Improving Human Health by Increasing Access to Natural Areas: Linking Research to Action at Scale

Report of the 2014 Berkley Workshop

Held at the Wingspread Conference Center, Johnson Foundation, Racine, Wisconsin
June 2014

The purpose of the Yale Program on Strategies for the Future of Conservation is:

- To support the efforts of the Maine Coast Heritage Trust, the Land Trust Alliance and similar private organizations to develop and apply new, innovative strategies for land conservation by linking the convening, research, and teaching activities at the Yale School of Forestry & Environmental Studies ever more closely to the needs of the land conservation community.

- Convening workshops and other conversations across sectors and perspectives in the search for new approaches to expanding the resources applied to land conservation in the United States.

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- Sponsoring student internships and research projects (through the Berkley Conservation Scholars program), to bring the passion, experience and creativity of Yale graduate students to bear on these issues; and

- Helping to bring together practitioners and academics in the search for new conservation tools.

The Yale Program on Strategies for the Future of Conservation is a major extension of the Yale School of Forestry & Environmental Studies’ continuing efforts to enhance the effectiveness of land conservation. Working with an advisory group of land conservation leaders, the program hosts workshops, training programs and other activities around the themes of engaging new communities in conservation, expanding the conservation toolkit, and ensuring the permanence of conservation gains.

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Introduction and Workshop Summary

Bradford S. Gentry
Yale School of Forestry & Environmental Studies

Scaling-Up the Connections Between Health and Nature: Summary of the Major Areas for Action

Bradford S. Gentry
Yale School of Forestry & Environmental Studies

Both the health and conservation communities are currently in periods of transformational change. The need to improve human health, while reducing costs and increasing access, is leading health organizations “upstream” toward more preventive and community-based measures. At the same time, the need to expand the value of conserved land to a wider range of publics is pushing conservation organizations to incorporate their lands into broader efforts to build healthy communities.

As described in the chapters that follow, many different groups are now working to expand the connections being made between improved health and increased access to natural areas. At the same time, many of these efforts are happening in individual locations or around particular topics in ways that make it hard to connect them across the country. Other barriers include competing priorities and skepticism about the mechanism of these connections within both health and conservation organizations.

The 2014 Berkley Workshop was convened to provide researchers and practitioners in both the health and conservation fields with the opportunity to discuss how to surmount these obstacles, collectively brainstorm ways to scale up the impacts of what we already know, and set the direction of work moving forward.

Rather than reinventing the wheel, the goal of this work should be to build from the wide range of efforts already underway – from research to advocacy to action. This will require time spent voluntarily sharing information and coordinating across multiple actors. Such a “network of networks” will only emerge and be sustained if participating in it helps each of the groups involved meet their own goals and missions even more effectively.
“To deepen the connections between health and nature, we need a radical disregard of boundaries – working within, outside and around (through ‘bank shots’) existing health and conservation institutions.”

—Howard Frumkin, University of Washington

So what do we need to do and where should we act now to deepen these connections still further? The remainder of this section summarizes the actions suggested by workshop participants (listed in Box 1) under the following broad headings:

- Develop **statements of shared beliefs and calls to action** around which to organize joint efforts
- **Share the work already underway** on multiple aspects of the connections between health and nature
- Enhance efforts to improve health by working with willing partners to **increase time in nature and to learn** from those experiences
- Conduct **more research** on health impacts, but also on the social and business aspects
- Explore **new business models** – for expanded action connecting health and nature
- Make **more compelling stories** of the benefits of these connections available for use with different audiences
- **Acknowledge and address the risks** of and barriers to more time in nature

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**Box 1: List of Workshop Participants**

*Stacy Bare, Director, Sierra Club Outdoors, UT*

*Ray Baxter, Senior Vice President, Community Benefit, Research and Health Policy, Kaiser Permanente, CA*

*Forrest Berkley, Board Member, Maine Coast Heritage Trust, ME*

*Marcie Tyre Berkley, Board Member, Maine Huts & Trails, ME*

*William Bird, CEO, Intelligent Health, UK*

*Bobby Cochran, Executive Director, Willamette Partnership, OR*

*John Cochran, Former COO, LA County Dept Health Services, OR*

*Ernest Cook, Executive Director, Knobloch Family Foundation and Sr. VP, Trust for Public Land, MA*
Kim Elliman, CEO, Open Space Institute, NY
Jay Espy, Executive Director, Sewall Foundation, ME
Howard Frumkin, Dean, School of Public Health, University of Washington, WA
Brad Gentry, Professor in the Practice, Yale Schools of Forestry & Environmental Studies and Management, CT
Gene Grigsby, President and CEO, National Health Foundation, CA
Peter Harnik, Director, Center for City Park Excellence, The Trust for Public Land, DC
Jeannette Ickovics, Professor, School of Public Health, Yale University, CT
Wendy Jackson, Executive Director, Freshwater Land Trust, AL
Elizabeth Love, Program Officer, Houston Endowment, TX
Rue Mapp, Founder, Outdoor Afro, CA
David Mays, Brand Communication, Kaiser Permanente, CA
Perry Robinson, MD and Founder, Greenwich BioMedical Inc., CT
Naomi Sachs, Founding Director, Therapeutic Landscapes Network, TX
Marc Smiley, Partner, Solid Ground Consulting (facilitator), OR
Chris Smith, Senior Program Officer, CO Health Foundation, CO
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Sarah Milligan Toffler, Executive Director, Children & Nature Network, MN
Lexi Tuddenham, MEM, Yale School of Forestry and Environmental Studies, CT
Elizabeth Ward, Director of Communications, Land Trust Alliance, DC
Rand Wentworth, President, Land Trust Alliance, DC
Cindi West, Associate Deputy Chief R&D, U.S. Forest Service, DC
Kristin Wheeler, Program Manager, Institute at the Golden Gate, CA
Robert Zarr, Pediatrician, Unity Health Care, and DC Parks Rx, DC
Develop statements of shared beliefs and calls to action around which to organize joint efforts

While the connections between health and nature are complex, we already know enough to move forward more aggressively. In doing so, we need to talk about these complex connections in ways that resonate with the audiences we are seeking to influence.

What follows are some of the major “frames” or ways of thinking and talking about these connections that are rallying support with different audiences.

For health and conservation professionals: the “Wingspread Declaration on Health and Nature”

Carrying on the Wingspread Conference Center’s history of generating influential “declarations” on topics of pressing social concern, Box 2 contains the “Wingspread Declaration on Health and Nature.” The Declaration was developed during and just after the workshop. It is intended as a concise statement of both the reasons for and the steps that should be taken to deepen the connections between improved health and increased access to natural areas.

Box 2: The Wingspread Declaration on Health and Nature

November 15, 2014

Nature and human well-being are connected:

The connection between people and the natural world is fundamental to human health, well-being, spirit, and survival. Nature is a source of food, clean water, clean air, medicine, shelter, and economic opportunity. Moreover, in order to thrive, humans require direct access to nature. Whether a city park, a community garden, a tree-lined street, or wilderness – nature in people’s daily lives reduces stress, renews the spirit, connects people to each other and increases physical activity. In short, humans are part of nature, our connection with nature is a fundamental human need, and we believe access to nature is a basic right.

However, large numbers of people – many of them children – are now disconnected from nature. As a direct consequence, people around the world are suffering from substantial health challenges, many of them preventable. Likewise, the natural world faces increased pressures and vulnerability. The human, natural, and economic consequences of these challenges are already enormous.

This situation calls for placing consideration of the nature-health connection at the center of research, design, and decision-making across multiple fields. Concerted, cooperative action from health, environmental, educational, governmental, and corporate actors is needed to reconnect people with nature and to secure commitment to protecting nature.
Call for action to connect people with nature:

We know enough to act now. A robust body of evidence demonstrates the benefits to human health and well-being of the natural world and of nature contact. Evidence also demonstrates substantial co-benefits, such as more vibrant communities, reduced health disparities, mitigation and adaptation to a changing climate, and business opportunities.

Therefore we commit our own efforts to the following goals. We also call on leaders in the public and private spheres to recognize these commitments as central to their own aims, and to commit their own organizational efforts to these goals:

1. Today’s children will grow up with an understanding of their interdependence with nature. They will habitually incorporate outdoor activity into their everyday lives, and grow up with an appreciation for nature. Achieving this goal will require changes in school facilities and curricula, urban design, public spending priorities, pediatric healthcare, and more. In approaching this goal, we will focus on the most vulnerable and under-served populations of children first.

2. Employers and business leaders will recognize the powerful economic benefits of reconnecting people with nature and, in particular, of encouraging outdoor activity in order to lower healthcare costs, improve employee recruitment, retention, and performance. In so doing, employers will become leaders in preventing illness and disability, promoting health and well-being, and working to steward nature.

3. Nature, and access to nature, will be recognized as an important part of our health infrastructure and we will invest in places for healing and places to promote health.

4. We will help build organizations that have the competencies to factor the nature-health connection into their decisions on a regular basis. This will require training and hiring of knowledgeable employees. It will also rest on incorporation of research findings on this topic, thus:

5. New research will further reveal the interdependencies between nature and human health. We will undertake quantitative and qualitative research initiatives to measure and illustrate the health, well-being, and economic benefits of embedding the nature-health connection into decision-making at all levels.

6. To support these measures, we will create a clearinghouse of research, information, case studies of success, and partnerships to support good decision-making and to help connect new networks of health and environmental organizations.

To sign on to the Declaration and commit to the call to action, contact Kristin Wheeler with the Institute at the Golden Gate at health@instituteatgoldengate.org.
Not only did all of the workshop participants sign the declaration, but many new signatories have already been added since it was released in November 2014. If you are interested in joining this effort please go to www.healthandnature.org for more information.

**For physicians: “Park Prescriptions” for their patients**

Increasing numbers of primary care physicians are also attracted to the idea of prescribing walking or other exercise in natural areas as a way to help address chronic diseases. For example, see the description of Dr. Robert Zarr’s work with primarily lower income patients in Washington, D.C. provided in Section 1. Since the workshop, the State of Maine has also announced that patients with park prescriptions from their physicians will be admitted free to state parks (see Box 3).

**Box 3: 10,000 Free Maine State Park Passes**

Let’s Go – a nationally recognized childhood obesity prevention program – Harvard Pilgrim Health Care, and Maine’s Bureau of Parks and Lands have partnered to provide more than 10,000 free passes good at 47 Maine State Parks for patients and their families. The passes, distributed by participating primary care physicians, promote an active, healthy lifestyle and make it affordable for families to take advantage of Maine’s fantastic outdoors resources.


If you are interested in helping physicians in your area join the Park Prescriptions movement you can find more information about it at http://instituteatgoldengate.org/national or http://www.parksconservancy.org/conservation/sustainability/parks-and-health.html.

**For land trusts: improved health as one of the community benefits of more parks and trails**

As land trusts work to expand public support for the parcels they conserve, an increasing number are pointing to health benefits – as well as benefits to biodiversity, water, temperature, attractive neighborhoods and other community goals – as some of the major reasons to support their efforts.

Section 1 includes a description of how the Freshwater Land Trust has worked with local health partners to substantially expand the park and trail systems in Birmingham, Alabama – all as part of a broader effort to revitalize the region’s economy. More and more land trusts are now exploring these connections.

“Access to nature is directly linked to the American ideals of democracy and justice for which veterans fought – after all, ‘everyone gets wet outdoors.’”

— Stacy Bare, Sierra Club
Within the health community: conceptual models supported by statistical analyses

All of these and related efforts require a strong foundation in science. While the participants agreed that we know enough to continue scaling up action, they also agreed that many questions are deserving of further research.

Two particular efforts to “state the case” for the beneficial links between health and nature in scientific terms, and thereby help point the way for both future action and research, were described:

- Box 4 contains a conceptual model developed by Hartig, Mitchell, DeVries, and Frumkin (2014) for how increased access to nature can lead to improved health (see also the discussion in Section 4). More recent research by Ickovics and others at Yale finds that this model is strongly supported by statistical analyses of both health and nature data sets for the New Haven region.


- Box 5 contains the diagrams developed by Dr. William Bird to describe the conceptual model he uses for these connections – i.e. that the human body is still that of a pre-industrial hunter-gatherer for which time in nature is a major reducer of stress.
These were just a few of the efforts to describe the connections between health and nature in a concise way that reaches different audiences – for example, several attendees also spoke of the spiritual connections they feel when spending time in a natural area. In the sections that follow, such conceptual framings are essential both to future research, as well as to efforts to tell “compelling stories” about the opportunities created by these connections.

They do also raise the question of what we mean by time in “nature” or “natural areas”? Do healing gardens in malls, exercise equipment in outdoor parking lots, community gardens or even paved trails through woods constitute “nature” or “natural areas”? In many ways, these questions get at the core values of the health and conservation organizations trying to partner around shared goals. As such, the answers will vary dramatically from organization to organization.

Among the commitments individual attendees made to follow-up on such statements were the following:

• Develop and follow a strategic plan for disseminating and using the Wingspread Declaration in ways that will generate the greatest impact.
• Bring the Declaration back to each of their organizations as a way to review their existing programs and consider changes going forward
• Disseminate the Declaration widely across the different networks in which they are involved
• Use the Declaration as a vehicle for starting discussions with possible new partners in new locations
• Publicize the Declaration across a variety of media sources and provide opportunities for others to sign on.

Share the work already underway on multiple aspects of the connections between health and nature

Given the large number of efforts already underway around the connections between health and nature (see the Sections that follow), as well as the pressures on new resources to do even more, it is imperative that an effort be made to build on each other’s work, rather than duplicating it.

Fortunately, the workshop participants felt that there was so much work to be done – in specific locations, on specific topics and with different audiences – that there was virtually unanimous support for trying to connect the existing networks in ways that will increase their impact through the sharing of information and opportunities. This will require respectful engagement – i.e. making sure that this sharing helps the different groups meet their own goals even more effectively. Formal agreements like the one made by groups in the Bay Area (see Box 6) can help establish ground rules.

Box 6: Healthy Parks Healthy People Bay Area MOU

In 2013, 29 cooperating agencies in the Bay Area came together to sign a Memorandum of Understanding that established a general framework for cooperation on the “Healthy Parks, Healthy People Initiative.” Agencies included groups representing parks and open space, healthcare, and public health and educational institutions, all committed to furthering the mission of getting people outside and active.

See more at: http://www.openspace.org/activities/hphp.asp.

Among the commitments individual attendees made to share information on these topics were the following:

• Devote organizational resources and staff time to the efforts to build and sustain a network of networks around health and nature
• Create a clearinghouse for new developments and on-going sources of information on health and nature
• Bring additional partner organizations into the effort, particularly from the Southern U.S.
• Coordinate conferences and other convenings on health and nature to be supportive of this effort across the U.S.

• Share experiences from the U.S. and gather information on international efforts in this area at the World Parks Congress, to be held in Sydney, Australia from November 12-19, 2014.

*Enhance efforts to improve health by working with willing partners to increase time in nature and to learn from those experiences*

Increasing numbers of health providers, foundations, land trusts and others are already working to improve health by increasing access to natural areas (as described in Sections 1 and 2) – even though more work needs to be done. In one example of an innovative partnership, the Bronx Zoo is leveraging its appeal to children to help bolster health programs.

**Box 7: Bronx Zoo Health Partnerships**

In 2008, the Bronx Zoo and the Wildlife Conservation Society (WCS), which manages the zoo, partnered with the New York State government to host a day-long child health insurance enrollment event. Families came to the zoo to ask questions and get help from professionals on how to get their kids signed up for a new state insurance program, and received free admission to the zoo for the day.


WCS and the Bronx Zoo also partner with the local Children’s Hospital at Montefiore to host an annual “Family Diabetes Day” with fun activities, diabetes education, and free access to the zoo.

See more at: [http://www.cham.org/services/endocrinology/events/](http://www.cham.org/services/endocrinology/events/).

We need to support and learn from these efforts to make a difference today, including in the following ways –

**Health providers:** During the workshop, participants from Kaiser Permanente and Unity Healthcare described their remarkable efforts to get their patients outdoors as part of their programs (see Section 1).

“Park Prescriptions give doctors hope that they can make an impact on ‘lifestyle diseases.’”

*Robert Zarr, Unity Health Care*
They can do so, in part, because it fits their business models – which are not focused primarily on getting paid for treating sick individuals, but rather capture revenues by preventing individuals from getting sick in the first place. For health providers with similar incentives/goals, some of the following steps were suggested:

- Include activity/park prescriptions in vital signs/treatment plans for patients
- Provide outdoor recreation options for patients – through ratings of local parks
- Develop intermediaries/aggregators for connecting patients to accessible, safe natural areas
- Focus on hotspots – communities most at risk
- Consider offering electronic patient records as data sets for research trials on access to nature and impacts on health

**Foundations:** Increasing numbers of foundations are also exploring the connections between health and nature as part of their community improvement efforts. To date, this is happening mostly through their environmental programs, but efforts appear to be growing on the health side as well.

Should a foundation decide to engage on these topics, it might consider the following types of steps:

- Convening different parties from across their regions and sponsoring planning efforts around what types of programs might best fit the local context and needs
- Supporting proof of concept efforts, taking action designed to learn what might work best
- Evaluating the results and revising the approaches taken accordingly – as well as funding new research on any unexpected results
- Leveraging their own and others’ resources to take actions that seem most likely to have a larger impact at scale

**Others facing health issues:** Over the course of the workshop, many other organizations – employers, schools, Y’s, boy’s and girl’s clubs, etc. – were noted as also having strong interests in the health of their people.

This creates the possibility for even more partnerships around connecting improved health and increased access to natural areas. Such efforts might be organized through and around:

- Existing health networks, such as Park Prescriptions, Every Body Walk, Convergence Partnership and others described in the sections that follow
- Regional collaborations on:
  - Trails/programs, such as those in Houston, Birmingham, Denver, San Francisco, New Haven and others
  - Policy, such as those developing in Oregon and Maine, or between the Children & Nature Network and the National League of Cities
Existing conservation networks, such as with the members of the Land Trust Alliance

Coordinated convenings/conferences, through the network of networks described above

Among the commitments individual attendees made to follow-up in this arena were the following:

- Bring the Park Prescriptions, Every Body Walk, Healthy Parks/Healthy People and similar programs to their communities
- Use the Land Trust Alliance events and publications to encourage members to reach out to and build partnerships with local health organizations
- Connect outdoor user groups (such as Outdoor Afro) to health organizations in their communities
- Reach out to park managers to investigate possibilities for increasing health activities/programming in their parks
- Rethink the design of parks to maximize the possible health benefits of capital improvements
- Work with county health departments, schools and others in rural areas to explore ways to use increased time in nature as a way to reduce chronic illnesses
- Work with schools to incorporate more time in nature into their curricula
- Bring approaches designed in the U.S. – Park Prescriptions, Wingspread Declaration, user/affinity groups, monitoring technology, others – to the U.K. as part of its effort to connect health and nature
- Encourage land trusts to consider bringing health professionals onto their boards

“We know that increased activity can improve health. We also know that access to nature can encourage and empower increased activity. So we should do everything possible to increase access to nature for everyone.”

