Osmerus mordax (Rainbow Smelt)

Priority 1 Species of Greatest Conservation Need (SGCN)

Class: *Actinopterygii* (Ray-finned Fishes)
Order: *Osmeriformes* (Smelts And Allies)
Family: *Osmeridae* (Smelts)

General comments:

ESA species of Concern - Atlantic-Labrador to NJ; anadromous

No Species Conservation Range Maps Available for Rainbow Smelt

SGCN Priority Ranking - Designation Criteria:

Risk of Extirpation: NA

State Special Concern or NMFS Species of Concern: NA

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:

Osmerus mordax'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:

Atlantic States Marine Fisheries Commission Stock Assessments:
Status: Decreasing, Status Comment: Recent Department surveys have found that many runs in Maine have declined, while others are extirpated.
Reference:
http://www.maine.gov/dmr/40smeltemergencyweb.pdf

High Climate Change Vulnerability: NA

Understudied rare taxa: NA

Historical: NA

Culturally Significant:

Species identified as both biologically vulnerable and culturally significant by Maine's tribes.

Habitats Assigned to Rainbow Smelt:

Formation Name **Freshwater Aquatic**

Macrogroup Name **Rivers and Streams**

Habitat System Name: Large River ****Primary Habitat**** **Notes:** *spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (both medium and large) on gravel, cobble, boulder, and less frequently sand substrate.*

Habitat System Name: Medium River ****Primary Habitat**** **Notes:** *spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (both medium and large) on gravel, cobble, boulder, and less frequently sand substrate.*

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Formation Name Freshwater Aquatic

Habitat System Name: Small River ****Primary Habitat**** **Notes:** *spawning habitat is located directly above the head of tide in the freshwater portion of coastal streams and rivers (both medium and large) on gravel, cobble, boulder, and less frequently sand substrate.*

Formation Name Intertidal

Macrogroup Name **Intertidal Mudflat**

Habitat System Name: Non-Vascular Mudflat **Notes:** *assumed feeding habitat*

Habitat System Name: Submerged Aquatic Vegetation **Notes:** *assumed feeding habitat*

Macrogroup Name **Intertidal Sandy Shore**

Habitat System Name: Sand Flat **Notes:** *assumed feeding habitat*

Habitat System Name: Submerged Aquatic Vegetation **Notes:** *assumed feeding habitat*

Macrogroup Name **Intertidal Water Column**

Habitat System Name: Confined Channel ****Primary Habitat**** **Notes:** *stage in water column before spawning, spawn immedetialy Above head of tide*

Habitat System Name: Embayment ****Primary Habitat**** **Notes:** *over-wintering area*

Formation Name Subtidal

Macrogroup Name **Subtidal Mud Bottom**

Habitat System Name: Submerged Aquatic Vegetation **Notes:** *assumed feeding habitat*

Habitat System Name: Unvegetated **Notes:** *assumed feeding habitat*

Macrogroup Name **Subtidal Pelagic (Water Column)**

Habitat System Name: Confined Channel ****Primary Habitat**** **Notes:** *stage in water column before spawning, spawn immedetialy Above head of tide*

Habitat System Name: Nearshore **Notes:** *migration, summer habitat*

Macrogroup Name **Subtidal Sand Bottom**

Habitat System Name: Submerged Aquatic Vegetation **Notes:** *assumed feeding habitat*

Habitat System Name: Unvegetated **Notes:** *assumed feeding habitat*

Stressors Assigned to Rainbow Smelt:

Stressor 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

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IUCN Level 1 Threat **Climate Change and Severe Weather**

IUCN Level 2 Threat: Storms and Flooding

Severity: Severe **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.

IUCN Level 1 Threat **Energy Production and Mining**

IUCN Level 2 Threat: Renewable Energy

Severity: Moderate Severity **Actionability:** Highly actionable

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 assocated with turbine strikes.

IUCN Level 1 Threat **Human Intrusions and Disturbance**

IUCN Level 2 Threat: Recreational Activities

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 **Natural Systems Modifications**

IUCN Level 2 Threat: Dams and Water Management-Use

Severity: Severe **Actionability:** Moderately actionable

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 liklihood 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: Severe **Actionability:** Moderately actionable

Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Liklihood 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.

IUCN Level 1 Threat **Residential and Commercial Development**

IUCN Level 2 Threat: Housing and Urban Areas

Severity: Severe **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. Liklihood 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.

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IUCN Level 1 Threat **Transportation and Service Corridors**

IUCN Level 2 Threat: Roads and Railroads

Severity: Severe **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: Droughts

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.

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. Liklihood of adjusting coastal development to accommodate is low.

IUCN Level 2 Threat: Temperature Extremes

Severity: Severe **Actionability:** Actionable with difficulty

Notes: Cold-water species - smelt has shown range truncation - range moveing northward. Ability to mitigate sea temperature change 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 gloubules, 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: Severe **Actionability:** Actionable with difficulty

Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Liklihood 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: Severe **Actionability:** Actionable with difficulty

Notes: Non-point source pollution (heavy metals and nutrient inputs) has been directly related to declining smelt runs. Liklihood 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 Assigned to Rainbow Smelt:

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

Conservation Actions Associated with the Diadromous Fish Guild:

Conservation Action **Category:** Public Outreach **Biological Priority:** moderate **Type:** on-going

Continue to work with the fishing industry to develop gear modifications that reduce of bycatch of diadromous fishes

Stressor(s) Addressed By This Conservation Action

Fishing and Harvesting of Aquatic Resources

Conservation Action **Category:** Public Outreach **Biological Priority:** high **Type:** on-going

Conduct education to increase awareness of the importance of these species to maintaining productive ecosystem functioning.

Stressor(s) Addressed By This Conservation Action

Lack of knowledge, Fishing and Harvesting of Aquatic Resources

Conservation Action **Category:** Research **Biological Priority:** high **Type:** on-going

Improve understanding of species distribution especially in regards to ecosystem interactions, predator-prey relationships, and prey buffering concepts

Stressor(s) Addressed By This Conservation Action

Lack of knowledge

Conservation Action **Category:** Habitat Management **Biological Priority:** high **Type:** on-going

Encourage improved municipal planning for siting for new or retrofitting development, taking into account future environmental change, to improve connectivity for diadromous fish passage

Stressor(s) Addressed By This Conservation Action

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

Conservation Action **Category:** Survey and Monitoring **Biological Priority:** high **Type:** on-going

Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently

Stressor(s) Addressed By This Conservation Action

Lack of knowledge

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

Stressor(s) Addressed By This Conservation Action

Other Threat

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

Stressor(s) Addressed By This Conservation Action

Lack of knowledge

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

Stressor(s) Addressed By This Conservation Action

Fishing and Harvesting of Aquatic Resources

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

Stressor(s) Addressed By This Conservation Action

Fishing and Harvesting of Aquatic Resources, Lack of knowledge

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

Stressor(s) Addressed By This Conservation Action

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

Conservation Action **Category:** Public Outreach **Biological Priority:** high **Type:** on-going
Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance

Broad Taxonomic Group Conservation Actions:

Additional relevant conservation actions for this species are assigned within broader taxonomic groups in Maine's 2015 Wildlife Action Plan: Element 4, Table 4-1.

Habitat Based Conservation Actions:

Additional conservation actions that may benefit habitat(s) associated with this species can be found in Maine's 2015 Wildlife Action Plan: Element 4, Table 4-15. Click on the Habitat Grouping of interest to launch a habitat based report summarizing relevant conservation actions and associated SGCN.

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, stressors, and voluntary conservation actions identified in the Plan complement, but do not replace, existing work programs and priorities by state agencies and partners.