Environmental Psychological Research with Undergraduates in the National Parks

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I became fascinated with National Parks as a child while gazing at topographical maps and dreaming about what all those squiggly lines translated to experientially. My interest in the environmental psychology of National Parks developed when I was an undergraduate psychology major on a summer camping trip along the south rim of the Grand Canyon in Arizona. Coming from northern California, my girlfriend and I were not used to making reservations for camping, even in the national parks, except for places like Yosemite, of course. This was the first trip to the Grand Canyon for both of us and we were excited to confirm the idyllic images we had of this place in our mind.

As a result of our lack of planning, when arriving at the canyon we found the campground filled to capacity, leaving the options of camping outside of the park or getting a hotel room. We were here to camp and experience nature at her finest, so we opted to camp on National Forest land just south of the park boundary. As it was getting dark we pitched our tent in a beautiful forest, just a few miles from the rim of the Grand Canyon. Following a peaceful night of sleep, we awoke at sunrise to the sound of helicopters taking off from somewhere not too far away. A glance at the map confirmed there was an airport nearby, something we had neglected to notice the evening before. The noise was very loud, nearly continuous, and outside of our control, variables I would later realize were important predictors of annoyance. At the time I knew little about the measurement of loudness, audibility, natural quiet, or soundscapes, but the experience made me think. I wondered if this was normal, the status quo. During the remainder of our trip, we visited many points of interest along the south rim of the canyon, and were always struck by the sheer number of people at each stop. Clearly our expectations of what the Grand Canyon would be like and what it was actually like were completely different. We left Grand Canyon with many pleasant memories of wonderful adventures, but the noise encounters and feeling crowded were negative experiences that would not go away. These events did not reflect our expectations of the Grand Canyon. I have spent a good number of years following this trip learning how such expectations and experiences can be measured.

At the time the trip to Grand Canyon seemed so serendipitous, and yet I would later realize the experience foreshadowed many great things to come. When we returned to campus for classes in the fall, I was fortunate to have a senior seminar in environmental psychology, and I soon realized this was the discipline that had the tools necessary to address such questions as experiences and expectations in national parks and other natural areas. My fascination with this discipline has intensified, and to this day, 15 years later, I remain immersed in the study of environmental psychology, especially in the national parks.

What is Environmental Psychology?

Many of the most basic environmental psychological research questions can trace their roots to the earliest psychologists, those who developed psychophysics. How do humans sense and perceive the physical world around them? How do we process light, sound, smell, and so on? During the first half of the 20th century, many psychologists recognized the importance of the physical environment to the development and control of behavior. By the 1960's environmental psychologists had formed their own discipline, with influence from social psychology, architecture, design, philosophy, and the environmental movement. What affordances does the physical environment offer? Do environmental attitudes predict behavior? How do we value and manage the commons? These questions hold particular significance to the environmental psychologist studying issues such as noise and air pollution in the national parks.

Environmental psychologists are interested in how humans affect the environment, and, in turn, how the environment affects human behavior. Often within the discipline the distinction is made between the natural and the built environment. Environmental

psychology is problem-oriented with researchers seeking resolution to a vexing real-world issue. Emphasis is often of a larger scale than most areas of psychology that tend to focus on the individual. Because of its focus, environmental psychology is interdisciplinary, allowing collaboration between researchers and students from seemingly disparate disciplines. Most importantly for those interested in researching in areas such as national parks, from its early stages environmental psychology has always valued applied and field based research (Bell, Greene, Fisher, & Baum, 2001).

A Brief History of the Parks

Prior to the turn of the 20th century, Americans began to recognize the importance of preserving natural areas for future generations to experience and enjoy. To this end, a number of public parks were soon established on a local and national level. Today National parks are scenic wonders that draw millions of visitors each year throughout the United States. National parks are natural laboratories that are under utilized for their educational value, especially at the undergraduate level. Variables of interest may center on the sheer number of visitors (crowding, density), the design of trail or transportation systems, and the import of human caused pollution (haze, noise) into such pristine landscapes. These research areas are especially important when considering one of the primary reasons for visiting a national park, wilderness area, forest, or other outdoor recreational environment is to escape the stressors found in the built environment (e.g., Driver, 1996; Driver & Brown, 1983).

Positive affiliations with natural environments, including national parks, are also a major goal of environmental psychology research. Natural environments provide exquisite scenery and the opportunity to be immersed in nature, producing a calming effect. Ulrich et al. (1991) have demonstrated that following a stressful experience, the viewing of natural scenes increases positive feelings and reduces physiological indicators of stress (blood pressure, skin conductance, muscle tension), whereas viewing urban scenes does not. Attention Restoration Theory, as set forth by Kaplan and Kaplan (R. Kaplan & S. Kaplan, 1989; S. Kaplan, 1995) proposes that the restorative value of a nature experience is, in part, due to the soft fascination of natural scenes, which allows stress-depleted attentional capacities to be renewed. These are but a few of the theoretical bases that can be drawn upon to establish a set of research objectives. Environmental psychological research in national parks is also fluid in the sense that the research itself can help to identify areas for further study and aid directly in the theoretical development process.

