

# **Geophysical Research at Storm Peak (GRASP)**

**2010-2011**

**External Evaluation Summative Report**

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## Project Evaluation Overview

This project was funded by the National Science Foundation. Building on the success of the 2008 pilot program, this two-year project has consistently met or exceeded its goals and objectives. The evaluation plan has included front-end, formative, and summative evaluation using both quantitative and qualitative analyses.

The program evaluation began with a summary of the pilot program's outcomes. Using this as a front-end evaluation foundation, the evaluation was customized each year as the program evolved. A formative evaluation report after the first year provided an analysis of the pre- and post-program participant survey results and included recommendations for fine-tuning of the program in its second year. Feedback from participants was overwhelmingly positive. A similar report after the second year provided data that were very consistent with the first year. The summative evaluation work included in-depth interviews with participants from all three years of the program to assess longitudinal effects of GRASP participation on the lives of attendees.

From the proposal, the first goal of the GRASP program was as follows:

*to help students from underrepresented groups develop skills in critical thinking and cultivate their self-esteem, self-discipline, commitment, and enthusiasm for scientific inquiry through a program that will have a hands-on field experience as its cornerstone. These skills along with practical advice will prepare GRASP students for careers within fields of Geoscience.*

This goal was well met. The groups of participants were quite diverse, and included many groups that are underrepresented in the geosciences. Increases in participants' skills, attitudes, confidence, and enthusiasm are clearly shown in their interview responses during 2012. Their accomplishments since participating in GRASP indicate their continued successes.

Specific objectives listed in the proposal were as follows:

- *Introduce the students to a spectrum of careers and professionals within Earth Science.*
- *Provide the students with information on financing their undergraduate and graduate education, and future summer research opportunities.*
- *Link the students with mentors (both faculty and peer-mentors) for their research projects and transition between their undergraduate and graduate programs.*
- *Provide the students with an authentic research experience in Earth Science.*

Each of these objectives has been met, as has been demonstrated by both the survey results and the interview data, summarized in this report.

*The second goal of this proposal was to strengthen pre-existing institutional partnerships allowing GRASP to become a self sustaining program beyond the proposed funding cycle.*

**Institutional partnerships have remained strong throughout the program. Instructors, guides, and advisors for the program include geoscience professionals from a half dozen research and education institutions. Plans are in place for future funding applications to continue the program.**

## Evaluation Implementation Overview

As planned in the original proposal, evaluation of the project focused on activities related to course goals and objectives. Multiple evaluation methods were employed using both qualitative and quantitative techniques in order to examine the impacts and effects of the workshop on participants.

The first phase of the evaluation was obtaining Human Research Committee approval from the University of Colorado's Office of the Vice Chancellor for Research. This evaluation was approved as Exempt.

The program evaluation itself began with a front-end evaluation analysis of the survey and interview data collected during the pilot program. This summary informed the design of the 2010 year of the program and its evaluation.

Working with input from project managers and evaluation specialists at the American Institutes for Research, the evaluator designed pre- and post-course online survey instruments to measure the attitude and content knowledge changes of participants. Analysis of the first year of results provided formative evaluation data for fine-tuning plans for the second year's implementation. Course grades were not a part of the program.

Although existing in the original plan, online journaling by participants did not prove practical during and after the workshop; therefore, alternative interaction and documentation methods were created. Open-ended feedback questions were included in the post-workshop survey to gather real-time impressions from participants. Course designers and faculty at participating schools exchanged reflections and suggestions as the course was developed using email and telephone conversations. A Facebook community was set up to provide an online learning community environment. This implementation, as well as the listserv and individual email connections, provided the interactive ongoing infrastructure to enable all participants in the program to remain engaged in a vital learning and support network during and after the workshop.

The archive of PowerPoint presentations created by participants and collected by project managers provide additional documentation of the students' achievements in both their scientific research and their presentation skills.

During February 2012, interviews with nearly all participants provided longitudinal and summative reflection data of participants' experience with GRASP. Qualitative analysis of these data revealed trends in participant career plans, graduate school ambitions, confidence levels, and other changes in their lives due to their involvement in the program. Impacts of the workshop, group work, presentation development, and the trip to Washington, DC, were all explored. These data were analyzed and presented to project managers in a 2012 report.