— Ray Baxter, Senior Vice President Community Benefit, Research and Health Policy, Kaiser Permanente

Conduct more research on health impacts, but also on social and business aspects

As the growth of Park Prescriptions has shown, every detail of the causal connections between health and nature does not need to be completely worked out before action can be taken by some physicians and other health providers.

At the same time, changes in conditions do need to be measured – i.e., how does the rate of increase in chronic illnesses go down as a result of increased access to nature? If increased physical activity is one of the clearest routes to better health (but not the only one – see framing discussion above), then the following types of questions should be answered:
• What is the role of expanded access to parks and trails in increasing the “functional movement” of individuals?

• If the health benefits of access to nature are derived not only through increased physical activity, what other benefits are easy to demonstrate and compelling for health groups?

These and related questions do suggest that research efforts to connect health and nature need:

• More analyses of existing data – as more patient (electronic health records), population/community health and environmental data becomes available, more statistical analyses can be done to understand better the relationships

• More trials – as more actions are taken to connect different populations in different locations to nature in a variety of ways (veteran and youth programs, park prescriptions, patient directed spending in the U.K., etc.) there will be more opportunities for clinical trials

• More sharing of research protocols – as more such analyses and trials are done, the network of networks should be used to move toward shared protocols and measurement tools yielding comparable results

• Incorporation of data on access to nature into national health surveys, health department accreditation programs and similar efforts to capture health data

• Better understanding of how the connections between health and nature work or might be improved in rural areas

• Better understanding of the costs of poor health – such as the work that has been done in Birmingham, AL

• Better understanding of how and why parks are used by different groups in different locations, such as the research now underway in New York and California, as well as across several hundred parks in more than 20 cities by the Rand Corporation

• Better mutual understanding of the missions/incentives/business models facing both:
  › Conservation organizations – from working in wilderness to urban areas, to capturing the benefits of nature for human or non-human populations
  › Health organizations – from working with individuals to populations, as well as from treating to preventing illnesses

• More case studies on how health and conservation organizations might work together, such as the agreement among parks and health organizations in San Francisco

• More access to funding for such efforts – from governments, as well as from foundations, corporations and others who will benefit from the work

Kaiser Permanente demonstrates how compliance with Affordable Care Act-mandated Community Health Needs Assessments (see Box 8) provides an opportunity to gather baseline data, establish guidelines for sharing and comparing information, and incorporate access to the outdoors into an understanding of community health.
Box 8: Kaiser Permanente Community Health Needs Assessments

Kaiser Permanente has developed a standard process and protocol for Community Health Needs Assessments (CHNAs) for the areas surrounding each of its 38 hospitals. It has also made much of its data publicly accessible.


The assessments, last conducted in 2013, will provide important baseline data for tracking future health trends. In addition, the initial assessment of the physical environment incorporates secondary data from the USA Parks ESRU layer, and in some cases data from Walkscore.com, a website that provides information on walkability down to the street address level.

Find examples of CHNAs here: http://share.kaiserpermanente.org/article/community-health-needs-assessments/.

Among the commitments individual attendees made to expand the research underway were the following:

- Conduct and disseminate regular reviews of the results of research on health and nature
- Convene a national gathering of researchers on health and nature – possibly to be held in the Pacific Northwest
- Actively share access to the huge data sets that are increasingly available on the health of child and adult populations, as well as community social and environmental factors
- Actively share research methodologies
- Expand the number of research projects and proposals that incorporate both health and nature
- Increase the number of interventions/trials designed to produce measureable results
- Incorporate more factors on access to and use of natural areas into health surveys
- Incorporate more health factors into surveys on park use
- Investigate more directly the connections between health and nature in rural areas
- Investigate the economic returns from improved health through increased access to parks
- Compare the role that access to nature plays (or does not) in different health providers’ community health needs assessments under the Affordable Care Act
- Analyze and disseminate a range of policy options for increasing access to natural areas
• Publish not only a high quality, peer-reviewed paper at the end of a research project on health and nature, but also a short summary for the broader public of the results and their implications for action

• Work with U.S. Senators and others to advocate to the National Institute of Health and the U.S. Environmental Protection Agency that they co-fund more research on this topic.

• Bring conservation and health leaders together to write an editorial on the connections for the Journal of the American Medical Association

• Advocate for an Institute of Medicine Panel on nature and health

**Explore new business models – for expanded action on health and nature**

While the vast majority of health organizations are incentivized to focus on treating people who are already ill, there is money to be made by keeping people healthier longer. The trick is finding ways to capture some of that money by increasing access to natural areas.

“The rise of consumer medicine – more self-monitoring, more data – creates huge opportunities for more feedback, more trials and better health outcomes.”

— Perry Robinson, Greenwich Biomedical, Inc.

Among the ideas from the participants for doing so were the following:

• Make it even easier for physicians to write park prescriptions – such as through park rating or activity services

• Work to incorporate improved access to nature into the Affordable Care Act community health benefit programs/requirements (see Section 4), such as through comparative analyses of plans, development of new guidance materials and collaboration with other networks working on these topics

• Investigate the application of “shared savings models” – share savings with whomever ends up with more cash if health costs go down over time – similar to those developed in the energy efficiency sector. Such efforts might include looking at:
  
  › Prepaid private plans like Kaiser and others
  
  › Public health clinics/Medicaid
  
  › Patient controlled plans like in the UK
  
  › “Social impact bonds” for improved health if savings can be measured and shared

• Engage with organizations outside the health industry who stand to gain from improved health through increased access to nature, such as:
  
  › Suppliers to more active publics – from activity monitors to shoes
  
  › Large employers
Among the commitments individual attendees made to explore new business models were the following:

• Work to incorporate access to nature into the community benefit requirements for non-profit health providers
• Analyze opportunities for public-private-nonprofit partnerships around parks, trails and other “green infrastructure” for health and other benefits to communities from natural areas
• Dig more deeply into the business case for health and nature in rural areas
• Investigate possible investment products for pension funds and other long-term investors interested in health

**Make more compelling stories of the benefits of these connections available for use with different audiences**

For many people, better health means clean, sterile places in which new tests are run and drugs administered. Having them think about access to woods, fields, waterways and similar areas as part of better health will require stories/examples that fit for them – engaging both their logical “heads” and their emotional/instinctual “hearts”. They will then need opportunities to see these stories in action in ways that meet their needs.

“**This work needs both stories to help people believe and facts to convince them that they should.**”

– Jeannette Ickovics, Yale School of Public Health

As such, building from the great work already being done by informal user/affinity groups to bring more people into natural areas for the benefits to their health makes a lot of sense. An ever-growing number of such groups include the following:

• Patients seeking physical activity: “Walk with a Doc” and similar programs
• Communities of color: Outdoor Afro and similar groups
• Veterans: the Sierra Club’s Outings programs and similar groups
• Programs in individual cities, such as Houston, Denver, Birmingham, Little Rock, New Haven, New York and elsewhere
“Who reads JAMA? We need ESPN, Jet, or Essence to make a big deal about the connections between health and nature.”

— Stacy Bare, Sierra Club

These and other efforts generate compelling stories — which can then be used to attract the attention and support of political officials at the local, state and national levels. Those stories also need to be told by “credible messengers” — individuals who are respected by the target audience(s).

“The messenger is as important as — or more important than — the message itself in trying to reach and move discreet audiences. People are tribal by nature, and to get them to stretch beyond their comfort zone, they will need to hear from a trusted advisor.”

— Elizabeth Ward, Land Trust Alliance

Among the commitments individual attendees made to capture and disseminate compelling stories on these connections were the following:

• Bring the stories, the Declaration and the opportunities to as wide a range of potentially influential audiences as possible, including:
  › Mayors and urban planners, as well as state and federal officials as part of conservation and health policy initiatives
  › Regional hospital councils
  › Designers and administrators of health care facilities
  › Networks of foundations
  › The World Parks Congress in Australia
  › The Outdoor Industry Association and others who will benefit from/support increased time in nature
  › Veterans’ organizations and the Department of Defense
  › The World Economic Forum Global Council on Health
  › The Land Trust Alliance

• Blog more regularly about health and nature connections — and encourage more guest blogs on their websites

• Prepare short pieces for the popular media more regularly on the health/nature connections
Author textbooks which provide more complete descriptions of the connections between health and nature

- Incorporate health connections into training materials for land trusts
- Incorporate nature connections into training materials for medical professionals
- Make the training materials that have been developed for veterans and time in nature open source and publicly available

**Acknowledge and address the risks of and barriers to more time in nature**

While the health benefits of access to nature are large, there are also risks to humans in natural areas, as well as barriers to access:

- “Feral spaces” that pose risks of crime
- Exposure to ticks, mosquitoes and other vectors for illness
- Cold, wet, dirty places that are uncomfortable and unattractive to many people
- Differences across cultural groups as to what makes a natural area more or less attractive
- Lack of effective access for some groups to attractive natural areas

“The more a park is used, the safer it gets.”

—Kristin Wheeler, Institute at the Golden Gate

As part of the efforts to increase access to nature, it is important to acknowledge and work to address these and other risks and barriers. Some of the health risks of natural areas and ways to manage those risks are described in the report of the 2013 Berkley workshop on “Improving Human Health by Increasing Access to Natural Areas: Opportunities and Risks” (available at [http://environment.research.yale.edu/publication-series/6131](http://environment.research.yale.edu/publication-series/6131)). Some of the cultural differences in attraction to and use of natural areas are described in the report of the 2008 Berkley workshop on “Saving Land by Serving People” (available at [http://environment.research.yale.edu/publication-series/5864](http://environment.research.yale.edu/publication-series/5864)).

“Connecting folks with ‘nearby nature’ in their neighborhoods is the key place to start.”

—Rue Mapp, Outdoor Afro

Access to nature is best seen as one component of improving human health, but by no means the only answer or one that is free from risks. Rather, it is essential to understand and address the risks and barriers through:

- Conducting medical and social research to inform management options, as well as by
• Listening to and building genuine partnerships with affected groups in areas where interests converge

Among the commitments individual attendees made to work on these risks and barriers were the following:

• Work with health departments, community organizations, foundations and others to understand better the barriers to increased access to natural areas and their impacts on health

• Make efforts to meet people “where they are” on the spectrum of comfort in the outdoors

**Background materials for workshop participants**

The rest of this report includes the background materials that were provided to participants prior to the workshop. This paper builds from the report of the 2013 Berkley Workshop (see workshop report at [http://environment.research.yale.edu/publication-series/6131](http://environment.research.yale.edu/publication-series/6131)). Its purposes were to:

• Provide the participants – given their wide range of backgrounds and experience – a common foundation for the discussions; and

• Offer some examples and ways to frame efforts to deepen the connections between increased access to nature and improved health by making them even more actionable.

As growing numbers of communities work to improve health by increasing access to natural areas, the major question is how might these efforts be scaled up to benefit even more people? The 2014 background paper is organized around two possible pathways for deepening these connections:

1. Helping to bring health, conservation and other interested groups together community-by-community through gathering, sharing and using examples from other cities/regions to help spark local action in new regions; and

2. Identifying critical data to collect and pathways to use that data for changing health practices, standards and other rules to include access to and time in nature as a core element of health programs into the future.

**The first path focuses on the lessons being learned from the collaborations that already exist between conservation and health organizations in some communities:**

• Inside hospitals, where healing gardens and green roofs help shorten recovery time.

• In community parks and playgrounds, where increasing access to safe, enjoyable places to spend time can reduce stress and increase physical activity.

• Across interconnected greenways, where trail systems offer opportunities to commute, exercise or just enjoy seeing different parts of a community.

Capturing examples and disseminating a menu of approaches that have worked in other communities should provide both conservation and health organizations a starting point for seeing what might fit in their locations.
Section 1 of this paper looks at some of the emerging collaborations between health providers and conservation organizations. Section 2 looks at some of the work being supported by foundations.

Since health providers need to meet their standards of care and their business models, while foundations are often more free to push the envelope, our hope is that by looking at these two groups together the paper gave the participants a wide range of examples to spark discussion. Clearly, in any particular community, other groups will also have major roles to play in acting on these connections – from local employers, to schools, health departments, community and economic development groups and many others.

The question for the first path is how might this growing body of experience best be used to spark action in even more communities?

The second path is aimed at expanding the more formal/institutional connections being made between the science on the health benefits of time in nature and the treatment or prevention regimes offered by health organizations. This involves at least two inter-connected efforts:

- Reviewing the existing science, both to determine which of the activities already underway are best supported by the research, as well as to identify new areas for or approaches to future research – including how best to measure the health impacts of time in nature; and
- Bringing the results of the science into the institutions and processes that establish the protocols for health care, from various standard-setting bodies, to political processes and the popular media.

- The goal of these efforts is to have health providers consider investing in gardens, parks or trails on the same basis that they consider investing in new emergency rooms or operating theaters.

Section 3 lays out a wide range of options for the types of data that could be collected to understand even better the health effects of time in nature. Section 4 then considers some of the major pathways for using current or future science to change health practices.

The question for the second path is how to move time in nature from being a “nice to have” to a “must have” in even more health systems.

The background materials for the 2014 Berkley Workshop were developed by Yale graduate researchers in collaboration with participants. The workshop offered opportunities for both facilitated exchanges of experiences and ideas, as well as free time for informal discussions exploring possible new ways forward. The results of the workshop are published by the Yale School of Forestry & Environmental Studies as part of the on-going Berkley Workshop series at http://environment.yale.edu/publication-series/land_use_and_environmental_planning/. The workshop was made possible by the generous support of donors to the Berkley Program on Strategies for the Future of Conservation. The views expressed in this report are not necessarily those of the Johnson Foundation, its trustees, or its staff.
Actions Underway — Healthcare Providers

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“We need to get more health and better outcomes for what we are spending, and we need to move our spending upstream, from costly acute and chronic care after our health has already been severely compromised to prevention, and promotion of healthy living and healthy environments.”

-Raymond J. Baxter, Kaiser Permanente

Increasing numbers of healthcare providers across the United States — such as Kaiser Permanente (see box below) — are beginning to invest in deepening the connections between access to natural areas and human health.

Kaiser Permanente’s Community Benefit Program

As one of the largest integrated healthcare insurers and providers in the country, Kaiser Permanente (KP) has launched a Community Benefit program designed to enrich the health of its members and the communities in which they live.

The program is divided into four categories: Healthy People, Healthy Environment, Healthy Knowledge, and Healthy Investments. The Healthy Environment program includes environmental outreach such as:

- Environmental Stewardship Programs
- Community Health Initiatives
- Every Body Walk! (a national initiative where patients meet physicians for fitness walks)
- Weight of the Nation

For more information see: Community Benefits: http://share.kaiserpermanente.org/category/about-community-benefit/
Some of these investments are in response to the need to reduce healthcare costs by preventing illnesses – as described in the quote above. Others are consistent with the provision in Section 9007 of the Affordable Care Act (ACA) that expands the community benefit requirements for non-profit hospitals and other providers. That provision encourages hospitals to address the root causes of disease in the communities they serve.

These and other factors are creating an increasing number of opportunities for land conservation organizations to work with health providers to connect people with natural areas – within the hospitals themselves, across the neighborhoods the hospitals serve, and throughout the wider mix of natural areas that are protected for a broad array of public benefits, including health.

This chapter outlines some of the collaborations already underway between health and conservation organizations – at the hospital, neighborhood, and regional scales. It is intended to start outlining a “menu” of ways that conservation organizations can consider reaching out to health care providers in their communities to explore possible collaborations.

1.1 The ‘Green’ Hospital Revolution

“It took me 35 years of practicing medicine and a PhD in medical history to learn that sometimes it is better to treat a sick patient the way a gardener nurtures an ailing plant than the way a mechanic fixes a broken machine.”

—Victoria Sweet, MD, PhD, Laguna Honda Hospital

The Joint Commission for Accreditation of Hospitals, a non-profit organization that certifies more than 20,000 health care programs in the U.S., has recommended that: “patients and visitors should have opportunities to connect with nature through outside spaces, plants, indoor atriums, and views from windows” (Larson and Kreitzer, 2004).

Perhaps this explains why landscape design in hospitals has become a flourishing business, as research unveils the positive effects that exposure to greeneries has on mental and physical health. In addition to gardens, health care providers are working to create avenues to deliver nutritious foods to their facilities. Such efforts are designed to minimize hospital costs, improve patient satisfaction, reduce environmental footprints, and expand opportunities to integrate elements of the natural world into treatment and prevention.

Healing Gardens

In recent years, healing gardens have become increasingly popular in healthcare settings, as evidence from a growing body of research suggests that exposure to natural environments can improve both patient experience and health outcomes. It may come as no surprise that gardening is a therapeutic activity – it intimately connects people with nature, offers relief
from symptoms and stress, and improves well-being. Within the context of healthcare, the idea that fresh air, sunlight, and greenery provided by a garden can be good for an ailing body is knowledge that dates back to medieval times. Saint Hildegard von Bingen, a 12th century medieval nun, practiced a form of medicine deemed in Latin as *viriditas* – “greening power” – the ability of the human body, much like a plant, to grow, develop, and self-heal from injury or illness (Sweet, 2012).

There is also evidence that incorporating nature into healthcare improves recovery outcomes. The most frequently cited study on this topic is a short paper published in *Science* in 1984. Titled “A View through a Window May Influence Recovery from Surgery,” Roger Ulrich’s study examined postoperative patients’ recovery in the presence and absence of a window with a view. Patients with windows that looked out onto trees had significantly shorter hospital stays, fewer negative comments, and needed less medication than patients with windows that looked out at a brick wall. These results suggest both that viewing nature has salutory effects on patients and implies cost saving advantages for hospitals that incorporate gardens into their design.