Obtaining Access

No matter what type of research is planned, the instructor or principal investigator should make the necessary contacts with personnel who work in the park several months ahead of the desired implementation date of the project. Often with environmental and social scientific research, the contact person in the park will be the resource manager. The resource manager may also have a list of research projects needed to be completed, some of which may be appropriate for a semester long undergraduate project, or an intensive summer research internship.

With careful planning and forethought, research in the national parks can be a straightforward and rewarding process. The depth of the project, amount of time, and what course requirements are to be satisfied will determine what type of research experience is possible. Formal research projects are often long-term, taking years rather than months to complete. In these cases, undergraduates may work on a piece of a broader research puzzle during the time they are involved.

One of the best ways of bringing environmental psychology alive is to become immersed in the environment itself. Over the years my colleagues and I have embraced this belief by teaming up and providing a three week intensive field study experience during the spring and summer in some of the most stunning and remote natural areas in the country. A group of 10-15 students and faculty focus on one or two research questions, with subsequent variations created by the inherent creativity that comes as a result of the experience. What is especially attractive about this approach is that undergraduates can be involved in every step of the research process. Emphasizing field based environmental psychological research in the national parks as a part of a course has led to several unique projects, a few of which will now be described.

Successful Undergraduate Projects

The process of simply getting around a park can become the focus of numerous research projects, as my students and I have found over the past seven years while visiting Zion and Bryce Canyon National Parks. In the spring of 2000 in Zion, a mandatory shuttle transportation system was launched running through Zion canyon and the gateway community of Springdale, Utah. The shuttle is now required for all

visitors exploring Zion canyon during the months of April through October. Each double-length shuttle bus has the capacity to hold 66 people, replacing approximately 25 automobiles that would otherwise be competing for one of the 450 parking spaces in Zion canyon. On busy weekends prior to the shuttle, as many as 5000 cars would crowd into the main canyon hoping to be lucky enough to find one of the limited parking spaces. One of the main goals of the mandatory shuttle system, therefore, was to reduce crowding and traffic congestion and the associated effects on park resources.

As discussed above, undergraduates in a field class can be involved in every step of the research process. Students are excited to get to a park such as Zion and cannot wait to go exploring. This offers the immediate opportunity to engage their natural cognitive mapping abilities by completing wayfinding activities such as riding and sketching the routes of the shuttle system. This type of informal research helps to stimulate creativity and makes the research process an enjoyable experience with the added feeling of personal ownership. Of course, if one desires a more formal approach to the research process, this, too, is also an option. Additional research layers can then be added, such as formally analyzing visitor flow patterns or generating a visitor survey. Undergraduates have also developed research projects focusing on specific attributes of the shuttle (such as crowding, accessibility, efficiency, preference, and overall success) as well as park resources (such as scenic beauty, naturalness, freedom, and solitude). For example, during the inaugural season of the Zion shuttle, 191 visitors completed a 25-item survey at one of three shuttle stops. Follow-up data was collected in the spring and summer of 2003 from 202 visitors, and in 2005 a total of 520 visitors participated using the same survey instrument. Survey questions included Likert scales, checklists, and open-ended response opportunities. While visitors initially had a few reservations about the mandatory shuttle system during the first season of operation, by 2003 the vast majority were pleased with the shuttle and consider it very successful. All variables directly related to the shuttle system, except for crowding, significantly improved in 2003 compared to 2000. The largest differences between these two data sets were shuttle accessibility and efficiency. In 2005, visitors again reported a very positive experience. Differences were apparent between 2005 and the previous samples, however the visitor experience with the shuttle system continued to be positive. Multiple regression results indicate the success of the shuttle system from a visitors point of view is mediated primarily by preference, accessibility, and efficiency (Mace & Marquit, 2004; 2006).

Past undergraduate projects have also focused on the economic impact of the shuttle system on business owners in the gateway community of Springdale, which shares shuttle stops (and tourists) with the park. During the shuttle season of 2003, one particularly motivated undergraduate, Josh Marquit, took it upon himself to interview all of the business owners in Springdale who were affected by the shuttle. Fifty-nine local business owners and managers completed a 47-item survey assessing specific impacts of the shuttle system on the local businesses (including such changes involving parking, traffic, tourist flow, and sales). Results indicated that local businesses were generally satisfied with the shuttle system, although responses were not as positive as park visitors. Still, significant improvements in parking, traffic congestion, foot traffic, and sales were all attributed to the shuttle system (Marquit, Mace, & Roberts, 2004). This undergraduate research project shows the importance of collaboration between stakeholders, including those affected in the local gateway community. Josh is now working on completing his doctorate at Utah State University, where he continues to research a variety of pressing issues in environmental psychology.

