

## **Citizen Science in Glacier's High Country: Mountain Ungulates and Pikas**



### **Citizen Science in Glacier's High Country: Mountain Goats, Bighorn Sheep, and Pikas**

Many changes are happening in Glacier's alpine and subalpine areas, causing growing concern about many high country plants and animals. These changes include invasions of insects and plant diseases, climate change, and a growing number of recreationists. Some individual species like whitebark pine (current estimates are of 50-60% mortality in most stands) are clearly in trouble and others, such as the Clark's Nutcracker (a species that has coevolved with whitebark pine), seem to be declining. But, in general, we don't know how healthy most of the animal and plant populations currently are in Glacier's alpine and subalpine areas nor how resistant they are to change. We need to know more in order to maintain and restore the health of this ecosystem.

The Citizen Science in Glacier's High Country project will engage volunteers to help determine the number and distribution of four of the wildlife species that we are currently most concerned about: mountain goats, bighorn sheep, and pikas. The status each of these species in Glacier is unknown.

Volunteers will receive training on species identification and will be taught how

to observe and what to note about each species. Volunteers will also learn about the current state of knowledge about the distribution of each species in Glacier, the life history of each species, and the management concerns for these species in the park. The efforts of citizen scientists allow us to cover significantly more ground and make more observations.

## Why are we concerned about mountain goats and pikas



What we don't know could fill a book

- How healthy are Glacier's alpine and subalpine animal and plant populations?
- How resistant are they to change?

Climate change

- Global average temperature has increased 1.5°F over last 100 years
- Earth's surface predicted to warm as much as 10 degrees by 2100
- Alpine and subalpine animals and plants cannot seek higher ground

Due to the nature of alpine habitats, it can be difficult to study them. Weather and terrain create a shorter season for surveys and limit access more than in lower elevations.

- Alpine habitats are largely regulated by their cooler temperatures. At high elevations, alpine wildlife have limited options when alpine habitats begin to change, because alpine ecosystems are islands of suitable habitat for high country species. Climate change is a significant factor that may affect wildlife that live in these environments.
- Alpine wildlife have basically three choices: they can adapt to changing conditions, they can move or they can die. Mountain goats and pikas will likely be unable to move to different terrain because they require cooler temperatures for physiological homeostasis. In addition, mountain goats use steep terrain for predator avoidance.
- Also, due to the sensitivity of mountain goats and pikas to changes in climate, these animals can act as sentinel species or “canaries in the coalmine,” which means that they may be able to indicate subtle changes in climate. They provide an opportunity for us to monitor how climate change

impacts wildlife.

## Why are we concerned about mountain goats?



**Declines in Montana's native range**



- The mountain goat is the icon of Glacier National Park and yet there is still very little that we know about them.
- Aerial surveys by Montana Fish, Wildlife and Parks have documented declines in mountain goat populations in portions of their native range in Montana. For example, there has been a decrease of 85% in the Bob Marshall from annual index counts. There are several possible explanations for these decreases, including movement into other areas. Additional factors that might impact mountain goats outside of Glacier National Park include hunting quotas and motorized winter recreation.
- In Glacier National Park, mountain goat index counts are conducted at Walton mineral lick, which is heavily used by mountain goats. The index counts at this location have decreased since 1990. However, it is difficult to know if the Glacier mountain goat population is decreasing in number or simply emigrating to other areas.
- In contrast, in many areas where mountain goats were newly introduced to suitable habitat, their populations increased successfully. This occurred in the Greater Yellowstone Area.

## Why are we concerned about mountain goats in Glacier National Park?

**Declining counts at some survey sites raise concerns about a potential population decline**

**Little research has been conducted on overall population**

**Little is known about how mountain goat populations may respond to the effects of global climate change.**



Glacier National Park is one of the best places to observe mountain goats in the world. The park contains the largest native population of mountain goats in the lower 48 states.

Climate change and glacial recession are both prominent factors affecting the land use and natural resources within and around Glacier National Park. Little is known about how Glacier's mammals in general and mountain goats in particular will respond. Specifically, despite some habitats that are literally melting away, others may be created. Potential effects on goat survival, reproduction, food limitation, and distribution remain highly uncertain.

Mountain goats have been monitored at a few isolated locations in Glacier National Park, such as the Walton Goat Lick, where the goat numbers have declined in recent years. However, little research has been conducted on overall population and where mountain goats are found and throughout the Park. We would like to obtain a good baseline estimate of mountain goat abundance now, in order to compare that figure with estimates in the future.

Such baseline information is critical for making informed management decisions and for determining how mountain goat populations may respond to the effects of global climate change.

- Mountain goats use the snow for camouflage with their white fur. Will the reduced snow cover from rising temperatures result in more predation?
- Mountain goats also use the snow to cool their bodies. Will warmer temperatures and loss of snow result in more stress on mountain goats?
- OR, perhaps the loss of snow could open up new vegetation or habitat that was previously unavailable to mountain goats.



The objectives of the Mountain Ungulate Monitoring program are to:

- Enlist the help of GNP staff and volunteers to collect baseline information about a species that may be sensitive to climate change,
- Map parkwide distribution,
- View how the population changes over time (population trends),
- Determine what type of habitat each species occupies through location data,
- Conduct annual mountain goat days population count.

These are BIG GOALS because mountain goats are notoriously hard to study (because of their habitat preferences). Therefore, citizen science is extremely helpful.



- Mountain goats are only found in North America and are not true goats. In the past they have also actually been classified as mountain antelope. They share a common but distant ancestor with the domestic goat, but are more closely related to musk oxen and antelope. Of their ancestors, they are some of the best climbers.
- Mountain goats are tied to escape terrain or rocky, steep cliffs. These mountain ungulates remain on steep terrain even during the winter months. They have soft hooves that are adapted to grip rocks like climbing shoes. Mountain goats forage on vegetation and generally eat whatever they can find.
- Female-juvenile (nursery) groups range in size from 2 to over a dozen mountain goats in native populations or on mineral licks. Large groups generally occur during early summer congregation on prime feeding grounds or on mineral licks. As the summer progresses and the vegetation dries out, group size decreases. Although juveniles are normally found in the company of adult females, a goat of any age or sex may be observed alone.

- By the age of 2, males begin to disassociate themselves from nursery groups. Adult males generally lead solitary existences, associating primarily with other males except for during the mating season, which takes place mid-November through early December.

## Bighorn Sheep Ecology



The bighorn sheep is another species of mountain ungulate that is found within Glacier National Park. These animals have a wider distribution than mountain goats, as there are desert and Sierra-Nevada populations of sheep. This species seems to use somewhat similar habitat to mountain goats, but sheep seem to use sheer cliff/very steep terrain less often than goats do. Bighorn sheep feed on forbs and grasses year-round, and generally move to lower elevation meadows during winter.

We would like to learn more about bighorn sheep in Glacier for several reasons. Firstly, we would like to examine if there is competition between bighorn sheep and mountain goats for forage and/or habitat. We can then compare these results with the research being conducted on mountain ungulates in the Greater Yellowstone Area, where researchers are examining the interaction between these species in an area where mountain goats are non-native. In addition, USGS completed a comprehensive bighorn sheep study within Glacier that can provide a comparison with more recent data.

## Behavior

### Behavior Categories

- Sitting/lying down
- Standing
- Feeding
- Walking
- Other



Social structure in mountain goats is maintained by a dominance hierarchy. This is particularly important for adult females with young, as females will compete for bedding and feeding sites. A mountain goat may swing its head to exhibit dominance.

Males are called bachelors and groups of females and young (young of year/kids, yearlings, 2 year olds) are called nursery groups. Interaction between these two groups does not typically occur until the winter time during the rut season or at mineral licks.

Mountain goats will molt from a winter coat to summer coat during the summer season (pictured). Females generally keep their winter coat longer than males, especially if they have a young of the year. Nannies with young cannot commit the energy and nutrients to molting early in the season, due to the energetic costs of lactating.