All data collected by the project evaluation are summarized in this Summative Evaluation Report.

# **GRASP Project 2008 Pilot Program**

## **Indicators for 2010 Evaluation Methodology**

The GRASP pilot program was conducted in 2008. Pre- and post-program surveys and post-presentation interviews were used to collect evaluation data from participants during this program. Instruments and data from this study were reviewed as the 2010 program instruments were being developed. Key points informing the 2010 evaluation instruments are listed below.

### **Pre-/Post-Program Surveys**

- It was decided that the 2010 instruments would be administered via SurveyMonkey.
- Several questions about self-efficacy were added to the pre- and post-program surveys to monitor any changes in participants' attitudes in this area.
- Due to the large number of begun-but-not-completed applications, two questions were added to the pre-program survey asking about the respondents experience with the application process.
- Likert scale questions were made with a consistent number of four options; some had an additional "I don't know" type option.
- Item analysis of the 2007 data showed that a few possible multiple choice items were not selected at all in 2007; these were considered for removal from the 2010 surveys.

### **Interviews**

- Experience with collaboration/collegiality and the availability of mentors/advisors were important.
- Two participants would have liked some more background information in advance of the start of the program—maybe some atmospheric science basics so they aren't completely lost with the Boulder presentations.
- One person suggested including writing practice/critique be included as well as the presentation component.
- The continued contact with the GRASP team was very important to participants. They also appreciated hearing about all the opportunities that were sent to them.
- Overall format was highly praised; some wished it could have been longer.

## 2010-2011 Evaluation Highlights

The program was very successful in 2010. Participants valued their experience a great deal.

The evaluation of this program included pre-program and post-program online surveys as well as review of the students' work after the program. A registration survey was completed in May 2010 by the nine accepted participants. One of these people did not attend the program; however, another person signed up and completed the program. This person plus the remaining eight original registrants completed the post-program survey. At any point in time, therefore, the response rate to these surveys was 100%. However, only eight of the nine participants who completed the program filled out the registration survey. The program took place in Colorado in August 2010. The post-workshop survey was completed at the end of the final day of the workshop. In November 2010, participants traveled to Washington, D.C., to give presentations on their research projects in groups of three.

Information gathered from the pre- and post-workshop surveys is summarized below.

**The group of participants was demographically diverse. Four participants were to be juniors in fall 2010 and five, seniors. Applicants had a strong interest in science and research when they applied.** Although a few participants had worked in a college labs or had been on geoscience field trips, none had been involved in any atmospheric research to date. Concern about and enjoyment in observing nature were high for all participants and this increased during the program for many. Attitudes towards hiking and camping were positive before the program and even more so after the program. Most participants enjoy reading and watching television shows about science, though this decreased very slightly after the program. Participants overall enjoy travel and did so even more after the program.

**Participants felt that engineering, math, and science are important and mostly interesting.** A slight preference for field work over lab work was seen among participants, but this did not change in any consistent manner during the program. **Interest in the geosciences was high among all participants. All participants believed that if they want to, they could be a scientist. All participants agreed that the geosciences, biology, and engineering are very important.** There was some agreement that biology is interesting but this decreased slightly after the program. Most participants agreed that math and engineering are interesting.

**Participants felt they understood what biologists and engineers do before the program; they were not so confident about what atmospheric scientists and computer scientists do (though this increased after the program). Most thought these fields were fairly well-paid. Most respondents thought they would enjoy a job in the geosciences.** Most participants knew what biologists and engineers do at work both before and after the program. Although most participants did not know what atmospheric scientists do before the program, they did afterwards. Understanding of what computer scientists do started out fairly weak and got slightly stronger during the program. Most participants agreed that biologists and geoscientists are well paid. They were in much stronger agreement that engineers and—to a lesser extent—computer scientists were well paid.

