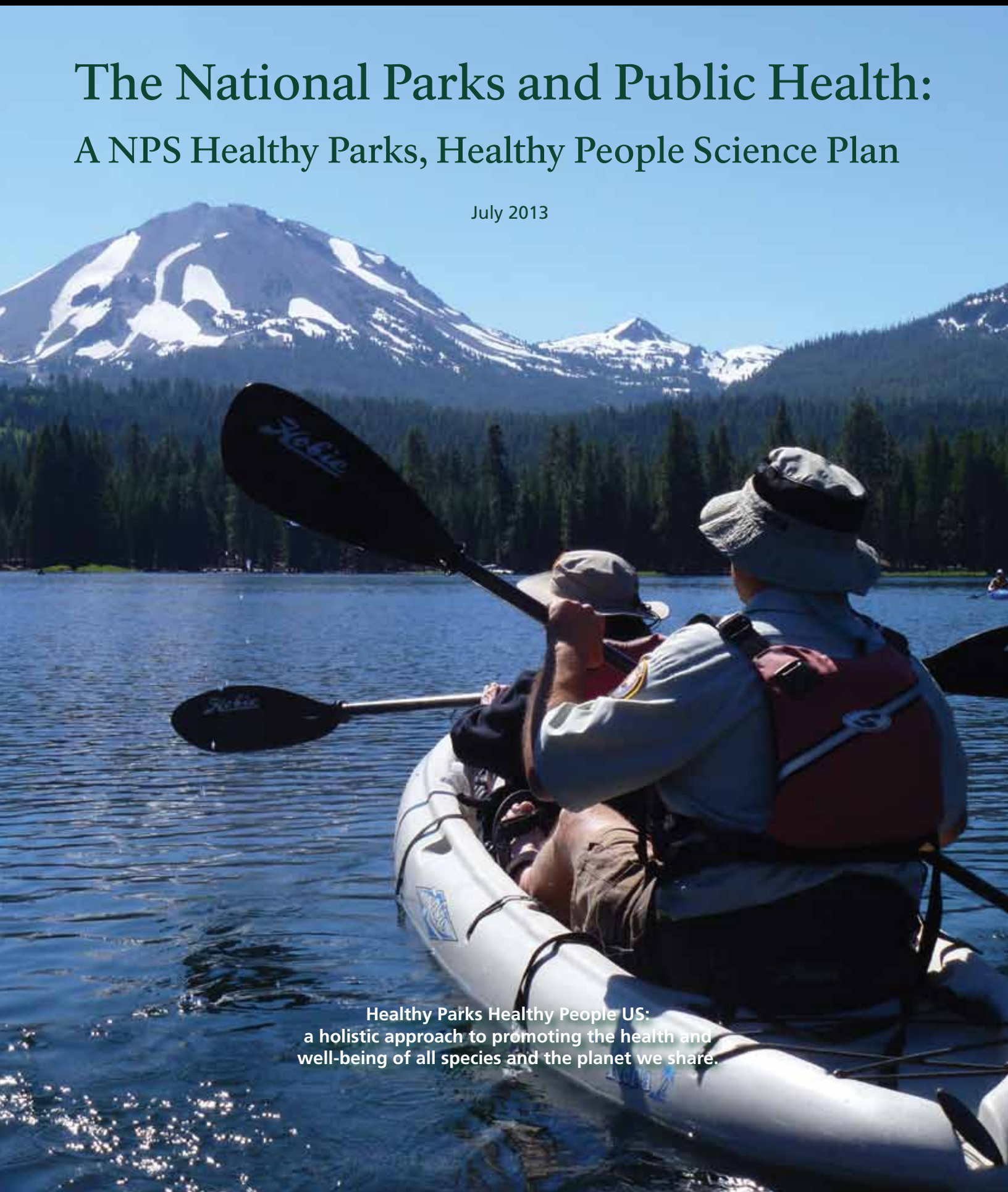
National Park Service
U.S. Department of the Interior

Healthy Parks Healthy People US

The National Parks and Public Health:

A NPS Healthy Parks, Healthy People Science Plan

July 2013



**Healthy Parks Healthy People US:
a holistic approach to promoting the health and
well-being of all species and the planet we share.**

Kayakers on Manzanita Lake,
Lassen Volcanic National Park. NPS

The National Parks & Public Health:
A NPS Healthy Parks, Healthy People Science Plan

National Park Service
U.S. Department of the Interior
Washington, D.C.

Apostle Islands National Lakeshore, NPS/NEIL HOWK

Foreword

The National Park Service has long been recognized as the custodian of our most treasured landscapes, cityscapes, and seascapes. These resources – that nurture, sustain, and inspire us – are now becoming better valued and understood for their collective benefits as park health resources.

The NPS Healthy Parks Healthy People Science Plan was developed with the engagement of academic researchers, health professionals, and federal scientists. It provides a framework and research agenda necessary to advance society's recognition of the role of parks and protected areas in contributing to the nation's health.

Park health resources, as defined by this plan, are programs, facilities, and environments (natural and cultural) that when used by visitors can provide demonstrable and often distinctive physical, mental, and social health benefits.

We look forward to collaborating with preeminent institutions, agencies, and organizations to enter this new chapter of scientific discovery that includes: the identification and evaluation of park health resources, physical activity, mental health and well-being, nutrition, education/communication, program evaluation, and additional areas of research such as the relationship between policy and park health resources.

Director

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Early morning visitor explores the remote wilderness shoreline of Shi Shi Beach in Olympic National Park. NPS/PABLO MCCLOUD

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Human Health and Parks

Parks and protected areas have long been recognized as important resources for public health. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being, and not merely the absence of disease" (World Health Organization [WHO], 1946). Parks can contribute to physical, mental, and social health (see literature review in Appendix 1). This includes the National Park System (NPS).

The NPS and its 401 units preserve natural and cultural resources for their enjoyment by American and international visitors. Each year, these parks are visited by more than 275 million people, and are staffed by 22,000 employees, 25,000 concessioner employees, and more than 130,000 volunteers. NPS also provides assistance programs to establish local, regional, and state parks, trails and greenways in local communities in all 50 states. For nearly 100 years, the NPS has contributed to the health and well-being of Americans by providing places that enable physical activity, promote mental health and wellness, and foster community through the preservation of ecosystems and interpretation of a shared heritage.

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For this plan, H*ealthy Parks, Healthy People* (HPHP) is a global movement that harnesses the power of parks and public lands to contribute to people's health and well-being. The Healthy Parks, Healthy People US program (HPHP US) encompasses a mixture of individuals and organizations whom contribute to HPHP in the US, and work to increase society's recognition of parks and protected areas (including state, local, and regional park systems) as places for the promotion of physical and mental health, and social well-being. The *NPS Healthy Parks, Healthy People initiative* (NPS HPHP) is specific to the NPS and its partners.

NPS HPHP science is focused on research to support NPS HPHP efforts. This requires a comprehensive understanding of the current and potential role of parks and public lands in public health. Research is critical to: 1) demonstrate that parks and public lands are sources of health benefits, 2) inform the design and implementation of effective park policies, programs, facilities, and environments related to health, and 3) quantify the health benefits of park experiences as a benchmark to improve the health impact of parks.

Rocky Mountain National Park, BioBlitz 2012. NPS/TODD EDGAR

Park Health Resources and Associated Benefits

Parks provide unique resources for promoting healthy behaviors and lifestyles. *Park health resources* are programs, facilities, and environments (natural and cultural) that when used by visitors can provide demonstrable and often distinctive physical, mental, and social health benefits. Examples of programs include educational/interpretive programs for students and visitors. Examples of facilities include locations to purchase healthy food and beverages and features of the park that provide multi-modal transportation. Examples of environments include cultural landscapes, soundscapes, green space, lakes, rivers and trails. Interaction with these park health resources can result in positive physical, mental, and social health benefits for visitors.

> "*Park health resources* are programs, facilities, and environments (natural and cultural) that when used by visitors can provide demonstrable and often distinctive physical, mental, and social health benefits."

When these resources are used by visitors, they can result in healthy lifestyle behaviors that promote health benefits. For example, a visit to a park can provide physical activity through hiking, promote nutrition through purchase of healthy foods, promote mental health and well-being through contact with nature, and promote social well-being by providing educational opportunities and social interactions with other park users. This research plan focuses on park health resources and their associated benefits within the NPS, and the contribution of these resources to the NPS HPHP movement.

