



Science in the Crown

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Hardy Survivors of the Alpine

By Melissa Sladek, Science Communication Specialist, CCRLC

Pausing to gasp in a breath of life-sustaining mountain air, I struggled to keep up with my companion and fellow co-worker on our journey toward tree line. Luckily, she became distracted by a rare alpine flower and stopped to show it to me. “This is a spectacular flower. It’s a *Potentilla uniflora*. Let’s see, I think the common name is...well, I can’t remember but look at the woolly hairs on its stem. These help protect the plant from the wind and cold. If you’re a plant up here, you have to be hardy.” Watching her turn and bound out of sight into the raw whipping wind, I started to realize that not just plants are tough at tree line.

After reaching the summit and passing by a large gathering of bighorn rams, we finally reached our destination, a craggy twisted stand of whitebark pine trees. Trees so “hardy” that they not only tolerate, but actually pioneer poor soils, steep slopes, and windy exposures in subalpine and alpine environments. Stopping to look at

the scene, I couldn’t decide what was more impressive, the crooked trees standing guard against the elements of the alpine or the people climbing in them.

I had accompanied Jen Asebrook, a lead botanist for Glacier National Park, up the Scenic Point Trail to learn about the efforts of the botany and revegetation crews in restoring this keystone species of upper subalpine ecosystems. Today the crews are caging cones, the first step in a series of many to save this declining species.

Much has been written about whitebark pine. I typically hear about the importance of its rich, fatty seeds as a food source for grizzly bears and other wildlife, especially in the Greater Yellowstone area. And at one time, before so many whitebark pines died, these seeds were also an important food source for bears in this region. The demise of this tree made me begin to wonder, “What other roles does whitebark pine play in Glacier and what might we expect to lose if it disappeared?”



NPS Photo

A cage covers a whitebark pine cone in order to protect it from the Clark’s Nutcrackers and squirrels that eat them.

SCIENCE IN THE CROWN

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Crown of the Continent
Research Learning Center

CCRLC is part of a network of research learning centers that the National Park Service established to promote research and scientific understanding.

Director's Corner

By Tara Carolin



This issue's Director's Corner might be titled “New Places, New Faces,” as 2010 has been a year for transitions

at the CCRLC. First, our Science Liaison, Paul Ollig, accepted a promotion as Chief of Interpretation at John Day Fossil Beds National Monument. Before departing, Paul supervised the completion of several publications and laid the groundwork for an innovative field trip to bring 22 San Diego high school students to Glacier (see article p. 5). Next to exit was Billie Thomas after serving as our clerk since 2005. Her temporary 4-year position expired and could not be extended. Billie worked for the Learning Center longer than any other employee since its inception in 2002 and might be called the grease that kept everything running smoothly. A seasonal clerk, Terry Peterson, was hired to fill in behind Billie. Terry has a diverse background including wildlife biology, history, teaching, and editing that make her a great fit for the RLC. Her “can-do” and “get-it-done” attitudes and friendly, positive nature make her a great asset to our office. Finally, we'd like to welcome our newest permanent employee, Melissa Sladek to our team. Melissa is replacing Paul Ollig as our new Science Communication Specialist. Melissa is not a stranger to the CCRLC, having worked as our Science Communication Technician since 2008. Many of the

products developed by the CCRLC over the past two years can be credited largely to Melissa's talents and skills in interpretive writing and graphic design. We are excited to put Melissa's experience to good use, and she already has a long list of new products in progress. A few faces have not changed in the past year. You can still find me at my desk, and Sheree West, our librarian, is always on the ready to assist with your needs for tracking down reports and literature about Glacier. We were grateful to have had Jane Clark on board, who helped us expand library service hours last summer by volunteering part time in the George C. Ruhle Library. Susan Sindt was recently recognized for 500 hours of volunteer service developing materials on threatened and endangered species for park naturalists and generally helping wherever needed in our operation, and last winter Sally Kintner contributed more than 500 hours assisting with data entry and entering digital images into the park's database. Jami Belt continues in her role as Citizen Science Coordinator while wrapping up her Master's degree at the University of Montana. We are proud to announce that Jami was recently awarded the Rocky Mountains Cooperative Ecosystem Studies Unit 2010 Student award for the exceptional impact on resources management and educational value of her thesis project, “Evaluating population estimates of mountain goats based on citizen science” (see article p. 7). We also look forward to announcing the arrival of a new, little face in Jami's family when her baby arrives in December!

