RECOVERY OUTLINE

Meltwater lednian stonefly (*Lednia tumana*) and Western glacier stonefly (*Zapada glacier*)

Montana Ecological Services Office

November 2019

Photos by J. Giersch, U.S. Geological Survey

I. INTRODUCTION

This document provides an overview of the known information for meltwater lednian stonefly (*Lednia tumana*) and western glacier stonefly (*Zapada glacier*) and serves to guide recovery efforts and inform consultation and permitting activities until a comprehensive recovery plan for these species is approved.

LISTING AND CONTACT INFORMATION:

Listing Classification: Both meltwater lednian stonefly and western glacier stonefly Threatened rangewide

Effective Listing Date: December 23, 2019 (84 FR 64210, November 21, 2019)

Proposed Designation of Critical Habitat: Determined Not Prudent

Final Designation of Critical Habitat: Determined Not Prudent

Lead Agency, Region: U.S. Fish and Wildlife Service, Department of Interior Unified Regions, 5, 7, and 9

Lead Field Office: Montana Ecological Services Office

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II. RECOVERY STATUS ASSESSMENT

A. BIOLOGICAL ASSESSMENT

Taxonomy

The meltwater lednian stonefly was originally described by Ricker in 1952 (Baumann 1975, p. 18) from the Many Glacier area of Glacier National Park (GNP), Montana (Baumann 1982, pers. comm.). The meltwater lednian stonefly belongs to the phylum Arthropoda, class Insecta, order Plecoptera (stoneflies), family Nemouridae, and subfamily Nemourinae. The meltwater lednian stonefly is recognized as a valid species by the scientific community (e.g., Baumann 1975, p. 18; Baumann *et al.* 1977, pp. 7, 34; Newell *et al.* 2008, p. 181; Stark *et al.* 2009, entire), and no information is available that disputes this finding.

The western glacier stonefly was first described in 1971 from adult specimens collected from five locations in GNP, Montana (Baumann and Gaufin 1971, p. 277). The western glacier stonefly is in the same family as the meltwater lednian stonefly (i.e., family Nemouridae; Baumann 1975, pp. 1, 31), but a different genus (*Zapada*). The western

glacier stonefly is recognized as a valid species by the scientific community (Baumann 1975, p. 30; Stark 1996, entire; Stark *et al.* 2009, p. 8), and no information is available that disputes this finding.

Description, Habitat, and Life History

The meltwater lednian and western glacier stoneflies are small insects that begin life as eggs and hatch into juveniles (nymphs) in aquatic environments with flowing water. Mature stonefly nymphs emerge from the water and complete their development in the terrestrial environment as short-lived, winged adults on and around streamside vegetation or other structures (Hynes 1976, pp. 135–136; Stewart and Harper 1996, p. 217) before reproducing and dying.

The meltwater lednian stonefly and western glacier stonefly are found in high-elevation, fishless, alpine streams (Baumann and Stewart 1980, p. 658; MNHP 2010a) originating from meltwater sources, including glaciers and small icefields, perennial and seasonal snowpack, alpine springs, and glacial lake outlets (Hauer *et al.* 2007, p. 107; Giersch *et al.* 2017, p. 2584). Microhabitat needs for both species include the underside of rocks or larger pieces of bark or wood (Baumann and Stewart 1980, p. 658; Giersch *et al.* 2017, p. 2579).

Stonefly nymphs disperse longitudinally (up or down stream) or laterally to the stream bank from their benthic (nymphal) source (Hynes 1976, p. 138; Griffith *et al.* 1998, p. 195; Petersen *et al.* 2004, pp. 944–945). Adult stoneflies generally stay close to the channel of their source stream (Petersen *et al.* 2004, p. 946), and lateral movement into neighboring uplands is confined to less than 80 meters (262 feet) from the stream (Griffith *et al.* 1998, p. 197). Thus, the meltwater lednian and western glacier stoneflies likely have limited dispersal capabilities.

For more detail on the description, habitat, and life history of the meltwater lednian stonefly and the western glacier stonefly, see Background Section of the final listing rule (84 FR 64211).