Outline of Research Plan

The objectives of this plan are to:

1. Provide the context and a description of HPHP US,
2. Describe a research agenda focused on the NPS HPHP, and
3. Propose a NPS HPHP science action plan for research implementation and information dissemination.

In this introductory chapter, the purpose and scope of the NPS HPHP Science Plan is outlined. An overview of human health and parks, the HPHP global movement, and the HPHP US initiative is given. A synopsis of a NPS HPHP science workshop conducted by the NPS is presented; the workshop results provided input for this research plan.

Chapter 2 describes a research agenda for the NPS as part of the NPS HPHP initiative. A series of research topics are proposed focused on:

1. Identification and evaluation of park health resources,
2. Physical activity,
3. Mental health and well-being,
4. Nutrition,
5. Education/communication,
6. Program evaluation, and
7. Additional areas of research such as the relationship between policy and park health resources.

The research agenda is focused on the NPS, but the questions, ideas, and methods of the agenda can be applied to diverse park and outdoor settings.

Chapter 3 presents a comprehensive action plan for accomplishing research for the NPS HPHP initiative. The plan describes three stages:

1 Organizing for research,

2 Conducting research, and

3 Applying research findings.

For each stage, specific and practical actions are recommended.

The report includes a bibliography and two appendices. Appendix 1 offers a brief review of selected scientific literature to illustrate the relationship between parks and human health. Appendix 2 is a list of NPS HPHP Science Workshop participants and their affiliations.

The Healthy Parks, Healthy People Movement

A combination of physical, mental, and social issues has created complex public health challenges worldwide. In response to these challenges, *The Global Strategy on Diet, Physical Activity and Health* (WHO, 2004) endorsed by the World Health Assembly in 2004, the *Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases 2008–2013* (WHO, 2008), and *The National Prevention Strategy* (NPC, 2011) urge nations to implement programs and actions to increase health and wellness among their populations.

Globally, noncommunicable diseases (NCDs) have surpassed infectious diseases as the leading cause of death. The leading causes of NCDs deaths are cardiovascular disease, cancer, respiratory disease, and diabetes. Populations are increasingly facing modern health risks that lead to chronic disease and early mortality. The prevalence of overweight and obesity among children and adults has reached epidemic proportions in developed nations. According to the US Substance Abuse and Mental Health Services Administration, by 2020, mental and substance use disorders will surpass physical diseases as a major cause of disability worldwide (Hyde, 2011).

The HPHP movement is a response to the challenge of contributing to a cultural shift within public health and medical care delivery systems worldwide. A HPHP global summit convened in Australia in 2010 engaged 1,200 participants and 37 nations in discussion on four major themes: 1) Healthy Communities: social and cultural connections, partnerships, economic development, and tourism, 2) Healthy Parks: managing the environment, sustainability, effective park management, and designing healthy parks for people, 3) Healthy Participation: participation from diverse backgrounds and demographics, facilities and programs, recreation and tourism experiences, and education, and 4) Healthy People: mental and physical health, quality of life, and holistic well-being.

Healthy Parks, Healthy People US

The countries represented at the HPHP global summit were challenged with adapting the broad goals of the summit to their specific needs. U.S. National Park Service Director Jon Jarvis established the NPS Health and Wellness Executive Steering Committee in 2010 to initiate steps for HPHP's integration in the US. The committee's objectives were two-fold: 1) explore the role of the NPS in promoting the health and well-being of the nation, and 2) recommend an institutional home and strategy to support health promotion.

"The HPHP movement is a response to the challenge of contributing to a cultural shift within public health and medical care delivery systems worldwide."

In 2011, the NPS hosted a HPHP US meeting in San Francisco, California, connecting 90 experts from various fields to address the following questions:

4. How can national, state, and local parks combine forces with business innovators, healthcare leaders, scientists, and advocacy organizations to promote wellness and reduce healthcare costs?
5. How can we influence a cultural shift to value parks for health? What can community leaders and managers learn from experts and visionaries to make this a sustainable idea that affects behavior at its core?
6. How is human health dependent on the health of all species and the planet we share, and in what ways can parks and open spaces strengthen these connections?

Meeting discussions led to a shared vision of the role of public lands on public health. The meeting contributed to the development of a HPHP US strategic action plan that included four focus areas: 1) demonstration projects-nodes of innovation, 2) research and evaluation, 3) communication and education, and 4) alignment and synergy.

A copy of the strategic action plan can be found at the HPHP US website, **www.nps.gov/public_health/hp/hphp.htm.**

Strategic actions of HPHP US can act as a catalyst for a contemporary cultural shift towards healthy lifestyles. The HPHP US Action Plan's seven principles guide the NPS:

- Promote health and well-being as an interrelated system linking human health to natural landscapes and all species;
- Seek expertise and resources from a wide range of partners in the public and private sectors;
- Include activities that contribute to physical, mental and spiritual health, and social well-being;
- Work takes place both within and beyond park boundaries;

- Encourage uses that promote the health of all species while avoiding those that impair resources;
- Seek to provide equitable access to open spaces and natural places;
- Commitment to improving public health will be mirrored in internal programs for the NPS workforce.

For these principles to be effective, HPHP US needs to be informed by the best available sound science from multiple disciplines.

NPS Healthy Parks, Healthy People Science Workshop

The initial step in developing the research plan was the facilitation of a NPS HPHP science workshop at Clemson University, February 8-10, 2012. NPS managers, scientists, agency partners, public health professionals, and academic researchers provided advice and counsel. Participants identified key research challenges and opportunities for the NPS HPHP US initiative. A wide range of recommendations emerged from the workshop illuminating critical research needs. A list of attendees, agenda, and a workshop meeting summary can be found at the NPS HPHP website.

A representative, but not comprehensive, review of the literature on parks and health was conducted. The literature review and the workshop notes were used to guide the development of the NPS HPHP Science Plan. The draft plan was reviewed by the workshop participants and representatives from the NPS, and this final report was prepared.

2

The Scope of the Research Agenda

In this chapter, a research agenda focused on NPS HPHP is proposed. It is based on the HPHP US Strategic Action Plan, the literature review, and the NPS HPHP science workshop. The agenda is organized around specific research topics. For each topic, a general description, potential data collection and analysis techniques, and applications of the proposed research are provided. At the end of the chapter, Table 1 summarizes the research agenda.

The research agenda presented focuses on the National Park System. However, the research questions, ideas, and methods can be adapted to other park and outdoor settings. This agenda is designed as a starting point for additional health research development and implementation in diverse park settings. NPS HPHP research, in tandem with established and ongoing research from various fields, can demonstrate the full relationship between parks and health benefits.

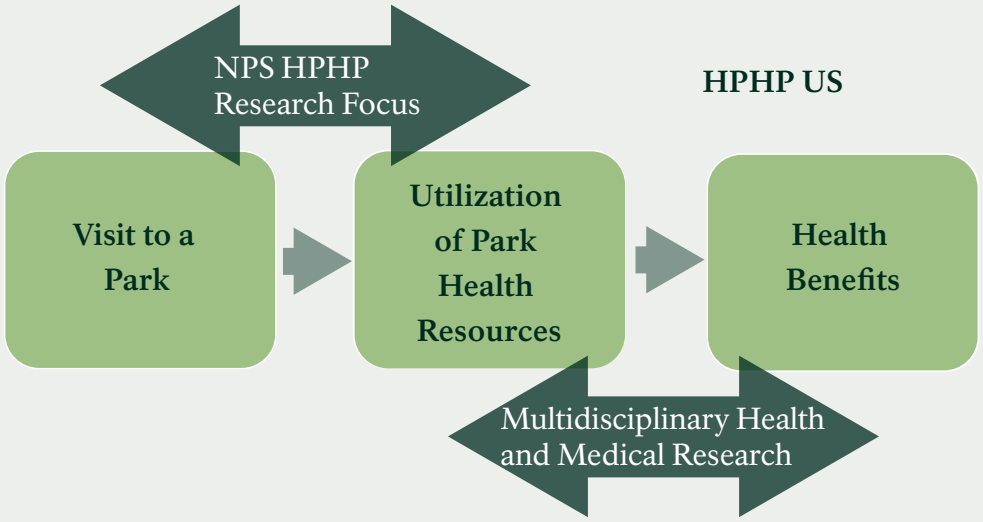
The research focus for the NPS HPHP Science Plan is illustrated in Figure 1. "Utilization of Park Health Resources" is the interaction with or exposure to health resources during a park visit. "Health Benefits" encompasses physical, mental, and social health benefits in response to the use of park health resources. The proposed NPS research focus is on the relationship of park visits to use of health resources; the NPS can apply available and ongoing multidisciplinary health and medical research toward an understanding of health benefits.

