



2023

CITIZEN SCIENCE

IN GLACIER NATIONAL PARK



**DEANNA BAGINSKI, JAMI BELT, EMMELINE
KRAUS, HANNAH ROODENRIJS**

PROGRAM OVERVIEW

Since 2006, the Citizen Science Program at Glacier National Park has been collecting valuable data on emblematic species that call the park home. Armed with binoculars and spotting scopes, volunteers from the local community and beyond travel throughout every corner of the park to collect data on focal wildlife species. Public participation in these research projects increases the number of surveys done and community engagement in wildlife conservation in Glacier. Studies show that large numbers of volunteers can cover more ground than a small team of biologists while collecting data of comparable quality.

The Glacier National Park Citizen Science Program has three long-term studies. We collect population and nesting data on Common Loons (*Gavia immer*), population trend and distribution of mountain goats (*Oreamnos americanus*) and bighorn sheep (*Ovis canadensis*), and document migrating raptors, especially Golden Eagles (*Aquila chrysaetos*), at our official Hawk Watch sites. This year we added a project focused on genetic sampling and habitat use to our monitoring of American Pika (*Ochotona princeps*). Each year, the Citizen Science Program also organizes a Bioblitz, which focused on nocturnal pollinators this year, as well as a Noxious Weed Blitz, and sampling mercury levels in dragonflies.

PROGRAM OBJECTIVES

1. Conduct surveys for long-term population monitoring.
2. Engage the public in conservation goals and collecting data for management uses.
3. Identify important habitat for loons, pikas, goats, and raptors.
4. Document impacts of visitation on wildlife.
5. Collect quality data to use for monitoring population status.



COMMON LOON



3,275



83



91,274

HIGH COUNTRY



3,521



99



98,130

COMMON LOON CITIZEN SCIENCE

While Montana contains the largest population of Common Loons west of the Continental Divide, they are listed as a Montana species of concern and management efforts are critical to population success. Approximately 40-50 chicks are hatched in Montana every year, and each one plays a vital role in reaching a healthy population. Often seen as an indicator of wilderness, Common Loons are highly sensitive to habitat loss, human disturbance, and environmental pollutants such as lead and mercury. Despite being similar in appearance to ducks, loons are not closely related to any existing waterfowl. Their closest relatives are penguins and albatrosses. Loons are an ancient species highly adapted to diving and fishing.



Jeff Jones

Common Loons have several behavioral traits and have very specific breeding habitat requirements that make them an ideal species for long-term monitoring. They are fiercely territorial, are very distinct by sight and sound, have strong site fidelity year to year. Also, once their chicks have hatched, they stay on that lake until the chicks learn to dive and defend themselves. These qualities assure our ability to accurately determine resident populations with the help of our citizen science volunteers.

LOONS IN GLACIER NATIONAL PARK

Glacier National Park's remote lakes serve as a crucial portion of remaining loon habitat throughout the state. Based on data collected in 2022 and 2023, Glacier National Park produced 14 to 22% of the chicks for the entire state. Chicks are extremely vulnerable to predation in the first few weeks of life. Glacier produced 11 of the 49 chicks hatched statewide this year.

IN GLACIER NATIONAL PARK:

320
SURVEYS
CONDUCTED

88%
BY
VOLUNTEERS

12%
BY
STAFF

ON BLACKFEET RESERVATION LAND:

29
SURVEYS
CONDUCTED

78%
BY
VOLUNTEERS

22%
BY
STAFF



Dee Baginski

SURVEY METHODS

As Common Loons return from their winter migration spots along the Pacific Coast to inland lakes after ice melt, volunteers here in Glacier National Park prepare to complete 1-hour surveys at each of the 45 loon lakes. In early May volunteers look for pairs that are displaying potential nesting behaviors. As the breeding season progresses, volunteers look for loons incubating their nests followed hopefully by hatching chicks. The annual “Loon Days” is a statewide effort where staff and volunteers across multiple land management agencies survey all the lakes with suitable breeding habitat during one weekend. Results from this event provide a snapshot of breeding lake success, while the season long effort provides understanding of the resident population for each lake.

USING POPULATION DATA TO INFORM MANAGEMENT

Information collected from these surveys plays a vital role in management decisions in the park. Having long-term population data can allow biologists to:

- Strategize recreation management and infrastructure development and maintenance to minimize nest disturbance.
- Provide a long-term dataset for population of Common Loons in Glacier National Park.
- Provide context for changes in loon population.
- Create a dataset for long-term lake inhabitation, nest success and chick production.

For more information about this project visit the [Loons on the Edge story map](#)



2023 NESTING HIGHLIGHTS

2023 was a busy year for Common Loons in Glacier National Park. Across the park 11 loon chicks hatched in seven broods and two on Blackfeet Tribal Land. Most successful nests were located in the North Fork Region of the park. The others were located in the Lake McDonald region of the park. Additionally, two chicks hatched on Blackfeet Tribal Lands outside park boundaries.



Bob Chinn

LOWER QUARTZ

In late May a loon incubating a nest was reported on Lower Quartz. A few weeks later the loons were scarce. The nest had been declared failed. Three weeks later two tiny chicks were reported on the lake and it is unclear whether the pair re-nested or the chicks went undetected.

LOGGING LAKE

In late May we spotted two nesting pairs at each end of Logging Lake. In collaboration with the Visitor Protection Division, we placed a closure at the backcountry campground to protect one of the nests. Both nests were unsuccessful for unknown reasons and chicks were never reported.

HARRISON LAKE

In mid-July we detected a single chick, representing the first successful nest in over ten years at this lake.