Distribution, Abundance, and Trends

Meltwater lednian stoneflies are known to occur in 113 streams; 109 in Glacier National Park (GNP), two south of GNP on National Forest Land, one south of GNP on tribal land (Figure 1; Giersch *et al.* 2017; p. 2582) and one north of GNP in Waterton Lakes National Park in Canada (Donald and Anderson 1977, p. 114; Baumann and Kondratieff 2010, p. 315; Giersch 2017, pers. comm.). We estimate the abundance of meltwater lednian stonefly in the millions of individuals, however, no population trend information is available for the meltwater lednian stonefly.

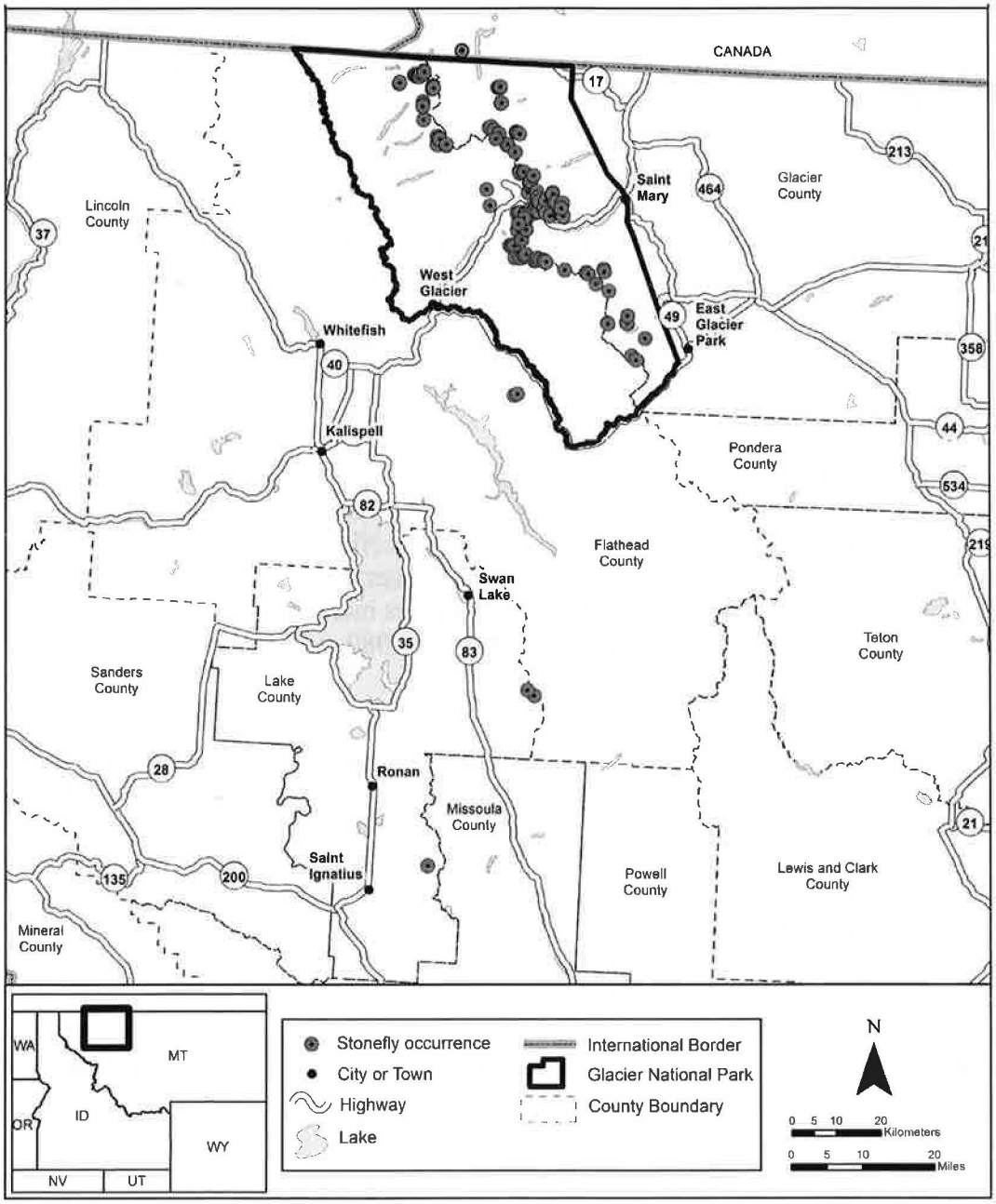

Figure 1. Documented occurrences of the meltwater lednian stonefly (*Lednia tumana*) from 1997 to 2016 in Glacier National Park, Waterton Lakes National Park (Canada), Great Bear Wilderness, Bob Marshall Wilderness, and the Mission Mountain Tribal Wilderness.

Western glacier stoneflies are known to occur in 16 streams; 6 in GNP, 4 in Grand Teton National Park (GTNP) and 6 in the Absaroka/Beartooth Wilderness (Figure 2; Giersch *et al.* 2017, p. 2584; Giersch 2017, pers. comm.). We estimate the abundance of the western glacier stonefly to be in the tens of thousands of individuals; presumably less numerous than the meltwater lednian stonefly. Western glacier stoneflies have decreased in distribution among and within 6 streams in GNP where the species was known to occur in the 1960s and 1970s (Giersch *et al.* 2015, p. 58).

For more detail on the distribution, abundance and trends of the meltwater lednian stonefly and the western glacier stonefly, see Background Section of the final listing rule (84 FR 64212).