“Whitebark” continued from pg. 1

Whitebark pine is classified as a keystone species, meaning it performs a role or function that increases the biodiversity of a community. This is true for mountain ecosystems across the west, including Glacier. Its ability to colonize upper elevations after a disturbance, such as a fire, and in harsh, dry, windswept sites makes it a key component in subalpine forests. By doing so, it creates microenvironments, or pockets, protected from the drying wind and sun of high elevations. These “pockets” sustain a diversity of life. Other conifers, such as subalpine fir and Engelmann spruce, are able to grow with the help and protection of the established whitebark pines. In addition, a variety of undergrowth arises which, combined with the multi-aged trees, provides food, shelter, nesting sites, tree holes, and burrows to a variety of animals.

But whitebark pine trees are categorized as keystone species for more than the successional diversity they provide. Persisting in high, snow-laden elevations and unstable soils, these trees also help to regulate runoff and reduce soil erosion. Whitebark pines generally grow in clumps, forming dense tree islands in areas of heavy snowfall or on windy ridges. The broad, spreading nature of their crowns act as both a snow fence, piling up significant amounts of snow, and an awning, shading the snow from melting. Together, this slows the rate of snowmelt in areas of high runoff. The result is later melt-off and higher stream flows in the needed summer months.

According to research by Stephen Arno, whitebark pine trees were once found in 10-15% of forested lands in the northern Rocky

Mountains. Today, it’s a different story. During the last 70 years whitebark pine trees have rapidly diminished. In 2001, research by Kendall and Keane estimates 44% of whitebark pine is now dead in the park. This drastic reduction in numbers is primarily credited to white pine blister rust, a non-native fungus that infects five-needled pines, along with reduced tree health from years of fire exclusion and mountain pine beetle attacks.

First reported in Glacier in 1939, white pine blister rust infects the branches and stems of whitebark pine trees, eventually causing



NPS Photo by Jen Hintz

A white pine blister rust canker infects the stem of this tree.

cankers, which kill the branch and eventually the tree itself. In recent years, research has shown that certain whitebark pines, known as ‘plus’ trees, show phenotypic genetic resistance to blister rust, forming little to no blister rust cankers. It is these ‘plus’ trees that the crews were climbing and caging at Scenic Point.

Before I had a chance to put down my pack, shouts for Asebrook’s opinion on measurements and ‘plus’ trees echoed up from the group of botanists gathered below. Jen dove into action and discussions of cankers and cones ensued. I asked Jen Hintz, another park botanist, what happens to the cones after they are caged. Jen explained, “This is just a part of the

whitebark pine restoration program in Glacier. We cage the cones to protect them from the Clark’s nutcrackers and squirrels that eat them and then revisit the sites in the fall to collect the seeds. The seeds are then sent to the US Forest Service’s Coeur d’Alene Nursery where seedlings are grown for replanting back in the park. This year (and last), we also sent seeds that will be genetically tested for blister rust resistance. This allows us to know which ‘plus’ trees are truly resistant, rather than those that just appear to be.”

Seed collection for rust resistant trees began in 1997 and in 2000, the first whitebark pine seedlings were planted. The success of these seedlings is critical to the survival of whitebark pine as monitoring efforts show a continual decline in the number of healthy whitebark trees in the park. Currently, 78% of remaining live trees are infected. Yet, research also shows that of the 6,400 whitebark seedlings planted between 2000 and 2007,



NPS Photo by Melissa Sladek

Recorders of the revegetation and plant monitoring crews look on as Eric Schmidt cages a whitebark pine cone.

41% survived. To date, none of the surviving seedlings have shown signs of blister rust. With a new understanding of appropriate planting techniques, researchers are hopeful current survival rates will increase in the future.

