

Bugs Below Zero – A Citizen Science Activity

Project Description:

Winter-active aquatic insects including stoneflies, mayflies, caddisflies, and non-biting midges are able to survive below-zero temperatures and can often be found on snowbanks. They are also a vitally important food for trout and other fish over winter and are sensitive to warming winter temperatures. Join university researchers from around Minnesota to document winter aquatic insect activity and the conditions under which they are active. Data from this project will be open to the public and be used to inform research on the biology of winter-active insects, effects of climate change and habitat use. The data will also be used for education and informing management of streams in winter.

Project question:

How does winter insect abundance and type of winter-active aquatic insect change with different air temperatures, water temperatures, observation dates, distance from stream, stream characteristics, and landscape characteristics over fall, winter, and early spring?

Posts on how to identify adult winter-active insects and male and female adult midges can be found at: <https://www.bugsbelowzero.com/meet-the-species>

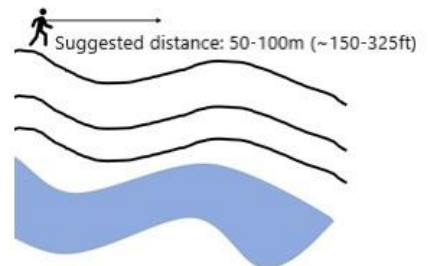
Equipment:

- Camera to take pictures of stream and insects
- Aquarium thermometer to collect water temperature (optional). Here is one model we recommend: <https://tinyurl.com/4h7bywkd> Note: Ensure you have solid footing and are not standing on ice when approaching the stream to get a measurement!
- Hip or chest waders (optional)

ATTENTION: Please upload observations to <https://www.anecdata.org/projects/view/949> after using this form.

Instructions for Collecting Insect And Ecological Data

Spend 10 minutes slowly walking in a line (called a transect line) located 3ft (1 m) from the edge of a stream bank and count the number of each type of insect you see on the snow about 3 ft on either side of you. Repeat the process again at 9 ft (3 m) distance from stream and 15 ft (5 m). If you have waders and are comfortable walking in the stream (and can do so safely), you may select this option. Note: For safety purposes, a field buddy is always recommended when entering the water! Suggested approximate distance for each line is 50-100m.



- This will leave you with a total of 3 transect lines that you've walked.
- If you are collecting data with more than one person or in a group, two people or more can walk the transect lines at the same time. If you are by yourself and/or time is limited, you may opt to walk a single transect line. We suggest the 3 ft line to collect data – this will maximize the number of insects spotted, as insects tend to be found closer to the stream channel.
- If you have a larger group or class, consider using this protocol on multiple stream sections.

TIP: If you want to maximize your chances of finding insects, try to go out on days that are above freezing!

Observation Data Sheet

NOTE: this information will be uploaded to Anecdata – you may choose to upload directly using a mobile device. Alternatively, print this form and take to the field.

Observer Information:

Name: _____

Date: _____

Time entered field: _____

Time left field: _____

Your role (student, faculty, volunteer): _____

Your Email: _____

Your City of Residence: _____

Stream Locality Information:


Stream Name (if known): _____

Stream GPS Coordinates*: _____

Stream County: _____

Nearest City/Town: _____

*Directions for finding GPS location on Google Maps App on smartphone:

- Zoom into your location
- Drop a pin where you can see your location marked by tapping and holding your finger down briefly on the screen above your location
- A new screen will pop up titled “Dropped pin”
- Under the space with the location icon () you will see the GPS location information in decimal degree notation. Example: 44.986533 °N, 93.185669 °W

Insect Observations:

Enter the number of each type of insect that you observe alive on the snow.