Identifying and Evaluating Park Health Resources

A systematic approach is needed for identifying, categorizing, and evaluating park elements that serve as health resources. Park settings may offer a different level of benefits among the physical, mental, and social impacts depending on their distinctive environments (natural and cultural), facilities, and programs. Identification, mapping, and quality assessment of applying a combination of park health resources can then be applied to interventions, in order to optimize health benefits. This research should focus on questions such as:

Yosemite National Park. NPS/
TAMARA BLETT

Figure 1: The role of NPS HPHP research within HPHP US in demonstrating the relationship between parks and health benefits.



- What are visitors' baseline levels of health prior to and post utilization of park health resources?
- What park health resources are most conducive to physical and mental health?
- Where are the resources located?
- What are the health values of these resources?
- Are different resources associated with specific park settings and types?
- What combination (type/intensity) of park health resources results in the maximum health benefits?

The NPS should develop a set of metrics for identifying and evaluating park health resources. Data can be collected and analyzed at multiple scales including park units, park types, and specific park resources. Techniques for data collection and analysis include scorecards, GIS mapping, observation, and surveys.

The proposed research can provide a baseline inventory of park health resources for use by NPS management and the public. Insight can be gained to the transferability of health benefits from one park setting to the next. Areas for improvement and growth can be identified by a clear set of metrics for park health resources evaluation. From this baseline inventory, a database can be developed to compare and track park health resources. The database can aid in management, research, and allocation of resources.

Documenting Physical Activity in Parks

The benefits of physical activity to health are clearly identified in the literature. Numerous forms of physical activity and recreation occur in park settings, which can be measured by duration, intensity, and type. Physical activity research within parks should focus on access to physical activity resources and engagement with these resources to receive maximum health benefits. Variations of physical activity can be associated with distinct health benefits. However, user groups may be constrained for various reasons in their physical activity in parks and hence not receive the associated benefits. Visitors' motivations and constraints for physical activity in a park setting should be evaluated. This research should focus on questions such as:

- What health resources for physical activities are available and where are they located?
- What is the extent of physical activity in national parks? What are the different classifications of physical activity within park settings?
- What is the duration and intensity of physical activity undertaken by visitors?
- Do parks help visitors meet their daily recommendations for physical activity?
- Do park visits contribute to future changes in healthy lifestyle behaviors?

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The NPS should evaluate the types, intensity, duration, and constraints of specific physical activities in parks. Data can be collected and analyzed at multiple scales including park units, health resources, individual visitors, visitor groups, and specific categories of visitors. Established tools and methods to measure physical activity type, duration, intensity, and location include GPS units, accelerometers, radio frequency identification tags (RFID), SOPARC (System for Observing Play and Recreation in Communities), and time-lapse photography.

The proposed research can provide a major contribution to an ecosystem approach to establishing the link between physical activity in parks and the emergence of interdisciplinary research demonstrating health benefits of parks. An evaluation of current use and quality of specific physical activity resources can enhance the ability of parks to provide health benefits. The research can support the development of park resources to meet visitors' daily recommended guidelines for physical activity.

Understanding the Link Between Park-going and Mental Health and Well-being

Prior research has shown that exposure and interaction with green space and natural settings improves mental health and well-being (see literature review in Appendix 1). The specific mechanisms by which parks promote well-being can vary—from viewing the aesthetics of parks from a car window to intensive and lengthy backcountry park interactions. Mental health and well-being benefits can take multiple forms such as improvements in mental illness symptoms, cognitive function, and stress relief. A greater understanding of opportunities and constraints of particular groups to utilize resources promoting well-being should be explored. This research should focus on questions such as:

- Which park resources and activities promote mental health and well-being?
- What are the specific mental health and well-being benefits of parks?
- What are constraints to park use and access to health resources that promote mental health and well-being?

The NPS should identify and evaluate park health resources associated with mental health and well-being and the potential constraints to these resources. Data can be collected and analyzed at multiple scales including park health units, health resources, individual visitors, and categories of visitors such as veterans and persons with diagnosed mental illness. Techniques for data collection include surveys, interviews, and focus groups.

The proposed research can provide the link between parks and medical research demonstrating mental health benefits. The evaluation of park resources promoting mental health and well-being can guide the development of strategies to enhance these resources and benefits. In addition, specific strategies can be directed towards subgroups that may or may not currently visit parks and utilize the mental health and well-being resources.

Evaluating Nutrition and Nutritional Information in Parks

Nutritious food and beverage offerings combined with health-based messaging and educational programming are two ways the NPS units can contribute to nutrition as an aspect of public health. Baseline data of nutritional content of current offerings and visitors' knowledge related to nutrition can assist the NPS and concessionaires in developing contracts which promote health and nutrition while satisfying the needs of the visitor. This research should focus on questions that explore barriers and

> "...research has shown that exposure and interaction with green space and natural settings improves mental health and well-being."

facilitators of healthy food and beverages in parks such as:

- What food/beverages are available and how nutritious are these items?
- What are the constraints to regulating the quality of food available in parks?
- What are the financial implications of regulating the quality of food sold by park vendors?
- How do park users respond to an inventory of healthy choices and constraints on non-nutritious foods in park food outlets?
- What is the baseline nutritional knowledge and preferences of park visitors, and are there significant differences between the general population's nutritional knowledge and preferences?
- Can nutritional signage mitigate concerns about availability of healthy/unhealthy foods?
- How can NPS policy lead to increased nutritional offerings?

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The NPS should conduct baseline inventories of: 1) the nutrient content of food/beverages offered in parks, 2) current nutritional knowledge of the public, 3) inventory of nutrition-based signage, and 4) tracking of concession food sales.

Data can be collected and analyzed at multiple scales including park units, individual visitors, and food concessions. Possible methods include surveys, inventory, observation and secondary data.

The proposed research can expand on a NPS nutrition environment assessment pilot study currently underway. The data of the public's level of knowledge for nutrition and their preferences for food items can be useful for designing appropriate signage and programs. The research can indicate the performance of the NPS in providing healthy items and help the NPS justify the expansion of healthy food options by concessionaires.

Improving Health Education/Communication in Parks

Education programming focused on healthy lifestyles provides the opportunity for the NPS to connect park visitors with health initiatives. The informal setting of parks offers a range of opportunities to promote visitor health within park visits and possible retention in homes and communities. Specific communication strategies used by the NPS can affect the efficiency and effectiveness of education resources. This research should focus on questions such as:

- What are NPS health education resources?
- What communication strategies are used and preferred by visitors?
- How do use and preference of health education/communication strategies vary by categories of visitors such as age and group composition?
- Do education programs lead to healthier decision-making at parks and at home that is consistent with national guidelines for physical activity and diet?
- Do certain types of interpretive programs lead to a reduction of perceived constraints to park health resources?
- Can interpretive programs designed for specific populations result in higher interactions with park health resources?

The NPS should assess the inventory of educational programs and content, effectiveness of the programs and investigate dissemination of NPS objectives through communication strategies. Data can be collected and analyzed at multiple scales including park units, programs, individuals, and categories of visitors. Methods for data collection include pre-surveys to gain baseline knowledge of visitors before exposure to educational programs; and post surveys to evaluate changes in knowledge on the topic and the planned behaviors of the individual resulting from the programs. Additional observational data can be collected through audience attendance and analysis of program content.

The proposed research can complement previous research by surveying visitors in addition to managers for evaluation of program effectiveness. Insight to the effectiveness of communication within the NPS can identify specific areas within the NPS to focus efforts for future development and adaptation of NPS communication strategies.

Developing and Using Program Evaluation Tools

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Short and long-term evaluation and monitoring are critical to the development, growth, and sustainability of NPS health programs. Health programs need to be designed so they are amenable to evaluation. The use of logic models can clearly link goals, activities, and expected outcomes and support a sound evaluation process. This research should focus on questions such as:

- What are the current methods and tools used for evaluation of park health resources and programs?
- How effective are these evaluation tools in NPS units?
- Do the current health programs and are future health programs amenable to sound evaluation and monitoring?