Family members and hospital staff also benefit from being around nature. Hospitals can be particularly stressful environments for families to visit and wait for healing loved ones, as well as for staff to work. Burnout among health care providers, particularly nurses, is high (Mitrone, 2008). In a study that evaluated three healing gardens at the Children’s Hospital of San Diego Pediatric Cancer Center it was noted that the majority of garden visitors were not children, but adults and staff (Sherman et al., 2005).

**The Healing Gardens at Legacy Health, Portland, Oregon**

Legacy Health is a non-profit charitable institution made up of six hospitals that treat a wide variety of patients. Across this hospital system, eleven healing gardens have been created to offer tranquil retreats for patients, families, hospital staff, and the public.
The goal of the healing gardens is to give patients a much-needed place to rest that speaks to their psychological, physical, and spiritual needs, while also giving the hospital the opportunity to study and quantify the benefits that green spaces can have on patients, their families, and even health care professionals under stress. Legacy Health offers many examples of how nature can be integrated into treatment through their award-winning healing gardens, a Horticultural Therapy Certificate program and workshops on Children in the Garden.

Images courtesy of Legacy Health Good Samaritan Hospital.


A recently published article examined the relationship between exposure to green spaces and mental health outcomes – it found that “higher levels of exposure to green space were associated with significantly lower levels of symptoms for depression, anxiety, and stress” (Beyer et al., 2014). These results suggest that “greening” within a hospital setting, or encouraging experiences in the community that expose patients to greenery, could have positive health effects for patients suffering from mental illness, as well as visitors, family, staff, and the surrounding community.

Community Garden in the Hill Neighborhood, New Haven, Connecticut

This community garden offers a unique example of how hospitals with limited resources can develop healing gardens through collaboration with the local community and land trusts. This particular garden was established through a partnership between the adjacent neighborhoods and the nearby Connecticut Mental Health Center (CMHC). Technical assistance and supplies were provided by the New Haven Land Trust to support the creation of the garden. Since opening in August 2013, the garden has offered a place for mental-health patients of CMHC to work and heal. The garden provides space where patients and the members of the surrounding community can interact with each other and with nature.

For more information see: New Haven Independent: http://www.newhavenindependent.org/index.php/archives/entry/a_new_sylvan_space_on_sylvan_avenue/
Garden environments can maximize the effectiveness of clinical treatments for the ill, encourage passive natural experiences that significantly reduce staff stress, improve patient health outcomes, increase client satisfaction, and strengthen the bottom line. There may well be considerable opportunities for individual conservation organizations to work with providers on such projects.

Healthy Food in Hospitals

Over 450 hospitals and food service management companies in the United States have committed to implementing strategies to improve the food and beverages they provide. Some of them have done so by taking the Healthy Food in Health Care Pledge promoted by Health Care without Harm – an international agency that promotes sustainable practices in health-care institutions (https://noharm-uscanada.org/issues/us-canada/healthy-food-health-care).

Plow-to-Plate, Milford, Connecticut

Plow-to-Plate is an award winning hospital food program at the New Milford Hospital in Connecticut. Through the Plow-to-Plate program, New Milford Hospital contracted a vendor to provide food deliveries from five local farms in Connecticut. The hospital menu features fresh, nutritious, and locally sourced food made from scratch by a permanent hospital chef. Hospital food programs, such as Plow-to-Plate, present an opportunity for agricultural land trusts to get involved in the healthy food movement through new, innovative partnerships.

For more information see: Plow-to-Plate: http://www.plowtoplate.org/

One means by which participating hospitals are honoring their Healthy Food in Healthcare Pledge is by providing healthier food options both within their facilities and to the surrounding communities.

Kaiser Permanente Farmers’ Markets

With over 50 on-site farmers’ markets across the country, KP is providing access to healthy foods for communities that would otherwise not have easy access to fresh fruits and vegetables. It does so as part of its Community Health Initiative for Healthy Eating, Active Living (HEAL). In addition, KP supports sustainable agriculture by sourcing local, environmentally sustainable food options in their hospitals’ kitchens, cafeterias, and vending machines.

For more information see: Kaiser Farmers’ Markets: http://share.kaiserpermanente.org/article/kaiser-permanente-farmers-markets-grow-to-more-than-50/
For conservation groups with expertise in urban gardens or local agriculture, these efforts by health organizations to offer restful natural areas or healthier, local food within their facilities offer great opportunities for possible collaborations.

1.2 Community Health Initiatives

Outside the walls of health facilities, there is increasing recognition that the way in which communities are designed and developed influences the mental and physical health of residents. A healthy community, as defined by the U.S. Department of Health and Human Services, “continuously creates and improves both its physical and social environments to help people support one another in aspects of their daily life to develop their fullest potential” (Center for Disease Control, 2014, http://www.cdc.gov/healthyplaces/about.htm). A healthy place is one that offers a variety of restorative, affordable, and accessible activities that encourage physical, mental, and social well-being and improve the quality of life for people of the community.

The purpose of this section is to describe some of the actions being adopted by health providers to increase access to natural areas in the communities they serve.

**Centers for Disease Control and Prevention**

The Centers for Disease Control and Prevention (CDC) is working to improve public health by funding community health projects. Programs that offer funding mechanisms, such as “Designing and Building Healthy Places” and “Communities Putting Prevention to Work,” aim to integrate evidence-based designs and health strategies to promote active and healthy living. Partnerships with the CDC could help to improve services for the park prescription model and other health initiatives that aim to connect communities to natural areas.

For more information see: Designing and Building Healthy Places: http://www.cdc.gov/healthyplaces/

**Park Prescriptions**

Park prescriptions are part of a movement to create a healthier population through the encouragement of an active lifestyle. Under this program, health providers prescribe and promote outdoor physical activity to patients and the public as a way to prevent and treat health problems resulting from inactivity, poor diet and other causes. These programs aim to build and strengthen relationships among parks, public health agencies, healthcare providers, public land use organizations, and other organizations throughout the country.
The programs described here represent a few admirable examples from the rapidly expanding efforts around park prescriptions. However, it is important to note that these efforts remain fragmented across the medical and conservation communities. Both groups should continue to work toward establishing methods to share lessons learned, educational resources, research results, and funding sources/business models.

D.C. Park Prescriptions (D.C. Parks Rx)

With well over 450 prescriptions written through Unity Healthcare Inc., this program (launched July 2013 and spearheaded by Dr. Robert Zarr) encourages physicians to prescribe nature to patients in an effort to encourage outside activity through the enjoyment of Washington, D.C.’s many parks and green spaces. The goals of the program are to decrease the impact of chronic diseases, such as obesity, asthma, and mental health disorders, and to foster the next generation of environmental stewards. The program is organized through a partnership with local health providers, the National Park Service, D.C. Departments of Health and Parks and Rec, U.S. Health and Human Services, George Washington University, the National Environmental Education Foundation, American Academy of Pediatrics, and the National Recreation and Park Association.


At-risk individuals who are advised by their doctors to be active outdoors and eat healthy foods may have difficulty following their prescription due to a lack of resources where they live or work. This is an area where support from the conservation community is needed. One such effort being led by a conservation organization in partnership with the health community to address the issue of access to healthy places is detailed in the box to follow.
Healthy Parks, Healthy People, Institute at the Golden Gate, San Francisco, CA

Since 2009, the Institute has formed partnerships and advocated action to promote the Healthy Parks, Healthy People initiative. This national movement aims to advance park prescription programs throughout the U.S. by motivating leaders in the parks and health fields to work together. The Institute delivers literature and workshop trainings to physicians in order to provide the knowledge and tools necessary for successful park prescriptions. These resources help physicians connect their patients to programs offered at over 30 Bay Area parks that have coordinated their programming for the movement.

The Institute collaborates with the CDC and the National Recreation and Park Association to research best practices for the park prescriptions programs across the county. With this information, in partnership with the San Francisco Recreation and Parks and the Southeast Health Center, they have begun to implement the best practices into a pilot project at Bayview Hunters Point. Prescriptions will be tracked, improvement in patient health monitored, and new park users monitored to measure the success of park prescription programs.

Note: The pilot project was made possible by a Community Benefit grant from K.P.

For more information see: Healthy Parks, Healthy People: http://instituteatgoldengate.org/health

These and other park prescription programs are starting to demonstrate what works and what deserves more research, as well as the institutional realities that must be overcome to achieve success. In general, two items are needed in order for park prescriptions to succeed:

- Healthcare practitioners need more access to resources on the value of physical activity in nature as a powerful resource for health. They also require training on how to counsel and prescribe parks to their patients, as well as incentives to do so.

- Parks, recreation and environmental organizations need to tailor their communications and programs to better serve patients with a variety of health conditions — as well as to the doctors making the park prescriptions.

Healthy Fruits and Vegetables Prescriptions

Health care reform is altering the way hospitals and the health system view and address public health. The Affordable Care Act attempts to turn a system that previously rewarded the provision of services to treat illness into one where providers will prosper by preventing disease and by promoting healthy lifestyles. As part of this transition to preventive care, hospitals are experimenting with alterations to care-delivery, including treating hunger and poor nutrition as a health issue.
Fruit and Vegetable Prescription Program, New York City

The emergence of a new health program in New York City has helped change the way we think about prescriptions. Launched summer 2013, The Fruit and Vegetable Prescription program is designed to provide families at risk for obesity access to nutritious foods. Physicians write scripts for unconventional medicine: healthy fruits and vegetables. Each month, a family is prescribed “Health Bucks” which are exchangeable at local farmers’ markets for produce.


1.3 Connections to Natural Areas

The obesity epidemic in the U.S. has become a pressing and costly issue. According to the CDC, approximately 35% of American adults are considered obese and approximately 17% of American children and adolescence are obese ([http://www.cdc.gov/obesity/adult/index.html](http://www.cdc.gov/obesity/adult/index.html)). In 2008, it was estimated that the annual medical cost of obesity was $147 billion (Finkelstein et al., 2009). Despite common knowledge that exercise is good for one’s health and reduces the likelihood of obesity, fewer than 40% of adults are regularly active, and 25% do not pursue physical activity at all (Jackson, 2001).

In a recent literature review, existing knowledge on the relationship between the built environment and childhood obesity was examined. It was recommended that: “in order for people to be more active…they need access to safe places for recreation and neighborhoods that are walkable” (Rahman et al., 2011). The planning and development of greenways, park connectors, and hiking trails are one place the medical and conservation community can begin to pool their efforts to improve human health and the environment. By offering an active community environment with greater opportunities to exercise, health care costs can be reduced as opportunities for outdoor recreation, such as hiking, are offered to broader audiences.

Trails are Medicine

While health and conservation professionals have drastically different careers and job duties, they do have a common overlapping goal – identify courses of action to get Americans active outdoors. The healthcare and conservation communities are beginning to work together on trails, which create conduits into more natural landscapes. The goal is to provide accessibility to populations of people who would not otherwise think of walking or hiking in their local greenways, parks, or open space. Overall, medical practitioners, county health departments, and conservation groups increasingly want the communities in which they serve to get up, get out, and get moving.
Red Rock Ridge and Valley Trail System, Birmingham, Alabama

The Freshwater Land Trust, fueled by the passion of its staff and supporters, has gathered most of the resources necessary to complete a 750-mile network of greenways, trails and waterways in Jefferson County, Alabama. This unique trail system is designed to connect the 29 cities of the County into preserved and restored lands, as well as waterways. The goals of the trail network include:

- Developing a network of greenways and paths that link people to local and regional destinations
- Providing a safe environment for people to walk and cycle
- Stimulating economic growth and decreasing healthcare costs
- Protecting and enhancing natural resources, including water and air quality

The Red Rock Ridge and Valley Trail System serves as a national model for what can be accomplished when health groups and conservation groups collaborate. The Freshwater Land Trust and the Jefferson County Department of Health formed a Health Action Partnership and received a grant from the Center for Disease Control’s “Communities Putting Prevention to Work” fund. This initial partnership and grant were the catalyst for future relationships and funding sources that have collectively raised over $2 million dollars to turn the trail master plan into a reality.


1.4 Conclusion

As highlighted throughout this chapter, unlikely partnerships are beginning to become more common as the health and conservation communities develop innovative ways to improve both human and environmental health. These efforts work across a range of scales. Whether in a small hospital garden offering a tranquil retreat from the stresses of hospital life, a city park providing a place to walk or play with friends and family, or an intertwined network of urban greenways, corridors, and hiking trails that connect urban residents to a variety of open spaces, there is plenty of room for collaboration.

The question is how best to scale up these many opportunities for collaboration. Is that best done community by community in ways that fit the local contexts – maybe by offering a menu of options drawn from the types of experiences described above? Is there also an opportunity to now change the business models of health providers even more fundamentally – maybe through the topics covered in the following chapters?
Possible Questions for Discussion

- Are there ways that the conservation community can bring value to the healing garden and horticultural therapy programs that are becoming increasingly popular within hospitals?
- What barriers exist to getting doctors to write or patients to follow their park prescriptions?
- How can the medical and conservation communities work together to improve access to parks and open space for urban and low-income populations (who are most at risk for chronic disease)?
- There seems to be a disconnect between the medical and conservation communities in terms of understanding existing programs, needs and expectations from one another. What can be done to improve linkages and collaborations between the medical and park/conservation communities to scale up health-conservation programs?
- Does improving access to natural areas make good business sense from a medical perspective? If not, why not? If so, how to make that case more widely known?

Some of the Organizations Doing Interesting Work on this Topic

**Healing Gardens**

- **Therapeutic Landscapes Network** – A multidisciplinary community of designers, health and human service providers, scholars, gardeners, and nature enthusiasts focused on evidence-based design in health-care settings. See: [www.healinglandscapes.org](http://www.healinglandscapes.org)

**Healthy Food**

- **Healthy Food in Healthcare** – A national initiative that is part of Healthcare without Harm and aims country to help improve the sustainability of their hospital food. See: [https://noharm-uscanada.org/issues/us-canada/healthy-food-health-care](https://noharm-uscanada.org/issues/us-canada/healthy-food-health-care)

- **Fresh Advantage** – A group of professionals who provide strategic guidance and technical support to healthcare institutions who wish to contract with dining services and food vendors that will provide nutritious food to patients, resident, employees, and visitors. See: [http://freshadvantage.com/](http://freshadvantage.com/)

**Park Prescriptions**

- **Rx for Outdoor Activity** – Offered through the National Environmental Education Foundation, these “train-the-trainer” workshops educate pediatric healthcare providers about prescribing outdoor activities to children in the communities they serve. See: [http://www.neefusa.org/health/children_nature.htm](http://www.neefusa.org/health/children_nature.htm)

- **Docs in the Park** – A park prescription program in Baltimore, Maryland that connects physicians with families in city parks to encourage patients to spend more time in nature. See: [http://berp.baltimorecity.gov/SpecialPrograms/DocsInThePark.aspx](http://berp.baltimorecity.gov/SpecialPrograms/DocsInThePark.aspx)
• **Rx Play** – A program in Portland, Oregon that is designed to create a bridge between the medical facilities and the community-based recreation systems to prevent childhood obesity. See: [http://www.oregon.gov/oprd/PLANS/docs/scorp/RxPlay/video/player.html](http://www.oregon.gov/oprd/PLANS/docs/scorp/RxPlay/video/player.html)

• **Recreation Rx** – A recreation prescription program in San Diego, California that is offered through collaboration between local physicians, the San Diego Nutrition Network, and the San Diego County Parks and Recreation Department. See: [http://www.recreationrx.org/san-diego-county-recreation-rx](http://www.recreationrx.org/san-diego-county-recreation-rx)

• **Walk CT** – A walking program established by the Connecticut Forest and Park Association, the oldest conservation organization in the state, with the objective of encouraging citizens to walk by providing an informative website, guided tours, and community support. See: [http://www.walkct.org/](http://www.walkct.org/)

**Medical Trails**

• **The Medical Mile** is a section of greenway along the Arkansas River Trail made possible by fundraising efforts by the local healthcare community. The intention of the trail is to prevent obesity and heart disease by providing a connection between the hospital and Pinnacle Mountain State Park. See: [http://www.americantrails.org/resources/health/medmile06.html](http://www.americantrails.org/resources/health/medmile06.html)

• **Mayo Clinic** – This clinic in Scottsdale, Arizona offers a nature trail that connects the hospital to natural landscapes so that patients and staff can enjoy spectacular sights within the Sonoran Desert. See: [http://s2.8020code.com/discussion/nature-trail-mayo-clinic-patient-video-guide-arizona-2f5cb7](http://s2.8020code.com/discussion/nature-trail-mayo-clinic-patient-video-guide-arizona-2f5cb7)

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Actions Underway — Health Foundations

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“The way we think about a healthy environment is broader than one issue, it is about parks and trails and access to the outdoors, and it’s about how the rest of the population behaves. The more people see others exercising, the more they’re likely to exercise.”

— Kent Thiry, CEO of DaVita, a Fortune 500 company which decided to move to Colorado in 2010 in part because of the health record of the state (R. Jones, 2013).

Foundations play a key role in funding a wide variety of health programs, including medical research, access to medical services, public education, organizational effectiveness of health care systems, disease prevention and others. At the same time, this programmatic approach appears to be yielding to more advocacy in the policy process. While health foundations are not likely to give up on programs altogether, many now recognize the cost effectiveness of becoming involved in the policy process to tackle their target issues. In addressing both the programmatic and policy advocacy component in pursuing their missions, foundations are becoming key players in partnerships at a variety of scales.

As health care dollars are increasingly scrutinized and hospital dollars devoted to Community Benefits need initiatives to fund, health foundations are helping shift the conversation toward more of a focus on disease prevention. Many of these foundations have placed promoting healthy lifestyles programs and advocacy agendas as menu items on their health portfolio. These investments take a variety of shapes, such as improving access to healthy foods and supporting an active population. This chapter offers a closer look at how health foundations are encouraging the citizenry to be physically active through the use of parks and public spaces in our communities and how foundations are approaching these projects from an institutional perspective.
2.1 Progress Begins with the Foundation in Health

The clearest and boldest steps health foundations can make in promoting use of natural areas are by providing vision, leadership, funding, maintenance, and programming for a park. This “one-stop shop” approach, while attractive in its simplicity, is idealized and relatively rare. Working at the community level, larger foundations often do not have the on-the-ground person-power and local connections to pull off such a project by themselves.

Successful projects can, however, begin with the health foundation’s vision, coupled with leveraging its broader networks. The Desert Healthcare Foundation provides one such example of how health foundations can initiate and manage park development.