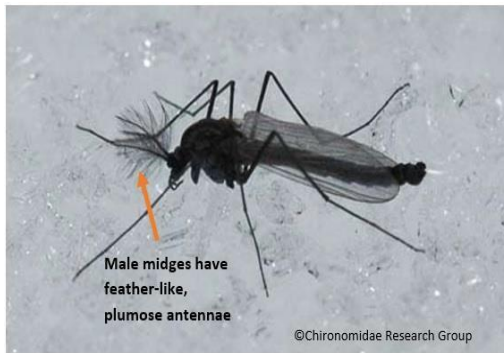
TIP: If you are not in a group and time is limited, you may opt to just fill in Line 1. If you have waders and are comfortable walking slowly in the stream, you may opt to observe insects directly on the stream edge or located on exposed gravel bars or “islands” within the stream.

	Line 1 (3ft)	Line 2 (9ft)	Line 3 (15ft)	In-stream
# of Caddisflies				
# of Stoneflies				
# of Mayflies				
# of Midges (chironomids)				
# of Other Invertebrates				

When entering observations into Anecdata (<https://www.anecdata.org/projects/view/949>), if possible, please upload one image of each insect type you observed. Images should be close to the example image in terms of quality.



If you see chironomids (midges), how many males and females are there? Look at images below to differentiate males vs. females. Note that male midges have feather-like, plumose antennae, while females have small, stick-like antennae:



Count the number of males and females and enter the total number of each from each transect line.

TIP: If you are not in a group, you can just fill in Line 1.

	Line 1 (3ft)	Line 2 (9ft)	Line 3 (15ft)	In-stream
# of males				
# of females				

Weather and Habitat Information:

Air temperature (°F): _____

Water temperature (°F): (optional): _____

Air temperature can be collected from a smart phone weather app; water temperature can be collected with an aquarium thermometer (see *Equipment* at top)

Weather Conditions (circle most appropriate):

Cloudy

Partly Sunny

Sunny

Snowing

Raining

Adjacent Land Use (circle most appropriate):

Crop/field

Protected land (e.g. CRP, park)

Pasture

Prairie

Urban

Forest (agricultural buffer: i.e., a few trees and then fields)

Forest (hardwood/conifer habitat)

Stream Conditions (use images to determine condition and circle the most appropriate category):

Completely open – Ice free

Partially frozen

Largely frozen

Completely frozen



Stream habitat (use images to determine stream habitat type):

Collect this data if you can see stream bottom. Look at the stream bottom over 40ft. (12m) of stream near where collecting insect data and estimate by sight the percent that each habitat type makes up within the 40ft area.

- **%riffles**-fast running water over rocks and little falls, fairly shallow, ripples break surface of the water _____
- **%runs**-areas of moderate current, deeper than riffles, smoother flowing surface, ripples do not break surface of water _____
- **%pools**-areas where current is slower, water is deeper, and many times debris accumulates _____





Stream Substrate Data (TIP: This is for those who want to be challenged! This data is optional to collect):

- Collect this data if you can see the stream bottom.
- Group 40ft. (12m) of stream near where collecting insect data into 8 segments of 5 ft. (1.5m) in length. Look at the stream bottom within each of the 8 segments and group all of the substrates within one size category together to estimate the total percent of that substrate in that segment. Substrate descriptions are found below the table.
- Document your data in the table below. To get the average of each substrate type within the whole 40 ft. (12 m), add up each category percent and divide by 8. Example: add all the percentages for sand up from each of the 8 segments and divide by 8.

	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Average
% Sand									
% Gravel									
% Rock									
% Boulder									
% Woody Debris									

Substrate Descriptions:

Sand: grain size between <1-20 mm (smaller than a lady bug)

Gravel: 20 mm-4 cm (ladybug size to ping pong ball size)

Rock: 4-40 cm (ping-pong ball to large basketball)

Boulder: (40 cm- >1 m) (larger than a large basketball)

Woody Debris: (branches/twigs in stream)

Photograph of stream site: When entering observations into Aneccdata, upload one image of the stream stretch you just observed to <https://www.aneccdata.org/projects/view/949>

Do you have any other ecological observations (birds feeding? Other predators?):