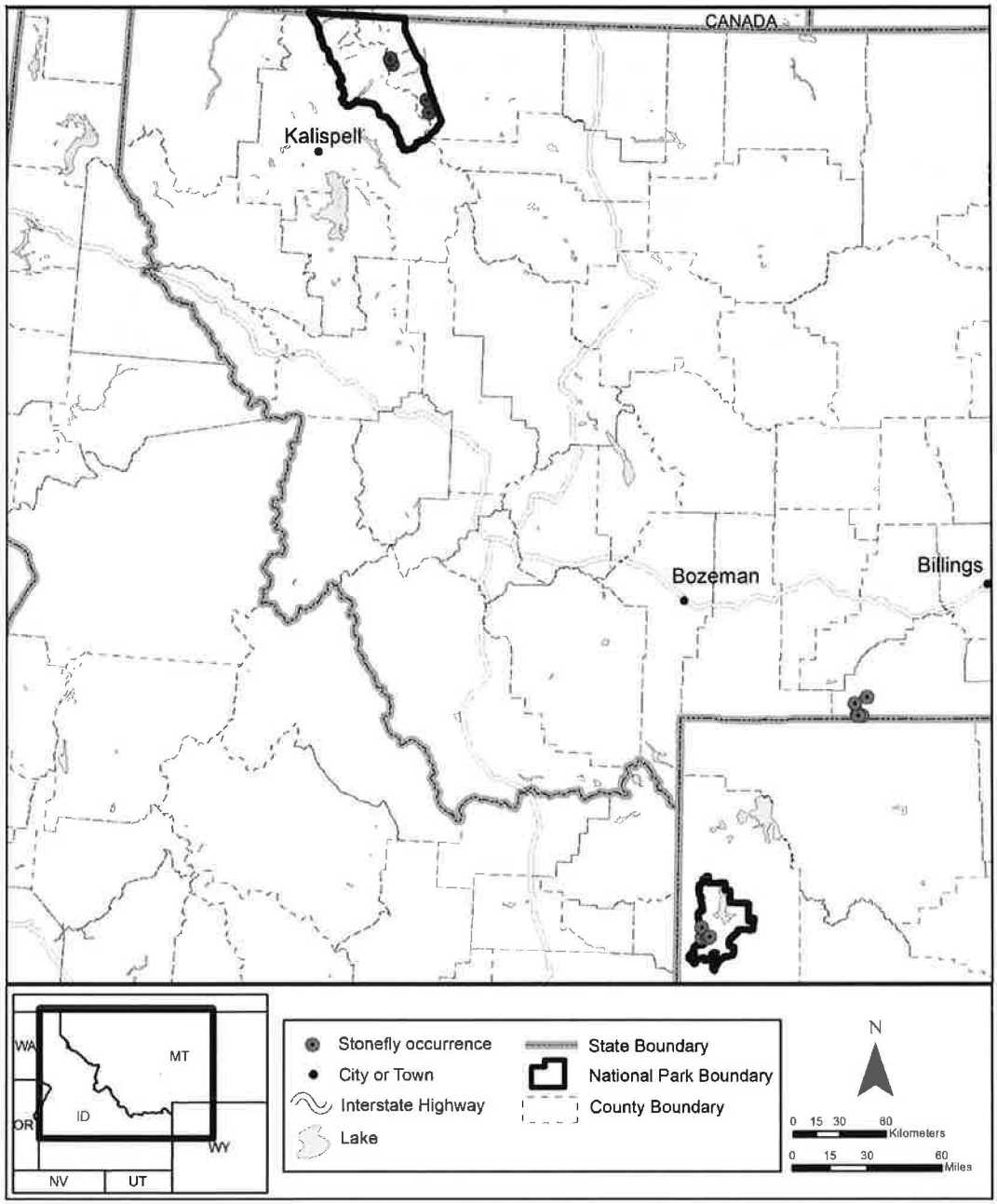

Figure 2. Documented occurrences of the western glacier stonefly (*Zapada glacier*) from 2010 to 2016 in Glacier National Park, Grand Teton National Park, and the Absaroka/Beartooth Wilderness.

Critical Habitat

Critical habitat was determined to be not prudent (84 FR 64211), in accordance with our regulations related to listing species and designating critical habitat at 50 CFR 424.12(a)(1), as finalized on August 27, 2019 (84 FR 45020).

A. VULNERABILITY AND THREATS ASSESSMENT

Habitat fragmentation and degradation in the form of declining streamflows and increasing water temperatures resulting from climate change are the primary factors currently affecting, and expected to continue to affect, habitat for the meltwater lednian stonefly and the western glacier stonefly.

Climate change

Habitats for both the meltwater lednian stonefly and the western glacier stonefly originate from meltwater sources that will be impacted by climate change, including glaciers, rock glaciers and small icefields, perennial and seasonal snowpack, alpine springs, and glacial lake outlets (Hauer *et al.* 2007, p. 107; Giersch *et al.* 2017, p. 2584). The alteration or loss of these meltwater sources and perennial habitat has direct consequences on both meltwater lednian stonefly and western glacier stonefly populations. Desiccation (drying) of these habitats, even periodically, could eliminate entire populations of the meltwater lednian stonefly and the western glacier stonefly because nymphs need perennial flowing water to breathe and to mature before reproducing (Stewart and Harper 1996, p. 217). Given that both stonefly species are believed to be poor dispersers (similar to other Plecopterans; Baumann and Gaufin 1971, p. 277), recolonization of previously occupied habitats is not expected following dewatering and extirpation events. Lack of recolonization by either stonefly species is expected to lead to further isolation between extant occupied streams.

Habitat with a high probability of occupancy for the meltwater lednian stonefly is modeled to decrease 81 percent by 2030 (Muhlfeld et al. 2011, p. 342). Western glacier stoneflies have decreased in distribution among and within 6 streams in GNP where the species was known to occur in the 1960s and 1970s (Giersch *et al.* 2015, p. 58).

For more detail on the expected effects of climate change on meltwater lednian stonefly and western glacier stonefly habitats, see the Climate Change section of the final listing rule (84 FR 64215).