## Reproduction



Mountain goats mate in mid-November or December during the “rut” or mating season. During this time, males return to the nursery groups and try to isolate one or two females. Males will compete mostly through posturing and other gestures, but will occasionally fight. In anti-parallel circle fighting, male mountain goats face the rear of the other goat and take swipes at the flank. This can sometimes result in injuries! Therefore, mountain goats possess a “dermal shield,” or 2-3 inches of thick skin, on their rear.

Females will gestate throughout the winter and give birth in the spring around the beginning of June to one young at a time, and twins are uncommon. Females in a nursery group are usually synched within of few days to give birth at the same time. This mechanism helps protect the group from predators. In preparation for birth, females usually prefer privacy and will go to the steepest and highest slopes.

Female mountain goats typically have 1 offspring, called a “young of the year” or “kid”, per year (when they successfully copulate), but twins can be observed occasionally. The is typically birthed in late May/early June. The newly born kids quickly learn to navigate steep terrain with ease.

The kid will follow its nanny closely for the first year. If the nanny doesn’t breed

during the Fall (resulting in a new kid by the following spring), the kid may follow its nanny during the following summer.

## Reproduction



Lambs, or young of the year, are born in late May or early June and can be recognized by their small size. Lambs follow their mothers closely for the first year. Yearlings are about half the size of adults and have smaller horns. Horn growth occurs predominately during summer and youth, and growth rings are apparent upon close examination. Female horns do not grow significantly after 4-5 years. The horns of older males may be broken at the tip, resulting in a loss of 1-2 years of growth.

Bighorn sheep are often observed in social groups. Ewes live in groups with lambs, yearlings, and younger males, whereas rams are typically found in bachelor groups. These groups are generally only found together during the November mating season.

Ram horn size can affect rank and dominance within a social group. During the fall mating season, rams with similar horn size establish dominance through head-on collisions. Typically only the larger, older males mate successfully.



Identification features

- Yellowish white fur
- “Beard” up to 5” long, retained year-round
- Both sexes have backward-curving, dagger-like horns
- Often in rocky, cliffy areas, but also meadow
- Use dense timber and creek bottoms for protection

There are many key features that can help you identify mountain goats in the field:

- Yellowish white fur
- A beard about 5” inches long that is retained year round
- Both sexes have backward curving horns (they are slightly different between the sexes).
- Adult males are somewhat stockier than females and have a larger horn base with a more gradual, consistent curve. (It’s still pretty hard to sex them.)
- They are typically found in rocky cliff areas, but will occasionally hang out in meadows and use lower elevations for movement (i.e. look everywhere for them).
- They use dense timber and creek bottoms for security and thermal cover against extreme weather conditions.



Bighorn sheep are typically the species that is most often confused with mountain goats. Bighorn sheep inhabit some of the same terrain/habitats as mountain goats, although mountain goats have the ability to utilize terrain/habitat that bighorn sheep cannot.

There are several features that can help the observer distinguish between mountain goats and bighorn sheep:

1. Horn color- Bighorn sheep have tan/brown horns, while mountain goats will have black horns.
2. Horn shape- When the animal faces the observer, one can tell that bighorn sheep have a more splayed horn while mountain goats will have much more straight horn.
3. Facial profile- Mountain goats have a much longer face (side profile) than bighorn sheep, who have relatively short, stout face. Also, bighorn sheep do not have a beard.
4. Tail- Mountain goats do NOT have a brown tail patch, while bighorn sheep DO have the brown tail patch.
5. Coat- Bighorn sheep tend to have darker fur but they can have light-looking

fur in the winter time. They typically have a tan/light brown coat, but during the summer they can appear sun-bleached. A very important distinguishing feature is that bighorn sheep have a brown stripe in the center of their rear. Mountain goats have a very shaggy winter coat that can be quite yellowish, and their summer coat will be shorter and white. Bighorn sheep do not have the same extremely shaggy coat during the winter, but do maintain a thicker, winter coat.

Shadows and poor lighting can make it difficult to quickly ID what you observe, but taking some time and using the key identification will help you be more certain in your classification. If you are unsure of the species ID, do not guess.

What species is pictured on this slide?

*(All are photos of sheep.)*



Here are some other species you may encounter on High Country surveys, which include potential predators and scavengers of mountain ungulates. In general, there is little known about mountain ungulate predation.

- Grizzly bears are not regular predators of mountain ungulates, but they will opportunistically prey on adults and their young. More often, grizzly bears will scavenge, rather than hunt mountain goats. Bears have been known to travel below avalanche slopes and cliff bands in the spring to look for mountain goats that died during the winter.
- Mountain lions are strictly predators and rarely scavenge. They have been documented taking advantage of the underpass that funnels mountain goats into a small area near the Walton Goat Lick.
- Wolverines will find avalanche kills by digging through snow and they will consume everything on the mountain goat carcass but the horns. Wolverines are notoriously aggressive scavengers and have been known to take carcasses from grizzly bears. If the opportunity arises, wolverines have the ability to predate upon certain mountain goats, such as kids or the sick/injured.

- Wolves and coyotes are also opportunistic predators of mountain ungulates.
- Golden eagles can knock young off cliffs.



Mountain ungulates can occupy a wide variety of habitat types. Many people have a tendency to focus their search on steep areas (ledges, cliffs, etc.) that they believe are likely locations to observe mountain ungulates. However, mountain ungulates can be found in a variety of habitats. Surveys should thoroughly cover all available and visible terrain, even if you do not think it is ideal mountain ungulate habitat. Therefore, be sure to scan systematically up and down across all terrain that you can see.

This slide shows the different habitats that you can list on the survey form. Record the habitat type that the mountain ungulates occupied when you first observed them. For example, scree is rock that is loose and not attached to the ground, and it is typically found below rock faces. Krummholz are stunted trees that grow in high elevation areas. Ledge is the most common habitat type for mountain goats.

## Mountain goat survey methods

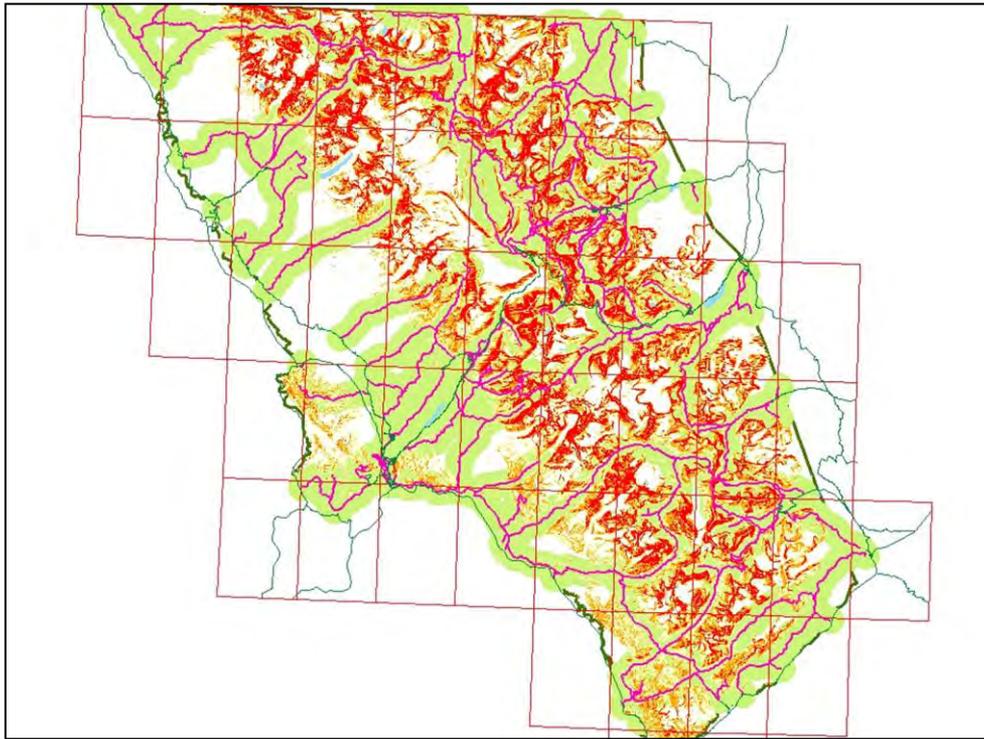


Aerial surveys are an excellent survey method because observers can easily view steep terrain. However, flight surveys do not seem to be a long term solution for mountain ungulate population monitoring in Glacier. This method can be invasive, as the noise can be disturbing to mountain ungulates. In addition, aerial flights are expensive and the high cost can result in limited coverage and/or replication. Aerial surveys also result in an underestimate of the total number of mountain goats by 30—84%.