**Desert Healthcare Foundation (CA): The Wellness Park**

Desert Healthcare Foundation created the 5-acre Wellness Park in collaboration with the City of Palm Springs, the Desert Water Agency, and Palm Springs Unified School District. The impetus behind the park was a board member’s desire to have a natural area around the hospital such that her husband, suffering from Lou Gehrig’s disease, had access to a natural area during treatment.

While the park was born out of an individual’s vision, the process for the park development was an example of collective impact. The City of Palm Springs offered to maintain the park for ten years at a cost of $1 per year. The Desert Water Agency contributed $250,000 and, in return, was allowed to incorporate educational signage about water use and quality. The Palm Springs Unified School District offered the sale of the land at a bargain price. The local health care district’s support of the park was stated using wording from the Healthy People 2010 federal program—encouraging fitness and disease prevention. The park has a quarter-mile walking/jogging loop with drinking fountains and benches, exercise stations, and various gardens—meditation, memorial, and a healing and fragrance garden.

In conducting this work, the Foundation:

- Is acting on the belief that health results from the proper care of body, mind and spirit;
- Defines health according to wellness, instead of illness;
- Focuses on prevention and health promotion, instead of acute, episodic treatment; and
- Encourages participation by the entire community.
Park managers now cite the presence of several informal economies and activities occurring at the park, including tai chi and yoga practice, dog walking, and an annual run with the mayor.

*Note: The federal government’s Healthy People 2010 initiative has now been superseded by a subsequent 2020 initiative.*

For more information see: Desert Healthcare Wellness Park: [http://www.dhcd.org/Wellness-Park](http://www.dhcd.org/Wellness-Park); Healthy People 2020 Initiative: [http://healthypeople.gov/2020/implement/Funding.as](http://healthypeople.gov/2020/implement/Funding.as)

Wellness parks can fit within many of the goals stated by health foundations. For land trusts, wellness parks are a useful concept that can broaden the toolkit for acquiring or facilitating the preservation of land. As another example of how foundations can direct the dialogue surrounding health and the use of natural areas, The Robert Wood Johnson Foundation Commission to Build a Healthier America published a 110-page report in early 2014 with the title “Time to Act: Investing in the Health of Our Children and Communities.” The recommendations of the report have close links to urban/community development and financing healthcare, and have potential consequences for land conservation. The three driving recommendations, along with other relevant suggestions, include the following:

- **1.** Make investing in America’s youngest children a high priority. This will require a significant shift in spending priorities and major new initiatives to ensure that families and communities build a strong foundation in the early years for a lifetime of good health.
- **2.** Fundamentally change how we revitalize neighborhoods, fully integrating health into community development.
  - **2a.** Support and speed the integration of finance, health, and community development to revitalize neighborhoods and improve health.
  - **2b.** Establish incentives and performance measures to spur collaborative approaches to building healthy communities.
- **3.** The nation must make a much more health-focused approach to health care financing and delivery. Broaden the mindset, mission, and incentives for health professionals and health care institutions beyond treating illness to helping people lead healthy lives.
  - **3a.** Adopt new vital signs to assess nonmedical indicators for health.
  - **3b.** Create incentives tied to reimbursement for health professionals and health care institutions to address nonmedical factors that affect health.”
As local land trusts seek to engage with the health foundations in their communities, they might consider how their work/vision is aligned with these goals—as they do mark three themes that appear in much of the dialogue. As a result, land trusts are likely to be more successful if they are able to address how a given project targets children’s health (especially with respect to obesity), community/neighborhood development, and health care cost efficiency.

2.2 Environmental Programs working with Health Programs

In addition to expanding health programs to include natural areas, some foundations with multiple program portfolios appear to be changing their granting guidelines. Environmental projects operating under the “nature for nature’s sake” paradigm appear fewer in number and seem to be giving way to grants that include humans. In some foundations, institutional policy now encourages program officers to find and solicit projects that fall under multiple portfolios. In others, program officers are pushing the collaboration across program boundaries themselves.

The Houston Endowment is one example of a foundation undergoing such a shift. The environment program now outlines four environmental goals—Air, Land, Water, and Urban Development—and emphasizes a clear imperative for connecting these goals to human benefits.

While this new framework may limit the types of projects that are funded, the pool from which to draw funds has been implicitly increased, expanding the numbers of “environmental” projects that fall within the Health portfolio. Spearheaded by Elizabeth Love, Program Officer for the Environment, and her colleague who oversees the foundation’s Health Program, the creation of the Healthy Living Matters collaborative provides an example of how the Environment and Health portfolios from the Houston Endowment came together to fund one project.

**Houston Endowment (TX): Funding of Harris County Healthcare Alliance**

In 2011, the Houston Endowment funded the Harris County Healthcare Alliance with money from both its Health (sub-category Prevention) and Environment (sub-category Urban Development) portfolios. The Alliance used the $2.5 million to build a private-public partnership to assess the influences of the built environment, food access, and public infrastructure on obesity and to mobilize policy actions to combat it. This collaborative, called Healthy Living Matters, is made up of health, education, policymaking, business, parks and conservation organizations. It has roughly 60 participating member institutions, including three with missions directly relating to parks and conservation (Houston Parks Board, Houston Wilderness, and Children & Nature Network).
This way of tackling obesity is novel in its collaborative approach. After a two-year assessment period, Healthy Living Matters published a community action plan with the goal to “advocate for Texas legislators to develop a statewide strategic plan to address hunger, nutrition, physical activity and obesity in children and families.” The recommendations were outlined under the titles, Eat (E), Play (P), and Learn (L). Relevant recommendations include:

- E4. Encourage use of available public lands in Harris Country for the development of community gardens and farmers markets.
- P1. Support the development and adoption of “Safe Neighborhoods” Policy:
  - Fix streets and sidewalks, promote Safe Routes to Schools efforts, build sidewalks in new developments,
  - Eradicate abandoned houses,
  - Improve lighting in streets and parks,
  - Support the ongoing development of safe trails and parks.
- L4. Promote outdoor classrooms and incorporate active learning into core curriculum subjects to increase physical activity in Harris County school districts.

Part of the collaboration included input from local citizens through focus groups, interviews, and surveys. Some of the major findings were:

- 67% of respondents said they would walk or bike if it only took 10 minutes and was safe.
- 42% of respondents said there aren’t any parks within walking distance.

At its core, Healthy Living Matters is about making healthy living easier. This community action plan suggests that improving access to, increasing safety in, and promoting programming in open spaces is critical for maximizing the public benefit of these areas.


The process through which the Houston Endowment decided to fund Healthy Living Matters may be instructive to how similar projects may occur in the future. Love and her colleague in the Health Program first engaged a group of local leaders from the health community and the conservation community. With these leaders interested in the health and environment nexus and ready to take action, Love and her colleague approached the Houston Endow-
ment board. With the network preemptively built, the board then gave approval to solicit a proposal from the Harris County Healthcare Alliance. As an important aside, the Houston Endowment does not normally solicit grants—suggesting the power of this approach for other large foundations.

To summarize, Love was given the go-ahead to pursue this project for three reasons:

- It targeted a long-standing goal of the foundation, childhood obesity,
- Other local leaders were already excited and invested, giving the project credibility, and
- Love convinced the board that policy change is more cost effective than funding programs.

In January of 2014, the action plan was published and Houston Endowment granted more funding for the transition from policy development to implementation. How these next steps unfold is still to be determined, though possibilities include creating a new 501(c)(3) entity to help carry the work forward. For many foundations, however, policy planning can be a tough sell. The Houston Endowment took a risk in funding Healthy Living Matters because rather than measurable benefits from a program, the only end products were a strategy document and a nascent network.

In contrast with the Houston Endowment, The Doris Duke Charitable Foundation (DDCF) has taken a top-down approach—the Foundation’s board has pushed program officers to find connections between portfolios. The outcome of this new approach has been the funding of several cross-listed programs, many of which lie between the Foundation’s Environment Program and Medical Research Program.

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**Doris Duke Charitable Foundation: Grow to Learn NYC and New York Restoration Project; Grants from 2012-2014**

In both 2012 and 2013, The Doris Duke Charitable Foundation pledged $100,000 to support Grow to Learn NYC, a public-private partnership between the Mayor’s Fund, GrowNYC, NYC Department of Parks and Recreation, and Department of Education’s Office of School Food. In 2014, DDCF pledged another $100,000 to the New York Restoration Program (NYRP), a non-profit organization dedicated to transforming open space in underserved communities to create a greener, more sustainable New York City. These grants functioned as an internal collaboration between its Environmental and Medical Research Programs. The 2014 grant was also cross-listed with the Child Well-being program.

The premise of these grants is to thoughtfully and quantitatively measure the health and social impacts of urban agriculture and urban design. The focus of the 2012-2013 grants was on Grow to Learn NYC’s gardening and environmental programs. In the 2014 grant, NYRP used the money to plan and develop a project to foster social and environmental resilience in a pilot neighborhood in New York City.
In both the GrowNYC and NYRP grants, the organizations and DDCF wanted to see an evaluation component added to the studies leading to the cross-listing with the Medical Research Program. All of the programs were or are supported by Health by Design, a firm with expertise in public health research and urban design. Rupal Sanghvi, the company’s founder and director, has earned a stellar reputation for conducting and designing this research.

The DDCF Program Officer, Andrew Bowman, was particularly excited about the 2014 project because the program is a proof of concept for the health and social benefits of park spaces in urban areas. The very core of the grant is the interplay between the Environment, Medical Research, and Child Well-being programs at DDCF. The ability to check off multiple mission goals likely made this particular grant more likely to be funded.

It may be interesting to note that in 2012 and 2013 DDCF granted $400,000 and $300,000, respectively, to other aspects of GrowNYC.


Two key points in the 2014 NYRP grant made it particularly attractive to DDCF:

- The meta-analysis of similar programs and the grant’s data-driven component enhances its ability to be duplicated and scaled from proof of concept.
- Urban agriculture and place-based education are hallmarks of the Environmental and Child Well-being programs.

The 2012 grant was the first Environmental Program grant from DDCF to be publicly cross-listed with another Program. Now, as of May 2014, three of nine grants in the Environment Program DDCF are formally cross-listed with another program.

For the local land trust, these examples highlight the importance of making personal connections with program officers and other mission based organizations, particularly those with a health component. At the Houston Endowment, Love targeted progressive, local leadership and developed a grant opportunity by reaching out to that local network. At DDCF, Bowman was attracted to the existing network of GrowNYC, Grow to Learn NYC and NYRP. All of these organizations have affiliations or missions that target human well-being with the environment.

Land trusts can learn from the other mission-based organizations in their area and try to affiliate in order to have greater clout through partnership. Many foundations are pushing the connection between humans and the environment, as well as leveraging their dollars further by finding opportunities that fit within more than one of their program fields.
Foundations are filling a much-needed role in developing the connection between human health and time spent in nature. Organizations like Health by Design, supported with funding from foundations, are pushing research to comply with the rigorous standards of classic public health and medical research. Foundations have the important flexibility to fund research that falls outside of traditional medical institutions or practices, thereby pushing the medical world to include nature as an important component of health.

2.3 Foundations Creating Access to the Outdoors

Developing and maintaining parks are important, but without sufficient access, the benefits of the park remain unrealized. Access to parks can be considered in two ways—number of parks per city and ease of transport to parks. Foundations are focusing on increasing access to parks through joint-use agreements (JUA) and urban planning efforts.

**Joint-Use Agreements**

In many communities, schools have the richest resources for supporting physical activity. After the school day, gymnasiums, ball fields, pools, and other school district resources are often closed—despite a desire from the local community to access them.

To capture this opportunity, some communities have turned to joint-use agreements (JUAs). JUAs are formal agreements between two separate entities setting forth the terms and conditions for shared use of public property or facilities. These joint use agreements are usually between school systems and a city, though nonprofit organizations have participated in these agreements as well. Typical examples of joint-use agreements include the following provisions (Prevention Institute and Berkeley Media Studies Group, 2014):

- A principal unlocks the school gate after hours so neighbors can shoot hoops or play ball on evenings and weekends.
- A school opens its soccer field to a local league for weekend games.
- A YMCA opens its gym to the local PE teachers so students have a place to exercise.

Such joint-use agreements are one of the tools that the Robert Wood Johnson Foundation has decided to pursue in a 5-year, $500 million pledge to reverse the growth in childhood obesity by 2015. According to RWJF’s 2013 Bridging the Gap report, nearly 93 percent of schools had some type of joint-use agreements in place with their community; however, many were vague. The report’s authors recommended that for joint-use agreements to work most effectively and give people better access to physical activity in their communities, the document should specify how the agreement will be managed on an ongoing basis. ChangeLab Solutions, based in Oakland, California, is a recipient of some of this funding and has been a pioneer in both developing joint-use agreements and making them even more effective.
Joint-Use Agreement Toolkit—ChangeLab Solutions (Oakland, CA)

ChangeLab Solutions is a nonprofit organization that provides community-based solutions that promote the common good by making healthier choices easier for everyone. It works primarily in policy development and provides documents that facilitate action items for its grantees.

Robert Wood Johnson Foundation, Kresge Foundation, and The California Endowment all played a role in ChangeLab Solutions’ development of a tool kit for joint-use agreements and a stock of four different joint use agreements ready for community deployment. In 2012, ChangeLab Solutions published its JUA toolkit “Playing Smart: Maximizing the Potential of School and Community Property Through Joint Use Agreements.”


Urban Design

Foundations and public health officials striving to connect health and nature can learn from Colorado, a state ranked 8th in the U.S. in overall health for the year 2013 (United Health Foundation, 2014). While the Colorado Health Foundation is more modest—ranking the state 18th overall (Colorado Health Foundation, 2014) – this foundation has been an integral part of the effort to make the state healthier. Their new Healthy Places initiative is one example of how the foundation is addressing the intersection of health and nature, specifically focusing on increasing access to nature through urban design.

Healthy Places: Designing an Active Colorado—Colorado Health Foundation

Healthy Places: Designing an Active Colorado is a five-year, $4.5 million initiative by the Colorado Health Foundation to support and inspire the development of healthy communities. Obesity is the primary target. Through community-led processes, Healthy Places will help Colorado communities become healthier places to live, work and play. The tenets of the initiative are:

• “Enhance walking, biking and transit connections throughout neighborhoods.
• Increase parkland, open space and recreational opportunities.
• Prioritize enhancement that encourage healthier lifestyles and behaviors for children and families.
• Invest in and prioritize good health through scheduled activities, classes, programming and events.”

From a health perspective, The Colorado Foundation cites two important findings that relate to urban design:

• “Residents are twice as likely to get adequate physical activity if their neighborhoods have access to sidewalks and trails.

• A child has a 20–60% higher chance of being overweight in neighborhoods with no access to sidewalks, parks or recreation centers.”

In 2012 the Colorado Health Foundation received requests from 26 communities to join the Healthy Places initiative. During the first phase of Healthy Places, the Foundation selected three communities to participate in an advisory panel process with the Urban Land Institute. Selected communities also will receive follow-up technical assistance.

See more information here: http://www.coloradohealth.org/healthyplaces.aspx

The Trust for Public Land (TPL), known for its work in protecting nature for people, took a new, more data-driven approach to advocacy with its ParkScore program in 2012. In Houston, Texas, TPL partnered with the Houston Endowment to develop these programs and create a methodology for incorporating the results into effective urban design.

ParkScore: Case Study in Houston—Trust for Public Land & Houston Endowment*

The Trust for Public Land is collaborating with the Houston Endowment to develop an innovative way to find locations for new parks in Houston. Beginning with the release of ParkScore in 2012, TPL has developed a number of tools to improve park planning efforts. These include a ParkScore analysis, ParkServe, and others.

ParkScore is a rating system developed by TPL to help large cities identify where new parks are most needed and which park improvements will deliver the greatest benefit to residents. The system uses a combination of geographic, demographic, and local data and ranks cities based on three basic factors: park access, park size, and park services and investment.

The Houston Parks and Recreation Department (HPARD) asked for technical assistance from the Trust for Public Land to integrate the ParkScore findings into the city’s planning process. With support from the Houston Endowment, TPL accomplished the following:
• Devised a tool that allows park planners to model the impact of creating one or more new parks on a city’s ParkScore. The tool gives an instant analysis of how many additional people would be served by a hypothetical new park, and how the new park would affect other factors that make up the ParkScore ranking.

• Created a tool that identifies where in a city a new park would have the greatest impact to improve access.

• Provided training to HPARD on the use of these tools.

HPARD is now using the tools TPL designed to assess community park needs and identify sectors and neighborhoods within each sector in particular need of new parks, and where strategic investment in new parks could produce the maximum benefit.

TPL developed a simplified version of ParkScore that has been dubbed “ParkServe.” ParkServe is a purely GIS-based analysis that uses spatial data on land use type, park location, and half-mile walking distance park service areas. The analysis incorporates weighted demographic indicators (population density, percent kids 19 and younger, and percent low income households) with the spatial data to identify priority areas. When complete, ParkServe results will be shared with all stakeholders.

The Trust for Public Land’s collaboration with the Houston Endowment has enabled Houston and Harris County to serve as a laboratory for the development of new and improved methods for siting parks. TPL is now aiming for widespread adoption of the ParkServe methodology by cities and urban communities across the country. With ESRI, a leading provider of GIS software, TPL is currently developing a web platform that will allow any urban municipality to upload GIS data on its park system and generate a ParkServe analysis.

For more information see: http://parkscore.tpl.org

* Written by Hannah Kohut, Senior Research Associate at The Trust for Public Land

Providing the legal framework (through JUAs) and the physical connectivity (through urban design) are critical components in creating accessible natural areas. Colorado Health Foundation and ChangeLab Solutions highlight public health concerns as a basis for their missions, while TPL highlights the social justice and public health aspects (Harnik and Welle, 2011).

While the wheels have already started rolling in Houston, a logical next step appears to be combining the power of ParkScore’s public awareness mission with a more comprehensive community health component. In order to focus urban design on health and natural areas, a partnership between TPL’s ParkScore team and GrowNYC/Rupal Sanghvi (see Section 3.2: Doris Duke Charitable Foundation box above) could be fruitful.
2.4 Foundations Making Partnerships

Much as the Houston Endowment and DDCF have seen the benefit of making partnerships within sectors of their own organizations, some foundations are making formal partnerships with other foundations and institutions in their communities to better address both health and nature.