Seeing the dead skeletons of whitebark pines scattered throughout this patch of blister rust infected trees, it seems the survival of this species is hanging on by a thread. I ask various members of the dedicated crew what chance they think these trees have. Heads shake, eyebrows raise. Most say it doesn't look good for the whitebark. When I ask about the impacts this will have on the

surrounding landscape, all agree that an essential component will be lost. All agree that some impacts may not even yet be understood.

And still, I also notice the excitement in their voice over the trees that have survived. As one of the climbers cages his 100th cone on a particular 'plus' tree, the huddled recorders standing below smile, exclaim disbelief, and pass on words of encouragement. It may be that we've seen the last of these crooked relics, but hiking down from the windy slopes of Scenic Point I began to wonder... maybe these hardy trees could be saved. After all, a group of equally hardy individuals is looking out for them.

Become a Featured Scientist

Each issue of "Science in the Crown" includes an article that highlights a different scientist or research project affiliate with the Crown of the Continent Ecosystem or Glacier National Park.

These articles are intended to help make current park science more visible and accessible to park staff, managers and the general public.

If you have a study you would like us to highlight, or know a scientist currently working in the park you think should be featured, please send an email to Melissa_Sladek@nps.gov

New Products from the CCRLC

By Terry L. Peterson

In 2010, CCRLC created two informative and engaging brochures and three new resource bulletins. In addition, we published a 'rack card' describing who we are and what we do.

Rocky Point Nature Trail is an interpretative brochure describing the changing landscape in a recently burned area. The brochure explains how different species have evolved with and adapted to fire. 'Fire up' your enthusiasm to discover forest succession at work.

Grizzly Bears in the Northern Continental Divide Ecosystem is an educational brochure that relates information from a recently completed study determining bear population densities and trends in the Northern Continental Divide Ecosystem. Read about delisting the grizzly, measuring "bear years," and other 'grizzly' topics in this publication.

Our new resource bulletins include

North Fork Homesteads, Climate Change and the Pika and Aquatic Invasive Species. In the North Fork Valley, European homesteaders predated Glacier National Park and many remnants of those homesteads survive today. The *North Fork Homesteads Resource Bulletin* revisits the history of homesteading in the North Fork as well as recent research of these sites. Homesteads, as archeological sites, have drawn a number of investigators 'up the river,' and led to interesting and engaging findings.

Climate Change and the Pika describes recent research about the North American Pika and how the pika is likely to respond to climate change. Lastly, our *Aquatic Invasive Species Resource Bulletin* draws attention to some of the aquatic invasive species threatening the integrity of Glacier National Park. Historically, non-native fish were intentionally introduced

for sport fisheries. Not only are these a concern but also other non-native species, both plant and animal, threaten our waterways. Read about how you can protect the park by recognizing these aquatic invasive species and stopping these 'invaders' from spreading.



Climate Change Ambassadors Come to Glacier

By Melissa Sladek

Studying climate change isn't always the most uplifting experience but, for the first time this summer, I realized that researching climate change with the right group can be. This past July, twenty-two high school students from San Diego made the trek to Glacier to participate in a week-long service learning project focused on climate change research and its effects on indicator species.

The students, representing 10 different inner city San Diego high schools, are all participants in the *Commission of Science that Matters* program at the Elementary Institute of Science (EIS). EIS is a premier science enrichment center in San Diego that has offered science and technology learning opportunities to students for over 40 years. Participants enrolled in the *Commission of Science that Matters* program address pressing real-world issues as they team up with leaders in the fields of science, business, and education.

In past years, these EIS students joined with scientists and park managers in the San Diego area to

work on service learning projects related to their studies. With this year's focus on climate change, the EIS group began searching for opportunities to work with climate change researchers. Through a series of conversations with staff at the National Park Service Rivers and Trails Conservation Assistance Program, the Southern California Research Learning Center (SCRLC), and Groundwork San Diego, an idea was born. . .perhaps the students could travel to Glacier National Park, cited frequently as the "poster child" for climate change, to collect climate change data.

