



Air Resources Division

Standard Operating Procedure #1, Pre-Season Preparation: Protocol Implementation Plan for Dragonfly Larvae Sampling and Mercury Analysis

Standard Operating Procedure, Version 1.0

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Revision History Log

The following table lists all edits and amendments to this document since the original publication date. Information entered in the log must be complete and concise. Users of this standard operating procedure will promptly notify the National Park Service and/or the U.S. Geological Survey Project Manager(s) of the Dragonfly Mercury Project about recommended and required changes. The Project Manager must review and incorporate all changes, complete the revision history log, and change the date and version number on the title page and in the header of the document file. For complete instructions, please refer to SOP #9, “Procedure for Revising the Protocol”.

Revision History Log: Documents the previous version, revision date, author, description of revision, reason for change, and new version number for all versions of this standard operating procedure. Add rows as needed for each change or set of changes tied to an updated version number.

Previous Version #	Revision Date	Author (with title and affiliation)	Location in Document and Concise Description of Revision	Reason for Change	New Version #
n/a	03/2022	Original authors	Initial version	n/a	1.0

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We relied upon and adapted from similar SOP developed by the Great Lakes Inventory & Monitoring Network (VanderMeulen et al. 2018). We wish to acknowledge the work of the authors, as well as their willingness to share that work. We thank Kirsten Gallo (formerly) of the National Park Service Inventory & Monitoring Division, for an internal review, and the following external peer reviewers: Krista Bartz, Southwest Alaska I&M Network and Andrea Blakesley, Denali National Park and Preserve.

1.0 Introduction

Prior to the field season, many preparations must be completed to ensure sampling can be undertaken according to schedule. The field season for collecting larval dragonflies from Dragonfly Mercury Project (DMP) parks is generally from May through October, though the sampling season for desert parks runs earlier (March through May) while the sampling season for tropical parks runs later (November through January). All details for the season need to be planned well in advance.

1.1 Preparations for DMP Field Personnel

Field preparations should begin 4 months in advance to allow enough time for coordinating logistics and ordering new supplies and equipment, if necessary. Table 1 provides a checklist and general guidance for activities conducted prior to sampling. Many of these activities are discussed in more detail in other standard operating procedures (SOPs).

Table 1. Checklist of activities to be completed before collecting larval dragonfly samples.

Activity	Description
Prepare calendar of planned field trips	Includes sampling dates, locations, personnel
Arrange field crew of community volunteers and citizen scientists	Work across divisions to identify and establish, if necessary
Review sampling methods to determine if revision is needed	Check web reference to see if method has been updated from version currently used
Review checklists of equipment and supplies required; prepare list of items to be ordered	Check each Standard Operating Procedure for detailed equipment and supply lists
Order supplies	Nets, waders, PFDs, etc.
Coordinate with the DMP for provision of the sampling kit	Cooler, sampling bags, spoons, field data sheet, etc.
Clean and test equipment; charge or replace batteries as needed	Includes camera, GPS unit, cell phone or radio
Site selection	Coordinate with DMP Project Managers/Assistant Project Manager on variable and random site locations; (fixed sites are established).
Obtain permission for site access, if necessary	
Confirm/apply/renew current park research and collection permits	See RPRS and reference text in SOP #3
Check field vehicle and boat for safety equipment and supplies	Includes material safety data sheets, flares, flashlight, gloves, extra sampling bottles, etc.
Schedule and conduct training	Boat training, field sampling techniques, etc.
Update field folder	Include maps, site information, field forms, sampling procedures
Prepare headers on field data forms, sample tags, chain of custody forms, analytical service request forms	Header information should be cross-checked with metadata to permit entry into ScienceBase.

Activity	Description
Review sample collection, processing, and documentation information	Includes sample collection, processing, and shipping procedures (SOP #3)
Make travel reservations and arrangements as needed	
Provide supervisor with schedule	

1.1.1 Read the Entire Protocol

Periodically read through the entire protocol, including all SOPs and if necessary, the Quality Assurance Project Plan (QAPP) provided by the U.S. Geological Survey (USGS) Contaminant Ecology Research Lab (CERL; Eagles-Smith et al. 2018). Be sure to understand the purpose for which the various types of data will be collected and review the SOPs for the types of measurements and samples needed. Be alert for portions of the protocol or SOPs that may need revision and bring these sections to the attention of the appropriate supervisor.