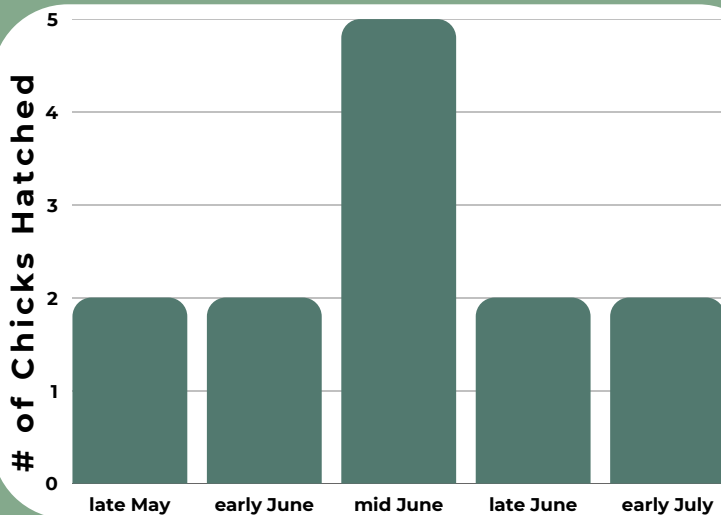
SWIFTCURRENT LAKE

In early May a pair of loons attempted to nest near the boat launch on Swiftcurrent Lake. Managers quickly relocated the public boat launch in effort to minimize disturbance and increase the likelihood of success. In spite of these efforts, we never detected incubation and seldom saw the loons on the lake after the first week of July.

EAST SIDE

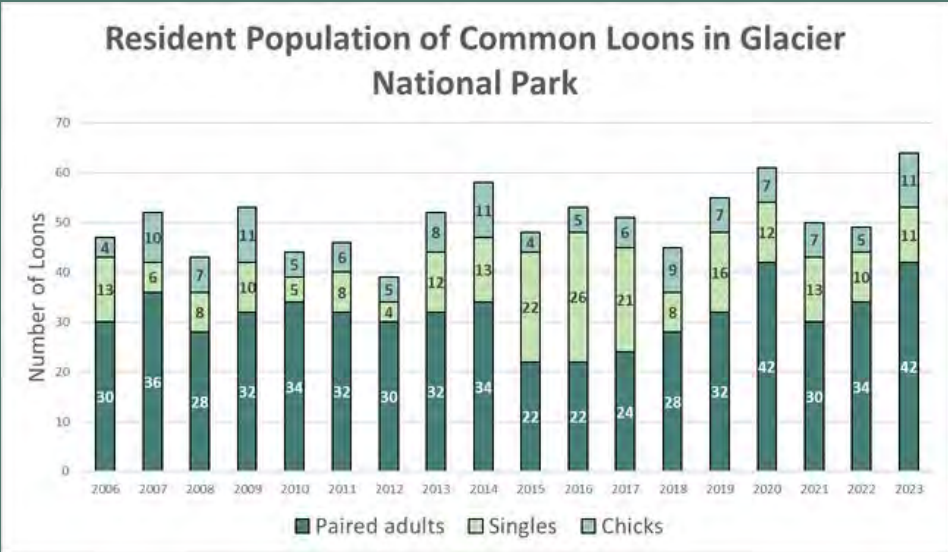
A new nesting attempt occurred on an east side lake that straddles Glacier National Park and Blackfeet Reservation Lands. Nesting success has never been confirmed on the east side of the park. The loons incubated the nest for a few weeks before the nest failed. Biologists detected the loons swimming far away from the stranded nest after water levels dropped significantly.

Estimated Hatch Dates



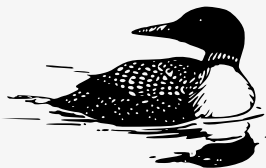
Jeff Jones

RESULTS

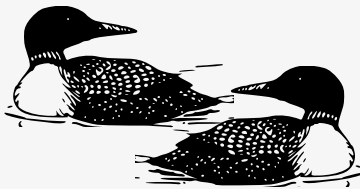


The graph above describes the resident loon populations from 2006 to 2023. Resident populations are determined by repeating surveys at the same breeding lakes every year and including data from the annual Loons Days event. This data helps biologists see large dips or slow downward or upward trends in the population.

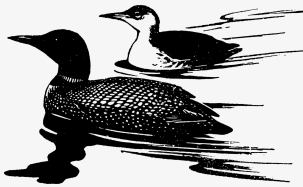
2023 RESIDENT POPULATION



11 SINGLES



21 PAIRS



11 CHICKS

LOON BANDING

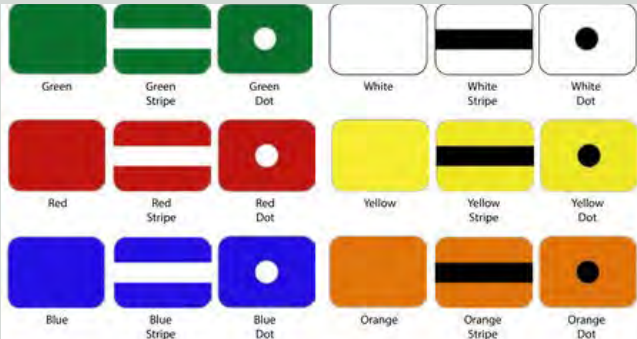
While most surveys conducted are observational, placing bands allows for identification of individual birds from a distance. It can give us more information about the distribution, site fidelity, mate fidelity, age, and pollutants affecting Common Loons. The 2023 banding effort was led by biologist Jami Belt and partner biologist Carl Brown from the Biodiversity Research Institute. They banded five loons on four lakes across Northwest Montana. When banded loons are re-sighted it gives researchers insight into the movement patterns of individual birds.



Hannah Roodenrijs

A loon waving its leg to cool down gives citizen scientists a brief moment to check for leg bands.

BAND COMBINATIONS



Hannah Roodenrijs

Biologists attach a silver ID band as well as a combination of colorful plastic bands to loons legs for easy visual identification of individuals.

HIGH COUNTRY CITIZEN SCIENCE

Glacier National Park hosts the largest intact, native population of mountain goats in the contiguous United States. After other areas in Montana showed a concerning decline in goat populations, the park decided that long-term population monitoring was necessary. In 2008, the High Country Citizen Science Project was established to use the power of citizen scientists to monitor high elevation species of concern including populations of mountain goats and track their shared habitat use with bighorn sheep. Mountain goats are an iconic species in Glacier National Park and highly specialized to alpine ecosystems which are threatened by climate change. Additionally, rapidly increasing recreation in once secure goat haunts has led to increased habituation and changes in behavior. Bighorn sheep, found in the park east of the Continental Divide, are similarly adapted to the high country and often share habitat with mountain goats. Additional information about the project can be found on the [High Country Citizen Science](#) NPS page.



