

Citizen scientists in action: Providing baseline data for climate-sensitive species

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IN TIMES OF SHRINKING GLACIERS

and funding opportunities, Glacier National Park (Montana) has had to seek creative new partnerships to meet management conservation goals. The park has developed a citizen science program both as a cost-effective means of gathering baseline data and as an outreach tool to educate visitors and foster resource appreciation and stewardship.

In 2005 the Crown of the Continent Research Learning Center (CCRLC), in collaboration with park resource managers, set out to determine whether some of Glacier National Park's numerous backcountry visitors would be willing to participate in a short training that would allow them to accurately collect data on common loons while hiking in the park. The answer was a resounding yes. The success of volunteer monitoring of loons led the park to formalize its citizen science efforts in 2008 by establishing the High Country Citizen Science Program for inventory of climate-sensitive species.

Climate-sensitive species

Over the past couple of decades, scientists have gathered excellent data documenting climatic changes in the Glacier National Park region. With data pointing toward warming climate trends, managers are increasingly concerned about how climate-sensitive species may be affected in the future. However, the park lacks sufficient staff to collect data on population distribution, abundance, and trends of species of concern.

Abstract

Since 2005 the Crown of the Continent Research Learning Center has been fostering a sense of stewardship in park visitors who are trained to monitor focal species of concern and contribute reliable data to Glacier National Park, Montana. In 2008 we initiated the High Country Citizen Science Program, which focuses on species of concern because of climate change, emphasizing mountain goats and pikas. Participants learn how to safely identify and observe the species, about their behavior and habitat, and why managers are concerned for their future under a changing climate. We have found that with proper study design, citizen scientists can collect reliable inventory data for management. Additionally, engaging the public and youth in data collection instills a strong sense of responsibility and a desire to promote resource conservation on behalf of the park.

Key words: citizen science, climate change communication, mountain goats, pikas

For instance, although mountain goats have long been considered an icon of Glacier, staff knew little about their population status and distribution. Because of observed declines in goat populations at selected viewpoints and uncertainty about current and future effects of climate change, park managers sought more information on mountain goat abundance and distribution (fig. 1).

Managers are also concerned about population trends of temperature-sensitive species, such as the pika. Research has shown that temperature is a crucial factor in determining pika habitat and survival. Climate research in Glacier National Park shows that the mean annual temperature for the park and surrounding area has increased more than 1.3°C since 1900—almost twice the global average increase (NOROCK 2010)—making it critical to evaluate current pika distribution in order to inform future monitoring.

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NPS PHOTO

Figure 1. Following a yearlong study module on climate change, San Diego high school students survey for mountain goats near Hidden Lake in Glacier National Park.

Citizen science

To support data collection on these important species in the absence of NPS-staffed inventories, Glacier National Park turned to volunteer citizen scientists.

“Citizen science” is a term that describes scientific programs and projects in which volunteers, some with no prior scientific training, perform science-based inventory and monitoring or research-related tasks. Citizen science programs offer a cost-effective method for monitoring wildlife over large geographic areas and for long periods of time. When working with species that are easy to identify and methodologies that do not require specialized experience or more than ordinary safety

risks, citizen scientists can assist staff in data collection. By training volunteers on research methods and current science, the CCRLC’s High Country Citizen Science Program not only increases understanding of particular species but also fosters a greater appreciation and awareness of the world we live in and the challenges we face in and around Glacier.

To help inventory mountain goats and pikas, we recruited citizen scientists through press releases, public presentations, flyers, partner groups, newspaper and magazine articles, radio spots, the park’s Web page, and, more recently, social media. Eighty-six volunteers participated in the first year of the program. By 2010, the third year,

that number rose to 143. Student interns are trained each year, and school groups from as far away as Houston, Minneapolis, and San Diego have participated in citizen science, generating enthusiasm for resource stewardship and science in youth.

Evaluating citizen science

Two studies have evaluated the efficacy of the High Country Citizen Science Program: first, a social science survey geared toward determining how well the program meets volunteer expectations, and second, a master’s thesis that analyzes the reliability of mountain goat data collected by vol-

unteers in comparison with data collected by biologists and aerial surveys.

In 2009, Rebecca Goe and Carly Phillips, sociology students at the University of Montana, surveyed participants in the program twice: once prior to the six-hour training session, and again at the end of the season. Most survey respondents indicated that the citizen science experience was “very fulfilling,” and all had positive things to say about the program. Comments ranged from appreciation for the opportunity to learn more about park resources to finding satisfaction in giving something of value back to the park. As one respondent put it, “[This program] is another excuse to go into the park, sit down for an hour and just search with scope and binoculars, the greatest and most effective and cost-efficient therapy out there!” (Goe et al. 2010).

In 2010, program coordinator Jami Belt completed a master’s thesis at the University of Montana evaluating the quality of citizen science data. She learned that biologists are often able to find more goats than do volunteers in a single survey, but volunteers were able to complete more frequent site visits than biologists (at least three times more often) and were more likely to capture the high minimum count on goats for a given survey site. In the final analysis, uncorrected density estimates from aerial survey counts (1.99 mountain goats/km² or 0.77/mi²), volunteers (1.91 mountain goats/km² or 0.74/mi²), and biologists (1.87 mountain goats/km² or 0.72/mi²) were statistically similar. We also learned that utilizing professionally developed field methods and a statistically robust study design are key to program success. Belt’s study concluded that with proper study design, citizen scientists can collect reliable inventory data on mountain goats (Belt 2010).

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Conclusions

Belt’s thesis results are great news for citizen science. While use of volunteers is a tremendous cost savings for resources management programs (in-kind value of volunteer hours in 2010 surpassed \$95,000, or seven full-time GS-5 employees for five months), a considerable investment of effort is required to manage and administer the program. As such, it is crucial to us as managers (as well as to the volunteers) to know that citizen science contributions are valuable to the park and are more than a purely educational investment. Knowing this, we have confidence to continue program expansion with our next project—involving citizen scientists in collecting climate-sensitive aquatic insects. We are delighted to find that citizen scientists can assist us in gathering useful baseline inventory data for climate-sensitive species, while we develop a constituency of volunteers who are passionately concerned about the importance of stewardship, education, and conservation of national park resources.

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References

- Belt, J. J. 2010. Evaluating population estimates of mountain goats based on citizen science. Thesis. University of Montana, Missoula, Montana, USA.
- Goe, R., C. Phillips, and J. Belt. 2010. Evaluation of Glacier National Park’s High Country Citizen Science Program. National Park Service, unpublished report, West Glacier, Montana, USA.
- NOROCK. 2010. Retreat of glaciers in Glacier National Park. U.S. Geological Survey Northern Rocky Mountain Science Center Information Sheet GlacRec2010.

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