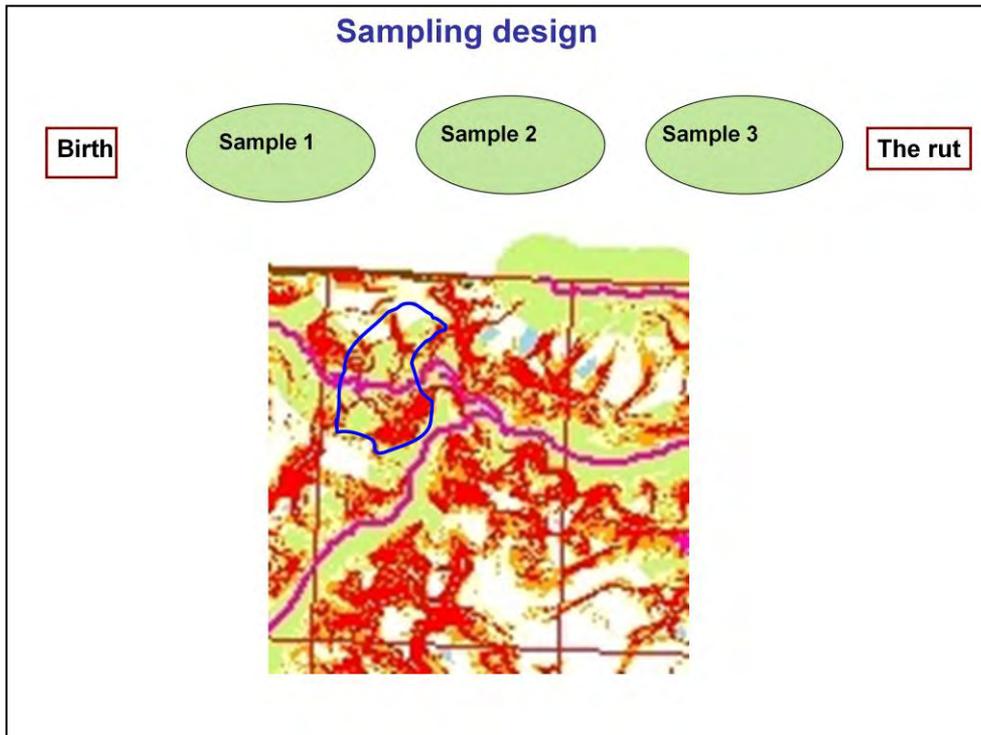
The use of paintball guns is an additional option for counting mountain goats. Biologists hit mountain goats with paintballs from a helicopter and perform a resurvey to determine how many are recounted. This method did not seem logical for Glacier, as it assumes a equal likelihood of observing mountain ungulates and teaches them to avoid helicopters. In addition, paintball splotches would seem unattractive to visitors.

Ground counts are a great observation method, but they are typically not very time or cost-efficient in mountainous terrain. In Alberta, hunters and outfitters recording observations of ungulates has demonstrated promise as a viable long-term monitoring technique. Citizen science volunteers make ground counts a viable survey method in Glacier National Park. Volunteers allow us to cover more ground, observe more locations in limited time, estimate sighting

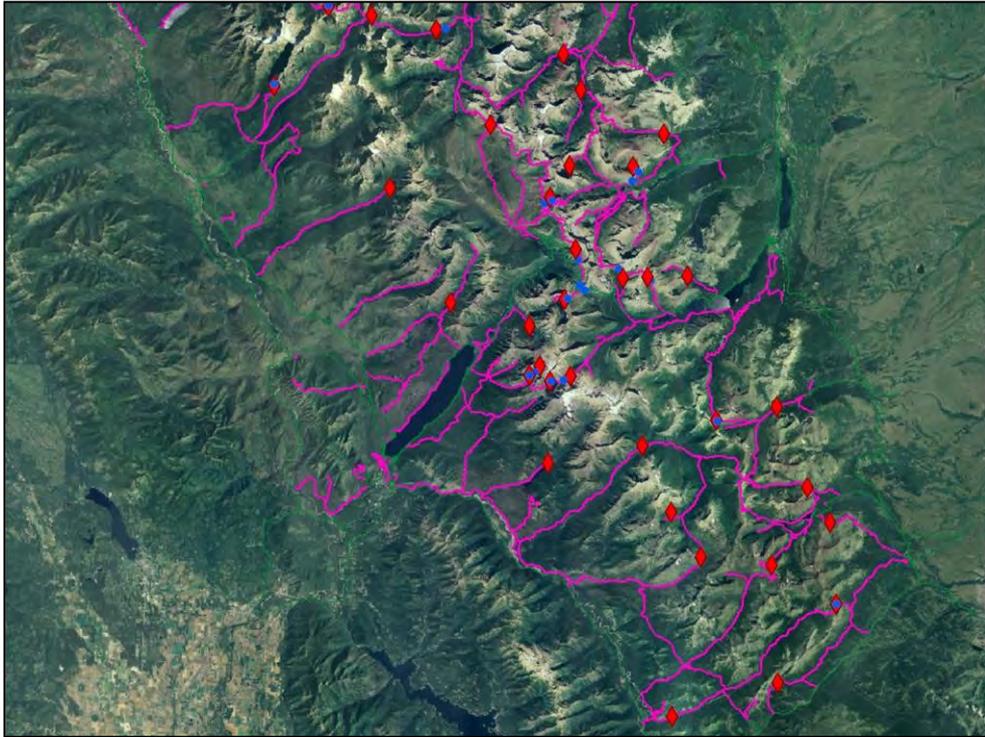
probability, and try to understand goat movements through multiple visits per survey site.



During our Glacier mountain ungulate survey design, the entire park was first divided into grid cells. According to the literature, mountain goats prefer areas in close proximity to escape terrain, meaning where the slope angle is over 25 degrees. Potential escape terrain habitat is shown on the map in red and orange. We also wanted the survey site to be in close proximity to a trail, and we created a 1 mile buffer on either side of every trail (shown in green on this map). One survey location per grid in ideal terrain was selected at random.