The NPS should conduct research evaluating the effectiveness of health programs in parks. Data can be collected and analyzed at multiple scales including park units, programs, individuals, communities, and categories of visitors. Possible methods for evaluation include observations, surveys,

interviews, focus groups, and analysis of secondary data. Examples of established telephone questionnaires are the Behavioral Risk Factors Surveillance System (BRFSS) and the NPS Comprehensive Survey of the American Public. Examples of secondary data include public health records and U.S. census demographic data.

The proposed research can help assess the effectiveness and aid in improvement of current health programs through evaluation, monitoring, and adaptation of programs. Areas for development of future programs can be identified and developed to maximize the health benefits of park health resources within NPS units.

Additional Research

In addition to the above areas of research, other valuable research questions were proposed at the HPHP science workshop, such as the impacts of social relationships and the retention of healthy lifestyles after a park visit is a possible area of research. Examples of research include: 1) evaluation of social capital/social cohesion as it relates to park units and visitor health, 2) families/friends/social groups as mediators for individual behaviors within park visits, 3) retention of healthy activities of one-time versus repeat park visitors in their home community, and 4) the relationship between proximity to national park units and the health of a community.

As part of the NPS mission statement, inspiration offers another area for research opportunities. Examples of research include: 1) identification of inspirational places and experiences in parks for visitors and NPS staff and 2) evaluation of the physical, mental, and social health impacts of these inspirational places and experiences.

The ecological health of parks and its relationship to human health and well-being offers an additional area for research. Examples of research include: 1) cataloging of potential health impacts and environmental services of built and natural components in parks, 2) examining how changes in transportation and environmental quality influence human health, and 3) examining how climate change and its associated effects can impact park health resources.

“As part of the NPS mission statement, inspiration offers another area for research opportunities.”

Policy is a relevant and impactful motivator for social change in public health and is essential to carrying out the objectives of the HPHP US movement. Examples of useful policy research include: 1) analyzing and evaluating the role of parks in public health policy, and 2) evaluating policies in parks as interventions to promote healthy park experiences and healthy lifestyles.

Quantifying the return on investment (ROI) of park-based disease prevention strategies to help reverse the rising trends of chronic diseases and associated healthcare costs is another critical area for research. While the economic benefits of investing in disease prevention through the promotion of physical activity, a healthy diet, and smoking prevention are well-known; further research on the efficacy and ROI of park-based promotion of these three health strategies is needed. Specifically, ROI can be calculated to include: 1) dollars spent relative to lifestyle behavior change, 2) dollars spent relative to chronic disease reduction, 3) dollars spent relative to increased life-expectancy, 4) reduced health care costs as a result of park-based disease prevention, and 5) dollars saved through innovative partnerships between park programs, health care providers and insurance companies. Additionally, ROI from contact with nature, and associated mental and social benefits, is another research area that could be explored.

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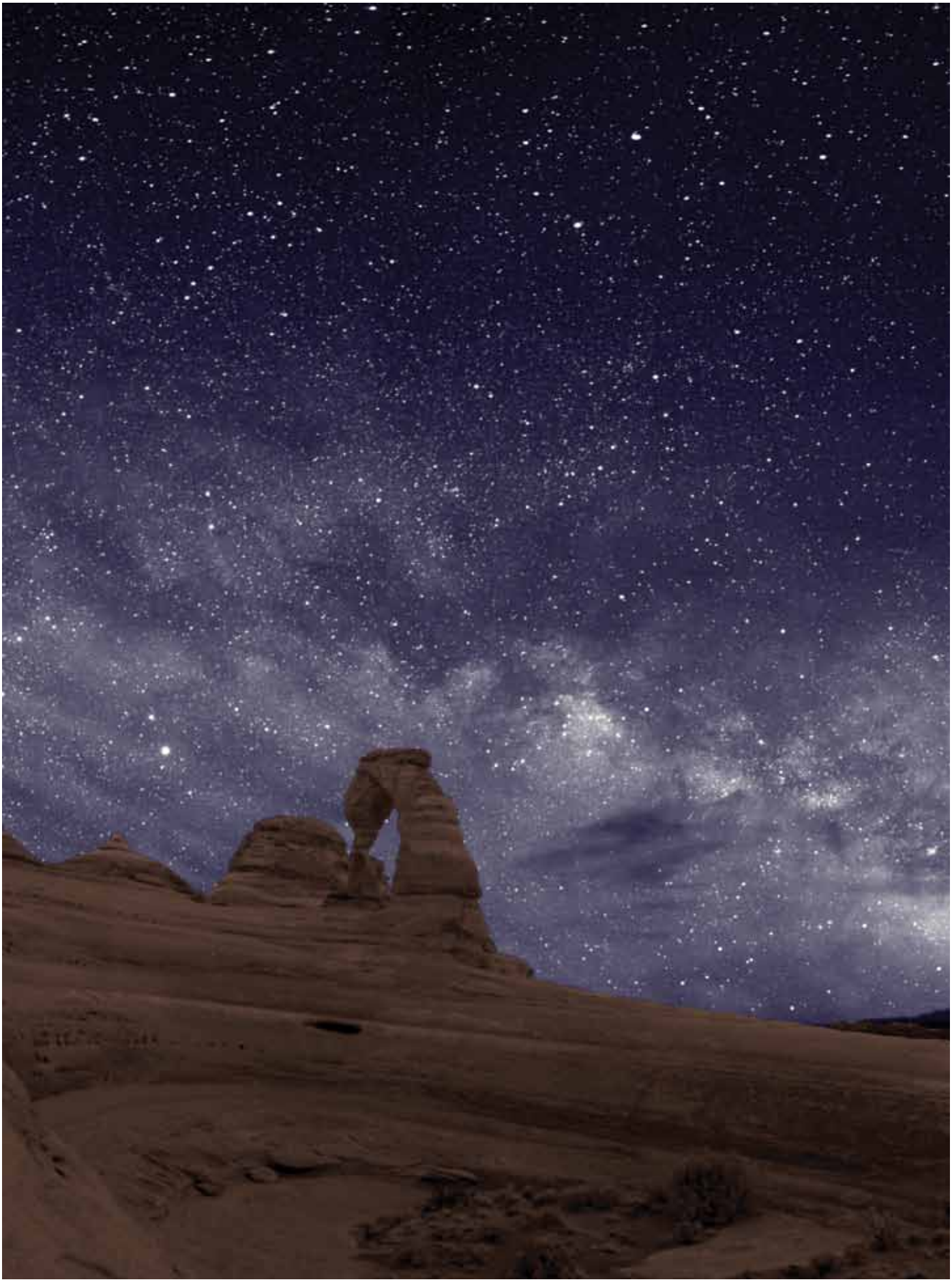
Table 1 provides a summary of the NPS HPHP research agenda. There are multiple methods to design research projects based on the previous research agenda questions. It is important to choose the method most appropriate for the specific question and context of the research. A combination of methods may sometimes be the best possible design for maximum quality of results and may require a multi-disciplinary research team. While a multidisciplinary team can be associated with higher transaction costs, the research designs could provide stronger evidence of park health resources' benefits.

Table 1: Summary of NPS HPHP Research Agenda

Park Research Topic & Questions	Scale(s)	Technique(s)	Application
Identifying and Evaluating Park Health Resources			
◦ What are visitors' baseline levels of health prior to and post utilization of park health resources? ◦ What park health resources are most conducive to physical and mental health? ◦ Where are the resources located? ◦ What are the health values of these resources? ◦ Are different resources associated with specific park settings and types? ◦ What combination (type/intensity) of park health resources results in the maximum health benefits?	Park units Park types Specific resource	Scorecards GIS mapping Observations Surveys	◦ Identify, locate, and assess current health resources in parks ◦ Promote development and growth of resources in parks ◦ Provide usable assessments for managers and the public ◦ Compare health resources across different park settings ◦ Investigate ideal combinations of dosage/ exposure to park health resources to maximize health benefits
Documenting Physical Activity in Parks			
◦ What health resources for physical activities are available, and where are they located? ◦ What is the extent of physical activity in national parks? What are the different classifications of physical activity within park settings? ◦ What is the duration and intensity of physical activity undertaken by visitors? ◦ Do parks help visitors meet their daily recommendations for physical activity? ◦ Do park visits contribute to future changes in healthy lifestyle behaviors?	Park units Specific resource Individuals Visitor groups	Focus groups Surveys Observation Monitoring tools Panel study	◦ Link to medical research demonstrating immediate and long-term health benefits ◦ Evaluate park resources for physical activity resources ◦ Identify and address constraints to physical activity and associated benefits ◦ Evaluate if park health resources help people meet daily physical activity recommendations
Understanding the Link Between Park-going and Mental Health and Well-being			
◦ Which park resources and activities promote mental health and well-being? ◦ What are the specific mental health and well-being benefits of parks? ◦ What are constraints to park use and access to health resources that promote mental health and well-being?	Park units Specific resource Individuals Visitor groups NPS employees and volunteers Veterans	Focus groups Interviews Surveys Monitoring tools	◦ Link to medical research demonstrating health benefits ◦ Evaluate park resources for mental health and well-being resources ◦ Identify and address constraints to mental health and well-being resources and associated benefits ◦ Identify specific groups who may receive specific mental health improvements from parks

