



## Saskatchewan Adult Invasive Mussel Monitoring (AIMM) Guide

### Background

Coordinated by the Government of Saskatchewan's Fish, Wildlife and Lands Branch, the Adult Invasive Mussel Monitoring (AIMM) Program is a partnership project with other non-government organizations (NGOs) and agencies to monitor waterbodies throughout Saskatchewan for aquatic invasive species (AIS) and adult invasive mussels.

Monitoring adult invasive mussels (e.g. zebra and quagga mussels) and other AIS is an important element of early detection in Saskatchewan. This protocol was developed by combining materials from Wisconsin, California, Alberta and British Columbia, with the goal of having a pragmatic, cost-effective monitoring program that provides a valuable tool for widespread early detection of AIS in waterbodies throughout Saskatchewan.

The objective is to establish partnerships with community organizations, including local stewardship, administrative, community and business groups, to provide valuable local involvement, information and data in a coordinated and collaborative manner. By following this protocol and using Survey123 for ARCGIS application this new reporting form provides an easy-to-use tool that the general public, NGOs and other agencies can use to record their AIMM efforts from the Saskatchewan waterbodies sampled. Anyone who finds evidence of invasive mussels or other AIS are asked to **immediately call the 24-hour SASKTIP line at 1-800-667-7561.**

Zebra and quagga mussels are a type of AIS that are threatening the livelihood of Saskatchewan waters. These mussels have been transported by freight boats and other watercraft from the ocean into freshwater. Zebra and quagga mussels have adapted to the North American environment and started to migrate and thrive, reproducing at a rapid rate. One adult mussel can produce up to one million veligers (baby mussels) which are hard to detect, as they are small and invisible to the naked eye. Veligers are small enough to infiltrate water treatment systems, fire protection systems, dams and water movement pipes causing serious problems as they grow into adult mussels. They can grow on top of each other which can lead to blocked pipes. In North America, 34 states and three provinces have been contaminated with these types of mussels, including Montana, North Dakota and Manitoba that border Saskatchewan.

### Introduction to the AIMM Form

The Saskatchewan Adult Invasive Mussel Monitoring (AIMM) Form is for recording the monitoring of aquatic invasive species. The AIMM form can be used by government, non-government organizations and the general public. The objective is to document the absence/presence of invasive mussels and other aquatic invasive species by substrate sampling, shoreline inspections, and checks when removing docks, buoys and anchors. REMEMBER – it is important to note ANY finding, which would help the Response Team should an invasive mussel be found in a waterbody in Saskatchewan.

In 2018 a program called Survey123 for ArcGIS by Esri will be used to report your AIMM 2018 findings.

### Step 1: Download Survey123

In order to participate, the **Survey123 for ARCGIS field application (app)** for mobile devices (e.g. smartphone, tablet) **must first be downloaded** from [Google Play](#) or the [Apple Store](#) prior to using them in the field. The Survey123 field app is FREE. Downloading the app ahead of time will allow access to the form even when you do not have an internet connection.

Once you download the field app, it will ask you to sign in when you first open it, but don't! You do not need an ArcGIS Online account to use the AIMM form - follow the next steps to access the form. If you have an ArcGIS Online account that is not part of the Government of Saskatchewan Organization, you will need to make sure you are logged out of Survey123.

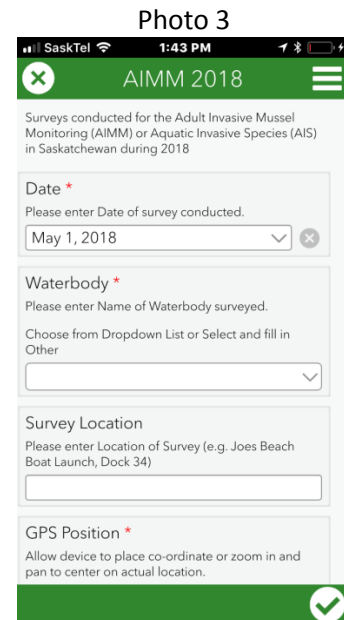
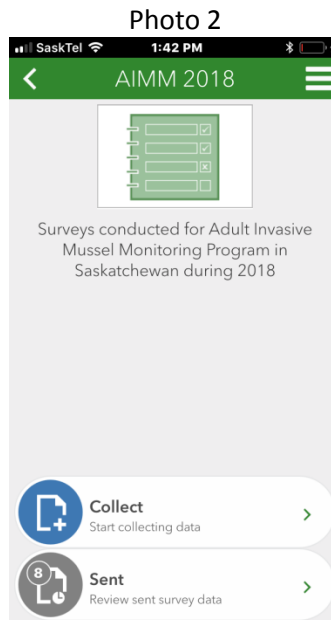
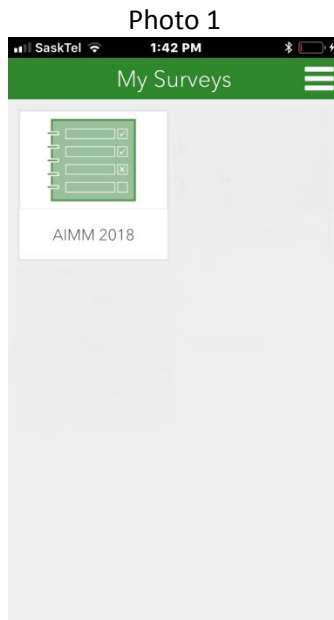
### Step 2: Accessing the 2018 AIMM Form

