



Insects

Roaring Brook Mayfly

Epeorus frisoni

Priority 1 Species of Greatest Conservation Need (SGCN)

Class: Insects (*Insecta*)

Order: Mayflies (*Ephemeroptera*)

Family: Flatheaded Mayflies (*Heptageniidae*)



General comments:

The Roaring Brook Mayfly belongs to the Flat-headed Mayfly family (Heptageniidae), whose larvae are characterized by a flattened head and body that allows them to cling to rocks in fast-flowing water. This globally rare species inhabits clean, cold, high elevation headwater streams, and is thought to be restricted to the Northern Appalachian Mountain range of northern New England. Despite targeted survey effort, it has only been found in 14 streams, stretching from Mount Katahdin to the western mountains. It is listed as state Threatened and at risk due to its restricted distribution, global rarity, and the vulnerability of headwater streams to development, intensive forestry, water quality degradation, and climate change.

Species Conservation Range Maps:

Town Map: [Epeorus frisoni_Towns.pdf](#)

Subwatershed Map: [Epeorus frisoni_HUC12.pdf](#)

SGCN Priority Ranking - Designation Criteria:

Risk of Extirpation:	Maine Status: Threatened	Federal Status: None	IUCN Red List Status: None
Regional Endemic:	<i>Epeorus frisoni</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).		
High Regional Conservation Priority:	Northeast Regional Synthesis (RSGCN): Responsibility: High, Concern: High NatureServe: Global Rank: G1 State Rank: S2		

Habitat Associations:

Formation: Freshwater Aquatic

Macrogroup: Lotic

★ Primary Habitat	Habitat System: High Slope Headwater <i>restricted to cold, high elevation, headwater streams in undisturbed habitat</i>
★ Primary Habitat	Habitat System: Moderate Slope Headwater <i>restricted to cold, high elevation, headwater streams in undisturbed habitat</i>

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Formation: Northeastern Upland Forest

Macrogroup: Acadian-Northern Appalachian Forest

Habitat System: Acadian-Northern Appalachian Forest Macrogroup- Unknown Habitat System

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 Other Options

IUCN Level 2 Threat: Other Threat

Severity: Moderate Severity

Actionability: Highly Actionable

Notes: lack of comprehensive statewide species assessment, recovery goals/plan, and site specific conservation plans

IUCN Level 2 Threat: Resource Needs

Severity: High Severity

Actionability: Moderately Actionable

Notes: MDIFW lacks funding and staff to implement conservation actions for SGCN invertebrates (e.g., surveys and monitoring, research, habitat protection, outreach and education)

IUCN Level 1 Threat Biological Resource Use

IUCN Level 2 Threat: Logging and Wood Harvesting

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer where loss of intact forest canopy can degrade stream and riparian habitat integrity and water quality (e.g., erosion off steep slopes, machinery in stream beds)

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IUCN Level 1 Threat Energy Production and Mining

IUCN Level 2 Threat: Renewable Energy

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer where loss of intact forested canopy can degrade stream and riparian habitat integrity and water quality; in stream channel from impacts of construction and poorly designed stream crossings (e.g., wind power development, clearing for electrical corridors in high elevation habitat)

IUCN Level 1 Threat Other Options

IUCN Level 2 Threat: Education & Outreach

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: some threats and challenges can be minimized through enhanced public outreach and advocacy (e.g., pesticide use, riparian habitat management, BMPs for stream crossings, awareness and appreciation)

IUCN Level 2 Threat: Lack of knowledge

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: lack of comprehensive knowledge about distribution, status, habitat, life history; targeted surveys have been conducted for this species but it is possible more occurrences could be found

IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Agricultural and Forestry Effluents

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer or stream channel where run off/application of pesticides and other chemicals for forest management can degrade water quality or impact nymphs

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IUCN Level 1 Threat Residential and Commercial Development

IUCN Level 2 Threat: Housing and Urban Areas

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer where permanent land use changes, increased road crossings, and loss of intact forest canopy can degrade stream and riparian habitat integrity and water quality (i.e., recent increase in development pressure in western mountains)