Undergraduates have also completed research projects comparing the mandatory shuttle system in Zion National Park with the voluntary shuttle system in Bryce Canyon National Park. In 2004, during the fall season, 115 visitors completed a 23-item survey similar in design to those instruments used in Zion. Results found only 30% of Bryce Canyon visitors using the shuttle, even though 91% of all visitors knew the shuttle was implemented to help lessen noise, air pollution, and crowding. Those riding the shuttle were generally pleased with their experience, however the majority of visitors remain in their private vehicles when given the option (Riddle & Mace, 2005). Follow-up data was collected the next summer, in 2005, with 113 visitors completing the same shuttle survey. Rider ship was slightly higher than 2004, with 32% getting on the bus. Riders were generally pleased, however the majority of visitors continue to experience the park in their own vehicle, contrary to their stated attitudes (Riddle, Mace, & Cox, 2006). Voluntary shuttle systems are great examples of adaptive management in parks affected by crowding, yet they also fall victim to the attitude-behavior discrepancy often found in environmental and social psychology. In Bryce Canyon National Park, the shuttle was well received, but not well used. Managers at Bryce continue to explore ways to

increase the number of riders on the shuttle without making it mandatory.

Research opportunities examining transportation systems and the visitor response are not exclusively limited to the parks in southern Utah. National Parks such as Denali, Acadia, Yosemite, and Grand Canyon are but a few of the 50 parks in the national park system that have instituted and experimented with alternative transportation systems (Gallegos, 2005), offering research opportunities for undergraduates from coast to coast.

Crowding and transportation systems are not the only issues that can be researched by undergraduates in National Parks. Additional stressors commonly encountered in built environments are now affecting the national parks and their visitors. Traffic congestion continues to be one of the most harmful impacts visitors can have on the park. Idling cars emit high levels of particulates, affecting the natural resources and the overall air quality of the park. Particulates reduce visibility by creating a uniform haze that can blanket the entire landscape. Visibility impairment has been a focus of research in national parks for decades, having the effect of reducing the scope of scenic vistas while also bleaching out the colors of landscape features, creating a duller visual experience (Mace, Bell, & Loomis, 2004). Observational research with an emphasis on scaling and measurement are topics of particular interest when examining visibility and scenic beauty in the parks.

Visibility impairment can also be researched at night in parks that have programs dedicated to the exploration and interpretation of the night sky. Bryce Canyon National Park and Cedar Breaks National Monument have some of the darkest skies in the country, and the parks offers numerous interpretive and experiential programs related to the night sky. A visitor can engage in a ranger led program in the amphitheater, peer through telescopes into the depths of the universe during astronomy programs, or take a night hike with an interpretive guide. One student project in 2006 assessed the effectiveness of these night sky related programs on the visitor experience in these two parks. At Bryce Canyon alone, stargazing and astronomy programs are attended by over 28,000 visitors annually, essentially equaling the remainder of all other interpretive programs combined. During the summer and fall seasons, 1179 visitors to Bryce Canyon and Cedar Breaks took part in the study. Results found those visitors engaging in a ranger-led interpretive program on stargazing valued the night sky more than day users. In general, day users of the parks viewed the night sky as an opportunity to enjoy nature and to be alone, while after dark visitors perceived the night sky as an opportunity to better understand the universe and stimulate curiosity in science. Results also indicated the night sky and associated stargazing programs to be more important to the travel plans of Bryce Canyon visitors than Cedar Breaks visitors. In sum, the results show visitors to Bryce Canyon and Cedar Breaks have positive attitudes towards night sky visibility and the interpretive opportunities in the parks. Nearly all respondents (99.4%) identified a national park, a local park, or a wilderness area as a preferred location to stargaze. Visitors clearly value this important resource and benefit from the programs dedicated to light pollution and the interpretation of the cosmos (Mace & McDaniel, 2007).

Noise created by tourist activities and their motor vehicles are other areas of concern for park officials and environmental psychologists. In high density parking areas or transportation corridors, motor vehicle noise can completely block the sounds of wind, water, birds, and wildlife. Noise can intrude on the natural quiet, reduce feelings of solitude and tranquility, and increase feelings of annoyance and negative affect (Mace, Bell, & Loomis, 1999; 2003; 2004). High decibel noise has also been found to adversely affect local wildlife. Consequently, a number of research objectives can be centered around the soundscape of a park.