**Desire for a career near home was very balanced in both the pre- and post- surveys.** Most respondents wanted a career that includes travel; this increased slightly during the program. **All respondents agreed that they'd enjoy a career in geoscience before the program, and were even more strongly in agreement after the program.**

**Participants appear to have positive attitudes about their ability to become a geoscientist and their support system. Overall impressions of geoscience faculty at their colleges were positive.** During the program, it appears that participants learned about the courses necessary to become a geoscientist. **All participants felt they could handle the coursework required to become a geoscientist before and after the program. All respondents felt their friends and family would be supportive if they became a geoscientist.**

**Respondents agree that there is a sense of community among geoscience majors; this agreement increased over the course of the program.** There was less agreement about the sense of community in biology, though this also increased over the course of the program. Respondents' agreement that there is a sense of community among engineering majors was not stronger after the program. **The group overall agreed that geoscience faculty members are easy to talk to and this didn't change much over the course of the program. Most respondents think that geoscience faculty members are willing to answer questions outside of class; this agreement was stronger in the post-program survey.** Most respondents did find geoscience faculty more interesting than other faculty; overall, the strength of this agreement increased during the program.

**Many participants planned to enter a graduate program after completing their bachelor's degree; many also thought they would work before or during graduate school. Among the partnering universities, Howard University and the University of Nevada at Reno seemed to be of the most interest to participants for graduate school.** Most respondents said they were likely to enter a graduate program right after graduation in both the pre- and post- program surveys, though their certainty seemed weaker in the post- survey. Most respondents were likely to enroll in a graduate program while working. The pre-program survey showed roughly equal numbers were likely to work for a while and then enter a graduate program; after the program, this was the majority. About half of respondents to both surveys were likely to get a job right after graduation. There was some interest in attending graduate school at each of the universities that were asked about. Over half the respondents were interested in attending Howard University. Less than half were interested in attending Tennessee State University. Over half the respondents were interested in attending the University of Nevada at Reno. Almost half the respondents were interested in attending Hampton University.

**Atmospheric Science and Geoscience were by far the most popular majors selected for graduate study. Almost all the respondents selected Atmospheric Science as a likely major in the pre-program survey. A majority of the respondents selected Geoscience as a likely major in the pre-program survey as well.** There was only one selection of Biology for a major in graduate school on the pre-program survey, four selections of Chemistry, three for Engineering, and two selections each of Computer Science, Math, and Physics.

**Participants felt confident overall in their academic skills for graduate school. They believed in the importance of a graduate degree but were concerned about paying for graduate school.**

Almost all respondents agreed that they had the academic skills to do well in graduate school and had the study skills to do well in graduate school. Almost all respondents believed it's important to have a graduate degree in order to be successful in their career. However, almost all respondents were worried about being able to pay for graduate school.

**Most participants were fairly confident in doing the work of geoscience research; this confidence increased in most cases over the course of the program. They were confident about their abilities to do well in their coursework, though a little less so for advanced geoscience classes. All were completely confident they would finish their bachelor's degree.**

More than half the respondents were at least moderately confident in designing a geoscience experiment coming into the program; that number increased by the end. Almost all the respondents were at least moderately confident in collection and analysis of geoscience data both before and after the program.

**Presentation confidence increased among participants.** Almost all respondents were very confident in their ability to prepare presentations for general audiences; after the program, their confidence was even higher. All but two respondents before the program were at least moderately confident preparing presentations for academics; however, two were not at all confident. After the program, all were at least slightly confident.

**All but two respondents before the program were at least moderately confident explaining research results to a general audience; after the program, all were at least moderately confident.** Before the program, most respondents were at least moderately confident in explaining results to an academic audience. This was also true after the program. Before and after the program, more than half the respondents felt at least moderately confident presenting at a geoscience conference. **Before the program, all but two respondents were at least moderately confident presenting a poster at a geoscience conference; this increased to all but one in the final survey.**

**In the first survey, all but two were at least moderately confident in their ability to answer questions about research results and four were totally confident. In the second survey, all but two were moderately confident.** Before the program, all but one participant were at least moderately confident of earning an A in an intro geoscience course; after the program, all were at least moderately confident and all but two were totally confident. Before the program, all but two participants were at least moderately confident in earning an A in an intermediate geoscience course; after the program, all but one were at least moderately confident and all but two were totally confident. Confidence in earning an A in an advanced geoscience class dropped somewhat between the two surveys; six respondents were moderately confident or better in the first survey, but only three were at that level in the second survey. Confidence in earning an A in a college math course increased slightly overall between the two surveys. Most respondents were only slightly confident of earning an A in a college physics course in the first survey; in the second, four were moderately confident or more and five were slightly confident or less.