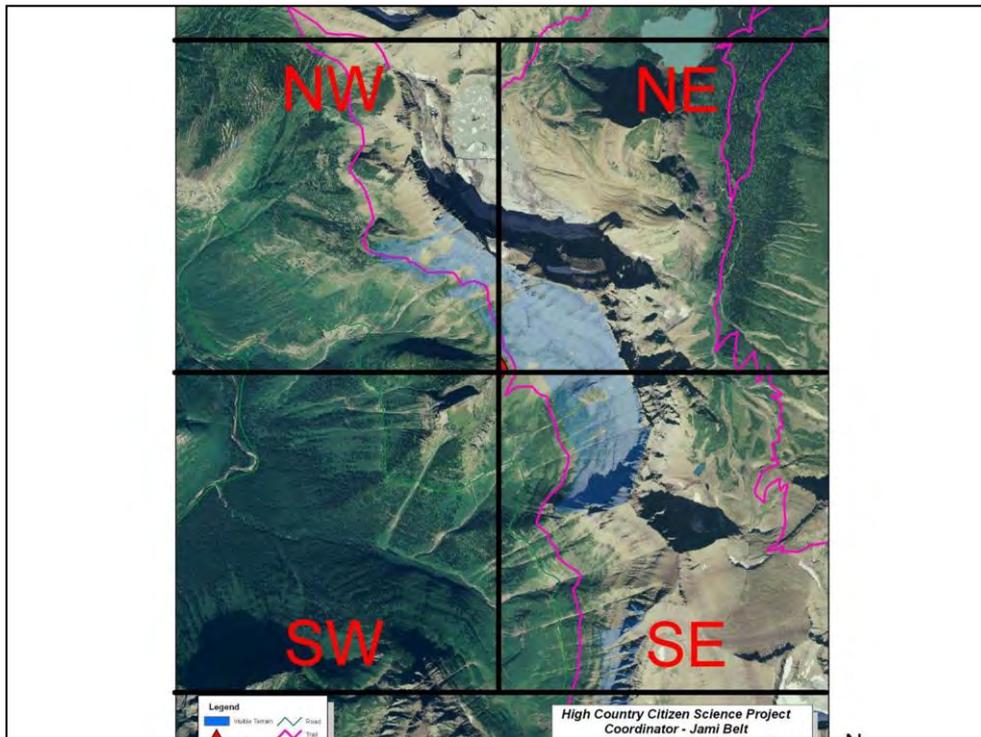
We seek to complete a survey at each site three times per season between birth and the rut. Parturition (birthing) begins in early June, and the summer season is divided into three sampling periods. This method is an effort to avoid double-counting of mountain ungulates, as they are most likely to stay within their home ranges between birth and the rut. Mountain goat home ranges have been estimated to be approximately 25 sq km in size, and a sample home range is shown in blue on the map. The grid cells that were mapped across Glacier are 88 sq km, meaning there could be about 3-4 home ranges in each sampling area.



This is a map of the selected mountain goat survey sites (red diamonds). A similar selection process was used to randomly select survey sites within all available pika habitat in Glacier National Park.



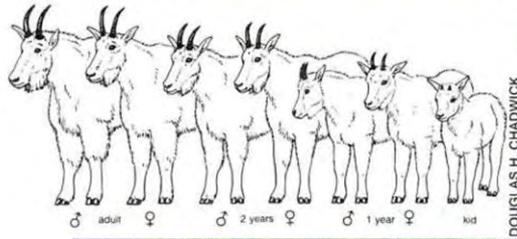
You can use a GPS and printed directions to locate the survey site. Upon arrival, you will set up a spotting scope and use binoculars to do a 360 degree survey of all visible terrain. The spotting scope is used to verify observations and to classify mountain ungulates. On your survey form, you will document the number of goats observed in 4 directional quadrants, as well as the behavior and habitat type upon detection. For our surveys, mountain ungulates are classified by sex and three age categories (adult, young of year and yearling).



This shows what a survey site map looks like, using the Haystack Butte location as an example. The red diamond in the center is where you stand during your observation. You will spend ½ hour observing the north half and ½ hour observing the south half of the survey area. You will then record in which quadrants mountain ungulates are seen.

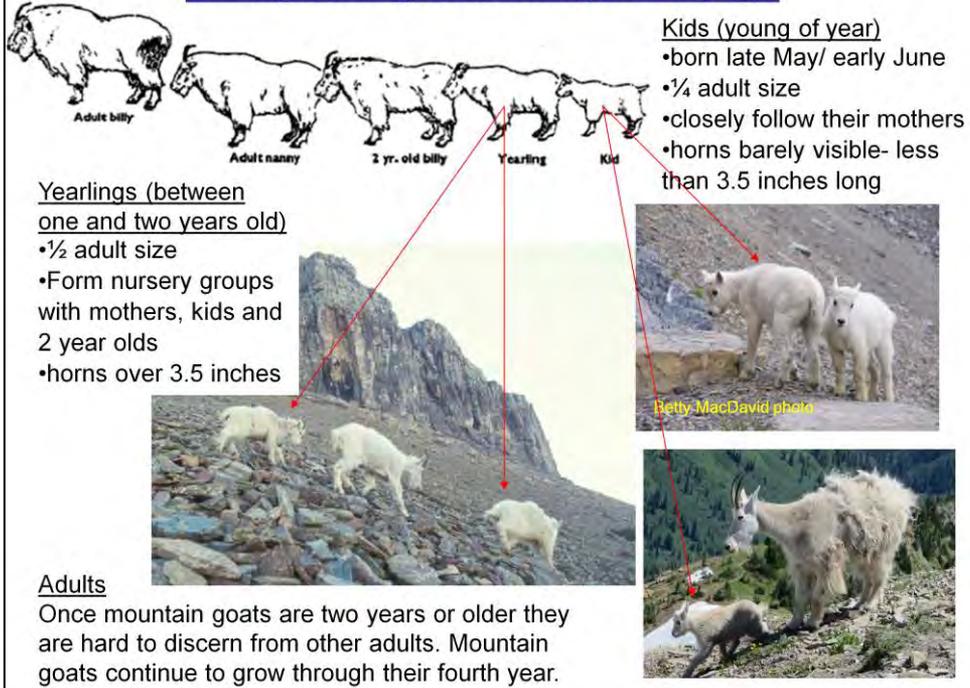
Due to the fact that views can be limited by mountains, ridges and hills, we did a viewshed analysis using GIS (a mapping program) to determine how much area is actually observed at each survey site. The viewshed at this site is shaded in light blue. This method allows us to calculate the density of mountain goats, or the number of mountain goats per area.

## Distinguishing mountain goats by age



When aging mountain goats, there are three classes: adults (including 2 year olds), yearlings (one year olds) and young of year. The main way to distinguish age classes is to compare the size of mountain goats relative to one another. Young of the year usually stay near adult females and do not have visible horns until late in the summer.

## Distinguishing mountain goats by age



**Adult billy**      **Adult nanny**      **2 yr. old billy**      **Yearling**      **Kid**

Yearlings (between one and two years old)

- ½ adult size
- Form nursery groups with mothers, kids and 2 year olds
- horns over 3.5 inches

Kids (young of year)

- born late May/ early June
- ¼ adult size
- closely follow their mothers
- horns barely visible- less than 3.5 inches long

Adults

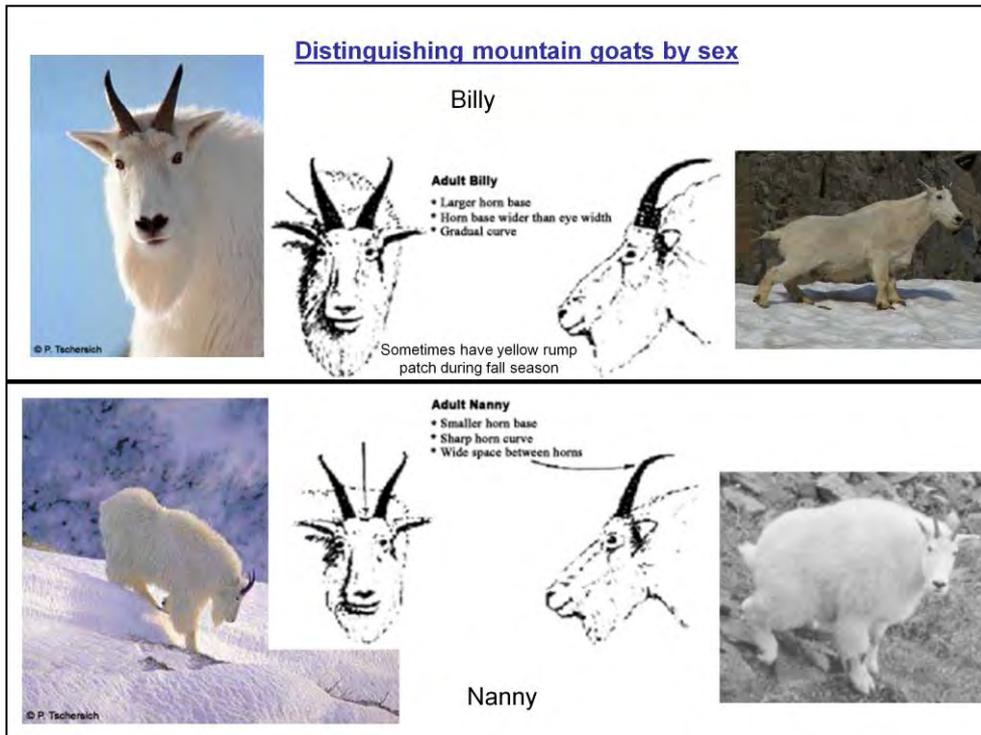
Once mountain goats are two years or older they are hard to discern from other adults. Mountain goats continue to grow through their fourth year.