Josie Bestwick



Lisa Fleischer

PROJECT OBJECTIVES

- Enlist the help of volunteers and biologists to collect baseline information about mountain goats at sites across the park.
- Monitor how the population size of mountain goats changes over time by analyzing population trends.
- Map park-wide distribution of mountain goats.
- Collect mountain goat fecal pellets to better understand genetic diversity and genetic structure.
- Document areas where bighorn sheep may overlap with goats and monitor changes in shared habitat use over time.



Dani Steele
Volunteer Amy Gravina scans the mountainside for goats and sheep during a survey.

SURVEY METHODS

Volunteers survey 37 sites distributed throughout the park, some involving only a short one to two mile hike while others are up to 20 miles into the backcountry. The goal is to get at least three surveys completed at each site between the birth and rut, or breeding, periods (June to October). Surveyors navigate to pre-designated observation points then use binoculars and spotting scopes to sweep the mountainsides for goats and sheep for one hour. They record any goat or sheep detections, along with information about the habitat, location, ages, and sexes of the individuals in the group.

247
SURVEYS
CONDUCTED

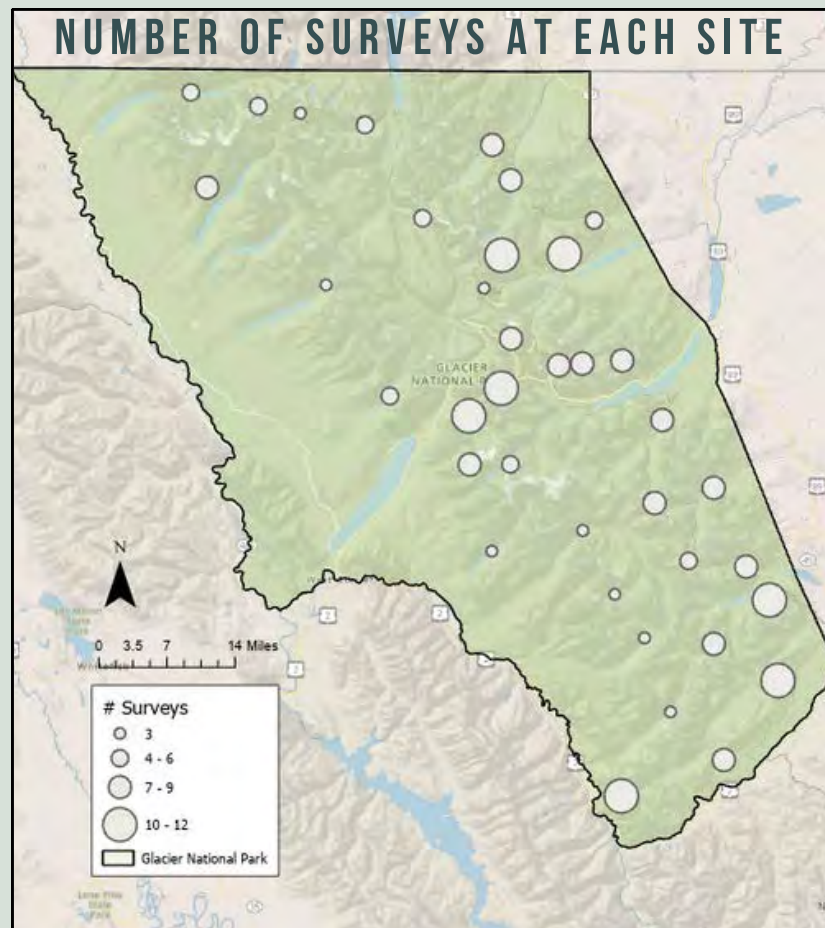
93%
BY
VOLUNTEERS

7%
BY
NPS STAFF

3,523
MILES
HIKED

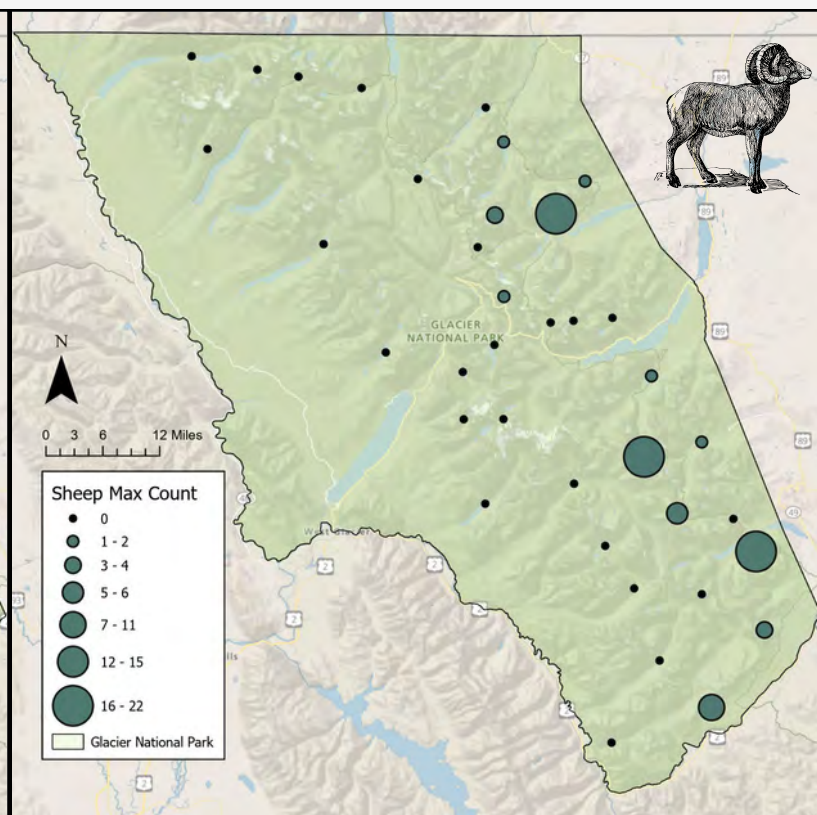
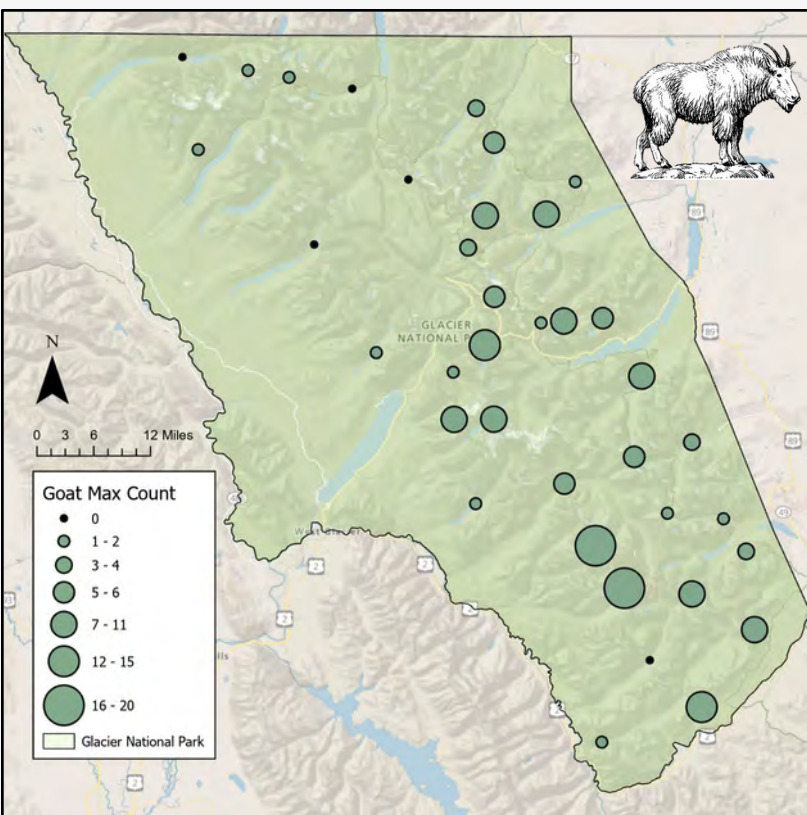
RESULTS