**Most participants were somewhat confident about the process of getting into graduate school on the first survey, but by the end of the program this confidence seemed a bit shaken for a few of them on the topics of essay-writing and the GRE.** All but two respondents on both surveys were at least moderately confident in their ability to write a graduate school application. All but two respondents on the first survey were at least moderately confident in their ability to write a compelling essay to apply to graduate school in the first survey. In the second survey, confidence levels had fallen somewhat with almost half only slightly or not at all confident. Confidence levels on earning a high score on the GRE fell somewhat between the two surveys. All but two expressed moderate or better confidence levels in the first survey, but only four expressed that level of confidence on the second survey. Confidence in obtaining adequate financial support for graduate school was similar in the two surveys. Two fewer people were totally confident in the second survey although three more were moderately confident.

**Participants' information on the graduate school application process improved during the program. Understanding of how to pay for graduate school changed in several areas. Respondents seemed slightly better informed of the graduate school application process after the program than before. The process of taking the GRE was slightly better understood after the program than before.** Awareness of scholarship opportunities increased slightly between the two surveys. Overall awareness of government programs to pay for graduate school increased slightly during the program. Participants knew slightly more about other sources available to pay for graduate school after the program than before.

**Most participants plan to work during graduate school; they were largely interested in fellowships, teaching assistantships, and research assistantships as well as scholarships.** Most respondents considered it likely they would pay for graduate school by working. About half the respondents thought they would pay for graduate school through financial support from family or friends. Almost half the respondents in the first survey thought they might pay for graduate school with a scholarship; well over half thought this in the second survey. Overall, it seemed slightly less likely that participants would use a loan to pay for graduate school after the program than before it. The likelihood of respondents paying for graduate school with fellowships seems slightly more likely after the program than before. **Almost all respondents thought they would pay for graduate school with teaching assistantships and/or research assistantships.**

When asked to describe the best things about the program, participants primarily mentioned the following:

- Direct interaction with the scientists.
- Including indoor and outdoor activities.
- Working with a diverse group of other students.
- The helpfulness of the mentors—Ian, Gannett, and Craig
- The variety of interesting scientific topics and hands-on experience.

When asked how to improve the program, the responses were primarily centered around the following:

- Allow a little more down-time and spread out the lectures a bit more; morning is the best time for the lectures.
- Provide name tags for the conference staff.
- Provide a sample agenda from a previous year on the application site so that people have a better idea of the program's structure.
- Provide an optional detailed session on applying to graduate school.
- Consider trimming the SOARS sessions a bit and adding more time outside at Storm Peak.

**Based on the evaluation results, the following specific logistical recommendations were made for the following year's program:**

- **The application process was considered easy to use; two suggestions for improvement were adding the ability to upload MS Word documents for the essays and acceptance of unofficial transcripts.**
- **Provide a sample agenda from a previous year on the application site so that people have a better idea of the program's structure.**
- **Allow a little more down-time in the program schedule and spread out the lectures a bit more; morning is the best time for the lectures.**
- **Provide name tags for the conference staff.**
- **Consider trimming the SOARS sessions a bit and adding more time outside at Storm Peak.**
- **Include a more extensive session on preparing for graduate school. It would be good to highlight the GRE and the essay since these seem to be areas of lower confidence for participants.**

## 2011-2012 Program Highlights

Once again, the program was very successful in 2011. Participants valued their experience a great deal. A registration survey was completed in May 2011 by the nine accepted participants. The program took place in Colorado in August 2011. The post-workshop survey was completed at the end of the final day of the workshop. In November 2011, participants traveled to Washington, D.C., to give group presentations on their research projects.

Findings from the pre- and post-workshop surveys are summarized below.

**There was excellent diversity in the program this year with participants who identified themselves as African American, Native American/Alaska Native, White, and Hispanic/Latino.**

The most important reasons that respondents cited for attending the GRASP program were learning about the GRASP program, learning about science, learning how to do research, and liking the atmospheric sciences. Most participants found the application fairly easy to complete; two found it very easy. The few suggestions to improve the process included making the open-ended questions less redundant and clearer instructions on who to send materials to.