As part of the Research Learning Center Network, Susan Teel of the SCRLC decided contacting staff at the Crown of the Continent Research Learning Center would be a good start. And thus, a partnership was born. For many months, discussions and planning between the various organizations ensued, cumulating in a plan for a hands-on, citizen science research expedition to Glacier National Park.

On July 4, after a year of studying climate change issues and a long and tiring train ride, twenty-two travel weary students along with ten equally tired adult chaperones scattered about the train station in West Glacier. With luggage carted and stacked in piles, the group waited for instructions. They gathered around for introductions, loaded their luggage into vehicles, and walked the three

miles from the train depot to the Apgar Campground. In an effort to reduce their carbon footprint during their week-long adventure, the Climate Change Ambassadors walked, hiked, or rode the park's shuttles to minimize their impact.

The week was packed full of training, research, and presentations. Students rose early and went to bed late in an effort to immerse themselves in conducting citizen science surveys on mountain goats, a species considered sensitive to climate change, learning about climate change research in Glacier, and assisting with the United States Geological Survey's repeat photography project. It was a hard week, but a life-changing one as one student said, "I personally learned so much about climate change and my personal strength and abilities. This trip has pushed me to keep my mind open and active and ready to learn."

On their final day, the Climate Change Ambassadors shared what they learned with park staff in creative multi-media presentations that included skits, video and sound clips, poetry, rap, and song. The students pledged to spread their knowledge of climate change to their peers, surrounding community, and even the nation.

At the end of the presentations, the students thanked all the EIS and National Park Service staff that made this life-changing trip happen. But, all of us involved in this program agree, the enthusiasm, drive, and creativity of these students actually changed *our* lives. . .leaving us with a new hope for our planet and the challenges that face us.



NPS Photo

EIS students search for mountain goats while conducting a mountain goat survey for CCRLC's Citizen Science Program.

Highlights of CCRLC's Citizen Science Program

By Terry L. Peterson and Jami Belt

Glacier National Park's Citizen Science Program, which started with Common Loon monitoring in 2005, now also provides critical baseline information on mountain goats, pikas, and invasive plants. Citizen science fosters stewardship and promotes public involvement in science while accomplishing research objectives that might otherwise be financially unfeasible. In 2010, 178 citizen scientists contributed over 4,900 hours. This adds up to an in-kind contribution of \$74,115 and is equivalent to 7.5 fulltime seasonal employees.

Glacier's citizen scientists gathered data all summer regardless of rain, wind, and cold weather. We were fortunate, though, that our annual count days for loons and goats were beautiful and sunny. During Loon Day this year, 46 observers surveyed 44 lakes and observed 28 adult loons (9 pairs and 10 singles) and 5 chicks in 3 separate broods (all on lakes in the North Fork). Citizen scientists monitor loons, a Montana Species of Special Concern, to develop annual estimates of population and reproductive success. Because Montana only has an average state loon population of about 35 chicks per year, each loon chick is important to the continuation of the loon population into the future.

For the third annual Mountain Goat Days, over 30 citizen scientists conducted an annual count of goat populations at representative sites throughout nearly the entire park between August 17th and 27th. In total, 155 goats were recorded. These counts represent a snapshot of the population at targeted sites from year to year, but do not represent a park-wide population

estimate. Glacier National Park resource managers use these numbers to detect potential population changes that may be precipitated by climate change and other changes in alpine habitats.

Twenty of our 22 regularly monitored pika sites had pikas present (confirmed when volunteers saw at least one pika and collected scat at each site), and citizen scientists discovered pikas in four other sites. Pika presence/absence is also important for monitoring continued habitation of the alpine by this temperature sensitive member of the hare family, in the face of climate change.

Most infestations of invasive plants in Glacier National Park are closely correlated to disturbed sites and backcountry trails. These areas provide a corridor for invasive plants to spread. Monitoring the spread of invasive plants along Glacier's 700+ miles of trails in the backcountry is a difficult task.

Our invasive plant citizen scientists learn how to identify 5 targeted non-native plant species, and how to map their locations using GPS units. This year, weeds were detected on 24 trails. On 14 trails, no invasive plants were found. We also held the first annual Noxious Weed Blitz. Blitz participants were trained as citizen scientists to assist Glacier's Invasive Plant Management Program by learning to identify, map, and pull invasive plants. Fourteen participants mapped and pulled weeds along Lower McDonald Creek and the Middle Fork of the Flathead.