Regulatory mechanisms

Several regulations including the Wilderness Act, National Park Service Organic Act, and National Environmental Policy Act provide some protection of habitat for most occurrences of meltwater lednian stonefly and western glacier stonefly from direct human disturbance. These are described further in section Factor D Inadequacy of Existing Regulatory Mechanisms of the final listing rule (84 FR 64219 or 81 FR 68379 in the proposed listing rule). However, we are not aware of existing regulatory mechanisms that are adequate in scope or scale to meaningfully reduce or eliminate the projected effects of climate change in the near future. While there are some national and international efforts currently underway to reduce greenhouse gas concentrations, we note that greenhouse gas loading in the atmosphere can have a considerable lag effect on climate, so that what has already been emitted will have impacts out to 2100 and beyond (IPCC 2014, pp. 56–57).

B. CONSERVATION ASSESSMENT

There are no active conservation programs that we are aware of for either meltwater lednian stonefly or western glacier stonefly. Habitats for both stonefly species occur in very remote, wilderness-type areas that are relatively free from direct human disturbance. The northern distributional limits of the meltwater lednian stonefly and the western glacier stonefly are not known. Potential habitat for meltwater lednian and western glacier stoneflies, similar to what both species are currently occupying, exists in the area of Banff and Jasper National Parks, Alberta, Canada. Aquatic invertebrate surveys have been conducted in this area, and no specimens of either species were found, although it is likely that sampling did not occur close enough to glaciers or icefields to detect either meltwater lednian or western glacier stonefly, if indeed they were present (Hirose 2016, pers. comm.). Sampling in this area for both meltwater lednian and western glacier stoneflies should be prioritized for the future and would help identify the northern distribution of both species or potential relocation sites that may be more climate-resilient than those currently occupied by both species.

C. SUMMARY STATEMENT OF RECOVERY NEEDS

Recovery needs for meltwater lednian stonefly and western glacier stonefly include: (1) surveys in the Banff and Jasper Parks, Canada area to assess presence/absence of meltwater lednian stonefly and western glacier stonefly; (2) identification of potential relocation sites for both species that are either further north than currently occupied habitat or in areas where microclimatic variables (e.g., slope, aspect, avalanche chutes) would be expected to increase the longevity of glaciers/snowfields; (3) outreach/education on the predicted effects of climate change on alpine habitats.

III. PRELIMINARY RECOVERY STRATEGY

A. RECOVERY PRIORITY NUMBER WITH RATIONALE

The meltwater lednian stonefly and western glacier stonefly are both assigned a recovery priority number of 11.

(1) The meltwater lednian stonefly and western glacier stonefly are distinct species;
(2) Both species face a moderate magnitude of threat;
(3) Both species have a low potential for recovery; and
(4) Neither species is in conflict with development activities or other forms of economic activities.

The moderate degree of threat to both the meltwater lednian stonefly and the western glacier stonefly is linked to the threat of habitat destruction due to climate change. While neither stonefly species is at risk of extinction in the immediate future, there is a continual threat to their habitat that, if not mitigated, is expected to put both species in danger of extinction in the future. Recovery potential is low for both stonefly species because the threat of habitat degradation from climate change is difficult to alleviate and greenhouse gases already emitted into the atmosphere are expected to have negative

effects on climate well into the future, even if emissions were reduced or eliminated today.

B. RECOVERY VISION

We envision recovery for the meltwater lednian stonefly to include sizable, stable populations maintained in GNP, with some level of connectivity between the majority of occupied streams for gene flow.

We envision recovery for the western glacier stonefly to include sizable, stable populations maintained in all three geographic areas where the species is currently present (GNP, GTNP and Absaroka/Beartooth Wilderness), with some level of connectivity between the majority of occupied streams for gene flow.

C. INITIAL ACTION PLAN

Surveys

- Complete an initial survey for meltwater lednian stonefly and western glacier stonefly in the Banff/Jasper Parks, Canada area by targeting habitat that has the highest potential to support one or both species.

- If either stonefly species is not found during surveys conducted in Jasper/Banff Parks, Canada, assess potential for surveyed sites to become relocation sites for either or both stonefly species.

- If either stonefly species is not found during surveys conducted in Jasper/Banff Parks, Canada, assess potential for previously surveyed sites in the GNP, GTNP and Absaroka/Beartooth Wilderness to become relocation sites for either or both species.