1.1.2 Prepare Calendar of Planned Field Sampling

Well in advance of the field season; prepare a calendar of sampling dates for the entire season. Consider when sampling larval dragonflies will be concurrent with other aquatic monitoring activities and the availability of citizen science groups who are able to participate. At some sites, particularly ephemeral ponds or streams, the timing of emergence and presence of water are important considerations. Allow for the possibility of bad weather days when sampling may have to be postponed. Include the location of sampling, dates, parameters to be measured, personnel, and any additional relevant notes (Table 2).

Contact appropriate park staff and citizen scientists well in advance to confirm dates of sampling visits, and to establish any plans regarding possible assistance from park personnel with the collection of samples. If appropriate, also contact DMP, I&M network, and/or regional staff who may be participating in the sampling event. If required, request and confirm assistance by park staff with transportation by boat within the parks. If necessary, check on availability and reserve park housing during planned sampling dates.

Table 2. Example of calendar of planned field sampling.

Location	Sampling Dates	Personnel	Notes
Indiana Dunes	1–5 May	Park biotechs and volunteers	Collect larval dragonflies
Isle Royale	6–15 July	Northland College	Collect larval dragonflies
Pictured Rocks	6–10 June	Park biotechs and volunteers	Collect larval dragonflies
Voyageurs	10–25 June	Park biotechs	Collect larval dragonflies

1.1.3 Arrange Field Crew of Community Volunteers/Citizen Scientists

The DMP aims to engage citizen scientists and community volunteers during the collection of dragonfly larvae at as many parks as possible, and has very effectively demonstrated community, citizen scientist, and youth engagement in the environmental sciences at national parks. Reach out to local groups or volunteers to enlist and coordinate participation. That may require working across park divisions, such as Interpretation, to connect with previously established community and school groups or initiatives such as Teacher-Ranger-Teacher or Every Kid in a Park that may have otherwise already engaged in park citizen science efforts. Examples of citizen science and community groups that have participated in the DMP include middle and high school classrooms, university-level students, Youth Conservation Corps, Boy/Girl Scouts, urban youth, Tribal interests, and more. Contact the group on behalf of the park to gauge interest, schedule a sampling event, and communicate pre-sampling logistics. Collect completed volunteer forms and photo release forms as required by the park.

For parks that sample dragonflies at more than one water body, consider sampling with the citizen science groups at the more easily accessed sites. Field reconnaissance (Section 1.1.11) will be especially integral to undergo at those sites where public participants engage in the collection process. In some cases, circumstances (lack of volunteers, very remote sites, park preference, etc.) may dictate that park partners, collaborators, and park staff are utilized for sampling instead of citizen scientists or volunteers.

1.1.4 Coordinate with DMP for Provision of Sampling Kit

After confirming participation with the DMP team, an email will be sent from dmp@nps.gov to coordinate pre-sampling logistics. Reply with the requested information (e.g., sampling timeline, number of sites, mailing address to ship supplies) in a timely manner. Upon receiving this information, a sampling kit will be shipped to the address on record before the first planned sampling event. Most necessary supplies are included in the sampling kit; others must be secured separately by the park staff (SOP #3, “Fieldwork - Larval Dragonflies”).

1.1.5 Review Checklists of Equipment and Supplies

Checklists help ensure that equipment and supplies will be ordered on time, data collection activities will be completed appropriately, and data quality objectives will be met. Review the detailed equipment lists that are included with each standard operating procedure (Table 3). Prepare a list of equipment and supplies that must be ordered and present it to your park and/or DMP field liaison.

Verify park-specific requirements for the disinfection of field gear and the availability of disinfection equipment (e.g., Hotsy machines or turkey fryers). Check on the availability of other potential needs such as laboratory space, freezers, or refrigerators.

Table 3. Checklists of equipment and supplies for monitoring mercury in larval dragonflies.

Checklist	Location
Safety equipment checklist	SOP #2
Field supplies and equipment checklist	SOP #3

1.1.6 Confirm/Apply/Renew Permits

For sampling stations located within park boundaries, a Research and Collecting Permit must be obtained before any work can be done. To renew or apply for the permit, go to the following website: <https://irma.nps.gov/RPRS/>

Follow the directions for renewing an existing permit or, if your project is not already in the system, follow the directions to apply for a new permit. Work with the research coordinator at each park.