This year, volunteers were able to conduct three or more surveys at every site, with some sites surveyed as many as twelve times. One metric that we draw from observational data collected in these surveys is the maximum number of goats or sheep seen at each survey site during the official one-hour survey period, also called a high count. High counts can be used to estimate the minimum population size and density of mountain goats in the park and track changes over time. This year, goats or sheep were observed in 58% of surveys, either during the survey period or hiking to and from the survey site. The highest number of goats observed during a survey was at Beaver Woman Lake with 20 individuals while the highest number of sheep seen during a survey was at Apikuni Falls with 22 individuals. The sum of goat high counts was 194 individuals.

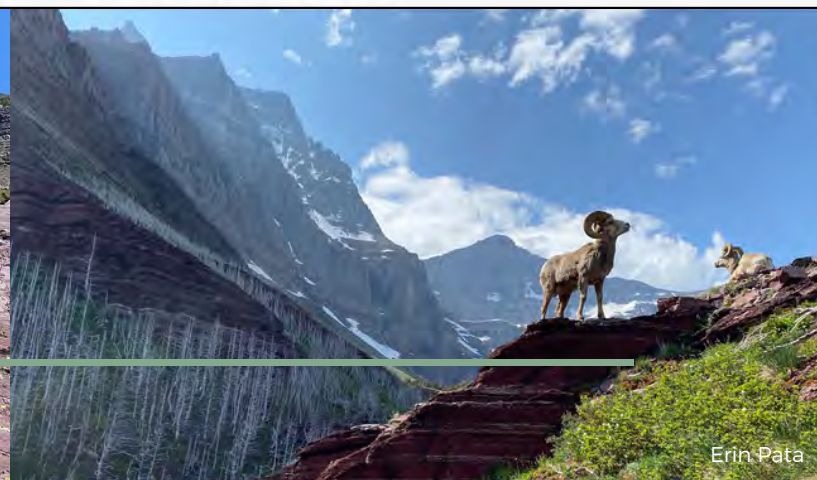
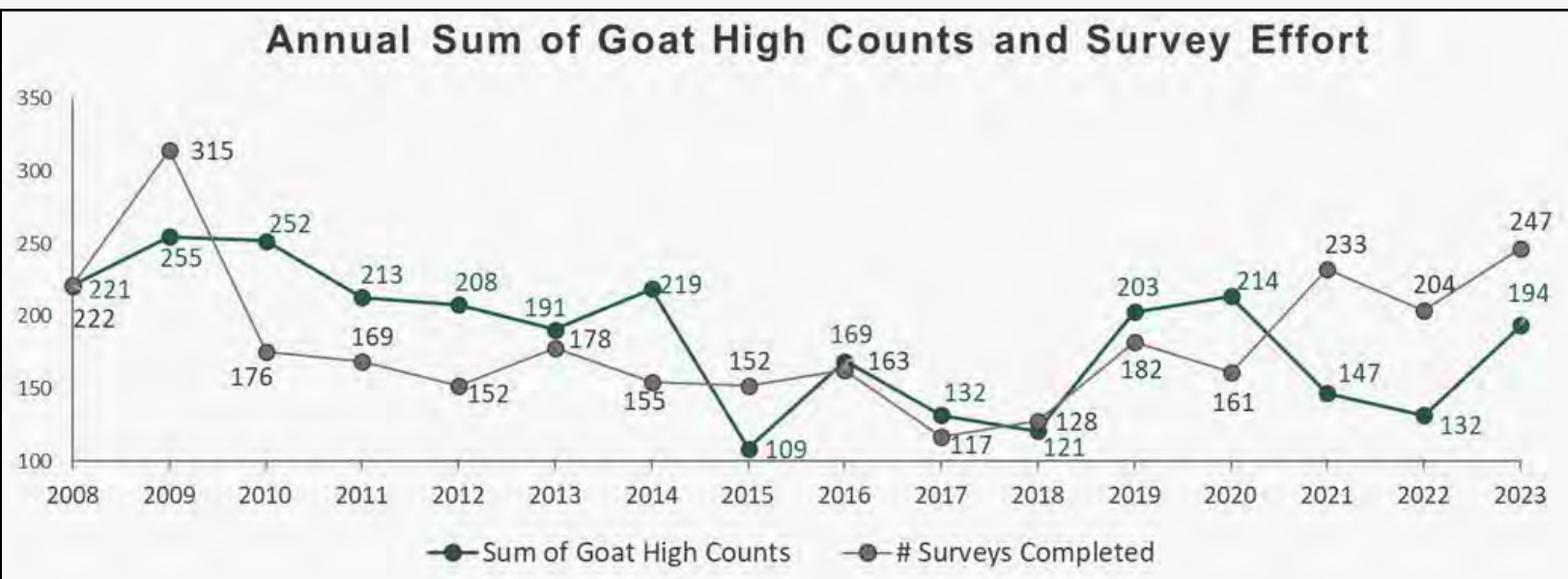