Most participants had gone on a geoscience field trip in college, and several had also worked in labs or done an independent research project. All but two participants were going to be seniors in Fall 2011; there were also a freshman and a junior. Almost all expressed concern about nature and the environment and agreed they enjoy observing nature in both surveys. One person increased their level of concern from disagree to agree between the pre- and post-surveys.

**There was an increase in the number of participants who enjoyed hiking between the two surveys.** Appreciation for camping stayed about the same. Respondents reported fairly strong agreement that they enjoyed reading nature publications; this didn't change between the surveys. All reported enjoying television shows about nature and science, though a little less strongly overall in the post-survey.

**Respondents reported enjoying travel to different places on both surveys. There was an increase in their preference for working in an outdoor science setting after the program.**

**All respondents were very confident they could become a scientist both before and after the program.** Although there was overall agreement, there was a very slight decrease in respondents' agreement that geosciences are interesting after the program, and a slightly stronger increase in their assessment of the importance of geosciences. Although there was overall agreement, there was a very slight decrease in agreement that math is interesting after the program, and a slightly stronger increase in agreement that math is important. Although there was overall agreement, there was a decrease in the agreement that engineering is interesting after the program, and a very slight decrease in agreement that engineering is important.

**Understanding of some geoscience fields increased for participants. Reported awareness of what biologists and atmospheric scientists do at work increased for several participants during the program.** Reported awareness of what engineers and computer scientists do at work decreased slightly for several participants during the program. Overall, there was a very slight increase in agreement that biologists are well paid and a slightly greater increase in agreement that geoscientists are well paid after the program. There was general agreement, decreasing very slightly after the program, regarding engineers and computer scientists being well paid.

**Respondents were fairly evenly split on wanting careers that allow them to work in their community before the program. After the program, a clear majority agreed with this desire. There was strong unchanging agreement in wanting a career that both allows and requires travel.**

**There was general agreement that increased slightly regarding enjoying a career in geoscience.** Two respondents increased their awareness of the courses needed to be a geoscientist during the program. **There was general unchanging agreement that respondents thought they could handle the courses necessary for geoscience. The general agreement increased slightly in strength during the program regarding family support for becoming a geoscientist. Similarly, there was general agreement that increased slightly regarding their friends' support for this career goal.**

**The general agreement that geoscience faculty are easier to talk and are more willing to answer questions with than other faculty didn't change much during the program.** Specifically, only one person (of the five who changed their views) increased their belief that geoscience faculty members were easier to talk with. Three were more sure and three were less sure of faculty's willingness to answer questions.

**Most respondents did not intend to enter a professional program right after graduation; two** definitely planned to do so after the program, whereas none definitely planned to do so before the program. **A larger majority planned to enter graduate school after the program than before the program. The majority of respondents planned to enter a graduate or professional program while working both before and after the program.** Those expecting to get a job right after graduation were about evenly split and the responses did not change before versus after the program.

**Before the program, only one respondent had definite plans to attend one of these graduate schools (UN-Reno). After the program, three reported definite plans (2 for UN-Reno; 1 for TSU).** There were slightly fewer respondents considering Howard for graduate school after the program than before it. Overall, plans to choose chemistry didn't change much (slightly less than half the respondents planned to do so on each survey). Only one person planned to select computer science as a major on each survey. Slightly fewer were interested in engineering as a major after the program (though the four definitely planning it as a major stayed with it). **Overall, there was a slight increase in respondents' reported likelihood to major in atmospheric science and/or geosciences after the program—both majors were considered likely by most of**

**the respondents.** Respondents considering math and/or physics as a major increased slightly after the program, but were overall not as numerous as those favoring the other majors.

**Almost all respondents were confident in their academic skills and most were confident in their study skills in both surveys. Almost all respondents thought it was important for their career to have a graduate degree and almost all were concerned about being able to pay for graduate school. There wasn't a great deal of change between the two surveys.**

**Confidence levels increased in respondents during the program to design a good experiment, collect data, analyze data, and prepare presentations for both academic and general audiences.** There was a slight increase in confidence in each of these areas after the program except respondents' confidence in answering questions about their research results (there was a slight decrease overall in this category).