Attended audibility logging and on-site sound recording can be completed by undergraduates, focusing on a variety of metrics in the different acoustic zones of a given park. Current metrics that can be collected observationally with limited equipment include the source of the sound, the maximum decibels of a sound or noise event, the number of events, the length of noise free intervals, and time of day and seasonal audibility variations.

The perception of sound and noise is inherently psychological (it must be “unwanted” to be noise, but a sound may not be unwanted by all who hear it). Consequently, research on pleasant and unwanted sounds in natural areas requires more than reliance on just the physical parameters of sound, especially when considering the park service must take visitor related variables into consideration when developing management plans. Therefore, variables such as annoyance, acceptability and appropriateness, tranquility, serenity, naturalness, as well as a host of mediating and demographic variables can also be included when researching the soundscape of a park.

Challenges and Obstacles

A number of challenges arise when completing environmental psychological research in the National Parks. Often these considerations are based on the

length and format of the course or planned research experience. For semester long courses with limited field research opportunities, an introductory level observational research experience will be the best option. Tracking and mapping visitor flow at popular viewpoints and using basic accretion and erosion techniques can provide a unique and rewarding research experience for those with a limited amount of time. Interpretive exhibits, placards, and displays afford the opportunity to examine existing signage and how information is communicated to visitors, including what is missing or confusing. Additionally, the physical design and construction of the visitor center or park museum may also serve as the unit of study, especially if there are notable green building practices. Observational research in the National Parks have the added benefit of not having to go through the extensive review processes of the National Park System and additional federal government agencies.

For those planning on spending a week or more in a park where visitor surveying is planned, approval must be gathered from a variety of personnel prior to surveying or interviewing. The resource manager of the park can provide the specific regulations required as they change from time to time. Once the resource manager approves the project, the survey will have to go through the National Park Service Social Science Review process and on to the Office of Management and Budget in Washington D.C. This process is detailed on the web at www.nature.nps.gov/socialscience/. This can be a time consuming process, even with an expedited review. If a topic is deemed "controversial" a full review taking 8 months will be required. An intensive field experience in a gateway community adjacent to a park may also require approval from the local chamber of commerce or town manager. While the survey approval process can be cumbersome, it helps to protect the city, park, and researchers from liability, and will help establish relationships that could lead to fruitful projects in the future. Of course with any research that is to be formally undertaken, presented, and/or published, the proposal must also pass through the scrutiny of the university institutional review board.

Finally, despite all planning and preparation the natural world always has its own lessons to teach. While most of the time this provides a positive and incomparable experience, there are times when, as a student once said, things can get "sketchy" and "spin wildly out of control" in an instant. For example, we have found ourselves in the grip of a June snowstorm in Bryce, huddled in the tiny spot of shade provided by the lone tree on Toroweap Point as the temperature exceeded 110 degrees, assisting in the search and airlift rescue of a group (not ours) along the north rim of the Grand Canyon while studying the soundscape, and spending a few hours retrieving a stuck hiker literally wedged into a slot canyon in a remote area of the Grand Staircase. The basic lesson of such experiences is to plan and prepare, be overly prepared, and then prepare some more. It is important to go into the experience expecting the unexpected. Above all, do not panic (remember that other psychological skills can also come in quite handy during these unpredictable situations). Emphasizing safety from the very beginning helps to dispel the feeling that nature is one big amusement park. Things can and do go wrong out here, so it is always a must to have someone in the group who is a trained wilderness EMT.

Conclusions

Providing a research experience for undergraduates in the national parks takes some planning and effort, however the rewards outweigh the hardships. Environmental psychological research experiences in the parks are best if they are designed with one or two objectives in mind, allowing students the creativity to move in many directions. Sometimes these follow-up research projects can turn into an internship or a grant with the supporting park. Many of these undergraduate driven research projects have been presented at local, regional, and international conferences, and submitted for publication in professional journals. These research experiences have the added benefits of helping with graduate school preparation and engaging in valuable service learning with the National Park Service and local gateway communities.

While this chapter has focused on environmental psychological research in national parks, it is important to point out there are many other local park or park-like settings surrounding most colleges and universities, which also provide a variety of research opportunities. State parks, reserves, forests, county, city, and even neighborhood parks offer opportunities for research, service learning, and educational enrichment. Getting outdoors is the key. Field experiences are powerful, producing moments of insight entirely dependent on immersion in the natural world. With some planning, creativity, and on-site exploration of local land areas, research questions easily come to mind.

The research partnerships formed between undergraduates, faculty, and park personnel has produced award-winning research while also creating additional opportunities for current and future students in the national parks. Beyond that, the experience itself has been personally and

professionally transformative, providing memories that will last a lifetime. More than any other teaching or research experience, those who engage in environmental field research in the national parks have found it to be one of the most educational and enjoyable experiences of their undergraduate career.

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