The Convergence Partnership, formed in 2006, is one such large collaboration brought together by health and the environment. The Convergence Partnership, originally focused on influencing change at the national level, now works at the local, state, and regional levels as well.

The Convergence Partnership (National)

The Convergence Partnership steering committee includes representatives from Ascension Health, The California Endowment, Kaiser Permanente, the Kresge Foundation, Nemours, the Robert Wood Johnson Foundation, the Rockefeller Foundation, and the W.K. Kellogg Foundation. The Centers for Disease Control and Prevention serve as critical technical advisors on the committee. PolicyLink, a national research and action institute devoted to advancing economic and social equity, serves as program director for the partnership. The Prevention Institute, a national non-profit organization dedicated to improving community health and equity through effective primary prevention, provides policy research and analysis along with strategic support.

The Convergence Partnership envisions a nation in which every community fosters health, prosperity, and well-being for all, by promoting:

• “Equity as the means to ensure that everyone has the opportunity to participate and prosper;
• Policies and practices that create conditions that sustain healthy people and healthy places; and
• Connections among people across multiple fields and sectors that catalyze and accelerate the work.”

The partnership’s tagline is Healthy People, Healthy Places. The partnership was founded on the belief that health and place are inextricably linked. It is acting to implement that belief in the following ways:

• “Influencing federal policy, such as Sustainable Communities Initiative, Community Transformation Grants and transportation policy.
• Promoting access to healthy food, including support of the national Healthy Food Financing Initiative to improve access to healthy food in underserved communities.
• Improving the built environment, featuring a focus on the connection between transportation and health.”


The Convergence Partnership supports the formation and growth of 14 regional convergence partnerships. Situated within the Regional Convergence Initiative, these smaller partnerships engage advocates, practitioners, and community leaders across multiple fields and sectors and serve as a capacity building mechanism for the Convergence Partnership. Nevertheless, these regional partnerships are expected to help foundations create sustainable partnerships that support and promote the three ideals of the Convergence Partnership listed above (Convergence Partnership, 2014). The 14 current regional convergence partnerships are:

• California Convergence
• Livewell Colorado
• Florida Partnership for Healthy People, Healthy Places
• Shaping Kentucky’s Future Collaborative
• Let’s Go! Maine
• Massachusetts Convergence Partnership
• Michigan Convergence Partnership
• Missouri Convergence Partnership
• Heal New Hampshire
• North Carolina Convergence Partnership
• Northwest Convergence Partnership
• Ohio Regional Convergence Partnership
• Greater Philadelphia Food Funders
• Washington Regional Convergence Partnership
Some Examples of Other Relevant Partnerships/Collaborations

• Coachella Valley Link – 52 mile alternative transportation network


• Health & Environmental Funders Network: Connect & Collaborate

  Partners: Various through different projects focusing on Community Environmental Health & Justice, chemicals in the environment, and fracking. http://www.hefn.org/connect

Barriers to Partnerships

The RWJF Commission to Build a Healthier America surveyed local organizations to determine the barriers to forming partnerships across the health and community development sectors. Some of the major barriers identified included:

• “Inadequate funding and resources
• Lack of shared vision and common goal
• Lack of skilled leadership
• Lack of mutual understanding and respect among partner organizations
• Lack of well-established relationships and communication links with potential partner organizations”

Understanding the changing landscape of health and nature can help address these major barriers. For example, new sources of funding may be made available through nonprofit hospital community benefit programs. Large foundations and existing partnerships, like the Convergence Partnership, could share lessons learned as they continue to navigate these obstacles. Overcoming these barriers and continuing to build partnerships is an imperative for the foundations looking to connect public health and nature in the future.

Land Trusts

A key component to these partnerships, particularly in the northeastern United States and urban areas elsewhere, is the local land trust. To be successful in navigating foundations and building partnerships, land trusts should:

• Identify the foundations that are operating in their regions
• Assess the missions of the foundations, as well as the types of grants that have been successful, and determine opportunities for future collaboration
• Network and partner with organizations that focus on community health and physical education, particularly regarding obesity, children's health, and/or safety
  › Cite foundation reports (e.g. RWJF Commission to Build a Healthier America) and/or federal missions (e.g. Healthy People 2020)
• Develop a grant proposal with partners explicitly listed
• Reach out to program officers in relevant foundations (based on location and grant topic), either directly or through the organization’s partners/networks
• Document successes and needs for the project to pursue further funding

2.5 Conclusions: Improving the Health Foundation and Nature Link

The link between health and nature is becoming a more common part of the dialogue at health foundations. The foundations mentioned in this chapter are among the leaders that others can look to in developing innovative programs that improve public health through access to nature. The greatest contribution health foundations can make is to help catalyze partnerships across interested local organizations.

Parts of the medical community will likely call for more studies similar to the NYRP-Sanghvi project and foundations will need to make decisions as to the number and type of research projects to fund. Yet while some foundations fund research, others, such as the Houston Endowment, are already pursuing the actions and policies that the research seeks to drive. As such, foundations are playing a critical role in joining both action and research across the nature and health connection.

Possible Questions for Discussion

• Considering the major barriers outlined in Section 2.4, how can health or environmental foundations better facilitate partnerships across the land conservation/park and health communities?
• How might large employers act like foundations and help support local partnerships to help fund public-private health initiatives?
• How can foundations help local communities better access federal, state and local funds for community health initiatives, like Healthy People 2020?

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Linking Science — Measuring Health Outcomes

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“If you don’t count, you don’t count.”
— Peter Harnik, TPL

This chapter is intended to provide a starting point for a much larger discussion among land conservationists, health care practitioners, researchers and funders about how to move forward in connecting health and nature. It focuses on the key questions of:

• Why measure the impacts of nature on health?
• What might or should we be measuring?
• What is already being done to measure the connections between nature and health?
• What are the challenges to accurate measurement?
• What are some of the most promising solution spaces and datasets to explore for the future?

While this paper is not by any means a comprehensive analysis of these issues, it aims to create a common understanding of the work to date and propose directions for future efforts.

3.1 Why Measure? The Challenge of Proof

In today’s world, people are feeling the effects of a life that has become too sedentary, too digitalized and too much spent indoors. In response, there has been a movement to bring nature back into our lives. Across the country, intentionally designed healing gardens, wild and winding trail systems, comprehensive experiential education for children and adults,
and other initiatives to get people back outdoors are all growing. But once we get people out there, then what? How will we know if it is making a difference?

We know instinctively that people who spend time outdoors are typically more fit, more physically active and often happier than people who spend all their time locked up indoors. However, we have lacked a comprehensive body of evidence that links nature to health (Mowen, conversation with author, March 19, 2014). Now, a new generation of research that substantively demonstrates such effects is expanding, driven by a demand for evidence-based policy-making and by funding that looks to leverage these benefits for three main goals:

- Lowering healthcare costs while improving access to and quality of care.
- Addressing and mitigating health and social inequities.
- Creating broader constituencies for land conservation.

In the past, much of the evidence linking nature and health was anecdotal, focusing on perceived impacts. Self-reporting and direct observation are still some of the most cost-effective and feasible ways of measuring the impacts of nature on health, but some researchers are now experimenting with quantitative measurements like skin conductivity, cortisol levels, and blood pressure.

Much like the alternative health and medicine movement, which has gained currency in recent years through studies measuring its health outcomes, the effects of nature on health are increasingly being documented in systematic and scientifically rigorous ways (Berkley, conversation with author, February 15, 2014). A suite of powerful new technology and mapping tools is rapidly developing in directions that could aid this movement.

Gathering health outcome data from exposure and access to natural areas, however, poses significant logistical and practical challenges, and many of these studies are still in their nascent stages. With limited resources available, practitioners in this field need to figure out what to measure and how to do it efficiently. How can we ensure that data collection is intentional and policy-directed? How can we prioritize funding for research in this area? What sort of data is still needed to conclusively demonstrate positive effects? And how will this data be translated into prevention and treatment regimes that can be enacted soon, so that as many people as possible may maximize benefits from them?

Ultimately, research and measurement in this field should be directed towards scaling up. We want to know how to measure the impacts of nature not only on the health of individuals, but also the cumulative impacts of landscape level planning on communities, regions, and cities.

Some of these nature-based health solutions may offer treatment for illnesses or chronic conditions, but their real strength likely lies in preventive care. As more of the health care system shifts toward prevention, regimes of time spent outdoors seem particularly promising for improving health and reducing disease.

Funders, hospitals, and government entities are looking to invest in policies or infrastructure that will have a big “bang for the buck,” affecting the health and behavior of many people.
They are interested in the cost-effectiveness of health solutions, with a heavy emphasis on getting results. Measurement should thus be focused toward compiling actionable evidence that is compelling enough to be translated into changes in health business models. The chains of causality that lead from natural areas to improved human health must be as clearly-defined and well-understood as possible. At the same time, as new initiatives are created, it is critical to direct funding to the right places—supporting what’s working and changing what’s not.

Pathways to Health

If we are to optimize funding and focus research, we must better understand the mechanisms that connect health and nature. A 2014 paper published by Hartig et al. in the *Annual Review of Public Health* suggests four commonly recognized pathways. Figure 1):

> Four Pathways by which the Natural Environment can Affect Human Health

![Image: Four Pathways by which the Natural Environment can Affect Human Health](https://www.annualreviews.org/)

These pathways (air quality, physical activity, social cohesion, and stress reduction) and their implications for measurement methodologies will be discussed at greater length later in this chapter, but for the moment, they provide a basic framework from which to start thinking about measurement.

As the paper’s authors note, however, “the mechanisms by which nature might affect health are multiple and synergistic,” and effects vary across different population subgroups, in dif-
Different contexts, and across spatial and temporal scales (Hartig et al. 2014). In addition, it will be critical to not only examine the effects of the presence of nature, but also of its absence in human lives. These consequences may be just as persuasive.

Throughout the research process, approaches must be drawn from multiple disciplines. The very first step may be to define “nature” or “health” in standardized terms that are mutually recognizable and comparable. Such definitions may tap into urban planning, epidemiology, ecology, psychology, or other fields. The next steps will be to determine the metrics, qualitative and quantitative, with which to delineate categories and track impacts, then to collect and analyze data at different scales. Findings will need to be further examined through the cost-benefit and cost-effectiveness perspective of health care economics, and through the lens of social and health equity. Finally, conclusions need to make their way back into policy and practice through avenues like evidence-based design, better funding and management of parks, and improved access to private conserved land. Collaborations are key to this research, facilitating the collection, management, and sharing of data between scientific experts, users, and other stakeholders.

**Dividing up Roles and Responsibilities for Measurement**

This paper’s primary audience is land trusts, foundations, and healthcare providers. To that end, it focuses on the capacities and strengths of these actors, and looks for synergies among them.

The diagram below suggests some preliminary ways these groups might divide up measurement, but with new developments in research these responsibilities might be reallocated in ways that make more sense or maximize efficiency.
For healthcare organizations looking to reduce costs and improve patient outcomes, gathering data on health and disease consequences of time outdoors could help optimize treatment. For example, obesity and diabetes is an obvious and very measurable area where improved access to the outdoors could provide a cost-effective solution. A 2006 study showed that a person with obesity spends on average $1,429 more per year on health care than a person of normal weight and these costs are rising (CDC, 2012a).

Increased physical activity, a strong corollary of access to open space, is an excellent way to both treat and prevent obesity and diabetes. In addition, the outdoors environment may also have other, more subtle benefits for health. Both healthcare providers and insurers are well-positioned to track such data for their patients and clients, while foundations might be better suited to analyzing large datasets at a population scale.

In the realm of health and social equity, measurement is a way for funders or healthcare organizations to identify critical gaps – such as the inequitable access to parks in certain cities or neighborhoods that has been called a “new dimension for environmental justice” (Strife and Downey 2009). Likewise, measurement and mapping of health care access or disproportionate rates of chronic disease may reveal areas that might particularly benefit from increased green space or outdoors initiatives.

While such initiatives are not a substitute for improved health care systems, they are a way to support and enhance improvements. With the advent of the Affordable Care Act, Community Health Needs Assessments (CHNAs) are becoming a crucial tool for many hospitals to establish a baseline and develop strategies to address local needs. Funders or government agencies looking to maximize their social impact will need to refine and test the use of specific health indicators to monitor and evaluate their impacts on their target communities.

As the proprietors of open space, land trusts and park agencies are well positioned to gather data on usage and land attributes that may ultimately lead to better management and more funding. While they often lack the staff and resources to systematically gather this information, opportunities exist for collaboration among foundations, hospitals, and land trusts that better supports the collection of relevant data and ties it into health information being managed by health care organizations.

And for land trusts, a better understanding of the connections between health and nature may be critical to survival in the future. U.S. Census numbers predict that by 2050, the majority of the U.S. population will be non-white. Accordingly, conservation organizations across the country have realized that they need to expand the demographics of their movement and broaden their appeal to become more relevant to those outside the “traditional” conservation community (Forbes, 2011). Partnerships that measure the value of conserved land and green space for health will help maintain funding and political support for these places, even through difficult economic times.

According to William Bird of the organization Natural England, “we can make a good case right now for land conservation based on its benefits to human health. The true question now is how to make this case more robust.” (Bird, telephone interview with D.Krause, 2014)
3.2 What Should We Be Measuring?

Determining health outcomes from time spent outdoors is complicated by the intertwined and confounding nature of the variables to be measured. This section attempts to break the questions of measurement into six separate categories:

- What type of exposure or use?
- To what kind of nature?
- For whom and at what scales?
- To address what needs?
- With what outcomes or effects?
- Using what tools or methodologies?

The chart below highlights some of the key types of data that might be collected for each of the six categories. Each category is then discussed in the sections that follow.

<table>
<thead>
<tr>
<th>Exposure and Use</th>
<th>Natural Environments</th>
<th>Target Populations</th>
<th>Needs Assessment</th>
<th>Outcomes and Effects</th>
<th>Measurement: Tools and Methodologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity</td>
<td>Types of trails</td>
<td>Individual health vs. epidemiology and community health</td>
<td>Proximity to green space</td>
<td>Caloric output</td>
<td>Direct observation</td>
</tr>
<tr>
<td>Access</td>
<td>Park facilities/</td>
<td>Vulnerable populations (underserved, low income)</td>
<td>Chronic health issues</td>
<td>Test performance</td>
<td>Self-reporting</td>
</tr>
<tr>
<td>Use</td>
<td>features/size/</td>
<td>Pregnant women</td>
<td>Community Health Needs Assessment</td>
<td>Social Cohesion</td>
<td>Individual surveys</td>
</tr>
<tr>
<td>Visitation</td>
<td>programming</td>
<td>Children/teenagers</td>
<td>Income, race, age</td>
<td>Stress reduction</td>
<td>Interviews</td>
</tr>
<tr>
<td>statistics</td>
<td>Public or Private</td>
<td>Obese and diabetic</td>
<td>Physical activity</td>
<td>Physical activity</td>
<td>Phone surveys</td>
</tr>
<tr>
<td></td>
<td>land</td>
<td>Preexisting substance abuse/mental health issues</td>
<td>Toxics/pollutants</td>
<td>Air quality</td>
<td>Mapping</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Urban parks vs.</td>
<td>Veterans</td>
<td>Wellbeing</td>
<td>Mortality/illness</td>
<td>Direct measurement (BP, cortisol, etc.)</td>
</tr>
<tr>
<td></td>
<td>Wilderness</td>
<td>Patients with chronic or acute disease</td>
<td>Reduced costs</td>
<td>Psychological tests</td>
<td>Psychological tests</td>
</tr>
<tr>
<td></td>
<td>Scale and “naturalness”</td>
<td></td>
<td></td>
<td>Health indicators</td>
<td>Health indicators</td>
</tr>
<tr>
<td></td>
<td>Vegetation &amp; Greenness</td>
<td></td>
<td></td>
<td>Health care costs and utilization</td>
<td>Health care costs and utilization</td>
</tr>
<tr>
<td></td>
<td>Tree cover</td>
<td></td>
<td></td>
<td>data</td>
<td>Emergency room visits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mailed methodologies</td>
</tr>
<tr>
<td>Recreation/leisure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilderness therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.1 Exposure and Use

When we are looking at the “dosage” of time spent outdoors, it is important to distinguish between proximity, access, and use, all of which are parallel but not interchangeable concepts. Additionally, we should be thinking of what characterizes “exposure” and how long we have to be exposed to nature to feel an effect. What is the role of active or passive use in mediating health effects, and as a corollary, what happens if we are not exposed to nature?
Finally, we may examine different types of use and characterize these through measurements of visitation or activity.

<table>
<thead>
<tr>
<th>EXPOSURE = DOSAGE X TIME?</th>
<th>WHAT KIND OF USE?</th>
<th>WHAT TO MEASURE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Visitation</td>
<td>• Education</td>
<td>• Intensity of activity</td>
</tr>
<tr>
<td>• Proximity</td>
<td>• Work</td>
<td>• Time spent</td>
</tr>
<tr>
<td>• Accessibility</td>
<td>• Resting/leisure activities</td>
<td>• Number of visits</td>
</tr>
<tr>
<td>• Use</td>
<td>• Active/passive</td>
<td>• Caloric expenditure</td>
</tr>
<tr>
<td></td>
<td>• Physical activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Therapy</td>
<td>SOPARC (these metrics will be expanded on in section 3.2.6)</td>
</tr>
<tr>
<td></td>
<td>• Active transport (like biking or walking)</td>
<td></td>
</tr>
</tbody>
</table>

Hartig et al. (2014) identify three ways to measure the exposure of a study group to nature. These include:

- Assessing how much “nature” exists close to where they live;
- Surveying them to ask how much time or how often they actually spend time in nature; and
- Objectively measuring the time they spend outside using GPS technology.

Within each of these realms, we can also make further distinctions. Whereas proximity might only be a distance to the nearest park, measured using buffering tools in GIS software, other factors may also affect access and use. For example, Kuo (2010) notes that just because a park is nearby does not mean that it will be used if it is seen as unsafe. Factors affecting use include:

- Perceptions of safety in that space;
- Transportation barriers – like dangerous streets or lack of sidewalks; and
- Programming or facilities (such as play structures or sports fields) at the park that make it more or less appealing or usable.

“Use” as a concept may be split into additional categories of work or leisure, and into varying types and intensities of physical activity. These variables are relevant because they allow us to distinguish between a park user sitting on a bench reading a book, and one running or playing an active sport, each of which may have different mental and physical health consequences.
Researchers have come up with several methodologies, such as the “SOPARC” method, which enables a blend of qualitative and quantitative assessments of park use. At the same time, however, it remains difficult to distinguish between health effects directly attributable to nature, and those that are a consequence of the physical activity itself.