In addition to our season-long participants, we engaged a number of interested groups in citizen



NPS Photo by Melissa Sladek

Jane Clark pulls oxeye daisy at the first annual Noxious Weed Blitz.

science. Students from three classes at the University of Montana were trained in our educational outreach program and collected data for our projects. We hosted 22 Climate Change Ambassadors, ages 13-17, from the San Diego Elementary Institute of Science for a week of camping, citizen science, and learning about climate change in Glacier National Park. Sperry Chalet Staff, teachers from Conservation Across Boundaries, and individuals attending the Glacier Park Associates Annual Fundraiser also participated in citizen science, furthering their contribution to Glacier.

The great success, this year, of the Citizen Science Program, can be directly attributed to the generous funding provided by The Glacier National Park Fund and by the dedication and hard work of the volunteer citizen scientists. We thank you all.

Does Citizen Science Really Work?

Results of a Master's Thesis on Mountain Goat Population Estimates

By Jami Belt

Citizen science is a term that describes scientific programs and projects in which volunteers, some with no prior scientific training, perform research-related tasks. Citizen science programs offer a cost-effective method for monitoring wildlife over large geographic areas and for long periods of time, while fostering a greater appreciation and awareness of research issues. The number of these programs is growing exponentially as participation and interest by the public increases and funding for ecological research diminishes. But the jury is still out about whether citizen science provides reliable data. Few studies have compared results from data collected by volunteers to results collected from more traditional methods (e.g., biologists and/or aerial surveys).

Mountain goats are the icon of Glacier National Park, yet little is known about their current population status and distribution across the park. Most of our knowledge about mountain goats in Glacier comes from a pivotal study conducted in the 1970's by Doug Chadwick. Recent declines in goat numbers at a prominent mineral lick in Glacier and throughout the neighboring Bob Marshall Wilderness, as well as the uncertainty of how climate change may be affecting them, identified mountain goats as a high priority species needing further research.

Mountain goats are also an ideal species for citizen science due to being highly visible, charismatic, and easy to identify. In 2008, with support from the Glacier National Park Fund, the High Country Citizen Science program was

born. One of the primary objectives of the program was to enlist citizen scientists to hike to mountain goat habitat throughout the park and count how many goats were present. During the course of 2008 to 2009, we trained 140 people to count mountain goats.

To ensure that this citizen science program would indeed detect potential changes in Glacier's goat population, research was needed to determine whether citizen science observations are a useful method for monitoring mountain goat populations. We also hoped to shed some light on the reliability of citizen science programs in general. To this end, I embarked upon a Master's thesis project to compare estimates of mountain goat abundance by volunteers at sites throughout Glacier to estimates by biologists and aerial surveys at a smaller number of sites.

Because volunteers are expected to have more highly variable skill levels than biologists, it was important to directly measure differences in detection probability, or the percentage of goats seen by volunteers versus the percentage



Photo by Travis Rosenkoetter

Even when she's not conducting surveys or training citizen science volunteers, Jami Belt's passion for goats seems to follow her wherever she goes!

seen by biologists. To do this, Glacier's citizen science volunteers teamed up with park biologists to do 76 side-by-side surveys. Communication was not allowed during these surveys. Comparing the results of these double observer surveys gave insight into which factors were causing differences in goat detection. Surprisingly, volunteer experience, as measured by a self-ranking survey, had no influence on whether volunteers had high or low detection probability. Mountain goat group size influenced detection probability more than any other

factor; as mountain goat group size increased, the percentage of goats detected by volunteers moved much closer to the percentage detected by biologists.

These double observer surveys also yielded an average detection probability for volunteers and biologists. As we anticipated, biologists saw a higher percentage (81%) of mountain goats on average than volunteers (65%). Therefore, abundance estimates of mountain goats by volunteers would be expected to be significantly lower than estimates by biologists and aerial surveys. But this was not the case. The population estimates by citizen scientists and biologists overlapped, and citizen science estimates were nearly identical to aerial survey estimates. But why?