Evaluating Nutrition and Nutritional Information in Parks			
◦ What food/beverages are available, and how nutritious are these items? ◦ What are the constraints to regulating the quality of food available in parks? ◦ What are the financial implications of regulating the quality of food sold by park vendors? ◦ How do park users respond to an inventory of healthy choices and constraints on non-nutritious foods in park food outlets? ◦ What is the baseline nutritional knowledge and preferences of park visitors, and are there significant differences between the general population's nutritional knowledge and preferences? ◦ Can nutritional signage mitigate concerns about availability of healthy/unhealthy foods? ◦ How can NPS policy lead to increased nutritional offerings?	Park units Individuals Concessions	Inventory Surveys Secondary data Observation	◦ Evaluate baseline nutrition options and changes in offerings and consumption ◦ Evaluate baseline knowledge/preferences and look for changes ◦ Identify trends and patterns associated with nutritional knowledge and decision-making ◦ Enhance resources to promote nutrition
Improving Health Education/Communication in Parks			
◦ What are NPS health education resources? ◦ What communication strategies are used and preferred by visitors? ◦ How do use and preference of health education/communication strategies vary by categories of visitors such as age and group composition? ◦ Do education programs lead to healthier decision-making at parks and at home that is consistent with national guidelines for physical activity and diet? ◦ Do certain types of interpretive programs lead to a reduction of perceived constraints to park health resources? ◦ Can interpretive programs designed for specific populations result in higher interactions with park health resources?	Park units Programs Individuals Categories of visitors	Observation Surveys	◦ Evaluate the educational and communication health resources in parks for staff and the public ◦ Expand and improve health education and communication in parks ◦ Evaluate successful strategies for education and communication ◦ Evaluate the effect of programming on reduction of perceived constraints to park health resources

Developing and Using Program Evaluation Tools			
◦ What are the current methods and tools used for evaluation of park health resources and programs? ◦ How effective are these tools in evaluation for health resources and programs in NPS units? ◦ Are current and future health programs amenable to sound evaluation and monitoring?	Park units Programs Individuals Employees	Observation Surveys Interviews Focus groups Secondary data	◦ Identify current evaluation tools for park health resources and programs ◦ Evaluate the effectiveness of programs to allow for improvement and growth ◦ Develop new health programs specific to groups and resources ◦ Establish improved monitoring and evaluation tools for evaluating health resources and programs in NPS units
Additional Areas of Research			
◦ What park resources/experiences are considered inspirational to staff and visitors? ◦ How do social relationships mediate interaction with park resources? ◦ Do visitors retain healthy lifestyles when returning to home communities? ◦ How does the ecological health of the park influence physical, mental, and social health of visitors? ◦ What role do parks play in public health policy? ◦ Do policies in parks act as interventions to promote healthy lifestyles? ◦ What is the return of investment of park-based disease prevention strategies?	Park units Communities Visitor vs. non-visitor Social groups Ecological systems	Surveys GIS Secondary data Interviews Visual tools	◦ Evaluate the inspirational, therapeutic, and spiritual resources of parks ◦ Evaluate the different social relationships and influences on healthy choices during park visitation ◦ Compare healthy choices of a visitor within park to choices within their home community ◦ Understand the relationship between the ecological health of the park and the health of the visitors and staff ◦ Evaluate role of parks in public health policy and current policies within the NPS promoting public health ◦ Understand the efficacy of park-based health promotion strategies in partnership with health and medical care providers and insurance companies



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Implementing the proposed NPS HPHP research agenda and supporting collaborations to benefit the broader context of HPHP US will require specific actions which can be accomplished in three stages: 1) organizing for research, 2) conducting research, and 3) applying research findings.

Stage 1: Organizing for Research

The first stage of the NPS HPHP action plan requires preparation for the proposed research through initial implementation of the research plan, funding, and partnership formation. The NPS HPHP Science Plan should be overseen by the Office of Public Health (OPH). The plan's focus on health and the distinctive issues/requirements associated with health research justify the OPH as the organizational location and leader for this work. Some examples of the anticipated responsibilities of the OPH include: 1) fostering interdisciplinary partnerships to support NPS HPHP science and HPHP US among a broad base of agencies, organizations, and disciplines at regional, national, and international levels of involvement, 2) preparing agreements, contracts, and task orders, 3) approving research plans, 4) human subjects review, 5) Office of Management and Budget (OMB) approval of public surveys, and 6) ethics review regarding human subjects research. A 0.5 full-time equivalent (FTE) will be needed to accomplish these tasks.

The establishment of a NPS HPHP science consortium is proposed for fostering research and collaboration to accomplish the NPS HPHP research agenda. The strategic goals of the proposed NPS HPHP science consortium would be to:

- Expand scientific understanding of the role of parks and public lands in contributing to a healthy civil society, with a primary focus on NPS units and programs.
- Enable program and institutional capabilities to conduct interdisciplinary and intersectoral research at park/community, regional, national and international levels.
- Maximize mission success among partnering member organizations.

Dark nights are important for human health as they promote a natural circadian rhythm.

NPS/DAN AND CINDY DURISCOE

The consortium should include a select set of research and network institutions, organized via cooperative agreements and focused on conducting NPS HPHP science research. Selection of participating institutions should reflect specific criteria, capacities, and contributions, and be established through formal competition to maximize public benefit and reduce costs.

Such a consortium could produce high quality and efficient research because of its distinctive collection of relevant expertise. The initial costs and time needed for the development of the NPS HPHP science consortium are worth the benefits; once built, all partners have a stake in the research consortium through resource and cost-sharing.

Stage 2: Conducting Research

The second stage of the NPS HPHP action plan involves implementation of the research projects described in the NPS HPHP research agenda. The first step is to identify park health resources. This is the foundation of the research plan and sets the stage for the subsequent research projects, which include: 1) documenting physical activity in parks, 2) understanding the link between park-going and mental health and well-being, 3) evaluating nutrition and nutritional information in parks, 4) improving health education/communication in parks, 5) developing and using program evaluation tools, and 6) additional areas of research as described in the NPS HPHP research agenda. This stage requires flexibility and research should not be prioritized simply based on available funding, but by both the logical progression described in the research agenda and opportunities for partnerships.

Stage 3: Applying Research Findings

The final stage of the NPS HPHP action plan involves applying research findings from Stage 2 research projects through the transfer of usable knowledge to four targeted audiences: 1) park management, 2) health and medical community, 3) scientific community, and 4) the public. Knowledge gained from research in the previous stage can guide programming development and policy formation. Each individual research project should allocate at least 5% of its budget needs for information transfer. This would ensure application to park management and the health community. Each project should produce a peer-reviewed publication for scientific literature in addition to a technical report to advance best available sound science and communicate with the scientific and health communities.

A feedback loop between the targeted audiences and the research consortium should be established to allow for responses, evaluation, and adaptations of NPS HPHP science research and programs over time. The first targeted audience is park management. Strategies to deliver information for this audience include technical reports, presentations at park meetings and park-related conferences, and training sessions with NPS staff. The second targeted audience is the health and medical community. Strategies to deliver information for this audience include

health websites, peer-reviewed journals and magazines, and presentations at public health conferences. The third audience is the scientific community. Strategies to deliver information for this audience include articles in scientific journals and presentations at scientific and academic conferences. The final targeted audience is the general public. Strategies to deliver information for this audience include social media, newspapers and magazines, websites, and signage/programming. The audiences and their specific delivery strategies are summarized in Table 2.

Table 2: Summary of the delivery strategies proposed for reaching targeted audiences.