Outreach

- Collaborate with USGS, NCTC or others to assess or develop outreach/education on the predicted effects of climate change on alpine habitats.

IV. PREPLANNING DECISIONS

A. PLANNING APPROACH

A recovery plan will be prepared for the meltwater lednian stonefly and western glacier stonefly pursuant to Section 4(f) of the Act. The recovery plan will include objective, measurable criteria which, when met, will result in a determination that the species be removed from the Federal List of Endangered and Threatened Plants. Recovery criteria will address all threats meaningfully impacting the species. The recovery plan also will estimate the time required and the cost to carry out those measures needed to achieve the goal for recovery and delisting. A combined recovery plan will be developed for both stonefly species.

Plan preparation will be under the stewardship of the Montana Ecological Services Office. At the present time, this species does not warrant the appointment of a recovery team. The Service will coordinate recovery efforts with an informal network of technical experts and involved parties (see Stakeholder Involvement below). A recovery team may be formally appointed if deemed necessary at a later date. Periodically, meetings among these parties may be convened for the purpose of sharing information and ideas about advancing recovery of meltwater lednian stonefly and western glacier stonefly.

B. INFORMATION MANAGEMENT

General

All information relevant to recovery of the meltwater lednian stonefly and western glacier stonefly will be housed in administrative files in our Montana Ecological Services Office in Helena, Montana. Biologists at this office will be responsible for maintaining the official record for the recovery planning and implementation process. Copies of new study findings, survey results, comments received, and other relevant information should be forwarded to this office (see Listing and Contact Information section above).

Reporting Requirements

Information needed for annual accomplishment reports, the Recovery Report to Congress, expenditures reports, and implementation tracking should be forwarded to this office (see Listing and Contact Information section above). Copies of the completed reports can then be disseminated to all contributors upon request.

C. RECOVERY PLAN PRODUCTION SCHEDULE

The following dates are dependent on personnel and funding being available to complete the recovery planning process:

Internal review draft:	Nov. 2020
Public review draft:	June 2021
Public comment period ends:	July 2021
Final recovery plan:	June 2022

D. STAKEHOLDER INVOLVEMENT IN THE RECOVERY PROCESS

Stakeholders

Meltwater lednian stonefly

- Public land managers with meltwater lednian stonefly on their lands, including representatives of National Park Service (Glacier National Park) and U.S. Forest Service (Flathead National Forest)

- Research agencies (U.S. Geological Survey)

- State agencies including the Montana, Fish, Wildlife and Parks and the Montana Natural Heritage Program

- Confederated Kootenai and Salish Tribe

- Parks Canada

Western glacier stonefly

- Public land managers with western glacier stonefly on their lands, including representatives of National Park Service (Glacier National Park, Grand Teton National Park) and U.S. Forest Service (Flathead and Custer/Gallatin National Forests)

- Research agencies (U.S. Geological Survey)

- State agencies including the Montana, Fish, Wildlife and Parks and the Montana Natural Heritage Program, Wyoming Game and Fish and Wyoming Natural Diversity Database

- Parks Canada

Stakeholder Involvement Strategy

- Inform stakeholders of the listing for meltwater lednian stonefly and western glacier stonefly, and the recovery planning process.

- Convene meetings of individuals interested in meltwater lednian stonefly and western glacier stonefly to exchange status information and identify recovery issues. The information from these discussions will help shape the initial draft recovery plan. We are reaching out to the above stakeholders to facilitate involvement of all interested parties. When needed, additional meetings and/or conference calls will be held to discuss particular issues.

- Targeted stakeholders and species experts will be invited to participate in these calls when relevant for the purposes of recovery planning. We will take advantage of all opportunities to interact with stakeholders in a productive and meaningful way. Stakeholders also may be asked to contribute directly in developing implementation strategies for planned recovery actions.

Meltwater lednian stonefly *(Lednia tumana)* and Western glacier stonefly (*Zapada glacier*) Recovery Outline

Approve: Karen E. Walsh **Date:** 12/18/2019

Regional Director

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