MOUNTAIN GOAT HIGH COUNTS

BIGHORN SHEEP HIGH COUNTS



Above: Maps displaying the distribution of mountain goat and bighorn sheep high counts at each of the 37 survey sites. Each dot shows the location of a survey site, and the size represents the number of animals seen during the highest count during one official one-hour survey across all surveys at that site. **Below:** The sum of all goat high counts across the park shown for each year that the project has run alongside the total number of surveys conducted in that year.



MOUNTAIN GOAT PELLET COLLECTION

In 2022, a large-scale citizen science effort to collect mountain goat pellets for genetic analysis took place in collaboration with partners at USGS. Though this project was not a main focus of our survey efforts this year, a few dedicated volunteers helped fill in gaps in the Livingston Range where collections were limited last year. Collecting pellets provides a non-invasive way to obtain genetic material from individual mountain goats. The genetic data will provide insight into the genetic connectivity of populations across the park, and the pellets will also be used to estimate diet composition.

RESULTS

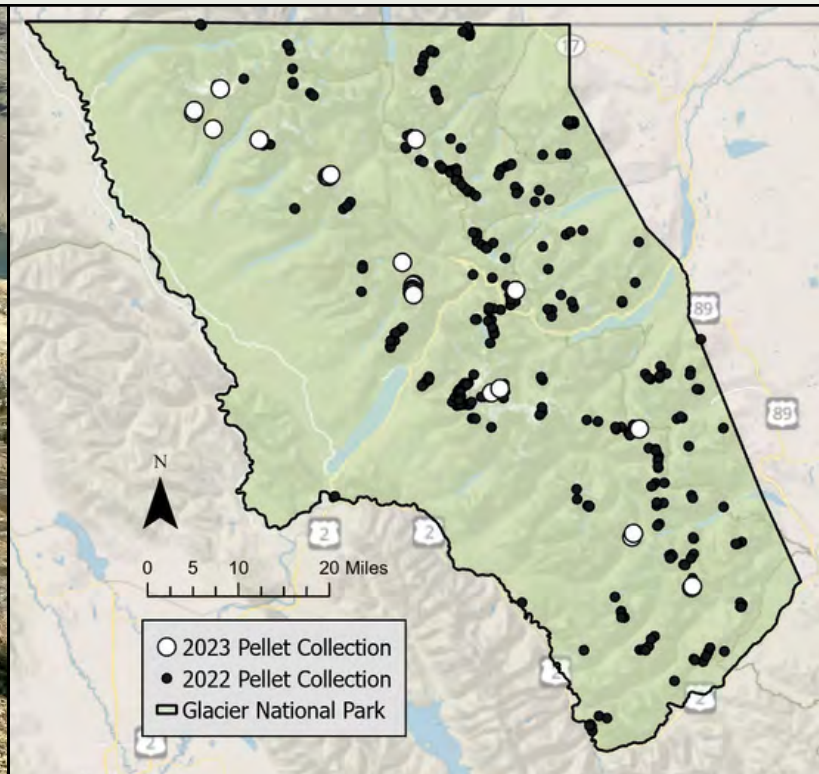
38 samples collected
55% by NPS staff
45% by volunteers



Josie Bestwick



Volunteer and former citizen science staff Alissa Anderson collecting pellets.



This year, mountain goat pellet collection focused on gaps in last year's data particularly in the Livingston Range in the North Fork of the park.

PIKA CITIZEN SCIENCE



Pikas have evolved to live in cold climates in talus slopes. Their thick coats and high metabolism keep their body temperatures at 104°F. While these attributes are beneficial in cold temperatures, they can be detrimental in hot ones. Pikas can experience fatal stress levels when their body temperatures reach 109°F. Park managers have reason for concern as predicted warming patterns may pose problems for this alpine species. Early snow melt can also lead to loss of the insulative blanket needed for spring survival.

PIKA PELLET PATROL

Citizen Scientists began monitoring pika presence in 2008. In 2021, the Citizen Science program piloted the Pika Pellet Patrol Project. Due to the success of the pilot (85% of the 48 samples were sufficient for DNA extraction), we expanded it to a park-wide program in 2023.

The surveys provide information on current pika presence and distribution in Glacier. In addition, the samples provide insights into the genetic connectivity of pikas in the park, including barriers to movement and their dispersal and breeding patterns.



An example of fresh pellets perched on top of a rock near a fresh hay pile.



PARTNERSHIP

This project is a collaboration with a team from the U.S. Forest Service Rocky Mountain Research Station led by Drs. Gavin Jones and Lucas Moyer-Horner. The team is revisiting pika sites to detect changes from baseline surveys conducted between 2007 and 2010. They re-surveyed 220 of the 360 previous sites, collected 210 pellet samples, and found 40 new remote talus patches. Citizen scientists are supplementing their results by surveying sites outside of their research scope and documenting additional talus patches.



Taylor Inman

OBJECTIVES

- 1 Collaborate with USFS Rocky Mountain Research Station to re-survey sites for detection of changes.
- 2 Collect pellets for genetic analysis to understand connectivity of populations throughout the park.
- 3 Pilot the use of mapping tools for citizen scientists to document new talus habitats.
- 4 Better understand pika distribution in the park and how it may be altered by climate change.
- 5 Determine conservation status of pikas in the park.



Jeff Jones



Taylor Inman



Josie Bestwick

SURVEY METHODS

Volunteers used Google Earth to find new potential talus patches to survey, expanding our knowledge of available pika habitat. The volunteers then used an [online ArcGIS map](#) of previously collected samples to determine which, if any, home ranges at those sites had already been sampled. They then hiked to those home ranges and searched for pikas and their signs, including calls, hay piles, and pellets. If the volunteers found pellets, they collected up to ten using standardized procedures to maximize DNA extraction and minimize contamination of the samples.