*Netty MacDavid photo*

Young of the year (YOY or kids) are about ¼ the size of adults. They are frequently seen next their mother, and their horns are barely visible (less than 3.5 inches in length).

Yearlings are about ½ the size of adults. They are found within nursery groups, but do not usually follow an adult. They have bulkier fur than kids and their horns are over 3.5 inches in length.

Mountain goats continue to grow through their fourth year, and sexual maturity is reached at 2.5 years.



It can be very difficult to distinguish mountain goats by sex, especially from a distance. Both sexes have “beards.” However, there are a few key characteristics you can use to try to distinguish them.

Male mountain goats are called “billies.” The base of their horns is thicker and leads to an overall stouter shape. In addition, the curve in the horn is more continuous than in females. Female mountain goats are termed “nannies.” The base of the female horn is thinner with a sharp horn curve.

An excellent way to distinguish between sexes is by observing their urination posture. Males stretch forward when urinating, whereas females crouch and bend their knees.

However, do not worry too much about determining the sex of mountain goats you observe. Gender information provides a broad understanding of where nursery and bachelor groups are located. The most important information you collect is the location and total number of mountain goats you observe.

## Distinguishing bighorn sheep by age and sex

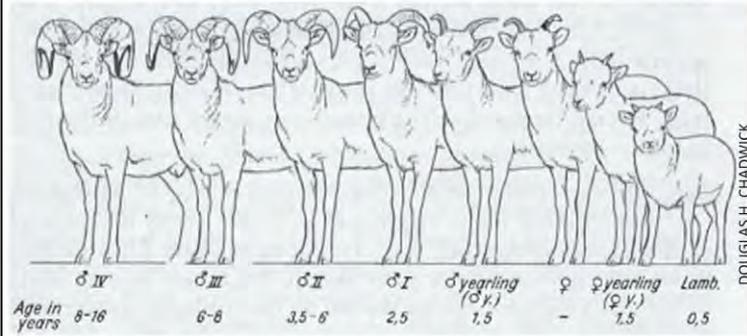


### Males (Rams)

- Thick curled horns
- Stockier
- Stretch during urination
- Yearlings and 2 year olds can look similar to adult ewes

### Females (Ewes)

- Slender, straighter horns
- Squat during urination
- Yearlings are smaller than adults



### Young of the Year (Lambs)

- Born late May to early June
- Short, barely visible horns
- Small size
- Found in ewe/lamb groups

DOUGLAS H. CHADWICK

It is slightly easier to distinguish bighorn sheep by age and sex. Males are called “rams” and feature large, curled horns. They are also stockier and stretch during urination. Females are termed “ewes” and possess slender, straighter horns. They also squat during urination, like mountain goat nannies.

Male yearlings and two-year-olds can look very similar to adult ewes, and are frequently found in ewe groups. However, their horns tend to be thicker than ewes and they are slightly stockier in build. Female yearlings are smaller than adults and are easier to identify.

Young of the year bighorn sheep are called “lambs.” They are born in late May to early June and possess short, barely visible horns. They are found in ewe/lamb groups and are frequently near their mother.



Can you classify these bighorn sheep?

Here are the answers:

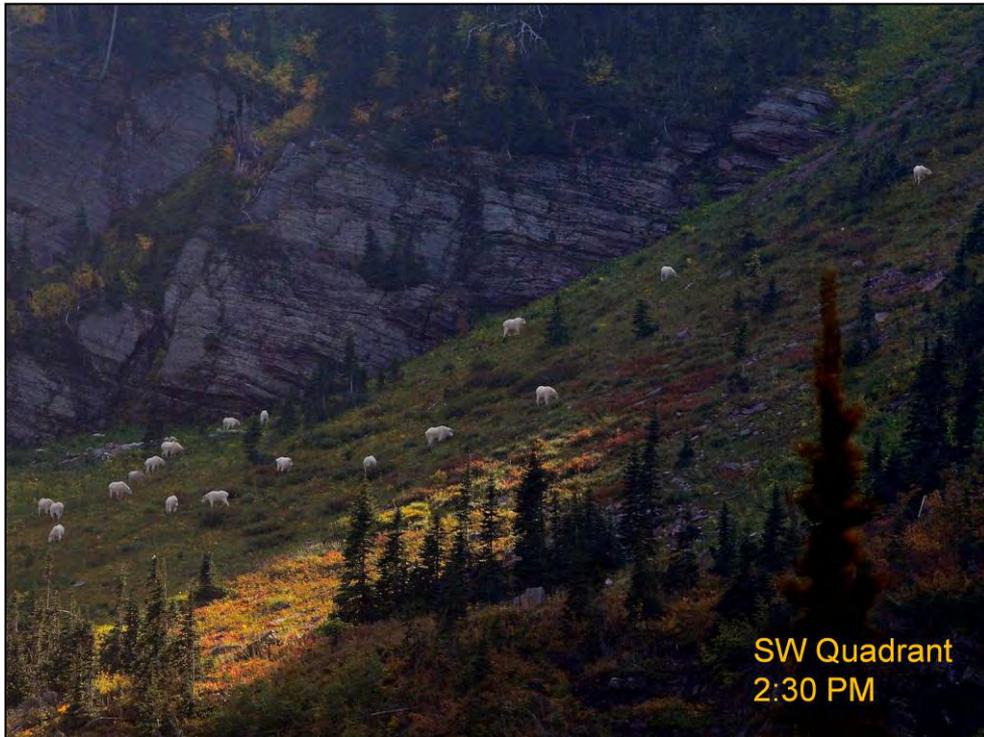
-Ewes at top left.

-Two-year old male at top right.

-Yearling at bottom. We cannot tell the sex of this animal because we do not know what time of year this was. Additionally, you do not need to distinguish sex on young bighorn sheep.

-Young of year (lamb) at bottom right.





These are ideal spotting conditions. What species is this?  
How many do you see?