IUCN Level 2 Threat: Tourism and Recreational Areas

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: permanent land use changes, increased road access, and loss of intact forest canopy can degrade stream and riparian habitat integrity and water quality (e.g. development/expansion of ski resorts and other mountain recreation facilities)

IUCN Level 1 Threat Transportation and Service Corridors

IUCN Level 2 Threat: Roads and Railroads

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer where loss of intact forest canopy can degrade stream and riparian habitat integrity and water quality (e.g., run-off, road salt); in stream channel where construction and maintenance can cause erosion of stream banks, sedimentation, water quality degradation, and direct mortality; impacts to stream habitat from poorly designed stream crossings

IUCN Level 2 Threat: Utility and Service Lines

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: in riparian buffer where loss of intact forest canopy can degrade stream and riparian habitat integrity and water quality; in stream channel where utility crossings can disturb stream bed and cause direct mortality of nymphs

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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: extreme and/or prolonged events (flooding or drought) can cause direct mortality, displacement, exposure, erosion of stream banks, sedimentation, increased water temperatures, water quality degradation, etc

IUCN Level 2 Threat: Changes in Temperature Regimes

Severity: Moderate Severity**Actionability:** Actionable with Difficulty

Notes: species requires cold water temperatures; potential impacts from climate change or water management could exceed species' temperature thresholds

IUCN Level 2 Threat: Habitat Shifting or Alteration

Severity: Moderate Severity**Actionability:** Actionable with Difficulty

Notes: potential impacts of climate change (e.g., increased water temperature, lack of snowmelt at high elevations, loss of high elevation habitat, etc)

IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Air-Bourne Pollutants

Severity: Moderate Severity**Actionability:** Actionable with Difficulty

Notes: impacts to water quality and direct impacts to nymphs from acidification, mercury deposition, other contaminants, etc

Species Level Conservation Actions:

Only species specific conservation actions that address high (red) or medium-high (orange) priority threats are summarized here.

Conservation Action	Category	Biological Priority	Type
Draft a statewide species assessment and conservation plan, including recovery goals, as well as site-specific conservation plans for each occupied waterbody.	Species Management	high	new

Threat(s) Addressed By This Conservation Action



Other Threat

Education & Outreach

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Conservation Action	Category	Biological Priority	Type
Work with conservation partners (e.g., University of Maine, taxa experts) to improve understanding of life history.	Research	moderate	new

Threat(s) Addressed By This Conservation Action

- Other Threat
- Lack of knowledge

Conservation Actions Associated with the Headwater Stream Mayflies Guild:

Conservation Action	Category	Biological Priority	Type
Develop/distribute Best Management Practices for landowners, land managers and conservation partners to avoid and minimize impacts of intensive land use activities (e.g., forestry, stream crossings, development, renewable energy projects, transmission line ROWs).	Habitat Management	critical	on-going

Threat(s) Addressed By This Conservation Action

- Utility and Service Lines
- Roads and Railroads
- Housing and Urban Areas
- Tourism and Recreational Areas
- Agricultural and Forestry Effluents
- Renewable Energy
- Logging and Wood Harvesting

Conservation Action	Category	Biological Priority	Type
Conduct comprehensive statewide surveys to inform/update diversity, distribution, habitat use, life history, and status.	Survey and Monitoring	high	on-going

Threat(s) Addressed By This Conservation Action

- Lack of knowledge

Conservation Action	Category	Biological Priority	Type
Develop/distribute outreach materials to raise public awareness and appreciation of freshwater aquatic insect ecology, threats and conservation needs.	Public Outreach	moderate	on-going

Threat(s) Addressed By This Conservation Action

- Education & Outreach

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Conservation Action	Category	Biological Priority	Type
Increase MDIFW staff capacity for survey and conservation of SGCN invertebrates.	Policy	critical	new

Threat(s) Addressed By This Conservation Action

- Education & Outreach
- Lack of knowledge
- Resource Needs

Conservation Action	Category	Biological Priority	Type
Update NatureServe S-ranks for all state-listed mayfly species.	Research	high	completed

Threat(s) Addressed By This Conservation Action

- Lack of knowledge

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.

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