Targeted Audiences	Delivery Strategies
Park Management	◦ Technical reports ◦ Presentations at park meetings ◦ Presentations at park conferences ◦ Training for NPS staff
Health & Medical Community	◦ Health and Medical websites ◦ Health and Medical journals/magazines ◦ Health and Medical conferences
Scientific Community Public	◦ Scientific journals ◦ Scientific conferences
Public	◦ Social media ◦ Newspapers/magazines ◦ Websites ◦ Signage/programming

Conclusion

Several important areas for NPS HPHP science research have emerged from this plan and the NPS HPHP science workshop. The literature review (See Appendix 1) provides examples of park research connected to health resources (physical activity, contact with nature and green space, nutrition, and education), constraints to health resources and measurement, and evaluation of park health resources. There is a need for further research within national parks to provide baseline inventory and evaluation of park health resources; explore the utilization of these resources during a park visit; identify specific constraints for parks; and measure and evaluate these unique resources and associated benefits. The NPS should use the general outline of the research agenda in this plan as a basis to establish a NPS HPHP science consortium, to guide research development and implementation in the NPS units, and to help fulfill the HPHP US vision for parks to be recognized and valued for contributing to a healthy civil society. Both parks and people will benefit.

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1 *Literature Review of Parks and Human Health*

Several major literature reviews have been conducted on the relationship between parks and physical, mental, spiritual, social, and environmental health (Godbey, 2009; Lee & Maheswaran, 2010; Maller et al., 2002; Richardson & Parker, 2011; Sallis, Floyd, Rodríguez, & Saelens, 2012). This appendix provides a brief, representative, but not comprehensive, review of the available literature. The term "parks" within this review is not specific to national parks, but represents a variety of outdoor natural settings.

1. Role for Parks in Public Health

The unique characteristics of parks make them ideal settings for promoting public health. Godbey, Caldwell, Floyd, & Payne (2005) provide a historic background of parks and the associated health benefits. In reviews by Lee (2011) and Sallis et al. (2012), governmental public lands and parks can support diverse outdoor recreation and provide unique settings for multiple users in comparison to other venues for public health. For example, parks are associated with higher accessibility and lower costs (Sallis et al., 2012) than other arenas for public health and recreation. In addition, the natural setting of parks provides for multiple types of physical and mental health benefits necessary for a holistic lifestyle (Maller et al., 2009).

Though the literature supports the role of parks in public health, recognition by governments and the general public has lagged (Maller et al., 2009; Richardson & Parker, 2011). The NPS has always supported preventive health and safety policies within parks, but until recently proactive steps towards public health have not been a priority (Wexler, 2004). Recognizing the role of parks in human health can change the way the political and public communities view parks in the future (Maller et al., 2002). It is key that the substantial health benefits of nature and parks are communicated to all sectors including the government and the public (St Leger, 2003).

Half Dome cables on a Monday.
NPS/ANNALISA JONES

In a 2006 report to the National Park System Advisory Board by the Committee on Health and Recreation, three public health outcomes were identified for national parks: 1) increased awareness of health benefits by park visitors, 2) increased health and physical activity in national parks, and 3) increased healthful lifestyles at home (National Park Service Advisory Board [NPSAB], 2006). Despite these desired public health outcomes, there is a lack of research demonstrating health opportunities and benefits specific to national parks (Maller et al., 2009).

2. Park Health Resources and Associated Benefits

For the purpose of this review, *park health* resources are programs, facilities, and environments (natural and cultural) that when utilized by visitors can provide physical, mental, and social health benefits.

2.1 Physical Activity

Physical activity in parks, green space, and other outdoor settings can contribute to public health by providing space and resources for physical activity and recreation. However, studies have found that most park visits result in sedentary versus active behaviors (Active Living Research [ALR], 2010). The Centers for Disease Control and Prevention recommends the following physical activity requirements to promote and maintain health: for children, 60 minutes per day, and for adults, 150 minutes per week of moderate-intensity aerobic activity, plus at least 2 days a week of muscle-strengthening activities (Centers for Disease Control and Prevention [CDC], 2008). The recent decline of physical activity (Richardson & Parker, 2011; Sallis et al., 2012) has led to fewer than 5% of adults participating in 30 minutes of physical activity per day (US Department of Agriculture & US Department of Health and Human Services [USDA & USDHHS], 2010). One of the contributing factors to this increase in sedentary lifestyles is a lack of parks and places for physical activity (USDA & USDHHS, 2010).

There have been several reviews of physical activity in parks and outdoor settings (ALR, 2010; Bowler, Buyung-Ali, Knight, & Pullin, 2010; Kaczynski & Henderson, 2007; McCurdy, Winterbottom, Mehta, & Roberts, 2010; Sallis et al., 2012). The Guide to Community Preventive Services recommends social support interventions in communities, enhanced access to places

for physical activity, and informational outreach activities (Community Preventive Services Task Force [CPSTF], n.d.). Some of the 2011 National Prevention Strategy recommendations for increased physical activity include facilitating access to safe, accessible, and affordable places for physical activity and assessing physical activity levels and provide education and counseling (NPC, 2011).

More time spent outdoors is correlated with higher rates of physical activity (McCurdy et al., 2010) and perceived physical competence (Sallis, Prochaska, & Taylor, 2000). Physiological health benefits from exercise in a "green" setting reveals reductions in blood pressure (Pretty, Peacock, Sellens, & Griffin, 2005), cardio-vascular disease, diabetes (Lee & Maheswaran, 2010), and body mass (Lee, 2011).

Mental health, such as improved self-esteem, can result from regular physical activity in a green setting (Barton & Pretty, 2010; Pretty et al., 2005; Thompson Coon et al., 2011). Reviews of the literature have identified additional psychological benefits such as improvements in cognitive functioning and reduction in stress (Fletcher et al., 1996) and improvements in cases of depression, anxiety, and psychoses (Taylor, Sallis, & Needle, 1985). There is a lack of research exploring the relationship between types of green space on physical activity (Thompson Coon et al., 2011).

Improved health from increased physical activity can also have economic impacts (Lee, 2011; Morris, 2003). For example, a study by Popkin, Kim, Rusev, Du, & Zizza (2006) identified direct and indirect costs associated with nutrition and physical activity.

2.2 Contact with Nature and Green Space

Contact with nature and green space can offer a variety of physical, mental, and social health benefits (St. Leger, 2003). Maller et al. (2002, p. 6) defines contact with nature "as viewing natural scenes, being in natural environments, or observing, encountering or otherwise interacting with plants and animals." For the purpose of this review, green space is not limited to national park settings, but includes other park settings, fields, trails, and playgrounds.

There have been many literature reviews of contact with nature/green space and associated health benefits (Abraham et al, 2010; Bowler et al., 2010; Lee, 2011; Lee & Maheswaran, 2010; Maller et al., 2009, 2002; McCurdy et al., 2010; Morris, 2003; Richardson & Parker, 2011, St Leger, 2003). Physical health benefits include reduction of heart rate, muscle tension, blood pressure, and positive influences on immunity and cardiovascular function (Karjalainen, 2010); Maller et al., 2002; Payne (2010);). Green space can aid in reducing health disparities among populations (Richardson & Parker, 2011, Wells (2003).

Herzog, Maguire, & Nebel (2003) found higher ratings for perceived restorative potential and preference for natural settings versus urban environments. The restorative benefits of natural environments (Kaplan, 1995) include improvement in mental health, such as the ability to cope with stress, improved mood and self-esteem, reduced depression, and anxiety (Maller et al., 2009, 2002), increased attention levels for children (McCurdy et al., 2010), and reduced negative emotions, such as anger and sadness (Bowler et al., 2010).

Social capital has been recognized as a factor for alleviating public health inequality (Hawe & Shiell, 2000). Several research reviews have identified the impacts of nature and green spaces on improved social capital (Lee & Maheswaran, 2010; Maller et al., 2002; Richardson & Parker, 2011) such as enhancing community relationships, creating a sense of place, greater community satisfaction, crime reduction, and aid in integration for migrant residents (Maller et al., 2002).

2.3 Nutrition

The 2010 Dietary Guidelines for Americans (DGA) report, developed by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services, illustrates the impact of dietary consumption on increasing societal health issues. In a review by Lichtenstein et al. (2006), a healthy diet was shown to reduce cardio-vascular risks and other diseases. The recommended caloric intake is dependent on gender, height, weight, age, and level of physical activity. Estimates range from 1,600 to 3,000 calories per day for adults and from 1,000 to 3,200 calories

per day for children/adolescents (USDA & USDHHS, 2010). The American Heart Association recommends that individuals consume a variety of fruits, vegetables, whole grains, low-fat dairy products and lean meats (Lichtenstein et al., 2006).