The 2018 AIMM form can be accessed by opening the following hyperlink on the device you intend to use:

<https://survey123.arcgis.com/share/24f0b3f208dc41358a77c6ed75c40c97?open=menu>

The Survey 123 application will ask if you want to open the AIMM survey using the Survey 123 field app or the browser. **Choose to open the AIMM 2018 survey in the Survey123 field app** and then select yes.

The AIMM 2018 survey form has now been downloaded to your device. Now when you open the Survey123 field app, the AIMM 2018 form will appear under My Surveys (Photo 1). Click/tap on the AIMM 2018 icon, then click/tap on Collect (Photo 2) and the form should appear (Photo 3).



The form can also be used on a computer's web browser (e.g., Chrome, Safari, Edge) if you select **Open in browser** when you open the hyperlink. **However**, you will have to manually relocate your GPS position to reflect the actual surveyed location. The browser is not recommended to be used in the field because it relies on an internet connection to submit the form. With the field app, you can save all of your entries and submit them at the end of the day when you have WiFi. If you are using a laptop in the field, the Survey123 field app can be downloaded on your computer.

### Step 3: Filling out a Survey123 Form for your AIMM findings

This form is designed to document both the presence and absence of aquatic invasive species by the use of substrate samplers, shoreline inspections and checking human-built structures and equipment removed from the lakes (i.e. docks, mooring lines, buoys).

#### AIMM 2018 Survey Form

1. **Date** (required) should automatically fill-in but you can select a different date. Must be between January 1 and December 31, 2018 (YYYY-MM-DD).
2. **Waterbody** (required) using a dropdown list of previously inspected lakes in 2017, select the waterbody you are monitoring. If a specific waterbody is not part of the list provided, select "Other" and type in the name of the waterbody in the textbox that appears.
3. **Survey Location** (optional) a text box to enter survey location name.
4. **GPS Position** (required) If you have the GPS enabled on your device you can allow it to place your location. You must tap the grey target icon to collect your location and/or increase the accuracy. Check the resulting location for accuracy and press it again if needed: aim for between 5-10 m but less than 100 m is acceptable in remote areas. Note that if you do not have cell service, the basemap will not load, but it will still be able to use your device's GPS to obtain the coordinates and accuracy.

If you have cell service and the basemap is visible, the point can be moved manually by tapping the map and then panning (tap and drag) and zooming (use two fingers and pinch to zoom in; or move the fingers apart from each other to zoom out) to center the map pointer as close as you can to the location. Once the point is in the desired place, tap the green checkmark in the bottom right corner.

AIMM 2018

Surveys conducted for the Adult Invasive Mussel Monitoring (AIMM) or Aquatic Invasive Species (AIS) in Saskatchewan during 2018

**Date\***  
Please enter Date of survey conducted.

2018-05-01

Please input a date between 2018-01-01 and 2018-12-31

**Waterbody\***  
Please enter Name of Waterbody surveyed.  
Choose from Dropdown List or Select and fill in Other

-Please Select-

**Survey Location**  
Please enter Location of Survey (e.g. Joes Beach Boat Launch, Dock 34)

**GPS Position\***  
Allow device to place co-ordinate or zoom in and pan to center on actual location.  
Please check that position is accurate.

Lat: 54.16243 Lon: -106.875

5. **Type of Survey** (optional) select one of 5 choices

Human-Built Structures/Equipment This survey checks for the presence or absence of invasive mussels, on features such as docks, buoys and other structures/equipment some of which can be removed from the lake.