Each of our survey sites provided a glimpse into a potential mountain goat home range or rough territories in which wildlife live, but observers could only see a portion of the home range due to topographic features blocking their view. Goats move around a great deal within their home range, which means that not all mountain goats living in the area were visible during each survey. Because volunteers were able to conduct more frequent surveys at each site, they had an increased likelihood of seeing a higher percentage of the goats inhabiting each home range.

Essentially, the likelihood of being in the right place at the right time goes up the more often you are in the right place. More frequent site visits by volunteers balanced out their lower detection probability resulting in abundance estimates that were close to those of biologists, but were actually less variable. In short, when volunteers can conduct far more surveys than

biologists can for an equal amount of funding, the resulting population estimates are statistically similar, at least in the case of mountain goats.

Now that the park had a viable baseline population estimate of mountain goats, an important question remained. Could citizen science mountain goat surveys reliably detect a significant decline in population size if one occurred over a period of say, 10 years? Due to the variability in our population estimates, we found that neither estimates by volunteers or biologists had sufficient statistical power to detect a 30% decline in mountain goat population size. However, by reducing the number of sites and increasing the number of surveys at each site, the ability to detect a decline of this level could be reached. These results underscore the

importance of evaluating a citizen science programs early in their establishment and modifying the survey design if necessary.

The value of engaging the public in research is huge, but more evaluations are needed to ensure that citizen science data is reliable and valuable to managers.

Jami Belt defended her thesis in September 2010.

She currently coordinates the Citizen Science Program at the Crown of the Continent Research Learning Center.

Become a Citizen Scientist

The CCRLC is looking for dedicated individuals who wish to assist with our research efforts as wildlife observers and citizen scientists. Participation in the program requires attending a 3-8 hour training session (depending on the project) and signing up as a park volunteer. Current citizen science projects include:

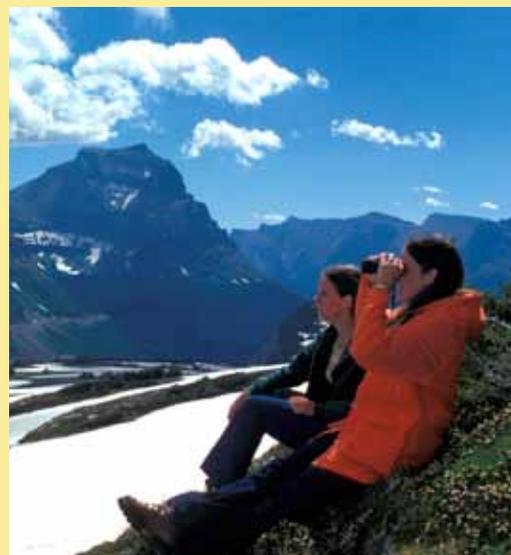
Common Loon Monitoring: Survey Glacier National Park's hundreds of lakes to document presence of Common Loons and breeding and nesting behaviors.

High Country: Collect data on the number and distribution of three species of concern for Glacier National Park: mountain goats, pikas, and Clark's Nutcrackers.

Noxious Weed Mapping: Survey Glacier National Park's 700+

miles of hiking trails to determine the distribution and extent of noxious weeds invading the park.

For more information, please contact Citizen Science Coordinator Jami Belt (jami_belt@nps.gov).



NPS Photo

Experiences of an Education Technician

By Steve Huffman

After majoring in Fisheries and Wildlife Science, I became a research assistant for various state and federal agencies where I worked with salmon, spotted owls, and sea turtles. These positions gave me the unfortunate experience of watching species near extinction; a motivating factor in my decision to work with a younger generation and become a science teacher.

In the last 13 years, I've been fortunate to teach science to students from sixth grade through the college level. But this summer, I was privileged to have the opportunity to combine my experience in field research and education while working for Glacier National Park as an Education Technician.

I am so impressed with the quality of all the people I met this summer and how technologically advanced natural resource management has become. My colleague, Mike Krug, and I were given the responsibility of designing a hands-on research project for local middle school and high school students that they could conduct while taking a field trip in the park.

