial extent is Southern Maine, but expanding along coast, so actionability is moderate, i.e. the threat can be minimized in newly developing areas.

IUCN Level 1 Threat Transportation and Service Corridors

IUCN Level 2 Threat: Roads and Railroads

Severity: High Severity

Actionability: Moderately Actionable

Notes: Most current road/railroad crossings within smelt habitat pose some passage problems because they are undersized or hanging during at least part of the tide cycle (most always hanging). 'Actionability' is moderate because culverts must be replaced and can be constructed to allow passage, but sometimes are not. Also must wait until the culvert is in need of replacement in most cases which can be 20-30 years. Likelihood is moderate because construction can allow passage. Certainty is low. Spatial extent is high within smelt spawning range.

IUCN Level 1 Threat Residential and Commercial Development

IUCN Level 2 Threat: Commercial and Industrial Areas

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: Armored shores decrease available forage and over-winter habitat. Spatial extent is fairly low (confined to a few areas), but is substantial in those areas.

IUCN Level 1 Threat Climate Change and Severe Weather

IUCN Level 2 Threat: Changes in Precipitation and Hydrological Regimes

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: Changes in annual water trends can affect water trends/discharge during important phases in the life cycle (spawning, rearing, outmigration). Recent NOAA research has shown that droughts and flooding during summer/fall can impact spring flow regimes.

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IUCN Level 1 Threat Climate Change and Severe Weather

IUCN Level 2 Threat: Changes in Temperature Regimes

Severity: High Severity

Actionability: Actionable with Difficulty

Notes: Cold-water species - smelt has shown range truncation - range moving northward. Ability to mitigate sea temperature change is low.

IUCN Level 2 Threat: Habitat Shifting or Alteration

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: Sea level rise could reduce or relocate spawning habitat. Likelihood of adjusting coastal development to accommodate is low.

IUCN Level 1 Threat Energy Production and Mining

IUCN Level 2 Threat: Oil and Gas Drilling

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: There is potential for offshore oil spills in the Gulf of Maine from tankers. The use of oil dispersants increases the effect on pelagic species by increasing the toxicity of oil globules, though the exact effects are not well documented.

IUCN Level 1 Threat Invasive and Other Problematic Species, Genes and Diseases

IUCN Level 2 Threat: Invasive Non-native-Alien Species-Diseases

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: Effect of invasives largely unknown but might have effect on specific populations (Kennebec). The ability, likelihood, and certainty to mitigate invasives is low.

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IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Agricultural and Forestry Effluents

Severity: High Severity

Actionability: Actionable with Difficulty

Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Likelihood is high and increasing (high certainty), actionability is low because further regulation of effluents is not likely within next 10 years in Maine.

IUCN Level 2 Threat: Industrial and Military Effluents

Severity: High Severity

Actionability: Actionable with Difficulty

Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Likelihood is high and increasing (high certainty), current spatial extent is a few locations, , actionability is low because further regulation of effluents is not likely within next 10 years in Maine.

Species Level Conservation Actions:

None. Only species specific conservation actions that address high (red) or medium-high (orange) priority threats are summarized here.

Conservation Actions Associated with the Diadromous Fish Guild:

Conservation Action	Category	Biological Priority	Type
Continue to work with the fishing industry to develop gear modifications that reduce of bycatch of diadromous fishes	Public Outreach	moderate	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Conduct education to increase awareness of the importance of these species to maintaining productive ecosystem functioning.	Public Outreach	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources
- Lack of knowledge

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Conservation Action	Category	Biological Priority	Type
Improve understanding of species distribution especially in regards to ecosystem interactions, predator-prey relationships, and prey buffering concepts	Research	high	on-going

Threat(s) Addressed By This Conservation Action

- Lack of knowledge

Conservation Action	Category	Biological Priority	Type
Encourage improved municipal planning for siting for new or retrofitting development, taking into account future environmental change, to improve connectivity for diadromous fish passage	Habitat Management	high	on-going

Threat(s) Addressed By This Conservation Action

- Housing and Urban Areas
- Commercial and Industrial Areas
- Domestic and Urban Waste Water
- Industrial and Military Effluents

Conservation Action	Category	Biological Priority	Type
Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently	Survey and Monitoring	high	on-going

Threat(s) Addressed By This Conservation Action

- Changes in Precipitation and Hydrological Regimes
- Changes in Temperature Regimes
- Lack of knowledge

Conservation Action	Category	Biological Priority	Type
Monitor population stock status through surveys and sampling programs	Survey and Monitoring	critical	on-going

Threat(s) Addressed By This Conservation Action

- Other Threat

Conservation Action	Category	Biological Priority	Type
Determine the location and timing of critical habitat use (for endangered species) and important habitat use for diadromous fishes at different life history stages	Research	critical	on-going

Threat(s) Addressed By This Conservation Action

- Lack of knowledge

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Conservation Action	Category	Biological Priority	Type
Investigate methods to reduce incidental bycatch in commercial and recreational fisheries	Research	high	new

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Gather information to support management, including stock assessments, population genetics, population monitoring, etc.	Research	high	on-going

Threat(s) Addressed By This Conservation Action

- Other Threat
- Dams and Water Management-Use
- Lack of knowledge
- Habitat Shifting or Alteration

Conservation Action	Category	Biological Priority	Type
Improve understanding of the relative roles of natural predation, fishing mortality, and climate change in stock dynamics	Research	high	new

Threat(s) Addressed By This Conservation Action

- Habitat Shifting or Alteration
- Problematic Native Species-Diseases
- Lack of knowledge
- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.	Habitat Management	high	on-going

Threat(s) Addressed By This Conservation Action

- Lack of knowledge
- Fishing and Harvesting of Aquatic Resources

Broad Taxonomic Group Conservation Actions:

Additional relevant conservation actions for this species are assigned within broader taxonomic groups in Maine's Wildlife Action Plan: Element 4.

Habitat Based Conservation Actions:

Additional conservation actions that may benefit habitat(s) associated with this species can be found in Maine's Wildlife Action Plan: Element 4. Click on the Habitat Grouping of interest to launch a habitat based report summarizing relevant conservation actions and associated SGCN.

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The Wildlife Action Plan was developed through a lengthy participatory process with state agencies, targeted conservation partners, and the general public. The Plan is non-regulatory. The species, threats, and voluntary conservation actions identified in the Plan complement, but do not replace, existing work