*Answer: 18 mountain goats*

**GOATS AND SHEEP DETECTED, LOCATION AND BEHAVIORS:**

| Time at detection of each goat or sheep group | Goats or Sheep | Quadrant where located (NE, NW, SE, SW) | Total # of goats/sheep in group | # adults if known (F= females; M= males) | ** Behavior of adults upon detection | # young if known (YOY= young of year; YG= yearlings) | ** Behavior of young upon detection | *** Dominant landscape feature | Photo taken (Y/N) | Comments and Photo ID # of verification photo: |
|---|----------------|---|---------------------------------|--|--------------------------------------|--|-------------------------------------|--------------------------------|-------------------|--|
| 14:30   | Goat           | SW                                      | 18                              | 3 unk                                    | feeding                              | 1 YOY  | Feeding                             | Meadow                         | Yes               | Photo 1  |
|   |                |   |                                 |  |                                      |  |                                     |                                |                   |  |
|   |                |   |                                 |  |                                      |  |                                     |                                |                   |  |
|   |                |   |                                 |  |                                      |  |                                     |                                |                   |  |

\*\*Behavior of adults/young of year/ yearlings upon detection: sitting/lying down; standing; feeding; walking; other (describe).  
 \*\*\* Dominant landscape feature at location where group of goats or sheep was first detected: (snow/ice) permanent snow/icefield; (ledge) rock outcrop/cliff /ledge, (loose rock) talus/scree/moraine, (meadow) meadow dominated by grass and other forbs, (shrub/krummholz) area dominated by shrubs or sparse patches of stunted trees, (forest) area dominated by trees, (road) goat initially detected in paved or unpaved road, (trail) goat/ sheep initially detected in trail.

**TOTAL NUMBER OF GOATS SHEEP SEEN DURING SURVEY PERIODS:** *Note if quadrant not surveyed. Report all zero sightings!*  
 GOATS: NE Quadrant: 0 NW Quadrant: 0 SE Quadrant: 0 SW Quadrant: 18  
 SHEEP: NE Quadrant: 0 NW Quadrant: 0 SE Quadrant: 0 SW Quadrant: 0

This form shows how you might enter the mountain goat observation from the previous slide. Please make sure to complete every section and report all zero sightings.



What species is this?

How many do you see?

*Answer: Bighorn sheep, 4 ewes and 4 lambs.*



What species is this?

How many do you see?

*Answer: Bighorn sheep (4 ewes) and mountain goats (4 unclassified adults)*



No obvious mountain goats can be seen in this photo, but by systematically scanning you can identify any suspect white objects. In this situation, 2 small white dots can be seen on the top of the ridge in the upper right. When this occurs, return back to the questionable spot to see if anything has changed and whether you have better lighting or a better chance of identifying whether these are mountain goats. If you cannot be certain what the white objects were at the end of your 1 hour survey, do not report them as mountain goats.



It is very helpful if you digiscope photos of each mountain ungulate group you observe. We can help verify your observations and photos provide an additional measure of confidence in the data.

We can zoom in on the photos to help determine what you observed. In this case, the digiscope photo allows us to see that this is a female (left), young of year (middle) and an unknown goat on the right.



What species is this?

How many do you see?

*Answer: 1 unknown adult mountain goat.*



How many mountain goats are in this photo?

Patchy snow can make them difficult to see.

*Answer: 4 mountain goats in this photo (one on upper left and three- 2 adults and 1 young of year- toward center right)*



At times, snow can be helpful in locating mountain ungulates, as you can look for tracks in the snow.

The yellowish-white fur of these mountain goats contrast with the white snow. Also, the snow makes it easy to observe their shadows.

*2 goats in this photo*



How many goats are on this loose rock slope?

This is more difficult. Lighting and lack of contrast can make it difficult to detect all the goats that are present. Repeated surveys at each site are important because repetition allows us to estimate detection probability, or the number of mountain goats actually detected in proportion to the number that are present.

*3 goats in the lower center right (one of them has dirt on its fur) and 2 (an adult and a young of year) in the upper left in the shadow of the large boulder.*

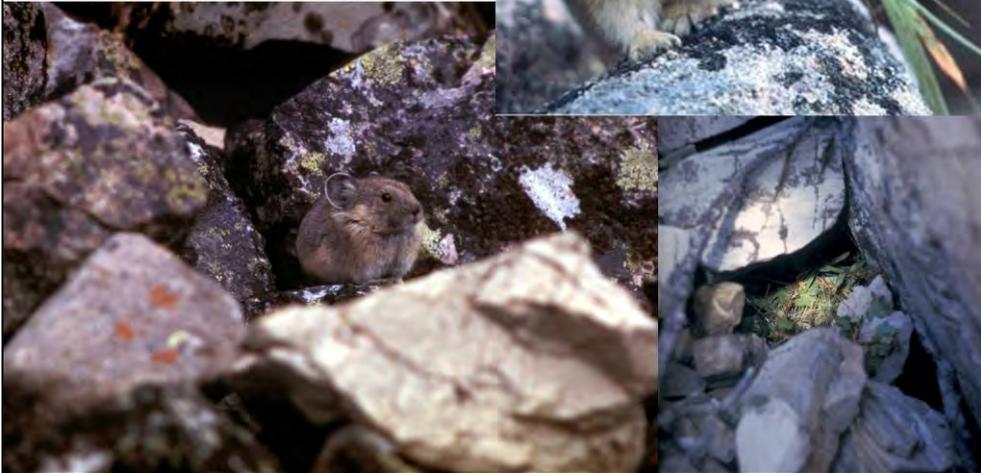


Have fun!

### Why are we concerned about American pikas?

Pika numbers have declined in the Sierra Nevada and the Great Basin, experiencing extirpation in several sites.

Pikas are vulnerable to high temperatures and decreased snowpack



Pikas are small mammals that live in talus fields of the high country. They are actually not rodents, and are members of the rabbit family (lagomorphs). During the long winter, they do not hibernate, but rather feed on large piles of dried vegetation that they have stored and scat.

Pikas are very sensitive to warm temperatures, and are therefore a good indicator species for changes in climate. Their populations have declined in Nevada, but their population trend in Glacier National Park is unknown. Pikas have not been listed as an endangered species because little is known about their overall population size and growth.

American pikas “put a face” on the consequences of climate change for montane biota, serving as a likely early-warning indicator, due to their low vagility (ability to move within an environment), low reproductive capacity, high energetic requirements, obligate relationship to talus habitat, and demonstrated vulnerability to high temperatures. Eight national parks are working together to monitor their respective pika populations, in order to get an idea of how they are doing overall.

## Pikas are sentinels of change in other montane species

- Specific to talus habitat
- Relatively poor dispersers
- Vulnerable to high temperatures
  - High body temp (104°F), high metabolic rate
  - Low upper lethal temp. (109°F)
  - Excellent insulation
  - Temperature stress can occur at ambient temperatures above 78°F
- Indicators of climate change
- Part of NPS Vital Signs Program

Pikas are obligate to talus fields found in the high country. Pikas are poor dispersers, as their survival rate through dispersion is less than 25%. Therefore, it is very difficult for pikas to move to a new area if their habitat becomes too hot or unsuitable.

Pikas are extremely well insulated for cold weather, in order to survive the long alpine winter. However, their insulation makes them vulnerable to high temperatures, which can cause concern due to climate change. Glacier National Park is a part of an NPS Vital Signs Program that seeks to learn more about pika distribution and occupancy.



Pikas mark and defend individual territories in their talus habitat. Talus is made up of a field of large rocks or boulders that do not frequently shift or move. A typical pika home range is approximately 18 – 25 m in radius, and a pika territory is about 11 – 15 m in radius.

Throughout the summer, pikas spend a large amount of time harvesting grasses and storing them in haypiles to dry. This vegetation sustains the pika through the winter, as they do not hibernate. Pikas will also directly feed on fresh vegetation during the summer. These small mammals are generalist herbivores and they forage near their talus territory.

Pikas practice coprophagy, which means that they eat their own feces and the scat of marmots. This practice allows pikas to absorb additional nutrients from partially digested grasses found in the pellets.

### American pika identification features

- 6-8 in egg-shaped body with short legs
- Grayish, brown or buff colored silky fur
- Relatively large, rounded ears
- Tail is not readily visible



Pika short call



Columbian Ground Squirrel



Hoary Marmot



Send reports or questions to High Country Citizen Science Coordinator: [Jami\\_Belt@nps.gov](mailto:Jami_Belt@nps.gov), 888-7986



Pikas prefer to inhabit the cool spaces between the large rocks of a talus field, where they can store haypiles and hide from predators. You can often hear their short calls, which is used to designate their territory and warn against predators.