Natural Shoreline Survey This survey documents shoreline surveys in which rocks, logs or other plant material along the shoreline are checked for the presence or absence of invasive mussels.

Substrate Sampler Specific sampler equipment is installed and checked to monitor for the presence or absence of invasive mussels. Two main types of substrate samplers are recommended and further details provided later in this document.

Combination of above Choose this option if your survey includes a combination of the above listed survey methods.

Other Choose this option if your survey was not one of the above mentioned methods.

6. **Surveyed Items** (optional) Select item surveyed or choose multiple items or Other if another item was surveyed.

7. **Additional Survey Details** (optional) text box for providing additional details.

8. **Results** (required) No or Yes answer. If Yes is chosen an Additional Information text box shows up for addition details or evidence to support confirmation plus advice to call the Saskatchewan **TIP LINE 1-800-667-7561 immediately**

**Type of Survey conducted.**  
What type of AIMM/AIS survey did you conduct?  
Please select one.

Human Built Structures and Equipment

Natural Shoreline Survey

Substrate Sampler (specific equipment installed to monitor for AIMM purposes)

Combination of above

Other

**Surveyed Items**  
Please choose items surveyed.

Boat Launch

Dock/Pier

Sampler

Shoreline/Beach

Buoys

Water Intake/Pumphouse

Watercraft (i.e., boats, canoes etc)

Other

**Additional Survey Details**  
Please provide a description or additional details of your survey for adult invasive mussels and/or other AIS (e.g., length of shoreline, subdivision, abiotic conditions, number of docks).

**Results\***  
Following your survey did you find any evidence of adult invasive mussels or other aquatic invasive species?

No

Yes

9. **Associated Group** (optional) select one from the dropdown list. General Public/Property Owner; Non-Government Organization (Volunteer, Member or Employee); Saskatchewan Government Employee (including ministries, agencies and corporations); Saskatchewan Municipal Employee; SAW (leads to choosing 1 of 11 watersheds); SKParks (leads to choosing a park or use Other); MoE-Fisheries; Other
10. **Contact Information** (preferable) is a text box to provide your name and contact information.
11. **Submit** (required) once you have completed the survey form press green check mark (smartphones and tablets) or the submit button (computers and laptops).

**Associated Group or Organization**  
Please select who you are recording this survey on behalf of:  
Choose from dropdown list or Select Other

-Please Select-

**Contact Information**  
Please provide us with your contact information.  
Full Name, Phone Number or Email Address

Submit

Powered by Survey123 for ArcGIS

#### Step 4: Submitting AIMM 2018 Form

In order to submit your AIMM 2018 form you will require an internet or cellular data connection. You can collect your survey form information on your mobile device while out in the field (or while outside of coverage areas) and choose the submit later option, then upload the information when you are back in service.

**AIMM 2018**

Surveys conducted for the Adult Invasive Mussel Monitoring (AIMM) or Aquatic Invasive Species (AIS) in Saskatchewan during 2018

Date \*  
Please enter Date of survey conducted.  
May 1, 2018

Waterbody \*  
Please enter Name of Waterbody surveyed.  
Choose from Dropdown List or Select and fill in Other

Survey Location  
Please enter Location of Survey (e.g. Joes Beach Boat Launch, Dock 34)

GPS Position \*  
Allow device to place co-ordinate or zoom in and pan to center on actual location.

Once you have completed the survey, use the green checkmark (lower right hand corner) to indicate you have completed the survey. Please note any red \* questions are required.

**AIMM 2018**

Associated Group or Organization  
Please select who you are recording this survey on

**Survey Completed**  
Your device is online  
Would you like to send the survey now?

Send Later

Send Now

Continue this survey

The device will ask if you wish to submit your form now or later. You must have internet connectivity to submit - Choose Send Later until you are able to connect.

**AIMM 2018**

Surveys conducted for Adult Invasive Mussel Monitoring Program in Saskatchewan during 2018

Collect  
Start collecting data

Outbox  
Send your completed survey data

Your completed form is now in the outbox.

**AIMM 2018 Outbox**

field\_0:2018-05-01,  
field\_1:choice46, field\_2:Fdrtg,  
field\_4:choice1, field\_11:N...  
Modified 2018-05-01 2:14 PM

List Map Send

Once you have connectivity, choose the completed survey from your outbox and send it.