Reference text in SOP #3, “Fieldwork - Larval Dragonflies” Attachment D: “Research Permit Application – example RPRS text”.

1.1.7 Review Sample Collection, Processing, and Documentation

Conduct a thorough review of SOP #3, “Fieldwork - Larval Dragonflies” and contact the Dragonfly Mercury Project (dmp@nps.gov) to verify procedures and analytical methods. Obtain copies of the field datasheet and any other required paperwork.

1.1.8 Clean and Test Equipment

Clean and test all sampling and safety equipment, including camera, GPS units, park radios, nets, and waders. Start each new field season with fresh batteries and replace spares in the field tool kit.

1.1.9 Vehicle, Boat, and Safety Gear

Check the maintenance schedule of field vehicles and arrange maintenance, if needed. Check boats and vehicles for safety equipment such as SDSs, flares, spare tires, triangles, cones, and first aid kits. Prepare a list of supplies needed and present the list to a supervisor. If using a trailer, ensure that the taillights are in working order. Check that the field toolkit is complete and replace tools, as needed. Review SOP #2, Training and Safety, for more information on required safety equipment for vehicles and boats.

1.1.10 Training and Safety

Keep current with training and the laboratory requirements associated with your data collection activities. New technicians will need basic skills training, including classroom instruction, hands-on training, and pilot-testing of equipment. Continuing field staff should attend refresher training and review network and park safety plans annually. If boat training is needed, be sure to schedule the training with the park early in the season. Initial and periodic refresher courses in basic first aid and CPR are required.

1.1.11 Field Reconnaissance

Make field reconnaissance trips, if possible, and especially if the sites will be sampled with groups of community volunteers and citizen scientists. If the sampling locations are new, visit the sites to be sure that they are accessible and that viable populations of larval dragonflies are present. If the sampling locations are established, visit to be sure that conditions have not changed from the previous year. Note conditions that could affect sampling operations, such as the seasonal high or low water levels, or site access peculiarities. In parks where sampling sites are accessible via roads, ensure all roads are passable and landing areas are accessible. In cases where sites are not accessible via roads, communicate with park backcountry staff to learn of potential trail closings or other

hindrances to sampling. When boats or canoes will be kept at certain lakes for the season, work with park staff to get the boats/canoes on site, hidden (if necessary), and secure.

1.1.12 Travel Arrangements

Make travel arrangements. Because hotel and campground reservations may be difficult to impossible to obtain at certain times of year, it is important to review the sampling schedule and plan ahead. Submit park housing requests well in advance of the sampling season.

1.1.13 Communicate with Supervisor

Ensure the project manager is informed of supply needs, problems with instruments, changes in sampling schedules, changes in sampling site conditions, and other needs that may have an impact on the project budget, data collection, schedule, or sampling design.

1.2 Preparations for DMP Project Managers and Assistant Project Managers

USGS and NPS staff collaborate on DMP management duties. Before parks can receive sampling kits and collect dragonfly larvae at the NPS units in consideration, the NPS and USGS Project Managers and Assistant Project Manager(s) must take steps to facilitate pre-season preparations and confirm park participation.

1.2.1 National Park Service

Table 4 summarizes the pre-season activities to be undertaken by the NPS DMP Project Manager and Assistant Project Manager.

Table 4. Checklist of pre-season preparations to be completed by NPS Project Manager and Assistant Project Manager. The timeline of activities may overlap.

Activity	Description
Participate in and arrange quarterly core team and science team calls	Work with USGS and core team members to plan for the sampling season; work with core team to identify priority parks and sites from which to gather data
Recruit priority/new parks, and coordinate logistics	Invite parks to participate via email and provide preliminary project information
Send survey of interest to previous parks, and coordinate logistics	Email online survey form (Attachment A) to DMP mailing list with a deadline for parks to complete; follow up as necessary to confirm and arrange funding
Schedule, host, and contribute to Annual DMP Webinar and DMP 101 Webinars	Present findings/updates at annual webinar; target new park participants for tutorial of sampling and logistics
Establish Interagency Agreement (IAA) with USGS	Define terms of IAA with USGS and NPS contracting
Collect cross-charge authorization forms	Email NPS contact; reference authorization form that conveys which sites are funded by what account(s)
Compile Purchase Request (PR) spreadsheet	Compile accounts provided in cross-charge authorization form into a master spreadsheet that can be referenced by PR and IAA