Google Earth

An example of what a talus patch near Apikuni Falls looks like on Google Earth.

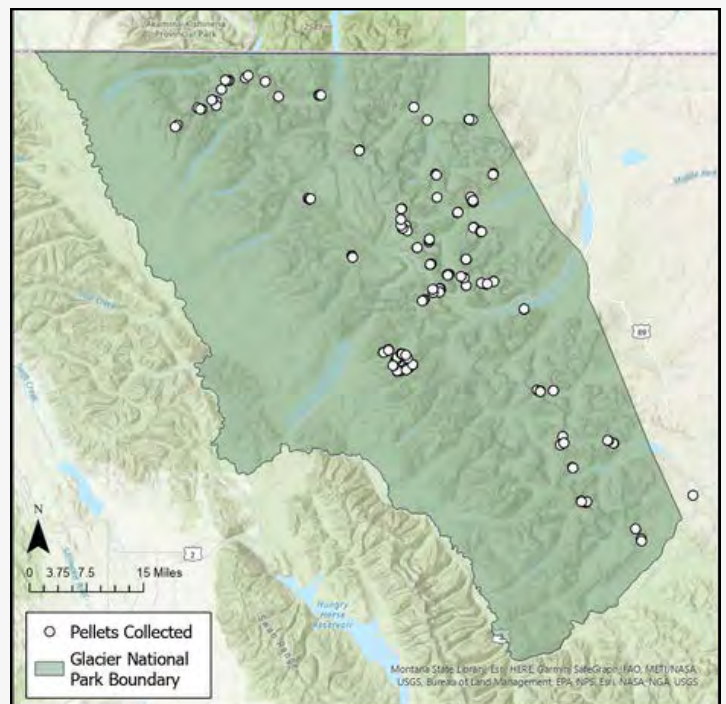
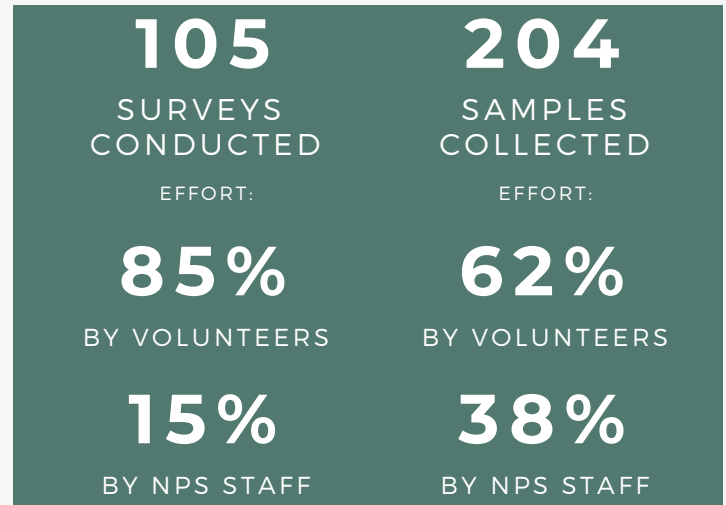
RESULTS



The project started in early July when pika signs are more detectable. In the short timespan from the beginning of July through the end of September, 31 volunteers conducted 89 surveys, surveyed 325 home ranges, and collected 126 of the overall 204 pellet samples.

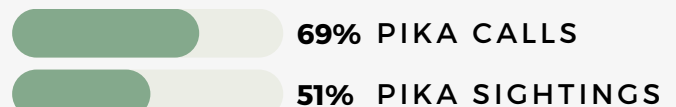
Volunteers had autonomy in where and when to survey, resulting in widespread sampling distributions. Samples were taken from both easy and hard sites to access.

In nearly half of the talus patches and home ranges, volunteers saw and heard pikas. Many of those pikas, like the one below, were seen adding to their hay piles.