An additional category of “use” is worth mentioning, as it provides a fruitful area for research: outdoor and experiential education. Outdoor education is a broad term that might be used to describe anything from an hour-long natural history class in an elementary school yard, to a multi-month wilderness experience for troubled teens. This wide range brings up the second category of measurement.

### 3.2.2 Natural Environments: The Green Spectrum

What kind of nature and what types of open space can produce desired health benefits? Vegetation and greenness are measures that have been used to demonstrate health effects like reduced post-surgery recovery times in patients whose windows provided natural views (Ulrich, 1984) or short-term changes in mental status or attention after viewing natural scenes (Kuo, 2010).

On a broader scale, however, it remains to be seen what attributes of landscapes create long-term effects on health. The type, location, and quality of the outdoors have implications for how and why it is used by people. One aim of this paper is to increase research and data collection on private land, but the bulk of research so far has taken place on public land, and differences in management of public and private land should be considered in the design of future studies.

Open space also comes with varying levels of “naturalness” and in different scales, from tiny urban pocket parks to immense national forests. A measure of proximity might show that there were multiple pocket parks in a downtown area, but the carrying capacity of these places might be much smaller than for a large parcel of open space (Robertson, conversation with author, April 14, 2014).

The chart below provides some suggestions for how land trusts and researchers might describe the type of nature they are investigating:
Parks are at the forefront of the research in this field, with novel partnerships between organizations like the RAND Corporation and the City Parks Alliance leading the charge.

**Assessing Parks in the US: City Parks Alliance and the RAND Corporation**

The City Parks Alliance and the RAND Corporation have teamed up to conduct a four-year, comprehensive assessment of physical activity and park management within 200 parks in 25 randomly selected cities around the US. It is one of the largest systematic park observation surveys ever initiated, and its detailed methodology strives for the sort of standardization that will make this data easily analyzable. The goal is ultimately to improve park management in ways that will facilitate and enhance physical activity.

Trained observers use a version of the SOPARC method (described in section 4.2.6) to note variables like number of people, type of activity, and intensity of physical activity in a park. Over the course of a week, they go out to gather data multiple times in a given park before moving on to the next one. In addition to physical activity, each park is described in terms of its neighborhood, physical structures, transportation access, condition and general atmosphere, and users are described in terms of their demographics. This information is input directly into iPads that upload to a central data management server for analysis (McHugh, conversation with author, 4/20/14).
Mapping and visualization technologies like aerial photography, along with remote sensing, Lidar and GIS software are all powerful tools in assessing the type of nature people are being exposed to at larger scales. However, all of these methods must be ground-truthed by researchers actually visiting the sites to verify that their remote observations of vegetation or tree cover are accurate and calibrated.

Ming Kuo at the University of Illinois Health and Landscapes lab has been conducting an ongoing longitudinal study using aerial photographs of schools to assess changes in levels of “greenness” over time, and to see how these levels correlate with changes in standardized test scores (Kuo, conversation with author, April 26, 2013). Tree cover, estimated using publicly accessible datasets and Lidar technology, has also been employed by some researchers, such as Bill Sullivan (also of the University of Illinois), in city-wide studies that look at its correlation with other variables such as social capital (Holton et al., 2014).

Urban forests and their benefits may also be measured down to the level of individual trees, as the USDA’s iTree tool does.

Managing Urban Forests

The iTree tool is an online tool that can be used as a benefits calculator for street trees in urban areas. At this time, it does not include health benefits in its analyses, but these could be incorporated in a later iteration.

For more information see: http://www.itreetools.org/streets/index.php

Land trusts and others interested in connecting natural areas and health should seek to create standard measurements that both quantify and describe natural spaces in terms of multiple variables like the ones considered above.

3.2.3 Target Populations

As we study health outcomes, it is important to know for whom we are measuring impacts and at what scale. Both the effects of contact with nature and the ways in which it is used could vary widely depending on who we are looking at. For example, different cultural groups may use parks in distinct ways – for picnics and family gatherings in some cases, for solitude and exercise in others. The impacts may also differ by age or health status – adults might benefit from different levels of physical activity than children, and preexisting conditions like heart disease or mental illness might amplify or decrease these impacts.
In order to better target interventions to address those with the greatest health needs, we need to focus on “vulnerable” populations to determine if nature is actually an effective way of treating them. Gathering demographic information is thus a key part of measurement. A few of the variables discussed above are considered in the chart below:

<table>
<thead>
<tr>
<th>EFFECTS AT WHAT LEVEL?</th>
<th>POPULATION SUBGROUPS</th>
<th>“VULNERABLE” POPULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Individual</td>
<td>• Healthy adults</td>
<td>• Underserved communities</td>
</tr>
<tr>
<td>• Family</td>
<td>• Children/youth</td>
<td>• Obese and diabetic</td>
</tr>
<tr>
<td>• Population group</td>
<td>• Pregnant women</td>
<td>• Other chronic disease</td>
</tr>
<tr>
<td>• Community</td>
<td>• Ethnic/racial/cultural groups</td>
<td>• Substance abuse/mental health problems</td>
</tr>
<tr>
<td>• City or county</td>
<td>• Urban/rural</td>
<td>• Veterans</td>
</tr>
<tr>
<td>• Region</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As a group with many mental and physical health needs, veterans are good candidates for therapeutic use of outdoor activity.

**Veterans and the Outdoors**

The R4 Alliance is a consortium of outdoor groups who provide recreation and therapy to military veterans. Its members seek to use the “healing power” of nature and outdoor recreation to support military families.

While one of the “R’s” listed in its name stands for “Research,” R4’s website notes: “While few doubt the positive impacts our member’s programs have on the lives of Our Military Family, we lack a homogeneous body of evidence to prove our efficacy and drive evidence based practices. In order to prove the benefit of these services and gain recognition in the medical community, we as an industry need to collaborate our research efforts to gain the body of evidence needed to prove the efficacy our services.”
This statement highlights the key issue in measurement of the connections between health and the outdoors: while most people agree that there are benefits to this exposure, the burden of proof is still on those who advocate for more time in nature.

The Sierra Club’s Military Outdoors program is a member of the R4 Alliance. It organizes trips providing service members with outdoor experiences. In collaboration with the University of California at Berkeley, the program is in the process of initiating a three-year longitudinal study of resilience related to veterans’ outdoor experiences.

For more on these topics see: The R4 Alliance: http://r4alliance.org/research/ and http://r4alliance.org/wp-content/uploads/2014/05/SIERRA_REPORT_6_13_Exploring-the-benefits-of-outdoor-experiences-on-veterans.pdf

Sierra Club Military Outdoors: http://content.sierraclub.org/outings/military

Other groups looking to improve the health of particular populations might use the R4 model to drive research investigating the effects of nature on their constituents, ensuring that their work is indeed effective in serving them.

### 3.2.4 Needs Assessments

Even before developing interventions, it is critical to focus attention on measurement of areas with the highest need for green space. Mapping is a powerful tool both for needs assessment and analysis. Breece Robertson, head of the GIS program at the Trust for Public Land (TPL), has been involved in creating a number of planning and assessment resources.

**ParkScore**

The Trust for Public Land (TPL) developed the ParkScore Index for the 50 largest U.S. cities. Using a combination of mapping tools and demographic data, TPL analyzed each city and gave it a score based on how well each city is meeting its population’s need for parks.

Points were given based on three main criteria: acreage, services and investment, and access. Acreage was calculated from two equally weighted measures: median park size and park area as a percentage of total city area. Services and investment were likewise calculated from number of playgrounds per resident and spending per resident, and access was based on the percentage of population within an unimpeded ten-minute walk of a park. Park need was also assessed based on U.S. Census data like “percentage of population 19 or younger” and “households with median income less than 75% of city median income.”
The interactive ParkScore tool serves as an accessible gateway for both practitioners and the public to access and easily visualize information. Users can look at city rankings, individual variables, and map indicators like childhood obesity.

See Chapter 2 for more information on how ParkScore has been applied in Houston.

In addition to ParkScore, TPL has led the way in designing and applying a number of other tools. For example, it works with city parks departments to study and increase equity in access to parks. This involves creating buffers around parks or using a network analysis tool to look at the actual pathways and roads that people take to access parks, then layering this with demographic data on income, housing, age, and other factors to analyze the need for open space in certain areas. This is the ParkServe tool. (for more information on the use of this tool see Section 2.3)

TPL is also working on a model that considers the carrying capacity of parks based on their size and facilities and a Park Access Indicator that will link the ParkScore and ParkServe tools. The Park Evaluator tool is a geodesign tool that can run calculations on what the impact of a park would be if it was put in a certain location. While this allows planners to evaluate individual parks, work still remains to assess park systems as a whole.

After parks are constructed or renovated, TPL and the City Parks Alliance plan to monitor the outcomes, and TPL is working with the Robert Wood Johnson Foundation to look at how the placement of parks might affect people’s health. To this end, they are interviewing individual park users to gather demographic data on their age, ethnicity, and health, with the intention of conducting follow up interviews with these same users to see if their health data changes over time. Most of these studies are still in their early stages, but in the future TPL hopes to be able to publish their findings (Robertson, conversation with author, April 14, 2014).

A partnership between these three organizations led to a comprehensive assessment of children’s need for access to green space in Kalamazoo, Michigan.

A vulnerability index was created based on demographic variables such as income, race, and age. This was combined with buffering projected out from existing parks, playgrounds, and recreational open space to assess which areas were more than a ten-minute walk from green space.

The study’s findings identified high-priority areas for targeting children’s outdoors initiatives. The maps generated also helped inform future city planning in Kalamazoo, a fine example of the power of maps for linking information to place.

For more information on this project see: http://cloud.tpl.org/pubs/convis-kalamazoo.pdf

3.2.5 Outcomes and Effects: Treatment vs. Prevention

“We’re moving from sick care to health care.”
— Marydale Debor, Connecticut Mental Health Center

Human wellness and health consists of multiple dimensions, ranging from happiness and satisfaction, to the absence of disease. Therefore, when looking at health outcomes from time in nature, a number of theoretical questions must be asked. These include:

• How does one tease apart complex health outcomes to find compelling evidence of a “nature effect”?

• How are behavioral changes that lead to better health outcomes, like increased physical activity, related to time spent outdoors? And how does one distinguish the impacts of physical activity from the impacts of nature?

• What changes are we measuring and from what baseline?

• Are we talking about treatment or prevention, and is one case more compelling than the other?

• What level of impact are we looking at in terms of public health?

• Are there models from other fields besides public health that will be useful for tracking outcomes?
• Are there differential effects for vulnerable populations?

• What are the pathways by which these beneficial effects work?

While some might see the effects of nature on health as “unstudyable,” reviews of alternative medicine practices may offer some basic guidelines for determining health impacts. In alternative medicine, it is useful to break down the “effect” into different components such as “relationship between the user and practitioner” or “the techniques used to enhance the healing process” (Long, 2002). For nature, these categories might correspond to the type of natural area a person interacts with or what activity they pursue outdoors. Encouragingly, researchers of alternative medicine insist that “established methodologies (e.g., experimental trials, observational epidemiology, social survey research) and data-analytic procedures (e.g., analysis of variance, logistic regression, multivariate modeling techniques) are entirely sufficient to both assess the effectiveness of interventions and explore the pathways by which they work” (Levin et al., 1997).

This is likely true of nature as well. The challenge, then, is to figure out where to look for effects and how to develop qualitative and quantitative measurements for them.

Some components of health that may be affected by nature are summarized in this chart. They will be further expanded upon below.

<table>
<thead>
<tr>
<th>PHYSICAL HEALTH</th>
<th>MENTAL HEALTH</th>
<th>SOCIAL CAPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Physical activity/Behavior</td>
<td>• Resilience</td>
<td>• Social cohesion</td>
</tr>
<tr>
<td>• Body Mass Index (BMI)</td>
<td>• Depression</td>
<td>• Collective efficacy</td>
</tr>
<tr>
<td>• Presence/absence of disease</td>
<td>• Stress</td>
<td>• Social control</td>
</tr>
<tr>
<td>• Need for medications</td>
<td>• Wellbeing</td>
<td></td>
</tr>
<tr>
<td>• Stress effects</td>
<td>• Self-concept/self-esteem</td>
<td></td>
</tr>
<tr>
<td>• Pain</td>
<td>• “Life effectiveness”</td>
<td></td>
</tr>
<tr>
<td>• Obesity/Diabetes</td>
<td>• Self-control</td>
<td></td>
</tr>
<tr>
<td>• Respiratory/cardiovascular health</td>
<td>• Life attitudes</td>
<td></td>
</tr>
<tr>
<td>• Blood Pressure</td>
<td>• Happiness/satisfaction</td>
<td></td>
</tr>
<tr>
<td>• Hospital visits</td>
<td>• Cognitive function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ADHD</td>
<td></td>
</tr>
</tbody>
</table>
Connecting Health to Nature

Contact with nature seems to have effects on physical health, mental health, social capital, general well-being, and even on cognitive performance. While many of these effects are positive, we must also consider possible negative effects, such as accidents or injury, or exposure to outdoor allergens and pathogens (Gentry et al., 2013).

In the past, much of the environmental health field focused on toxicity and pollution. These issues are still critical as we consider the effects of natural space and time spent outdoors for health. For one thing, since they tend to enclose sources of pollutants, indoor environments tend to be more toxic than outdoor ones (Godbey, 2009). In some cases, however, time spent playing outdoors may lead to greater exposure to pollutants, such as ozone on hot summer days in the city.

As outdoor air quality is already a commonly monitored variable with a large available dataset, it may be worthwhile to consider the interaction between vegetation and air quality, with resulting changes in air-quality-related health outcomes. While trees may be a source of allergens and hydrocarbons (Hartig et al., 2014), they also tend to sequester pollution, improving air quality. A 2013 study looked at tree loss due to the invasive Emerald Ash Borer beetle. Donovan et al. found a relationship between Ash tree loss and increased human mortality related to the presence of fine particulates that cause cardiac or lower respiratory tract disease (Donovan et al., 2013).

In addition to air quality, Hartig et al. cite three other main pathways that have been found to connect health and nature. Physical activity may have both physical and mental health effects. Safe, high quality, natural spaces can attract people outside and encourage more outdoors walking, active play, or “active transport” like walking or biking. At the same time, open spaces that encourage people to interact with each other may foster the building of relationships and a sense of community that has been proven to positively impact mental and physical health. Both of these pathways also contribute to reduction of stress. Contact with nature has been shown to reduce markers of chronic stress like cortisol, and to reduce illnesses associated with stress. It also may promote an increased “subjective well-being” both by creating distance from stressors like traffic or noise and by helping restore attention, cognitive function, and the ability to deal with stressful situations (Hartig et al. 2014).

These pathways intertwine in multiple ways, contributing overall to physical health, mental health, social cohesion, and the treatment and prevention of many illnesses.

Physical health effects from nature might manifest as changes in some of the following measurable indicators:

- Body Mass Index (BMI), a measure of body fat based on one’s height and weight (McCurdy et al., 2010)
- Blood Pressure and Heart Rate (Park et al., 2010)
- Pain (Malenbaum et al. 2008)
Detailed health status, which can include many variables and health indicators. (Berkley, conversation with author, February 15, 2014)

Mental Health effects may include changes in the following:

- Self-reported wellbeing. (Kellert and Derr, 1998)
- Stress indicators like salivary cortisol levels or skin conductivity. (Miller, 2012).
- Severity of ADHD symptoms. (Kuo & Faber Taylor, 2004)
- Mental resilience. (Wells and Evans, 2003)
- Happiness and satisfaction. (Kellert and Derr, 1998)
- Cognitive function. (Berman et.al., 2008)
- Concentration and test performance. (Faber Taylor and Kuo, 2009)

More general effects on health or socialization include:

- Social Capital (Halton et al. measured this using a telephone survey and a questionnaire. Residents were asked to score seven statements about their neighborhood, including five related to neighborhood social cohesion and association.)
- Self-Concept. (Kellert and Derr, 1998)
- Behavioral or attitude change. (Sibthorp et al., 2008)
- “Life effectiveness,” which refers to “generic life skills which facilitate surviving and thriving across a variety of situations.” (Neill, 2008)

While health effects from nature are indeed complex, measurement by health care providers or researchers should endeavor to capture easily quantifiable variables like blood pressure or BMI, but should not ignore more qualitative ones like mental health, self-concept, and social efficacy.

3.2.6 Measurement: Tools and Methodologies

Perhaps the most critical question of all in this growing field of research is how to gather the data we are seeking. In addition to the health measures mentioned above, most research so far focuses on physical activity, park visits, and types of use, employing a combination of observational and self-reporting techniques like regular monitoring of parks, interviews, or surveys. Instrument-based measurements are also becoming more popular, although these studies are more difficult to conduct. (See Section 3.4 for more information on these challenges.)

Sarah Barbo, in her 2014 master’s thesis at the Yale School of Forestry and Environmental Studies looking at the correlation between health and nature, provides a useful matrix that sorts relevant studies according to their methodology (observed/measured or self-reported), and their health effect (physical or mental).
In general, different types of measurement may be sorted into observation, self-reporting, and measurement using external devices or tools, each of which is expanded upon below.

Observation can be conducted by researchers or through collaboration with trained lay people (Harnik, conversation with author, April 8th, 2014). Observers may use standardized forms that detail quantitative or qualitative information such as number of park users or the atmosphere of a park.

Self-reporting usually takes place through interviews, in-person surveys, or mail-in and telephone surveys. Surveys should be designed to allow for the management and comparison of data. Thus, they may include categorical, scalar, and open-ended questions on wellbeing, health status or preexisting conditions, amount and frequency of outdoor recreation, and on stress levels.

**Tools for Measuring Physical Activity:**

Physical activity measurement using external devices may be one of the most fruitful areas of research at this point. Simple, portable instruments like the following help facilitate the gathering of detailed information.