Activity	Description
Provide direct consultation with parks in preparation for the sampling season	Work with USGS to answer any preliminary questions park contacts might have about where to sample, what supplies to get, etc. Schedule calls if necessary.
Plan field visits where applicable	Coordinate with select parks to conduct field visits, assist with sampling efforts, and assess ongoing project functions

1.2.2 U.S. Geological Survey

Table 5 summarizes the pre-season activities to be undertaken by the USGS DMP Project Manager and Assistant Project Manager.

Table 5. Checklist of pre-season preparations to be completed by USGS Project Manager and Assistant Project Managers.

Activity	Description
Assemble/ship sampling supplies/kits	SOP #3
Coordinate sampling logistics	Track park participation, obtain contact information, engage in communication, and arrange details pertaining to the selection of sites, shipment of sampling supplies, and the earliest sampling date
Provide direct consultation with parks in preparation for the sampling season	Work with NPS to answer any preliminary questions park contacts might have about where to sample, what supplies to get, etc. Schedule calls if necessary.
Contribute to Annual DMP Webinar and DMP 101 Webinars	Present findings, updates, and offer tutorial for sampling and shipping procedures
Attend/schedule core/science team calls	Work with NPS and DMP core team to plan sampling season and identify priority parks and sites from which to gather data
Establish Interagency Agreement (IAA) with NPS	Define terms of IAA with NPS and USGS contracting
Plan field visits where applicable	Coordinate with select parks to conduct field visits, assist with sampling efforts, and assess ongoing project functions

1.3 Literature Cited

Eagles-Smith, C.A., J.J. Willacker, J. Pierce, and C. Rumrill. 2018. Quality Assurance Project Plan (QAPP) for general operations of the U.S. Geological Survey (USGS) Forest & Rangeland Ecosystem Science Center (FRESC) Contaminant Ecology Research Laboratory (CERL).

VanderMeulen, D.D. and B. Route. 2018. Standard operating procedure #1: Pre-season preparation, version 1.0. In VanderMeulen, D. D., B. Route, J. Wiener, R. Haro, K. Rolfhus, M. Sandheinrich, S. J. Nelson, A. Klemmer, C. Eagles-Smith, and J. Willacker. 2018. Protocol for monitoring mercury in dragonfly larvae and fish (version 1.0): Great Lakes Inventory and Monitoring Network. Natural Resource Report NPS/GLKN/NRR—2018/1726. National Park Service, Fort Collins, Colorado.

Attachment A – DMP Survey of Interest

Below is the list of questions included in the annual DMP Survey of Interest that the NPS Project Manager/Assistant Project Manager sends out to the distribution list of previous park participants as mentioned in Table 4. The survey exists as a Microsoft Form and can be viewed at this link:

<https://forms.office.com/g/h6tYftDmGJ>. Phrases in **bold** may need to be updated annually.

- 1) Name and title
- 2) Email address
- 3) What park(s) are you representing?
- 4) Would you/your park like to participate in the **2022** sampling of dragonfly larvae for mercury analysis?
- 5) Are there known populations of dragonfly larvae or suitable habitat for dragonfly larvae at your park?
- 6) How many sites are you interested in sampling?
- 7) Do you anticipate engaging public participants in data collection?
- 8) If yes, do you have a specific community or citizen scientist group in mind for this project?
- 9) Central DMP funding can only support a limited number of parks. Typically those parks are new parks, but additional funds, if available, may also provide support for parks that meet a range of other considerations, such as: being at particularly elevated risks to Hg, or representing a poorly covered geographical area or unique habitat type that are not well represented in the existing database.

If you are a returning park, can your unit, region, network, learning center, or friends group help support the costs to participate? The cost is **\$1,800** per site, per park for supplies, shipment, lab analysis, data management, reporting, and scientific oversight. Authorization forms must be submitted with account information by **May 26, 2022**.
- 10) **Would you like to be involved in DMP's outreach and education initiatives, namely the development of teacher tools and the science communication workshop, or have you developed outreach pieces of your own that could serve as useful models?**
- 11) Comments welcome.