After first learning about all the limitations and liabilities that go along with bringing school children into Glacier, we were assigned to Dennis Divoky's Fire Effects Crew to learn about fire effects monitoring. After that we worked with PhD candidate Dave McKenzie from the University of Wyoming studying western red cedar near Avalanche Lake.

The next week we spent four wonderful days at the head of Logging Lake on the Northwest side of the park studying the geomorphology of bull trout

habitat. Here, Dan Kotter and his crew from the United States Geological Survey (USGS), put Mike and I to work doing streambed analysis along transects, measuring stream flows, and setting up remote water and air temperature sensors. This will allow scientists to put together 3-D snapshots of how climate change and melting glaciers are affecting the habitat of bull trout and their ultimate survival.

Next, we traveled to the east side of the park to work with the



Steve Huffman on Mt. Siyeh

revegetation and monitoring crews as they caged whitebark pine cones. Whitebark pine trees are part of a complex food web that involves the Clark's Nutcracker, squirrels, and grizzly bears. Unfortunately, these trees are dying out in the park due to a disease called blister rust. By caging the cones on the surviving trees, scientists are able to collect the seeds, propagate healthy seedlings, and ultimately replant trees to help save this critical alpine species.

We also had the privilege of spending a day up in Many Glacier with physical scientist Lisa

McKeon of USGS. She explained her work in photographically documenting the disappearance of the park's original 150 glaciers. With only 25 glaciers left in the park, her photographic exhibit at the Many Glaciers Hotel was one of the most stunning, in-your-face, examples of the effect climate change is having on the park.

On my days off, I managed to squeeze in a few climbs. One memorable weekend, I made back-to-back climbs of Mt. Reynolds and Mt. Siyeh. The scramble to the top of Siyeh was particularly unforgettable because we were able to sit on the 10,014 ft. summit and look 4,200 feet down on the beautiful aqua-marine color of Cracker Lake while a grizzly bear, just a few 100 meters below us, rolled boulders looking for army cut worm moths.

Mike and I felt inspired by our days out in the field with Glacier's research crews and spent the next two weeks writing a sixty page curriculum guide for teachers. The curriculum focuses on collecting data and creating a data set during a plant monitoring field trip to the park. As the data they collect accumulates over the following years, students will be able to analyze any trends or changes that occur. This allows students to understand the power of collecting a large data set, and the power of not just learning science, but actually doing science in the Crown of the Continent.

This is an important and necessary combination that I can relate to as both a researcher and an educator. It allows for students to gain a more rounded experience of what science is and why research is important. . . not to mention lighting the spark for future budding scientists.

Intern Spotlight

By Staff

This summer the CCRLC was lucky to have some wonderful interns and volunteers. Whether it was working in the library, conducting citizen science surveys, or assisting us with 22 high school students from San Deigo, each individual allowed the CCRLC to accomplish its many projects and goals. Our center would not run smoothly without them!

"My time here at Glacier was extremely valuable and taught me a lot about research for the sake of conservation."

~ Hale Morrell

students from California. Marc can truly say some of his 'firsts' in life happened here...such as his first time ever backpacking!

We also had our remarkable Jane Clark who not only volunteered three days a week in the library, but also conducted many citizen science surveys. Without her help, the library would not have been open additional

Hale Morrell worked with Jami Belt on the Common Loon Monitoring Citizen Science project. All of us appreciated her dedication, motivation, and hard work coordinating Loon Day. Marc Jeker assisted with the High Country Citizen Science project and the EIS

hours. And finally, Dylan Lewis stepped in at the end of the summer to assist Jami with wrapping up all citizen science projects. His positive attitude and willingness to learn was infectious. Thank you CCRLC interns and volunteers!



NPS Photo

Marc Jeker and Hale Morrell cross a foot bridge near Grinnell Lake.

Crown of the Continent Research Learning Center

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Crown of the Continent Research Learning Center Goals and Mission:

- Facilitate use of parks for scientific inquiry;
- Support science-informed decision-making;
- Communicate relevance and provide access to research knowledge; and,
- Promote resource stewardship through partnerships

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