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**Defining “Health” in the N\(\rightarrow\)H literature**

<table>
<thead>
<tr>
<th>Physical Health</th>
<th>Mental Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived general health, # of health complaints (Maas 2009) (deVries 2013)</td>
<td>Mental Fatigue/Restoration (Kaplan 1995)</td>
</tr>
<tr>
<td>Self-reported BMI (Zick 2013)</td>
<td>Stress (Glahn 2003) (Beyer 2014)</td>
</tr>
<tr>
<td>Physical activity SQUASH (deVries 2013) (Coombe 2010)</td>
<td>Social support (Maas 2009)</td>
</tr>
<tr>
<td><strong>Transformed Physical Composite Score (Lansu 2014)</strong></td>
<td>Perceived Stress Scale (deVries 2013)</td>
</tr>
<tr>
<td></td>
<td>Social cohesion (deVries 2013)</td>
</tr>
<tr>
<td></td>
<td>Depression (Beyer 2014)</td>
</tr>
<tr>
<td></td>
<td>Anxiety (Beyer 2014)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-reported</th>
<th>Observed/Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight (Donovan 2011)</td>
<td>Physical activity (Donovan 2013) (Richardson 2010)</td>
</tr>
<tr>
<td>Post-surgery recovery time (Ulrich 1984)</td>
<td>Mental Fatigue/Restoration (Kaplan 1995)</td>
</tr>
<tr>
<td>Hemoglobin A1C, blood pressure, and BMI (Moreno 2014)</td>
<td>Stress (Glahn 2003) (Beyer 2014)</td>
</tr>
</tbody>
</table>

*Source: (Barbo, 2014)*

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• Accelerometers/odometers: These devices may be worn by subjects to measure the intensity of their physical activity outdoors (Cleland et al., 2008)

• GPS: Global Positioning System devices or even mobile phones that have GPS capabilities could be used to track the actual amount of time and the number of visits that subjects make to natural areas.

• METS (see below): This provides a system for estimating caloric output for different types of physical activity.

**METS**

Barbara Ainsworth at the College of Health Solutions at Arizona State University has developed the MET or “Metabolic Equivalent Task” system as a proxy for measuring the caloric expenditure of physical activities. Researchers have developed a comprehensive ranking of different activities. For example, running might burn a certain number of calories per hour, but playing tennis might burn a different amount.

For more information see: http://prevention.sph.sc.edu/tools/compendium.htm, https://chs.asu.edu/content/barbara-ainsworth, and https://sites.google.com/site/compendiumofphysicalactivities/

**Park Use**

Park use and visitation is an area that has received a lot of attention, as policymakers and planners try to optimize the design and management of parks for healthier communities, and determine how to value national parks. Some ways of measuring park use include the following:

• Observation protocols and systems, like SOPARC (described below), which researchers can use or train others in. These systems attempt to create some sort of standardization and comparability across much broader datasets than are presently available.

• Social media/geotagged photos to estimate park visitation. A 2013 study compared geotagged photos of recreational sites posted on social media to empirical data on visitation at the actual locations and found that this crowd-sourced information could be used as a proxy for metrics like national park visitation rates. (Wood et al., 2013). http://www.nature.com/srep/2013/131017/srep02976/full/srep02976.html

• Tourism dollars may be another way to estimate park visitation.
SOPARC

SOPARC, or System of Observing Play and Recreation in Communities is a system that has been widely used in parks and recreation areas.

Originally developed in 2006 by researchers Thomas Mackenzie and Deborah Cohen, SOPARC collects information not just on the park environment and the number of users, but also demographic information on users’ age, ethnicity, and gender, on the type of activity they are engaged in, and on the accessibility of the park itself.

Active Living Research provides extensive resources on the use of SOPARC and RAND Health has developed a free online and downloadable iPad app along with a training DVD, all available through http://activelivingresearch.org/node/10654 and http://www.rand.org/health/surveys_tools/soparc.html

Health Indicators

Another way to measure health involves the use of health indicators. Health indicators are summary measures used to look at one or more aspects of health of individuals, populations, or environments. They can be used in large surveys to effectively track changes across populations or groups (Allee, 2010).

Many resources exist for health indicators, but more work still needs to be done to separate out the most important ones for this field. U.S. Census data can also be a critical tool in evaluating need and outcomes on a broader scale. However, it poses a major problem in that it has not been consistently collected at the same scale across the country. Some other resources are listed here:

- **Community Health Status Indicators Report**: This 2009 Report from the U.S. Dept of Health and Human services provides some examples of useful health indicators: [http://www.cdc.gov/CommunityHealth/homepage.aspx?j=1](http://www.cdc.gov/CommunityHealth/homepage.aspx?j=1)

- **Health Indicators Warehouse**: This is a source for national-level health data that is already compiled and could be analyzed with an eye to changes in access to green space. [http://www.healthindicators.gov/](http://www.healthindicators.gov/)

- **The Health Measurement Research Group**: A collaboration between the National Institute on Aging and the National Institutes of Health also offers a number of standardized Health-Related Quality of Life Measures. For example, the SF-36v2 is a multi-purpose, 36-question survey that touches on mental health, physical health and well-being. It can be self-administered or given by a researcher. [http://www.healthmeasurement.org/Measures.html](http://www.healthmeasurement.org/Measures.html)

- **Healthy People 2020**: an initiative of the U.S. Department of Health and Human Services (see discussion in Section 2), tracks the health of the U.S. population based on 26 “Leading Health Indicators” organized under 12 topics, including access to health services, environmental quality, and social determinants. Indicators within these topics
Some health indicators by life stage include the ones outlined in the following chart. Hospitals and foundations may be well positioned to gather and analyze this information at the regional and population levels, with a focus on the ones that are associated with the greatest healthcare costs or the largest health inequities (Ickovics, conversation with author, April 24, 2014).

<table>
<thead>
<tr>
<th>Birth</th>
<th>Childhood/Adolescence</th>
<th>Adulthood</th>
<th>End of Life</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gestational age</td>
<td>• Self-concept</td>
<td>• Respiratory disease</td>
<td>• Chronic disease</td>
<td>• Age-adjusted mortality</td>
</tr>
<tr>
<td>• Birth weight</td>
<td>• Development</td>
<td>• Mental health</td>
<td>• Cardiovascular disease</td>
<td>• Premature death</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cancer</td>
<td>• Leading indicators of death</td>
</tr>
</tbody>
</table>

Whether using self-reporting, observation, or measurement, stakeholders must divide responsibilities to best suit their own strengths, and work towards the standardization that will make large datasets analyzable. For example, land trusts and park managers might expand on the numbers that organizations like the RAND corporation are gathering on park use to start collecting their own data, while hospitals and health care providers might provide support to land trusts to help gather data on blood pressure and cortisol levels before and after outdoor activity.

3.3 What is Already Being Done to Measure Effects?

Building on the overview of measures above, this section outlines some of the research that has built the foundation for our current understanding of how nature and health are connected. For example, Ming Kuo’s work at the University of Illinois Laboratory of Health and Human Landscapes (http://lhhl.illinois.edu/) has used a wide variety of measures to describe the effect of nature on people in urban environments. Rachel and Stephen Kaplan at the University of Michigan have also done work on Attention Restoration Theory and the role that spending time in natural areas can play (Kaplan and Kaplan, 2005).

Major methods for measuring health effects from exposure to nature that have been used to date include:
• Standardized test scores examined longitudinally at schools with different ratings of greenness (Kuo, conversation with Author, 2013).
• “Self control” after exposure to green space (Taylor, Kuo, and Sullivan, 2002)
• Severity of symptoms for children with ADHD as reported by parents after a walk in a park (Kuo and Faber Taylor, 2004)
• Performance on a concentration test for children with ADHD after time spent outside (Kuo and Faber Taylor, 2004)
• Violence in housing units with different levels of greenness (Kuo, 2010)
• Cognitive performance (on a number sequence recall test) after exposure to natural images (Berman, Jonides and Kaplan, 2008)
• Psychological distress and global self-worth perceptions in areas with varying levels of vegetation (Wells and Evans, 2003)

Studies of the Japanese practice of “forest bathing” have employed several quantitative measures to compare physiological states before and after spending time in a forest (Williams 2012), such as:
• Cortisol, a stress hormone released throughout the body, the levels of which are sampled in the saliva
• Sympathetic nerve activity
• Blood pressure
• Heart rate

Wilderness therapy and therapeutic experiential education groups have employed psychological tests to measure effects before and after a trip, including:
• Locus of control
• Behavioral symptoms
• Self-efficacy (Davis-Berman and Berman, 1989)
• Rosenberg Self-Esteem Scale (RSES)
• Pearlin Mastery Scale (PMS)
• Social Anxiety and Distress Scale (SADS)
• World Health Organization Quality of Life Scale (WHOQoL-Bref) (Cotton 2013)

Methods used to assess the impacts of outdoor education include
• Self-reported effects (Derr and Kellert 1998)
• “Life Effectiveness Questionnaire” (Neill 2008)
• “Tennessee self-concept scale” (Ewert and McAvoy 2000)
• Differential assessments for different populations (Orren and Werner 2007)
• Long term effects or “far transfer” studied through surveys and interviews (Sibthorp et al. 2008)

Additional research on the impacts of outdoor education on children includes several meta-analyses of the research to date as well as “A Review of Research on Outdoor Learning,” published in 2004 for the U.K.-based Field Studies Council. This review represents an excellent, but not exhaustive, summary of research on outdoor and adventure education from a British perspective: http://www.wilderdom.com/research/ReviewResearchOutdoorLearningRickinson2004.html. Further links to outdoor education research can be found at the end of this chapter.

Naturebridge
Naturebridge is an environmental education program based in the San Francisco Bay area that runs multi-day science education programs for students of all ages. It has shown a particular commitment to measurement and evaluation of its impacts on participants. It releases a biannual environmental education research bulletin compiling and summarizing the latest research in the field.

More information can be found at: http://www.naturebridge.org/resources

Tools that are being used to evaluate physical activity or the use and availability of parks and recreation spaces include the aforementioned ParkScore, ParkServe, and SOPARC tools, but also:

• System of Observing Fitness Instruction Time – SOFIT (1991) and System for Observing Play and Leisure Activity in Youth – SOPLAY (2000). Both are systems that are similar to SOPARC.
• Checklist for Health Environments at Work – CHEW (2002) – focuses on access to physical activity and natural areas in the work setting
• Short Questionnaire to Assess Health-enhancing physical activity (SQUASH) (Sallis, 2009)

Some land trusts are already leading the way by rating trails and open spaces. For example, as part of the creation of the Red Rock Ridge and Valley Trail System, a plan for an exten-
sive trail network near Birmingham, Alabama, the Freshwater Land Trust worked under a grant from the Centers for Disease Control aimed toward enhancing community health in the area. For each proposed trail, they developed a set of criteria — rating the trail type and design to guide how each trail is built and used. (For more information see Section 1.3 or http://www.redrocktrail.org/)

Similar models could be used to categorize different types of open space and match them to the manner or intensity of activity desired by a user or prescribed by a doctor — as described in the following box:

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**Parkpages**

Dr. Robert Zarr, a physician with Unity Healthcare in Washington DC, has been working with the DC Department of Health to develop a database that provides such information to doctors and the low-income patients who most need it.

Zarr’s “Parkpages” database, which is integrated with the DC Park Rx program, provides a short summary of information about each park, including its proximity, features, and programming. http://www.aapdc.org/prx/ The database is linked to the Electronic Medical Records System, so physicians can have access to it as they are treating patients.

At the same time, every time a parks prescription is written, it is recorded next to other measures gathered at the time like BMI or blood pressure (Zarr, conversation with author, April 24, 2014.). In the future, Dr. Zarr hopes to develop a mobile app and a way to gather biometric data and information on whether or not patients actually go to the parks prescribed (Myrie and Daniel, 2014).

For an NPR story about Dr. Zarr see: http://www.npr.org/blogs/health/2014/07/14/327338918/to-make-children-healthier-a-doctor-prescribes-a-trip-to-the-park

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The following diagram lays out some general methodologies organized across scales of concern and a range of qualitative to quantitative methods that may be used by researchers looking at the connections between health and nature. Stakeholders may choose methodologies based on the type of information that would be most convincing to funders or policy-makers, or on their own strengths in data-gathering.
3.4 Challenges for Measurement

While much important work has been done in this field and ever more exciting studies continue to be developed, significant barriers to research still exist. Critical challenges for measurement include:

- Who will collect the data? Parks are understaffed, while volunteers can be inconsistent and hard to coordinate.
- What equipment is needed and who will pay for it?
- How do we get the data? For logistical reasons there is a bias towards self-reporting.
- How do we avoid a sampling bias, or compensate for it in self-reporting?
- How do we recruit individuals for the study and is there any way to achieve a random sample?
- How do we track individuals over time?
- How will behavior change when people know they are being measured and how do we compensate for this?
- How do we obtain and handle sensitive health information?
• How should we manage and analyze data?
• When is it appropriate to use quantitative measurements, and how do we ensure that the data captured in a qualitative format is equally usable?

A few of these challenges are expanded on below.

3.4.1 Objectivity/Bias

By its very nature, this work is not being conducted in the lab. Thus, it is difficult to control for the diverse variables that affect the connection between health and time in nature.

“There is no such thing as an objective measure,” says Geoffrey Godbey, Professor of Recreation, Park, and Tourism Management at Penn State. In his work on parks, he has found that giving people accelerometers or pedometers inherently changes how they exercise and recreate. There may be a point at which people become so accustomed to wearing a unit that this effect falls off, but he is not sure exactly when that is. In addition, Godbey points out that there is “no such thing as a random sample” in a park. The number of people and the behaviors they display are constantly shifting, even in response to researchers’ manipulations. The demographics of physical activity are affected by many factors, including community infrastructure, safety, affordability, recreational programming, and social ties. (Godbey, conversation with author, March 14, 2014)

Self-reporting is a frequently used methodology for gathering data on stress levels, physical activity, park use, and health status that is relatively cost-effective, but sometimes inaccurate. Parks researcher Andrew Mowen says that self-reporting of physical activity tends to overestimate the actual quantity, often by at least two times (Mowen, conversation with author, March 19, 2014).

Ideally, more than one measure should be obtained for each variable in order to triangulate and normalize for some of these effects. For example, researchers might combine self-reporting with interviewing key informants and wiring up some participants to instruments that can quantitatively measure their activity. Gathering multiple sets of data will help control for bias.

3.4.2 Quantitative Measures and Follow-up

At the same time, even quantitative measurements taken by researchers may be unreliable. For example, cortisol, usually measured from saliva, is expensive to test and according to some researchers, difficult to calibrate because it “jumps around a lot.” Encouragingly, researchers have also found that self-reported stress levels are generally a good proxy for measured stress (Godbey, conversation with author, March 14, 2014).

Obesity and BMI are highly measurable and highly trackable, but they still pose the challenge of how to follow up with people once you have measured them. (Godbey, conversation with author, March 14, 2014) Even studies that attempt to gather a random sample by measuring people at a park run into challenges when trying to track individuals’ health...
over a longer term. For example, people like having their blood pressure taken on-site for free, but it is hard to get either their prior information or follow up with them afterward to look for longer-term effects of outdoor recreation. All these instrumental measures are also confounded by other variables that might be affecting measurements, such as medications, preexisting high blood pressure, or other conditions.

3.4.3 Scale and Availability of Data

According to Breece Robertson of the Trust for Public Land, one of the biggest challenges she encounters as she works with different park mapping models is the scale and availability of data.

Most health data exists at the county or state level right now, so it is very difficult to analyze it down to the level of the individual or even of a local community. Meanwhile, TPL's current work looks at the effects of individual parks, but there is no way of scaling up, because based on the available data one cannot meaningfully extrapolate to the whole park system to see how people are being served by it (Robertson, conversation with author, April 14, 2014). Therefore, better analysis must be preceded by efforts to fill in the relevant information at the appropriate level (census-block, county, or individual geo-coded address).

Even if this data exists, however, researchers may not be able to gain access to it. Local health departments usually cannot share the data they gather, and many hospitals are unable to give access to confidential health information. In some places, researchers have been able to get past this hurdle by obtaining access to aggregate data, or by asking people to self-report on their own health.

Hartig et al. also point out the current limitations in connecting disciplines like epidemiology and psychology that are fundamentally concerned with different scales — in this case the population or the individual, respectively. In the future, gaining access to reliable data at multiple scales and connecting it in a meaningful way for interpretation will be critical to nature-health research.

3.4.4 Entangled Variables

Physical activity and time spent outside are not discrete variables. Their effects are often hard to distinguish from one another. In the long term, more intervention studies are indicated in order to try to isolate variables to see how they affect outcomes. Interventional and longitudinal studies may help disentangle some of these issues over time.

3.5 Solution Spaces for the Future

The future of research on the connection between nature and health is both promising and full of opportunity. New policy standards like health impact assessments or community health needs assessments are continuing to open the way for researchers to gather baseline
data for tracking future changes related to green space interventions. At the same time, tools like personal technology are making it ever more possible to work with and gather data at the individual level.

An approach that combines tapping into health data that already exists and gathering original data for further studies will be crucial to strengthening our understanding of these connections.

### 3.5.1 Health Impact Assessments

Health Impact Assessments (HIAs) have now become standard as part of the planning and approval process of many projects, driven by a need to assess health inequalities and account for human impacts (World Health Organization, 2014). HIAs offer a way to assess the community health impacts of projects, policies, or programs, often using publicly accessible health data. The National Park Service offers an HIA workbook and planning tool for parks and trails that guides users through creating a community health profile, gathering data for a site, planning and designing the trail or park, and creating a system for monitoring and evaluation: [http://www.healthimpactproject.org/hia/us](http://www.healthimpactproject.org/hia/us)


### 3.5.2 Data Access

William Bird of Natural Health England suggests that many opportunities may exist to work with existing data or health data that is still being collected, rather than starting projects entirely from scratch (Bird, conversation with D. Krause, 2014). For example, existing healthcare cost information from insurance companies or hospitals may be useful even as new data is gathered. This may prove especially important in light of the fact that while funding cycles for research on interventions may be only three to five years, some effects of nature on health, especially at the population level, may take much longer to be revealed (Hartig et al., 2014).

Professor Jeannette Ickovics of the Yale School of Public Health and the Community Alliance for Research and Engagement (CARE) has recently started working with a Connecticut healthcare database called CHIME, which has a record of 31 million patient encounters, including emergency room use, outpatient visits, and inpatient stays, dating back to 1980 and geocoded down to individual street addresses. She hopes to be able to look at change in health indicators over time, eventually linking those changes to amounts of greenspace in different neighborhoods (Ickovics, conversation with author, April 24, 2014).