There were slight decreases in the very high overall confidence to earn an A in introductory and intermediate geoscience courses after the program. **There was a strong increase in a preliminary moderate confidence in earning an A in an advanced geoscience course and a slight increase in confidence for earning an A in a college math course.** There was no change between the two surveys in confidence for earning an A in a physics course.

**All respondents were totally confident in both surveys of being able to finish their bachelor's degree. Confidence overall in writing a strong application and a compelling essay for graduate school was lower after the program than before.** It was very slightly lower after the program for earning a high score on the GRE. Overall, confidence in finding financial support for graduate school stayed about the same between the surveys.

**Overall, there was an increase in reported knowledge in taking the GRE, scholarships, government programs that help support graduate school, and other ways to pay for graduate school after the program. The strongest knowledge level indicators after the program were regarding the GRE.**

**Though specific selections changed for a number of respondents, overall likelihood to pay for graduate school by working and/or financial support from family/friends remained about the same in the two surveys, with a slight increase in the latter.** Likelihood to use a scholarship or loan between the two surveys varied less but decreased slightly. **Research assistantship was considered the most likely overall, and remained constant between the two surveys. Likelihood of using fellowships and teaching assistantships both increased slightly between the two surveys.**

**All respondents considered it likely that in ten years they would be working in a geoscience field and/or a career in the sciences. Between the two surveys, there was an increase in likelihood that they would be working in geoscience.**

**Open-ended feedback questions about the program were very positive. The most common suggestion for improving it was to make the program longer.**

## DC Trip and Participant Activities After the Program

All participants traveled to Washington, DC, during the fall after their summer workshop. They received a tour of Goddard Space Flight Center and Howard University. At Howard, they delivered group PowerPoint presentations on their research projects to an audience (which included mentors who had been participants in previous programs). Topics of their presentations were as follows:

- An Analysis of Local Diurnal Particulate Concentration
- Cloud Condensation Nuclei and Aerosol Concentrations at Storm Peak Laboratory
- The Affects of China Yellow Dust at Storm Peak Laboratory
- Effects of Arizona Wild Fires Observed at Storm Peak Lab
- Aerosol Anomalies at Storm Peak Lab
- Regional Transport of Trace Gases Associated with Wildfire

During their trip, the participants also toured various attractions including the National Mall and the Smithsonian.

The students from the program have continued to distinguish themselves in pursuing career-oriented opportunities. Starting with the DC trip in 2010, many previous participants become mentors of new participants. From interview data, this has shown to be very effective for both those who are mentors and those who are mentored.

### ***Accomplishment Highlights***

**At least five participants are currently in graduate school, and another five have applied.**

**A number of participants have been accepted for prestigious opportunities, honors, and internships since their GRASP experience.** A few examples of these are listed below.

One student from the 2010 program was accepted for the UCAR FORMOSAT-3/COSMIC Data Users Workshop 2011. UCAR describes this program as "an opportunity for students who are U.S. citizens or U.S. permanent residents to attend and participate in a special "student session" of the Taiwan-hosted Fifth FORMOSAT-3/COSMIC Data Users Workshop." This student presented in a formal poster session and participated in a student conference.

In January 2011, Dr. Hallar had two 2010 GRASP students join her at the University of Wyoming, flying aboard the King Air for research flights over Storm Peak Lab. They were involved in all aspects of the field campaign including flight planning and instrument operation. This experience was funded jointly by GRASP and Dr. Hallar's NSF ATM grant.

A 2008 participant was selected to attend the 2011 Undergraduate Leadership Forum at the National Center for Atmospheric Research.

One of the 2008 participants was accepted into a program at the Center for the Environmental Implications of NanoTechnology (CEINT) for the summer of 2011. Her research topic was

Environmental Nanobiogeochemistry: Impact of Macromolecular Coatings on the Interactions of Nanomaterials with Bacteria and other Inorganic Environmental Surfaces. In 2011, this participant was also honored as a White House Champion of Change; she was one of twelve local leaders in the effort to recruit and retain girls and women in science, technology, engineering, and math (STEM) fields.