Once submitted a Thank You note states:  
Great! Your data was sent successfully. Thanks.

Remember to CLEAN DRAIN DRY your equipment to help prevent the spread of invasive species.

Thank you for your participation.

**Remember – if you identify or find evidence of invasive mussels, immediately call the 24-hour TIP line at 1-800-667-7561.**

## APPENDIX

- **Monitoring for Adult Invasive Mussels**
- **Using Substrate Samplers – go to 1.0**
- **Doing Shoreline Surveys of Checking of Structures in Water – go to 2.0**

### 1.0 Substrate Samplers

There are two main types of substrate samplers:

- Stacked-plate design (Figure 1)
- Portland sampler (Figures 2).

The Portland sampler (Figure 2) is a low-cost, minimum effort sampler that works best for detecting the presence or absence of invasive mussels. The stacked-plate design (Figure 1) is often used in

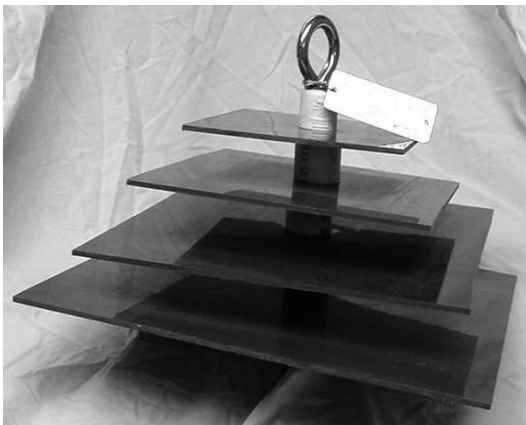


Figure 1. Stacked substrate sampler for zebra mussel monitoring.

circumstances where understanding the change in an invasive mussel population is of interest, rather than just presence/absence.



Figure 2. Image of a “Portland Sampler” substrate (Portland State University Center for Lakes & Reservoirs).

### 1.1 How to Build a Portland Sampler

#### **Materials**

- Coated clothesline wire or other heavy line
- 5 cm (2”) PVC pipe cut into 15 cm (6”) lengths
- Sandpaper
- Cement or an attachable weight
- Prepare the cement as directed on the package and then fill half the PVC pipe with cement to help weigh down the sampler. Another option is to find an object that can be attached to the sampler to weigh it down, and eliminate the need for cement.

## How to Construct

- Cut the 5 cm PVC pipe in 15 cm (6") pieces.
- Rough up the outside of the PVC with the sandpaper.
- Drill a hole through the pipe in the approximate center (7.5 cm/3") of the pipe to allow the I-bolt to pass through.
- Attach the I-bolt.
- Prepare the cement as directed on the package and then fill half the PVC pipe with cement to help weigh down the sampler. Another option is to find an object that can be attached to the sampler to weigh it down, and eliminate the need for cement.

## 1.2 Location Selection

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Ideally the sampler would be deployed in a shady area as deep as possible (preferably at least six feet, but can be shallower) with some water flow or wave action in the area.

Avoid areas where there is a large amount of current.

As boat traffic is a vital part of the spread of aquatic invasive species, it is recommended that the sampler be deployed in areas of high boat traffic (e.g. marinas, docks, piers and boat launches).

Other access points such as fishing hotspots, resorts, campgrounds, or where diving ducks tend to reside, are additional areas for potential deployment of substrate samplers.

## 1.3 How to Deploy Your Sampler

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**Always ask permission before deploying/attaching a substrate sampler to any structure such as a dock, buoy or swim area marker.**

At each location, one substrate should be deployed in a manner that will not interfere with boater or swimmer activities. The number of locations will vary from one waterbody to another.

In efforts, to prevent wildlife from severing the line suspending the sampler, plastic-coded clothes wire or chain may work better than rope. As an option to increase the sampling surface area, mesh or pot scouring pads can be attached along the line suspending the substrate sampler.

A small brick or concrete block anchor will help hold the sampler in place and acts as an additional substrate sampler.

A physical description of the area, a lake map indicating each sampler location and corresponding GPS co-ordinates should be obtained at the initial time of deployment.

If possible, record the local contact information for the person who will be checking the substrate most often for each site/location if not being done by yourself.



## 1.4 Monitoring

Substrate samplers should be checked at minimum once a month during the timeframe when water temperatures reach 12°C, which is when invasive mussels start to spawn. Initial deployment should happen before the water temperature reaches 12°C. In most years the sampler will need to go in by late May to early June, but can go in later if not able to get to the waterbody being sampled.