There are many contributing factors to our society's health epidemic including portion size, the nutrient content of foods, accessibility and cost efficiency of nutritious foods, lack of exercise, and negative influence of social media (Lichtenstein et al., 2006). For individuals and families to make healthy choices, they need the tools to make educated decisions and access to affordable healthy choices (USDA & USDHHS, 2010). In a study by Burton, Creyer, Kees, & Huggins (2006), consumers significantly underestimated the caloric and fat content of food items. In addition, this study found that the decision-making of consumers was influenced by the availability of nutritional information. In 2011, the CDC and NPS conducted a study of 47 parks in 33 states using adapted Nutrition Environment Measures Surveys (NEMS) to assess restaurants, snack shops, and vending machines for access, pricing, and promotion of healthful versus less healthy foods and beverages, including water (Wong, Allen, & Higgins, 2011). The preliminary results revealed that only 26% of beverage vending machine choices consisted of healthful drinks, and only 19% of restaurants offered greater than one entrée on the menu labeled as healthy.

Some of the recommendations supporting nutrition in the 2011 National Prevention Strategy, on which the NPS can focus its efforts, include: 1) increasing access to affordable and healthy foods, 2) implementing organizational nutritional standards and policies, 3) improving nutritional quality of the food supply, and 4) helping people recognize and make healthy food and beverage choices (NPC, 2011).

2.4 Education

Student and public educational programs can be effective venues for park staff to promote healthy choices for visitors within and outside the park setting. Programming, which enables the participant to retain and apply the information to their lives, has been found to be effective for learning although further research is warranted on the development of these programs (Lee, 2011).

In a 2007 study, sixteen parks within the NPS developed and implemented public-health focused educational programming. Surveys were given to program managers and staff to measure program effectiveness. At least 90% of the managers and staff showed strong support for the programs and their ability to provide visitors with information they would not likely have received elsewhere in the park (Wong & Higgins, 2010). However, this study did not survey visitors, which would offer the most useful evidence for program effectiveness.

Interpretive programming can have effects on visitor behavior through increased awareness (Tubb, 2003). Hoehner, Brownson, Allen (2010) evaluated the effectiveness of programs and communication strategies targeted towards physical activity and recreation in seven national parks. Five of the seven pilot projects showed evidence of an increase in physical activity associated with the intervention activities. Podcast tours, another avenue for education in the parks, positively influenced tourist experiences and stewardship in a national park setting (Kang & Gretzel, 2012). However, this study was not specific to health-related podcast tours, which may be an area for future research.

The NPS offers a variety of curriculum-based educational programs to students within the parks and in schools (Stern, Wright, & Powell, 2012). There are many unique benefits associated with learning outside the classroom, such as cognitive and affective learning and an opportunity for investigation, discovery, and hands-on experiences (DeWitt & Storksdieck, 2008). For example, a food waste program was found as a contributor to changes in reported stewardship behavior and knowledge at a residential national park educational program for students (Stern, Powell, & Ardoin, 2008).

3. Constraints to Using Park Health Resources

Many types of constraints (intrapersonal, interpersonal, and structural) to using park health resources and receiving the associated benefits have been documented by research (Crawford & Godbey, 1987; Jackson, 2000; Son, Kerstetter, & Mowen, 2008; Wilhelm Stanis, Schneider, & Russell, 2009). For the purpose of this review, constraints include park

characteristics such as size, facilities, accessibility, and safety. Additionally, social characteristics associated with constraints to park health resources (gender, age, ethnicity, socio-economic status) are discussed in the following section.

3.1 Park Characteristics

Constraints categorized as park characteristics include size, facilities, accessibility, safety, aesthetics, and types/quality of facilities and programs. Accessibility has been well documented in the literature as a constraint for populations to benefit from park health resources. In reviews by Sallis et al. (2012) and ALR (2010), availability and proximity to parks/recreation facilities are associated with an increase in physical activity among multiple age groups. However, parks that are accessible may have lower perceptions of safety and lower quality of physical and social processes which can impact use (Franzini et al., 2010).

In addition to park access, aesthetics, features, quality of the green space (Lee & Maheswaran, 2010), size, and attractiveness (Sugiyama, Francis, Middleton, Owen, & Giles-Corti, 2010) were found to be influential factors of frequency and type of use. The presence and quality of trails (Kaczynski, Potwarka, & Saelens, 2008) and the amount and quality of organized activities and events at parks (Cohen et al., 2007) may also be factors affecting park use.

Safety (Richardson & Parker, 2011) and maintenance of facilities (Lee & Maheswaran, 2010) were found as constraints and several reviews found fears associated with crime, traffic, and racism to be influences of park use (Lee & Maheswaran, 2010; Sallis et al., 2012).

3.2 Social Characteristics Associated with Constraints

Social characteristics associated with constraints to park health resources include gender, age, ethnicity, and socio-economic status (ALR, 2010; Lee, 2011; Lee & Maheswaran, 2010). For example, Cohen et al. (2007) found large differences in park use dependent on gender and Floyd, Spengler, Maddock, Gobster, & Suau (2008) found differences in physical activity levels dependent on age.

Reviews of the literature have identified ethnicity as an influential factor in frequency and types of green space use (M. Floyd & Doorley, 2008; Franzini et al., 2010; Lee, 2011; Lee & Maheswaran, 2010; Reed, Price, Grost, & Mantinan, 2011; Richardson & Parker, 2011). For example, Burk, Shinew, & Stodolska (2011) found a lower rate of leisure time physical activity in outdoor recreation areas among Latinos.

Disparities in health conditions are influenced by socio-economic status (Sallis, Story, & Lou, 2009). Green spaces and parks, which promote good health, can play an important role in alleviating socioeconomic health disparities (Mitchell & Popham, 2008). Relationships between socio-economic status and participation and access to green space and outdoor recreation have been identified in the literature (Lee & Maheswaran, 2010; Richardson & Parker, 2011). Within the NPS, a survey found significant differences among racial and ethnic groups on their perceptions and visitation of parks (National Park Service & Natural Resource Stewardship [NPS & NRS], 2011).

There are also constraints associated with park educational resources. Teachers are most strongly influenced by their comfort level with park programming, perceptions, and expectations of the programs to enhance student achievement (Stern et al., 2012). It is important for park management to understand and address the barriers to participation and effectiveness in educational programs to improve education as a park health resource.

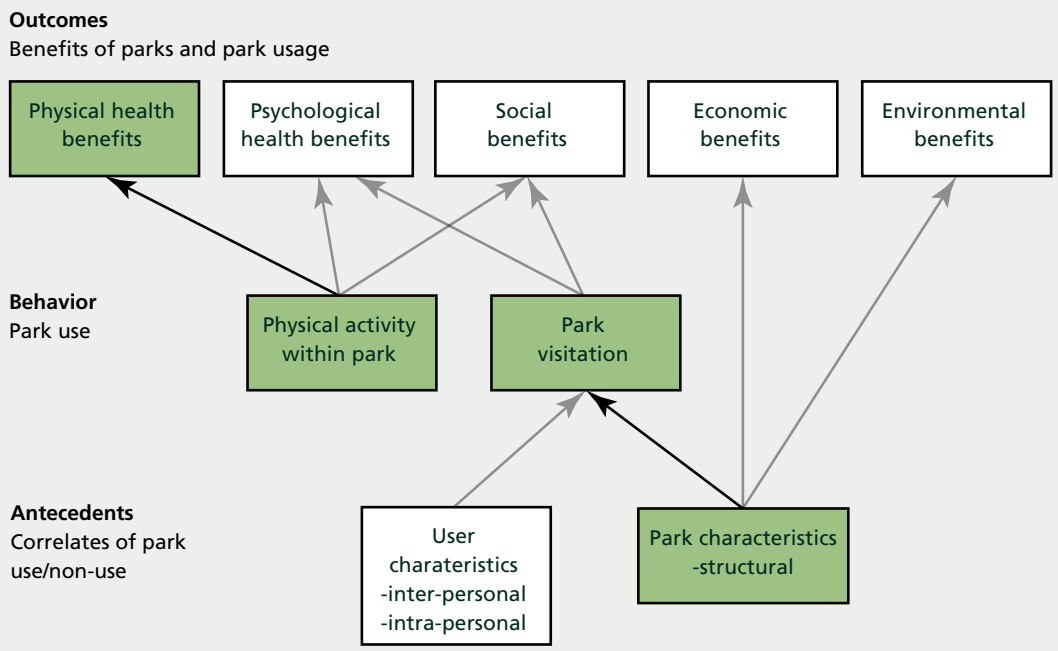
4. Measurement and Evaluation of Park Health Resources and Benefits

Researchers use many techniques to measure and evaluate park health resources and benefits (Godbey, 2009; ALR, n.d.). The following sections identify and describe some established frameworks and methods. Finally, some issues with current methods highlighted in the literature are provided.