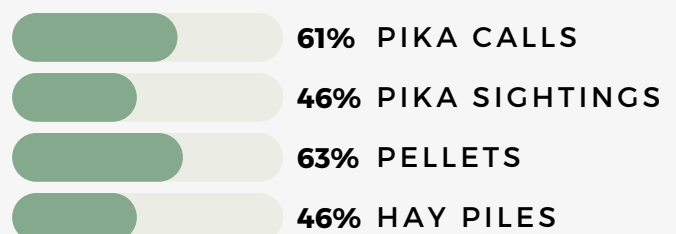


PERCENTAGE OF TALUS PATCHES AND HOME RANGES WITH PIKA SIGNS

WITHIN TALUS PATCHES



WITHIN HOME RANGES





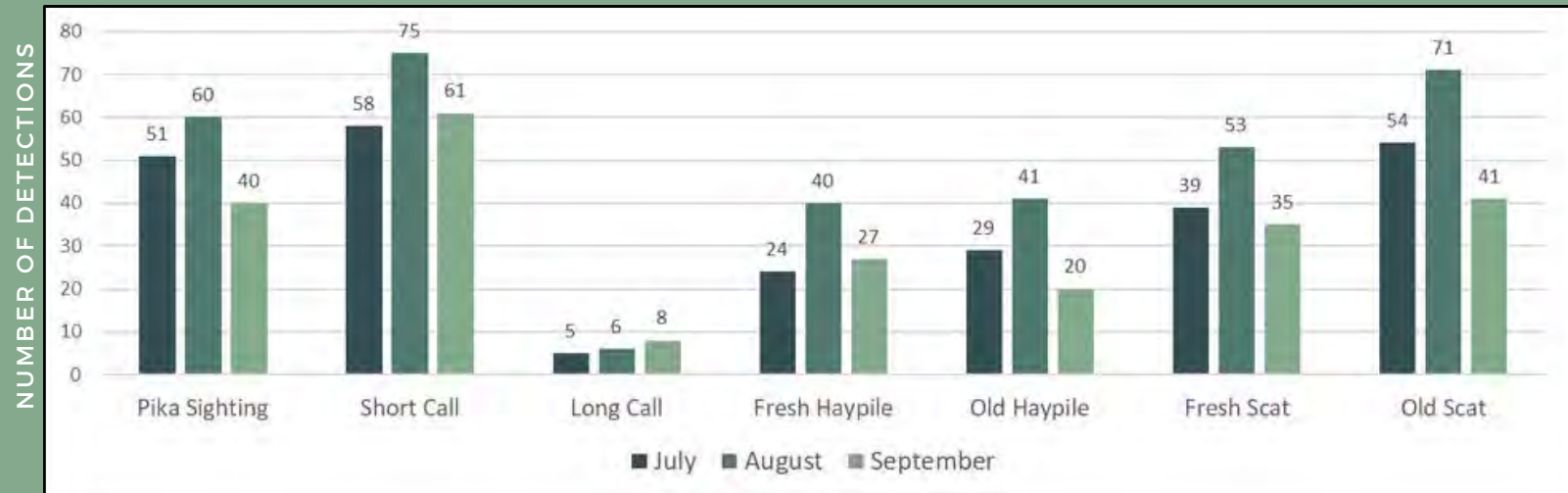
Jeff Jones

HAY PILES & PELLETS

Pikas are active year-round but spend most of their winter in their talus homes, eating from hay piles that they create throughout the summer. Pellets also provide a source of nutrition and are often found in hay piles. Pikas' protective coloration can make detection of the animal difficult, so finding fresh hay and pellets is another indicator of current presence in home ranges.

July, August, and September had similar numbers of hay piles and pellet detections, after accounting for the number of home ranges surveyed.

PIKA SIGNS FOUND IN HOME RANGES BY MONTH



SHORT & LONG CALLS

Pikas have two different calls: long and short. Pikas often use short calls to alert others to dangers and to define and defend their territories and often use long calls to attract mates.

Throughout the season, volunteers reported hearing more short calls than long ones. That is likely because pikas most often mate in late May or early June.



COLLABORATIONS AND OUTREACH

ROCKY MOUNTAIN GOAT ALLIANCE



Each summer, members of the Rocky Mountain Goat Alliance join regional biologists to conduct mountain goat counts. This year, they surveyed here in the park from August 21st to 25th. One group backpacked from Cut Bank to Red Eagle Lake while another group hiked to Poia Lake to conduct surveys.

MONTANA CONSERVATION CORPS



A crew of six young adults from the Montana Conservation Corps conducted high country surveys for three weeks in late August to mid-September across Glacier National Park. The crew visited sites that needed final surveys done, including all the sites in the challenging Nyack Loop.

FLATHEAD HIGH SCHOOL



International Baccalaureate students in an Environmental Science class at Flathead High School conducted goat and pika surveys at Firebrand and Piegan Pass. Second year students designed their own research projects on pikas, exploring how environmental conditions affect hay piles.

PIIKUNI LANDS CREW



We partnered with the Piikuni Lands Crew for the third year to conduct loon surveys. This Montana Conservation Corps crew contained six youth and young adult members of the Blackfeet Nation. They completed eight loon surveys on tribal lands and 189 hours of work. They detected two chicks.

WHITEFISH HIGH SCHOOL



Students from an Advanced Placement Environmental Science course at Whitefish High School joined us in May to learn about nocturnal pollinators and do a virtual tour of the C.P. Gillette Museum of Arthropod Diversity. In September, they collected dragonflies in Cut Bank.

OUTREACH AND SOCIAL MEDIA

11
PRESENTATIONS

408
ATTENDEES

11
SOCIAL MEDIA POSTS

68,307
TOTAL ENGAGEMENT

1,497,657
TOTAL REACH



NOXIOUS WEED BLITZ

The Citizen Science Program hosts an annual Noxious Weed Blitz, inviting volunteers for a day of hands-on learning about local invasive weeds.

Native plants are plants that have existed historically in the area and provide food and habitat for native wildlife. Invasive plants were introduced into the area by human actions and have spread aggressively, threatening the growth of native plants, thus endangering the health of Glacier's ecosystems.

Forty participants helped to protect these ecosystems by learning to identify and pulling five of the park's most prolific invasive weeds including Spotted Knapweed, Oxeye Daisy, St. John's Wort, Houndstongue, and Yellow Toadflax.



HAWK WATCH

Hawk Watch is a worldwide, collaborative effort to monitor raptor migration that occurs during both spring and fall migration. Glacier National Park established an official Hawk Watch site in 2021 after piloting several locations beginning in 2017. Park biologists and Citizen Science staff train volunteers each fall in how to identify diurnal raptor species that may migrate through the park. We also host an open house each fall with live raptors and had 75 attendees in 2023.

Glacier is a very important corridor for Golden Eagle migration as discovered in the 80's by park biologists. During September and October at the Lake McDonald Lodge or Mt. Brown observation point, volunteers count thousands of these eagles and other raptors as they fly by, collecting information on their age, sex, and color morphs. The final report for this project will come out in December.

For more information about this project, visit the [Hawk Watch NPS page](#).

NOCTURNAL POLLINATOR BIOBLITZ

This year, the Citizen Science Program hosted the first ever Nocturnal Pollinator Bioblitz in the park. Nocturnal pollinators can include bats, butterflies, lizards, mice, and moths. This bioblitz focused on moths, which have been virtually undocumented in the park, despite being the most abundant nocturnal pollinator- at least ten times more moth species than butterflies have been identified across the world. Moths pollinate many of our rare plants and provide a major food source for one of our most beloved species, the grizzly bear.

Moths and other nocturnal pollinators are vulnerable to light, air and water pollution as well as climate change. The bioblitz was focused on discovering, identifying, and cataloging the rich variety of moths present in our park in order to provide a baseline for monitoring their persistence into the future.

Moth researchers Mat Seidensticker from the Montana Moth Project and Chuck Harp from the C.P. Gillette Museum of Arthropod Diversity worked with over 100 citizen scientists during three events to attract and identify moth species using bucket traps and light sheets lit with black lights as well as pheromone traps.

The researchers conducted nocturnal sampling at nine sites over five nights, collected approx. 675 specimens, and catalogued 128 macro-moths and around 60 micro-moths. So far, they have identified four moth species that are new state records never before documented in Montana.

In addition, naturalist and photography expert Kristi Dubois worked with citizen scientists to photograph moth species. For more photos, visit [Kristi's Flickr page](#).