Monitoring for adult invasive mussels when using a substrate sampler:

1. Remove substrate from water slowly and carefully.  
**\*REMEMBER, Don't clean the Substrate Sampler off.**
2. Place substrate into a bucket for inspection to capture anything that may fall off.
3. Closely inspect all surfaces of the substrate, paying close attention to corners and holes as well as the suspending lines and anchors.
4. Juvenile mussels are very small, so inspect carefully by feeling along all the surfaces for a rough sandpaper-like feeling which, if present, may indicate the presence of small juvenile mussels.
5. During the inspection, also look for other potential invasive species. Suspect organisms can be collected, labelled and frozen in water; arrangements will be made for pick up.
6. If attached mussels are found or suspected, remove the substrate from the water, place in a sealed plastic bag or container, **call the TIP LINE 1-800-667-7561 immediately** and deploy a new substrate (if one is available).
7. If no invasive mussels are found, replace any damaged or worn materials and deploy again (**do not clean substrate sampler**).
8. Completely fill out a reporting form each time the substrate sampler is checked. This includes taking note of any aquatic or riparian plant coverage in the area of the substrate.

## 1.5 List of Equipment You May Need

- Personal Protective Equipment and Supplies
- Clip board with forms and field book
- GPS and Digital Camera with spare batteries
- Heavy monofilament or braided fishing line, rope, and/or coated clothesline wire
- Small concrete block or brick to act as anchor
- Basic tools such as knife, screw driver, etc.)
- Boat hook (might be helpful when retrieving the substrate sampler during monitoring)

## 1.6 End of Season

During the final substrate sampler monitoring event of the season or when checking in water structures or shoreline, follow the steps identified in the AIMM protocol and remember if attached mussels are found or suspected, place substrate sampler in a sealed plastic bag or container, and call the **TIP LINE at 1-800-667-7561 immediately**.

If no invasive mussels are found, rather than redeploying the substrate sampler, it can be cleaned, which will help prevent the transfer of organisms while preparing the samplers for reuse next year.

To do this, please follow the steps below to clean a substrate sampler:

1. Remove all vegetation, mud or debris that may be clinging to the complete substrate sampler set-up (including all deployment lines, floats, anchors, etc.) and dispose of them properly; Pay attention to cracks and crevices, as mussels like to attach to these areas.
2. In a bucket or container, submerge the complete sampler set-up (i.e. anything that came in contact with the lake) in hot tap water 50oC (or warmer) for at least 10 minutes;
3. Untie any knots or clamps, and thoroughly scrub all surfaces including the space inside the PVC pipe (a bottle brush may work well for this), then rinse with hot water;
4. Allow everything to completely dry before placing it in storage for the winter; and
5. To be safe, dump all water used during this process on land in a suitable location away from any storm drains, ditches and waterways.

## 2.0 Shoreline Surveys or Checking Structures in the Water for Adult Invasive Mussels

### 2.1 When to Monitoring

The time to do shoreline surveys and check items in the water is after water temperatures reach 12°C. This is when adult invasive mussels start to spawn and juveniles begin to fall out of the water column and attach to items such as rocks, sticks, docks, buoys, etc. After this time of year you could do your AIMM check once a month and report your findings.

### 2.2 Shoreline Surveys or Checking Items in the Water

Shoreline surveys involve walking approximately 10 to 20 metres along the shoreline. During this survey it is important to look at rocks or other hard structures that adult invasive mussels could attach in the area from 3 feet of depth into shore. When doing a shoreline survey or checking items in water it is important to do the following:

1. Rub hands along surfaces of removed structures to feel for invasive mussels.
2. Juvenile mussels are very small, so a careful thorough inspection is needed.
3. Pay attention to cracks and crevasses as the mussels like these areas.
4. Invasive mussels will attach to structures using their byssal threads.
5. While doing the inspection also look for other potential invasive species
6. Report your findings on the AIMM survey
7. If you have a positive findings call the **TIP LINE at 1-800-667-7561 immediately**, take pictures of the suspected aquatic invasive species, label, date it and store it in a fridge or freezer until someone comes to pick it up.

### 2.3 List of Equipment You May Need

- Personal Protective Equipment and Supplies
- Clip board with forms and field book
- GPS and Digital Camera with spare batteries
- Basic tools such as knife, screw driver, etc.