A 2011 participant was able to participate as a shadow with a member of the Steamboat Springs ski patrol as they provided insight into how patrollers use their knowledge of weather and snow science to keep a resort safe. The student participated in taking weather and snow observations as well as digging a pit and doing a complete snow profile and stability tests. He shadowed at the Grand Junction National Weather Service office, where the staff taught him about mountain weather forecasting and allowed him to do a balloon launch. The student was also able to arrange a shadow at two other National Weather Service offices.

Dr. Hallar worked with the National Weather Service Grand Junction office to get a 2010 GRASP participant a volunteer position over his holiday break. He then received an internship at the Sullivan/Milwaukee National Weather Service office in 2011; he was chosen over 13 other applicants due to his Grand Junction experience.

## **Longitudinal Evaluation 2012 Follow-Up Interviews with Program Participants From All Three Years--2008, 2010, 2011**

During February 2012, eighteen telephone interviews were conducted with participants of the GRASP program. Participants included three from 2008, seven from 2010, and eight from 2011. Following is a qualitative analysis of the interview data.

During the interviews, the appreciation expressed for the GRASP program was enthusiastic and universal. Many respondents repeatedly emphasized their appreciation for the work of Gannet, Ian, and Craig, both during the program and afterwards. All participants had remained in touch with at least some of the others from the program, creating a geographically distributed community that primarily uses Facebook, email, and telephones to stay in touch with each other.

Participants' experiences doing scientific research at Storm Peak, working with their groups on their projects and presentations, traveling to Colorado and Washington, DC, and learning about graduate school and career opportunities was very valuable. They all expressed interest in and understanding of the topics they researched during the program. The mentoring program at GRASP was mentioned positively several times by both mentors and those mentored.

The attendees' backgrounds, academic emphases, and career visions varied quite a bit. Nevertheless, each person described the ways in which their GRASP experience had enhanced their undergraduate experience, their graduate school plans, and their career goals.

Questions and response summaries are included below.

### ***How did you first hear about GRASP?***

**The most effective method of informing candidates about GRASP appears to have been via undergraduate professors and advisors.** Ten participants had heard about GRASP from one of their professors or an advisor. This was by far the most common way GRASP was made known to respondents. Two heard about it through an organization they belong to, two from a direct email, and one each from a mentor, parents, career services department, and a website ([pathwaytoscience.org](http://pathwaytoscience.org)).

### ***What were the best things about participating in GRASP?***

**Travel, conducting scientific research, visiting Storm Peak Lab, and networking were the most often-mentioned highlights of the program.** Travel was the item mentioned the most frequently as one of the best things about participating in GRASP—eleven people mentioned it. Eight described the participation in scientific research and six specifically mentioned visiting Storm

Peak Lab as highlights of the program. Networking (both with scientists and other participants) was cited by eight interviewees as well. Other aspects of the program mentioned by more than one person were the group work, the presentation experience, and finding out about additional science programs or opportunities. Aspects mentioned once included mentoring newer GRASP participants, career/grad school counseling, and the program leaders.

### ***What was it like working with the scientists at Storm Peak?***

#### **Participants had nothing but positive comments about their interactions with the scientists.**

Twelve respondents started out their answers to this question with some variation on a positive exclamation (e.g., *great, really nice, awesome, really cool*). Five people mentioned Gannet, Ian, and/or Craig specifically, citing a positive aspect of their interaction with them. Five people appreciated the variety of expertise offered by the scientists at Storm Peak. Four especially appreciated the support after the week-long workshop was done. Three characterized the scientists as helpful; another three commented on how well the scientists dealt with the variety of experience and expertise of the attendees. Four people mentioned how good the scientists were at explaining things. Other things respondents appreciated were the relaxed, non-intimidating atmosphere, the mentors from previous GRASP programs, the facilitation of group discussions, and the excellent feedback that was offered to participants.