* Not to Scale



Hyles euphorbiae
(Leafy Spurge Hawk Moth)



Nedra hoeffleri
(No common name - Only three specimens previously known)



Agapeta zoegana
(Knapweed Root-Borer)

Photos by Chuck Harp
and Mat Seidensticker



DRAGONFLY MERCURY PROJECT

The Dragonfly Mercury Project is a nationwide citizen science study collecting dragonfly larvae for mercury analysis. Since establishment in 2009, the project has engaged over 6,000 volunteers across 140 national parks. This year, we engaged 30 student volunteers and collected 60 dragonflies and six water samples in three of Glacier's water bodies.

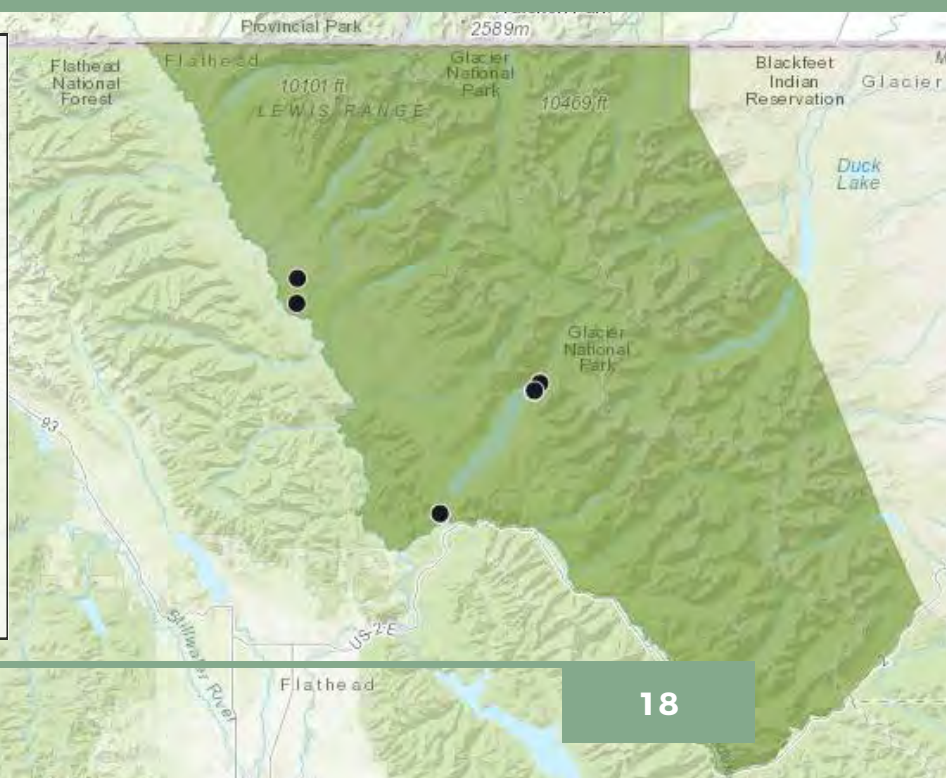
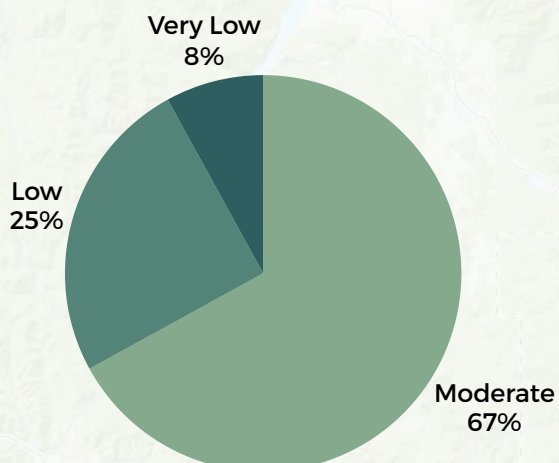
After settling in a water body, atmospheric mercury can be transformed into a more toxic form called methylmercury, which can then bioaccumulate, endangering animals at the top of the food chain, including humans and wildlife.

Dragonfly larvae are useful for biomonitoring because they are found ubiquitously and as mid-level predators of the aquatic ecosystem, they can be a good indicator of the mercury levels in the local food web.

For more information about this project, visit the [USGS Dragonfly Mercury Project Story Map](#).

MERCURY SAMPLING FROM 2014 TO 2021 IN GLACIER FROM THE DRAGONFLY MERCURY PROJECT DATA DASHBOARD

**MERCURY CONTAMINATION LEVELS
ACROSS ALL YEARS AT SIX SITES**



ACKNOWLEDGMENTS

THANK YOU TO GLACIER NATIONAL PARK CONSERVANCY FOR FUNDING AND SUPPORTING ALL OF OUR CITIZEN SCIENCE PROJECTS.

We had the opportunity to share our Pika Pellet Project with some folks from the Glacier Conservancy in August. We had a great day hiking to Piegan Pass, observing pikas, and searching for hay piles and pellets. We even had a pika haiku (or “piku”) contest.

The winning haiku:

Eating my poop
In the mountains of Glacier
Another great day

- Rachel Dura



Andrew Smith



AND THANK YOU TO ALL OF OUR VOLUNTEERS THIS SEASON! THIS WORK TRULY CANNOT BE DONE WITHOUT YOUR HARD WORK AND DEDICATION.

Here are some photos from volunteers out in the field this summer:



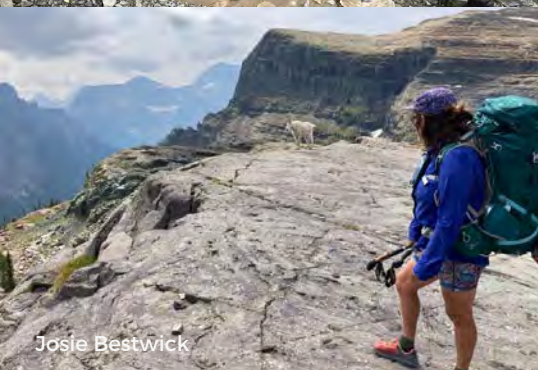
Alissa Anderson



Angie Winter



Danielle Steele



Josie Bestwick



Danielle Steele



Alissa Anderson