In order to spot pikas in a talus field, look for movement. The dark brown fur of pikas provides excellent camouflage, but you can observe them as they dart among the talus. Pikas are active for 30% of daylight hours. Since pikas do not have visible tails, you can easily distinguish them from other common small mammals with tails, such as the hoary marmot and Columbian ground squirrel.

## American pika behavior and ecology

- Dart about on talus
- Defend individual home ranges on talus of ~400 m<sup>2</sup>
- Call, a distinct, shrill whistle call or a short squeak,
- Most active at dawn or dusk
- Collects vegetation in haypiles, up to 3 feet in diameter and holding up to 50 pounds of vegetation
- Haypiles most conspicuous during late summer or early fall





Pikas mate in the spring, resulting in a 30 day gestation period. When choosing when is a good time to mate, female pikas try to time the birth so that the snow will be melted enough to provide forage once the pikas are born. If the litter is born too early, there will be too much snow and limited food resources. However, if the birth takes place too late in the season, other pikas may have already weaned their litters and there may be no more open territories.

Pika females have 1-2 litters per year that are born from May-September. However, in low elevation areas, pika young can be born as early as March. Litters consist of 2 - 5 (occasionally up to 7) young, and they depend on their mother for at least 18 days. They are weaned at 3-4 weeks and generally stay beneath the talus until they have grown to full size at about 4 weeks of age.

Once full-grown, juveniles establish their own territories and create their own haypiles to survive the winter. Young pikas will breed for the first time during their second summer. Annual pika mortality is about 37 – 46%, and pikas can live up to 7 years of age.

## Habitat

- Specific to talus (piles of boulders >1 ft. diameter)



Talus fields consist of boulders that are at least 1 foot in diameter. The large size of the rocks provides excellent pika habitat. Talus is pictured in the photo on the left.

Scree is pictured in the photo on the right and consists of smaller, loose rock. Pikas do not tend to inhabit scree fields, because there are not large spaces under the rocks where they can take cover.

## Neighbors

- Often live near marmots, chipmunks, ground squirrels, and bushy-tailed woodrats
- Primary predators include coyotes, longtail weasel, shorttail weasel, and pine martens

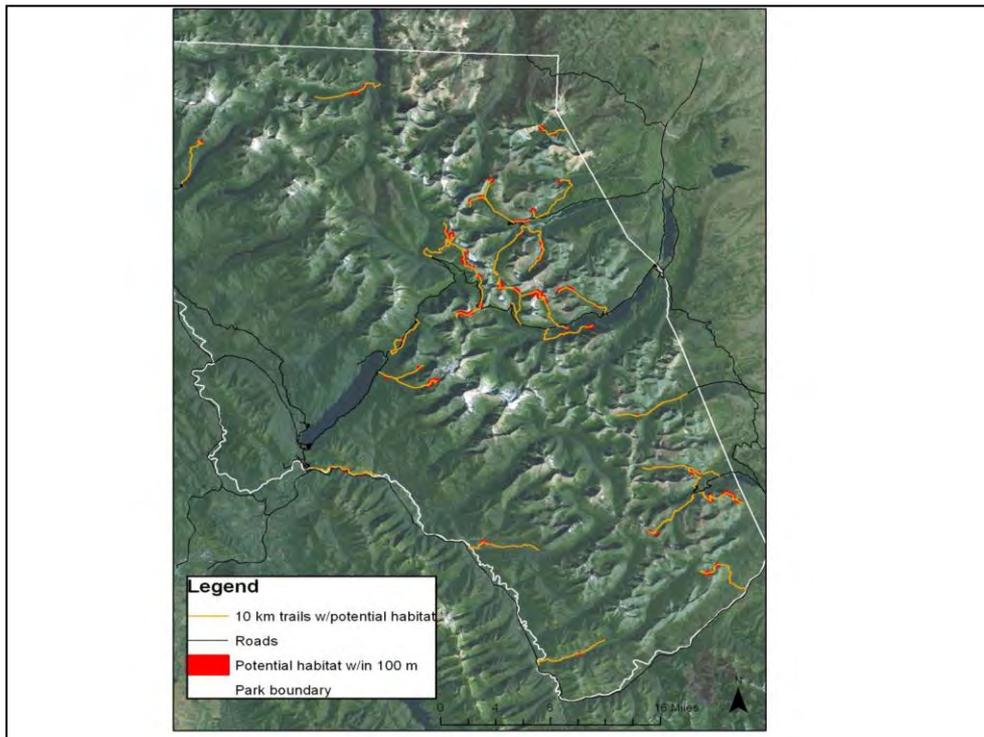


One key difference between pikas and the rodents found in talus fields is that pikas do not have a visible tail. A marmot is pictured above.

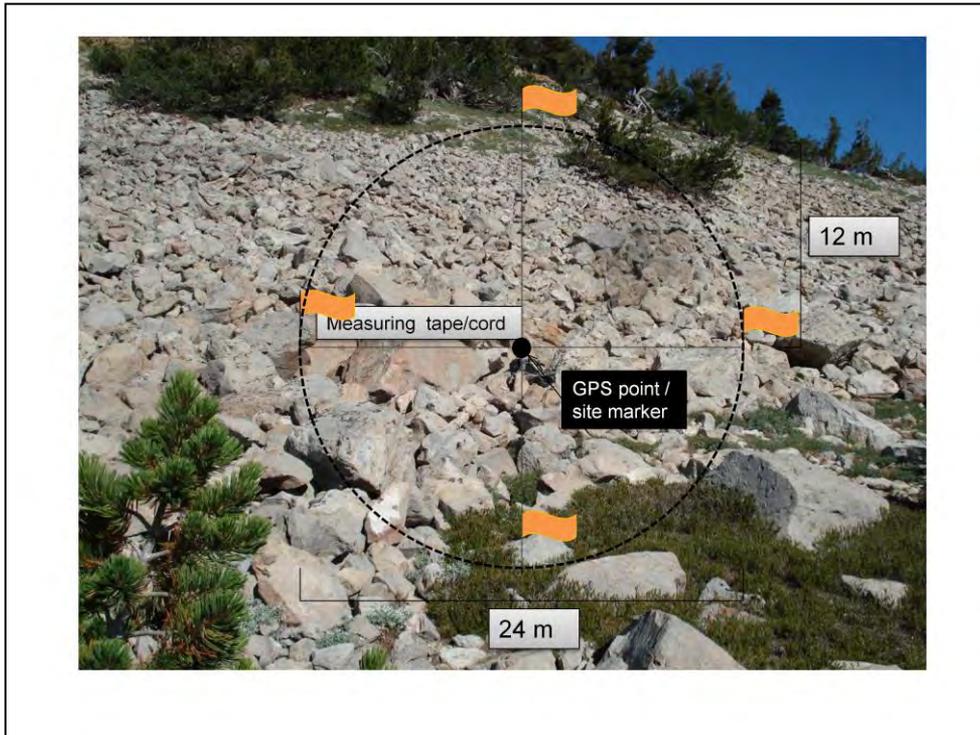
Pikas will call to warn about the presence of predators. However, if a pika spots a weasel, it will remain silent. This is because weasels are small enough to fit under talus rocks and chase a pika into its territory.



Our objectives for pika monitoring are a bit different than our goals for the mountain ungulate project. Instead of examining population trends, we would like to learn about pika persistence and occupancy over time. We would like to know how this biological information might change over time with the occurrence of climate change. We would also like to document new or previously unknown locations of pikas in Glacier National Park.



In 2012, we implemented protocols developed by the National Park Service's Inventory and Monitoring program. These protocols were developed in 2008 and have been implemented in 8 western National Parks (including Glacier National Park), as part of the Climate Change Response program. This map show the locations of survey sites that were selected for this long-term monitoring effort.