### ***How was it working with your team on your research project?***

**The three respondents from the 2008 program were the most positive on how well things went with their teams overall; perhaps this was due to there only being two in each group. Although a number of participants found working on a team (often with members in different locations) challenging, most seemed to find it a worthwhile experience.** Fourteen respondents seemed to think the team work went fairly well; responses ranged from “wasn’t too hard” to “really well.” Two people said it was difficult. Seven people reported a certain amount of challenge involved in working on a team. Five specifically mentioned the challenges of having team members being in different locations and time zones. Email, Skype, phones, and videoconferences were all used by teams to coordinate their work. One person was appreciative of the milestones and the telecon with Gannet and Craig after the workshop. One team pushed to get as much completed during their time at Storm Peak as possible; this was cited as an effort they were glad to have made.

### ***Tell me about your research topic? Why is this topic important to you?***

**All respondents described their research topic in a fair amount of detail. All found the topic, the software, or the instrumentation they had used interesting.**

### ***What was the trip to Washington, DC, like?***

**All but one person had good things to say about the DC trips.** (One person found the trip hectic but didn't say anything else.) Six people said the GRASP trip was their first time in DC. Seven specifically mentioned enjoying the tour of the Mall, and six mentioned the tour of Howard University. Both those who were mentors and those who received mentoring mentioned this as a valuable experience. **Overall, the experience was valuable to almost all the interviewees.**

### ***Have you stayed in touch with the scientists and other participants from the GRASP program? If so, how?***

**All respondents reported still being in touch with someone from the program.** Fifteen said they were still in touch with other participants; ten were in touch with Gannet; and three each were in touch with Craig and Ian. One mentioned being connected with their mentors and another with the person they mentored. Eight were in touch using Facebook, three using email, two meeting face-to-face with others, and one each using telephone calls and texting.

### ***What did you learn about careers in science during GRASP?***

**All respondents said they had learned something about science careers during the GRASP program. Twelve specifically described their learning about the variety of science careers that are available. This variety included the specific jobs (e.g., engineer, researcher, modeler), the federal and state agencies where one can work, and the interdisciplinary nature of scientific research.** Five people became more convinced that graduate school is a good option for them and two learned that travel can be part of a science career. One person mentioned being surprised about how friendly everyone they met at the agencies was.

### ***How has your participation in GRASP affected your experience in college?***

**All but one of the respondents described some positive effects on their college experience after their participation in GRASP. Eleven people described the ways in which their undergraduate experience was enhanced; four mentioned how understanding the interdisciplinary nature of science and/or the real-life and fieldwork applications of research enhanced their studies.** Three said GRASP had helped prepare them for graduate school, and two described clearer career ambitions and goals. Other enhancements included the positive effects of improved presentation skills, research skills, and confidence levels.

***Are you planning to (or have you already) applied to graduate school? If so, where and in what field?***

One person is in a PhD program, four are in masters programs, five are applying to graduate programs, and seven plan to apply for graduate programs in the future. Five said atmospheric science was their field of interest for graduate school; others included biofuels, engineering, environmental science, hydrology, geography, geology, and medical school.

***Have you learned about or participated in additional research experiences via GRASP?***

Everyone had learned about opportunities through their connection with GRASP. Six had participated in such opportunities, and two were waiting to hear whether they had been accepted to such a program.

***Do you feel more motivated to continue with a career in environmental science because of GRASP?***

Six respondents said GRASP did motivate them to continue with an environmental science career, and ten said that the program enhanced their already existing motivation for their career. Two people mentioned the PhD programs they were in as a direct result of their GRASP experience.

***Has participating in GRASP affected your career plans?***

Those who hadn't previously provided this information answered this question. Three explained how GRASP had inspired them to apply to graduate school, which they hadn't intended to do before. Another was considering a PhD instead of just a master's degree. Two felt the experience helped them refine their career interest areas.

***How would you suggest improving GRASP in the future?***

Seven respondents suggested having the Storm Peak research time be extended--that was by far the most common suggestion. Other enhancements suggested by two or more people were to increase the logistical framework for supporting everyone to stay engaged between the Storm Peak week and the presentations in DC, and to offer alternate activities in DC for those who have been there before. Additionally, people suggested having participants be geographically clustered to support their meeting face-to-face, to provide background materials ahead of the

Storm Peak session to bring everyone up to the same foundational knowledge, and to have a structure for continuing one's GRASP research after the DC trip.