4.1 Current Frameworks and Methods

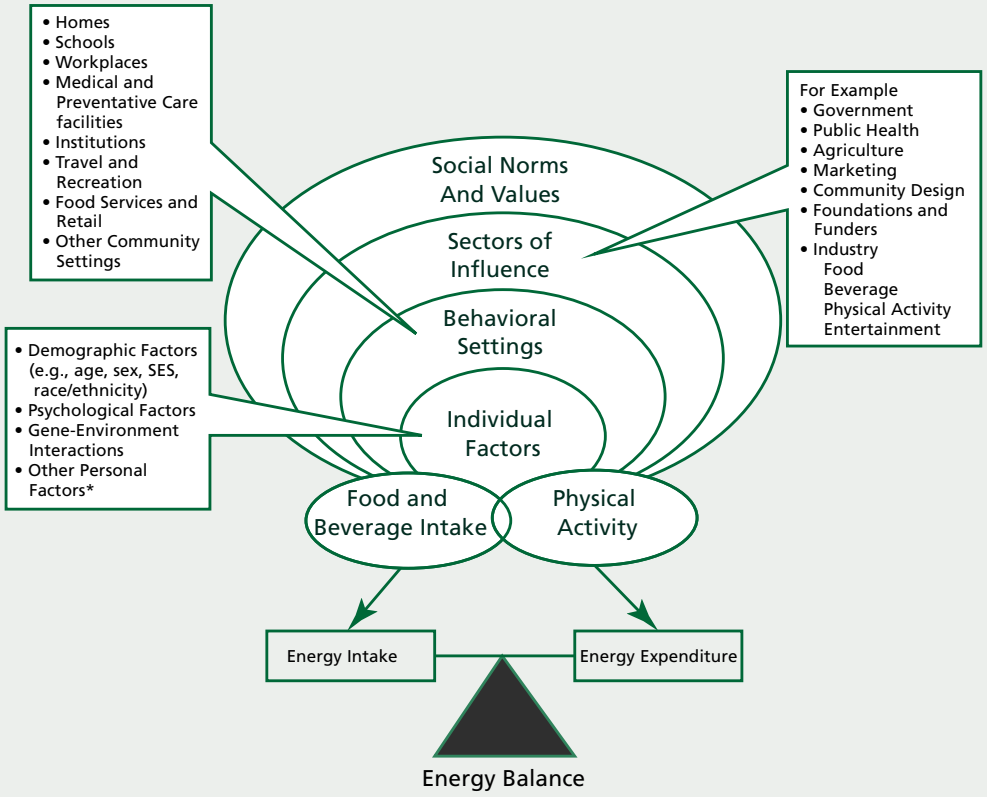
A conceptual model (see Figure 1), designed by Bedimo-Rung, Mowen, & Cohen (2005), can assist in identifying relationships among user and park characteristics, park visitation and physical activity within parks, and beneficial outcomes (physical, psychological, social, economic, and environmental). This specific study focused on physical activity from park visitation and the associated physical health benefits (see shaded boxes and darker arrows of Figure 2). Different research design and methods will be dependent on the focus area within the model.

Figure 2: Adapted from (Bedimo-Rung et al., 2005). The diagram represents the focus of the paper's study on physical activity and physical benefits (see darker arrow and shaded boxes).



Another helpful framework, created by the CDC, was included in the Dietary Guidelines for Americans 2010 report. The Social-Ecological Framework (see Figure 3) identifies many factors influencing a person's decision-making process for nutrition and physical activity: individual factors, environmental settings, sectors of influence, and social/cultural norms (CDC, 2008). This model can aid in HPHP research through development of research questions and data collection methods for targeted audiences based on factors influencing the decision-making process. Additionally, the model can be adapted by adding "Parks" as a sector of influence and "Travel and Tourism" and "Parks and Recreation" as discrete behavioral settings.

Figure 3: A social-ecological framework for nutrition and physical activity decisions (USDA & USDHHS, 2010). Adapted from (CDC, 2008).



*Note: Other relevant factors that influence obesity prevention interventions are culture and acculturation, biobehavioral interactions; and social, political, and historical contexts.
Sources: Adapted from IDM (2007); CDC (2006)

Many existing survey instruments and surveillance systems could be adapted to address research needs. A few of these tools include:

- Behavioral Risk Factors Surveillance System (BRFSS) is a tool developed by the CDC to plan, apply, and evaluate public health programs through telephone questionnaires. The method has been adopted by all states which use similar methods and analyses for comparability of results (Remington et al., 1988).
- The Visitor Services Project (VSP) is a tool developed in 1982 and an ongoing research project by the NPS Social Science Program. The program obtains information of visitors' actions, preferences, and needs in parks (NPS, 2007).
- The Nutrition Environment Measures Survey (NEMS) is a credible and dependable measure of the nutritional environment (Honeycutt, Davis, Clawson, & Glanz, 2010), which uses observational measures to evaluate the types of foods offered, the availability of healthy choices and information, and the pricing and promotion of healthier food choices.
- System for Observing Play and Recreation in Communities (SOPARC) is a metric for assessing physical activity and associated contextual data in community settings (Mckenzie, Cohen, Sehgal, & Williamson, 2006) by providing information on park characteristics, such as accessibility and usability (Godbey, 2009).

Another resource for methods is The Active Living Research website, **www.activelivingresearch.org/resourcesearch**, which provides an extensive list of community and park measurement tools associated with physical activity, nutrition, and health resources. Some of the listed tools for measurement and evaluation include the Physical Activity Resource Assessment (PARA), System for Observing Leisure Activity and Play in Youth (SOPLAY), the St. Louis Environmental and Physical Activity Assessment, Environmental Supports for Physical Activity Questionnaire, and BRAT-Direct Observation Instrument (ALR, n.d.).

Methods for measuring physical activity identified in a report to the National Park System Advisory Board by the Committee on Health and Recreation include pedometers, infra-red counters, visual observation, surveys, on-line self-reported log of activity, a passport program, GPS monitoring, and wearable radio frequency identification (RFID) tags similar to those used for marathons (NPSAB, 2006).

Additional tools used by researchers to measure and evaluate park health resources and benefits include a Health Impact Assessment (HIA), Path Environmental Audit Tool (PEAT), Experience Sampling Method (ESM), and Ecological Momentary Assessment (EMA). Two tools for measuring self-esteem and mood are the Rosenberg Self-Esteem Scale (RSE) and the Profile of Mood States (POMS). Chang, Hammitt, Chen, Machnik, & Su (2008) measured psychological responses of viewing images of restorative environments through electromyography (EMG), electrocephalography (EEG), and blood volume pulse (BVP) measurements.

4.2 Issues with Current Methods

There are many issues identified in the park/health literature associated with current methods of data collection and analysis. Reviews by Maller et al. (2009) and Lee (2011) found an abundance of subjective evidence of benefits of nature, but less scientific research on the physical effects on mental and physical health. Lee & Maheswaran's review (2010)found paucity in the literature of studies establishing credible causal relationships of green space and health and a lack of measures of physical activity. Richardson & Parker (2011) found recommendations for dose-response research associated with green space and health. Lastly, Lee’s review (2011) identified a lack of standard evaluation tools used for education programs as a problem.

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Park visitor admiring horned bladderwort. NPS/JEAN SEAVEY

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U.S. Department of the Interior

The mission of the Department of the Interior is to protect and provide access to our nation's natural and cultural heritage and honor our trust responsibilities to tribes. We:

- encourage and provide for the appropriate management, preservation, and operation of the nation's public lands and natural resources for use and enjoyment both now and in the future;
- carry out related scientific research and investigations in support of these objectives;
- develop and use resources in an environmentally sound manner, and provide an equitable return on these resources to the American taxpayer; and
- carry out trust responsibilities of the U.S. Government with respect to American Indians and Alaska Natives.

National Park Service

The National Park Service is a bureau within the Department of the Interior. We preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. We also cooperate with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

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