This photo is a diagram of the set-up necessary to complete a pika survey. The survey encompasses a search area that is 24 meters in diameter and approximately 400 square meters in size, which is the size of a typical pika territory.

The protocols are as follows:

*\*\*Surveys should not be conducted in inclement weather such as rain, snow, high winds\*\**

### **PIKA SURVEY PROCEDURES**

**Survey equipment:** Measuring tape/cord, pin flags, and GPS unit.

**Recommended:** Leather gloves, camera, flashlight, and watch.

1. Navigate to survey site using route map, GPS point location and photo of reference on trail. Once close (~10 m) begin looking for the metal site marker and/or rock cairn. Once you find the site marker\*, enter the site number as “Site Name” on the data form.\*If you cannot find the site marker after some time (>30 minutes), move on to another site and notify the citizen science coordinator.
2. Use the measuring tape or cord to measure out 12-m to four edges of the

plot, leaving a pin flag at each edge (see right). This will help you establish/visualize the search area. Note: Sometimes the plot will extend beyond the talus but you should still use same site center and plot edges. In these cases, all rock in the plot should be searched and all ground cover types in the plot, even if beyond the talus, incorporated in the cover estimates.

3. Sit quietly for 5 minutes, looking and listening for pikas. Record any detection of pikas within the plot as well as the approximate distance of the detection from the marker.
4. Begin searching the entire circular plot for the pika sign types (noting the start time on the form). You may record multiple detections in one row if those were found at the same location (e.g., fresh haypile and fresh scat in the same rock crevice). Search the site for a minimum of 15 minutes and a maximum of 30 minutes, ensuring to look in every possible crack and crevice through the search area. Record the time you completed the search.
5. Estimate the percent cover for each ground cover type and complete survey questionnaire (above).
6. Return survey forms ASAP by fax (406) 888-7903, or email [glac\\_citizen\\_science@nps.gov](mailto:glac_citizen_science@nps.gov), or mail GNP-CCRLC, PO Box 128, West Glacier, MT 59936

## Site marker (aluminum tree tag)



This is a typical site marker that is found at the center of each survey plot.

## Surveys Procedures

- Search permanent 12-m radius plot for:
  - Pikas (visual and call)
  - Pika sign (haypiles and scat)
- Start w/ 5 minute quiet
- Search in/under all crevices for 15-30 minutes
- Record all detections per location/crevice
  - Any pika sightings outside of the plot recorded on back of form
  - Photograph haypiles and collect scat



During the traverse search, you will look for evidence that pikas currently or formerly occupied the area. While searching in and under all crevices for 15-30 minutes, you will record all pika sightings, vocalizations, haypiles, and scat found within the plot. If you see or hear a pika outside of the plot, you can record this information on the back of the survey form.

## Identifying pika haypiles



Take verification photos  
of all haypiles



When you spot haypiles and scat, please take verification photos. It is also very helpful if you collect a sample of fresh scat and place it in a small brown envelope.

## Detecting pika presence using sign

Old Haypile



Fresh Haypile

A haypile often looks like a diverse salad of cut vegetation. Fresh haypiles contain newly cut vegetation, whereas old haypiles have been completely dried. There is often scat along the edge of a haypile as well.

## Detecting pika presence using sign



Fresh Scat



Old Scat

Fresh scat is malleable and has a green tinge to it, due to the chlorophyll found in the plants that pikas ingest. Old scat is crumbly and is not green in color.

| GLACIER NATIONAL PARK HIGH COUNTRY CITIZEN SCIENCE PIKA SURVEY FORM (2013)  |                   |   |   |                              |  |                          |   |
|---|-------------------|---|---|------------------------------|--|--------------------------|---|
| *Date:  |                   | Observer (s):<br>(circle person who conducted search) |   |                              | Phone/Email:   |                          |   |
| Citizen Science Hours (includes driving, hiking & survey time)  |                   |   |   | Time at start of day:        |  | Time at end of day:      |   |
| Trail Name:   |                   |   | Number of miles hiked:                                  |                              | Site Name (#on marker and/or map):<br>If Site marker is not found, enter GPS coordinates of where you began your survey. |                          |   |
| Arrival time at site:   |                   | Begin time for traverse search:                       | End time for traverse search:                           |                              | Departure time from site:  |                          |   |
| TIME AND TYPE OF PIKA DETECTION (Please write "none" if no pikas or sign observed during survey.)   |                   |   |   |                              |  |                          |   |
| PIKA DETECTION TYPES = Pika Sighting, Pika Call, Fresh Haypile, Old Haypile, Fresh Scat, Old Scat   |                   |   |   |                              |  |                          |   |
| Fresh hay/scat contains visible chlorophyll (green tint) and some plasticity when squeezed. Old hay/scat is more brittle, contains little (hay) or no (scat) visible chlorophyll. |                   |   |   |                              |  |                          |   |
| *For the number of pellets, approximate into the following categories: <5, 5-10, 11-50, 51-100, >100  |                   |   |   |                              |  |                          |   |
|   | Time of detection | Detection type (may list multiples per location)      | Distance (m) from site center                           | If fresh scat, # of pellets* | If old scat, # of pellets*   | Verification photo (Y/N) | Comments (Other wildlife and or sign, uncertain detections, etc.) |
| 1   | 14:30             | Fresh Scat  | 5   | 51-100                       |  | Y                        | collected sample  |
| 2   | 14:32             | Old Scat  | 2   |                              | 11-50  | Y                        |   |
| 3   | 14:36             | Old Haypile   | 7   |                              |  | Y                        |   |
| 4   | 14:37             | Fresh Haypile   | 9   |                              |  | Y                        |   |
| 5   | 14:39             | Pika Sighting   | 3   |                              |  | Y                        |   |
| 6   |                   |   |   |                              |  |                          |   |
| 7   |                   |   |   |                              |  |                          |   |
| 8   |                   |   |   |                              |  |                          |   |
| 9   |                   |   |   |                              |  |                          |   |
| 10  |                   |   |   |                              |  |                          |   |
| Estimate % cover for each ground cover type (0, <1, 1-5, 5-25, 25-50, 50-75, 75-95, 95-100, or 100%):   |                   | Rock:   | Bare ground (dirt, mineral soil, plant debris/ sticks): | Grass:                       | Forb (non-woody plants):   | Shrub:                   | Tree:   |

This is a pika survey form. Observations are recorded for fresh/old scat, fresh/old haypiles, pika sightings, and pika calls.

Goal is to determine whether pikas are currently using the potential territory you are surveying



Survey for a minimum of 15 minutes

If no fresh sign (fresh haypile or fresh scat) and no pikas or calls are detected, continue surveying for a maximum of 30 minutes

The overall goal of your survey is to determine whether pikas are currently using the potential you survey. The survey should be 15-30 minutes in duration.

## Hoary Marmot Monitoring



While you are out in the high country, be sure to document any marmots you detect! Watch for a large, bulky ground squirrel and listen for their characteristic long whistle. In 2014, we began a collaboration with a Master's project at Montana State University to learn more about hoary marmots in Glacier National Park.

If you observe or hear a marmot, it would be helpful if you document the date/time, detection type, location, and UTM's. You can write down this information on the back of a high country (pika or mountain ungulate) observation form or on a Wildlife Observation Form.

## Marmot Scat



Marmot scat is much larger than pika scat

Pikas use marmot scat to supplement their diets



You can also watch for marmot scat while you complete pika surveys. Marmot scat is much larger than pika scat and does not form rounded pellets.

Pikas actually can use marmot scat to supplement their winter diets. The pika in this photo was observed in Glacier collecting marmot scat. Research has shown that marmot scat actually contains more energy by density than haypile grasses alone!

**Funding and Acknowledgments**



**Glacier National Park  
CONSERVANCY**

**Thanks to the  
many dedicated  
citizen scientists  
and VIP's who  
make this happen**



## Questions?