The cost of health care is a central question in this puzzle and may also be usable as a proxy...
for health indicators. Ickovics is working with the Health Care Costs Institute (HCCI: http://www.healthcostinstitute.org/) to analyze spatial, geocoded data on medical service use and determine how different variables might be interacting. HCCI provides access to information on health care utilizations and costs for 10 million people in the U.S. who use private insurers like Kaiser, Aetna, or United Health Care. In the future, Medicare data could prove to be especially useful for tracking the vulnerable and underserved populations Ickovics is studying.

For Ickovics’ preliminary work in this field, hospital billing data is proving to be some of the most compelling evidence for the effects of green space on health. In the future, she hopes to connect maps and green space data to information about birth outcomes, mental health status, and substance abuse. As she points out, a tremendous amount of information, such a codes for health conditions, exists at the aggregate level and could be used to learn much more about utilization and costs (Ickovics, conversation with author, April 24, 2014).

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**Health Care Hot Spots**

Healthcare “hot spotting,” is a new approach in health care that tries to improve efficiency and reduce costs by mapping hospital billing data to find out where the “hot spots” of high cost patients are. The approach focuses on “high utilizers” – the 5 percent of patients who account for more than half of healthcare costs. These patients typically have complex medical conditions compounded by social issues.

Dr. Jeffrey Brenner and the Camden Coalition of Healthcare Providers in New Jersey piloted a method to offer more targeted and collaborative care that in some cases reduced costs by more than half per patient. The Robert Wood Johnson Foundation is now helping to disseminate this approach to other areas of the country.

Hotspot maps could be overlaid with maps of access to green space either to visualize areas of high need or to identify possible health treatments in the form of a nearby park or trail.

For more information on hot spotting see: http://www.rwjf.org/en/research-publications/find-rwjf-research/2012/03/hot-spotting-leads-to-better-care-at-a-lower-cost.html

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The PewResearch Internet Project suggests another opportunity to gather data: according to a recent Pew telephone survey, 69% of all U.S. adults track a health indicator for themselves or for a loved one. These indicators include weight, exercise routine, diet, or symptoms of a chronic condition like high blood pressure or diabetes. People living with one or more chronic condition were found to be significantly more likely to track their symptoms.

The fact that many individuals are already keeping track of their health suggests that there is a tremendous opportunity here for participatory research on the effects of outdoors time...
on commonly used health indicators. At the same time, it is also clear that a huge amount of
daily individual health data already exists that could be analyzed and processed. This data,
while it may be less “objective” than that gathered by researchers, has the advantage of being
collected more frequently. It simultaneously offers a potential longitudinal perspective if
correlated with known events, such as the regreening of a neighborhood.

Overall, people surveyed by Pew monitored their health data by keeping track “in [their]
head[s],” by writing things down, or by using some sort of technology, including a prolif-
eration of cell phone apps that have developed for the specific purpose of helping people
manage their health (Fox and Duggan, 2013). Access to any of these personal data sets in
the future will have to be managed in a manner that is both sensitive and secure.

### UCLA Center for Health Policy Research: the California Health Interview Survey

The UCLA Center for Health Policy Research conducts the California Health Inter-
view Survey, the nation’s largest state health survey.

The CHIS is a telephone interview study that asks 10,000 Californians a series of
question about their health. Policymakers and researchers then work with this data
to generate algorithms that they can extrapolate, and the data is ground-truthed to
verify if they are actually getting an accurate cross-section of the population.

Datasets like this one have the advantage of being localized, lending themselves well
to research.

For more information see: [http://healthpolicy.ucla.edu/chis/Pages/default.aspx](http://healthpolicy.ucla.edu/chis/Pages/default.aspx)

### 3.5.3 Community Health Needs Assessments:

Community Health Needs Assessments provide a fantastic opportunity to establish baselines
and focus our efforts for improved outdoors access in the communities that need it the most.

### Yale-New Haven Community Health Needs Assessment and the Greater New Haven Community Index

As mandated under the Affordable Care Act, health care providers like the Yale-New
Haven hospital system are required to conduct a Community Health Needs Assess-
ment (CHNA) or be subject to a $50,000 annual fine.
Yale–New Haven contracted with the Community Alliance for Research and Engagement (CARE), headed up by Jeannette Ickovics at the Yale School of Public Health, to conduct a comprehensive assessment of health in its communities. The report was one part of the Greater New Haven Community Index 2013, a survey that took a broader look at strengths and opportunities in New Haven, and was coordinated by DataHaven, an organization that uses data for community action. For the Health Needs Assessment, CARE representatives went door to door in neighborhoods throughout New Haven and administered surveys that asked interviewees a number of categorical, quantitative, and qualitative questions about their social and economic situation, health status, habits, and hospital utilization.

Such CHNAs will be critical for assessing both health needs and nature impacts in the future. Future iterations of CHNAs could incorporate questions about access to green space into the questions about physical activity and health that are already used. At present, the New Haven CHNA provides an excellent baseline from which to look at future interventions.


Studies similar to the New Haven assessment are currently being conducted across the country. The result will be a number of usable datasets that will be regularly revised, and whose protocols should be updated as soon as possible to incorporate open space considerations as a component of community health.

3.5.4 Personal Technology

Perry Robinson, a physician recently hired by the Open Space Institute to help deepen the connections between open space and health, points out that many people in the U.S. carry smartphones, which are constantly engaged in the passive collection of data like GPS coordinates. He notes the recent growth in the “wearables” movement—small electronic devices that can connect to your phone and monitor everything from the number of steps you take, to variability in your heart rate.

From Fitbits to pregnancy trackers, technology provides an opportunity to both quantitatively measure health indicators and to organize qualitative information in a way that makes it easy to track trends. Soon, an app on your phone may even be able to predict a heart attack before it even happens (Robinson, conversation with author, April 26, 2014).
Scanadu

Scanadu is a startup that designs personal health scanners to measure everything from temperature to blood pressure to stress. The Scanadu Scout is a biscuit-sized scanner that, when held to the forehead, captures physiological data in the moment and tracks trends over time. Currently under development is the Scanaflo, an at-home urine test kit that will test for levels of bilirubin, pH, and other indicators. The devices are part of a movement to personalize health care and put more information into the hands of patients themselves, while facilitating better communication with healthcare providers.

For more information see: https://www.scanadu.com/

The data gathered by devices or apps like Scanadu is currently proprietary information whose use would raise concerns about privacy. However, as Robinson points out, such technology also offers the potential to “gamify the process of going outside,” motivating people to recreate through competition, setting health goals, and playing games. (Robinson, conversation with author, April 26, 2014)

3.5.5 Longitudinal Data and Intervention Studies

Longitudinal and interventional studies are necessary for better understanding how nature impacts health in the long term. Studies should be done to measure changes in the physical environment as well as impacts on people. For example, if there is a change to the physical environment – such as creation of a new trail nearby – can we also document changes in health before and after the change has been made?

The initial work for these studies involves establishing a baseline so that changes may then be detected. For example, at a given park or natural area, one should look at the use of the site before and then after changes like increased programming, landscaping, a river cleanup, or even increased degradation of the environment. (Mowen, conversation with author March 19, 2014).

The Central Park Study

Large scale, participatory studies have been conducted in Central and Bryant Park in New York City to count users of the park and describe their activities. The hope is that in the long term, longitudinal data will demonstrate the positive impacts of increased user programming over time.

For the Central Park Report see here: http://www.centralparknyc.org/assets/pdfs/surveyreport_april2011.pdf
Assessing Park Renovations

TPL, the San Francisco Department of Public Health (SFDPH) and the RAND Corporation are collaborating on a study of three parks in underserved San Francisco neighborhoods that are being renovated to see if there will be demonstrated changes in physical activity. Pre-renovation studies were completed in 2009, and post-renovation studies, which included the use of SOPARC and SFDPH environmental assessment tools like the Healthy Development Measurement Tool and the Pedestrian Environmental Quality Index, wrapped up in 2012. Results showed a significant increase in use and perceptions of safety in the renovated parks.


Professor Andrew Mowen at Penn State University is currently looking at the effects of park renovation in Philadelphia on visitation, health and social capital. Professor Mowen focuses in particular on the outcomes of collective efficacy, social cohesion, and informal social control, as well as the role of park design in creating a sense of place and connection to the outdoors. This work follows up on another study that he conducted in Allentown, Pennsylvania that surveyed people to ask them about their physical activity and perceptions of the park. The Allentown study showed a significant positive increase in both these indicators post-renovation.

Before and after studies of parks that are being renovated in places like Philadelphia or San Francisco are important because they provide the opportunity to compare against a known baseline and help us understand how we might target interventions to provide better health for people.

Currently most work in this area is being done on public parks and land. Private land might be a new avenue for research, providing the opportunity to start baseline studies in a place where accessibility to a certain piece of land has just increased.

The final step will be incorporating this information into outcomes-based or evidence-based design, such as those principles being promoted by the Therapeutic Landscapes Network: http://www.healinglandscapes.org/blog/2012/04/evidence-based-design-accreditation-and-certification-edac-why-it-matters/

3.6 Conclusions

The impact of nature on health is and will continue to be a growing area of research, developing ever more refined techniques for measurement and ever more effective ways of analyzing data. In the process, as we develop a more thorough understanding of the pathways by which these effects happen, many more questions will emerge, each with their own challenges and opportunities. On one end of the spectrum, we may one day be able to quantitatively track the effect of a “dose” of nature all the way down to the cellular level in the human body.
the other end, we will need to develop more comprehensive qualitative measurements that allow for better comparisons between treatment groups without losing the variation that accurately captures differences in experience at the individual level.

Jeannette Ickovics notes that at the same time, we should also consider a case study approach. It is critical to keep our target audiences and end policy goals in mind in the course of research. This will push us to produce not just hard numbers and statistics, but also “readily understandable data with an emotional appeal” that can be used in outreach to many audiences, from community members to health providers to Congress (Ickovics, conversation with author, April 24, 2014). Measurement must be both rigorous and specific, compelling and understandable.

Moving forward, we must continue to expand efforts to bring people together to measure health outcomes from outdoor recreation—from the scientists who can break it down to the outdoor users who do it. Peter Harnik of the Trust for Public Land points out the classic Catch-22 of funding for parks departments. Park managers want to gather this data, but they do not have the staff or the money. In contrast, departments like the Department of Transportation tend to have lots of data and it helps them get more funding (Harnik, conversation with author, April 8, 2014). Park departments would do well to follow this model.

As private entities working with funders, land trusts can play a crucial role in helping to collect this data and turn it into the evidence needed to tie together the goals of access to nature and improved health. Creative partnerships among citizen groups, parks, foundations, health providers, academic institutions, and many others could help build the capacity needed to gather this data and turn it into real change. Only with this sort of cooperation will we be able to create the critical body of research needed to maximize the benefits of health from nature.

**Possible Questions for Discussion**

- What roles can land conservation organizations usefully play in research on nature and health?
- What about health organizations?
- How and where should funders direct their support for this type of research and action?
- What types of data have the most credibility with the health care community? What about with funders, with policy makers, or other stakeholders?
- What kind of data is already out there that could most readily be used for this research? What new types of data still need to be produced?
- What types of data can be collected by physicians, hospitals, park rangers, foundations, and other stakeholders?
- What level of conservation/access to natural areas is needed to achieve change?
Useful Informational Links/Places Doing Interesting Work

TOOLS, METRICS, & GUIDELINES FOR MEASUREMENT

• Active Living Research: Tools and Measures: http://activelivingresearch.org/toolsandresources/toolsandmeasures

• RAND Health clearinghouse of research on parks, obesity, and other topics: http://www.rand.org/topics/urban-parks-and-recreational-facilities.html and http://www.rand.org/topics/health-and-health-care.html?tag=Obesity


• Healthx Design is a company headed up by metrics whiz Rupal Sanghvi that focuses on outcomes-based design: http://healthxdesign.org/

• The Centers for Disease Control and Prevention maintains a dataset on community design elements, including public spaces, and their health effects. http://ephtracking.cdc.gov/showMonitoringElementsOfCommunityDesign.action

• National Recreation and Parks Association Research: https://www.nrpa.org/research-papers/


HEALTH IMPACT ASSESSMENTS

• Active Living Research: Health Impact Assessment: http://activelivingresearch.org/healthImpact-assessment-resources


• CDC Parks and Trails Health Impact Assessment: http://www.cdc.gov/healthyplaces/parks_trails/default.htm


RESOURCES FOR HEALTH DATA

• The Behavioral Risk Factor Surveillance System is a state-based system of health surveys that provides information at the city, county and state levels on risk factors including diabetes, cardiovascular disease, physical activity, and obesity: http://www.cdc.gov/brfss/

• The CDC Chronic Disease Indicators website offers primarily state-level information for 97 health indicators and allows users to collect and report data on chronic disease: http://apps.nccd.cdc.gov/brfss-smart/SelMMSAPrevData.asp
• **Sortable Stats 2.0 - Interactive Database for Behavioral Risk Factors and Health Indicators:** A CDC website offering information at the regional and state level on death rates by disease, disease burden, risk factors and preventive services: [http://wwwn.cdc.gov/sortablestats/](http://wwwn.cdc.gov/sortablestats/)

• **The Environmental Public Health Tracking Network:** [http://ephtracking.cdc.gov/showHome.action](http://ephtracking.cdc.gov/showHome.action)

• **The National Center for Health Statistics** may also be a useful source of indicators that could be used in this work: [http://www.cdc.gov/nchs/](http://www.cdc.gov/nchs/)

**OUTDOOR EDUCATION**


• Part of the wilderdom.com website serves as a clearinghouse for quite a bit of outdoor education research. Here they provide a partial list of organizations and universities that are engaged in outdoor education research: [http://www.wilderdom.com/research/organizations.html](http://www.wilderdom.com/research/organizations.html)

• **Research Meta-analyses:** This is a summary of several meta-analyses of outdoor education research: [http://www.wilderdom.com/research/ResearchReviewsMetaanalysis.html](http://www.wilderdom.com/research/ResearchReviewsMetaanalysis.html)

• For general **Outdoor Recreation Research Information:** [http://www4.ncsu.edu/~leung/recres2.html#univ](http://www4.ncsu.edu/~leung/recres2.html#univ)

• **University of Michigan study:** Studying the effects of environmental education for elementary school students: [http://meera.snre.umich.edu/reports-and-case-studies/effects-outdoor-education-programs-children-california](http://meera.snre.umich.edu/reports-and-case-studies/effects-outdoor-education-programs-children-california)

• **Kellert and Derr**’s paper provides a particularly valuable resource in the form of an annotated bibliography from pages 78-104: [http://www.childrenandnature.org/downloads/kellert.complete.text.pdf](http://www.childrenandnature.org/downloads/kellert.complete.text.pdf).

**HEALTH INDICATORS**

• **Community Health Status Indicators:** [http://www.cdc.gov/CommunityHealth/homepage.aspx?j=1](http://www.cdc.gov/CommunityHealth/homepage.aspx?j=1)

• **Health Indicators Warehouse:** [http://www.healthindicators.gov/](http://www.healthindicators.gov/)

• **The Health Measurement Research Group:** [http://www.healthmeasurement.org/Measures.html](http://www.healthmeasurement.org/Measures.html)

Useful Reading/Works Cited


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Improving Human Health by Increasing Access to Natural Areas: Linking Research to Action at Scale


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Linking Science — Changing Healthcare Practices

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When Rachel Carson released *Silent Spring* in 1962, environmental leaders and the public were not concerned about what the exact concentration levels of DDT (dichloro-diphenyl-trichloroethane) were that contributed to weak bird eggshells (Mark Schleshinger, conversation with the author, May 16, 2014). Instead, the public understood that the chemical was harming wildlife and they demanded that measures be taken to ban the substance. Enough of a scientific understanding existed to warrant constructive action.

Today, a similar case should be made for increased access to and use of natural areas for improved human health. While the increased utilization of green space is not an outright cure, and questions, uncertainties and risks still exist (Hartig et al., 2014), enough science is understood to begin to move forward in conserving green space for the public’s health.

The presence and utilization of natural areas is a factor that has the potential to cumulatively benefit human health and wellness in a number of ways. As the 2013 Berkley Workshop background paper entitled “Improving Human Health by Increasing Access to Natural Areas: Opportunities and Risks” explored, many opportunities exist to improve mental health, foster cognitive development, manage obesity and diabetes, and to mitigate the harmful effects of heat waves. Likewise, the *Annual Review of Public Health* article “Nature and Health” by Hartig et al. (2014) investigated how nature positively contributes to improved air quality, physical activity, social contacts, and reduced stress in urban environments. Robust, scientifically based cases can also be made around clean drinking water and nutritious, locally produced food. The healthful benefits of the natural environment are increasingly understood, and they should be promoted and more fully utilized for the public’s good.

The question is, how best to do so? The following four sections explore how the known benefits of green space might best be brought to tangible land conservation and public health action at scale. These sections include:
1. Laying the groundwork and building capacity
2. Influencing the health care industry
3. Taking political and policy action
4. Pursuing strategic opportunities

The concepts addressed below reflect a wide review of the ingredients and pathways for affecting deep change in our approaches to health. These ideas focus on ways and places to build capacity, spread awareness, and take effective action.

To accomplish this goal, and as described in the diagram below, these efforts should seek to utilize and influence both:

- Vertical networks, where specific audiences and goals are targeted, and
- Horizontal networks, where a large and diverse constituency is mobilized to support change.

While this chapter is organized in a categorical fashion, it is important to realize that many of the concepts discussed below are directly interrelated and build on one another.
4.1 Laying the Groundwork and Building Capacity

Many health care and land conservation organizations are beginning to use access to natural areas as a way to achieve their respective goals of improving human health and expanding the purpose and role of open space.

These initiatives, however, currently lack the depth and breadth needed to realize widespread, positive actions at scale. To succeed at advancing land conservation’s role in improving the health of communities, a strong operational foundation should be created. To accomplish this, both human and financial resources should be mobilized and organized to focus specifically on the connections and opportunities that exist between human health and land conservation.

What follows are a series of initial recommendations designed to provide a more coordinated and unified strategy to improve health and wellness through access to and use of natural areas.

Developing a Common Language

The common goal of creating and improving access to natural areas for improved human health is challenged by the differing perspectives, values, and vocabularies of health care and conservation professionals. Land trusts and the health care industry work in vastly different arenas and day-to-day operations share very few similarities. By developing a common language and understanding, the goals of both groups can be more effectively achieved.

A common language affords several positive benefits. Standardizing vocabulary promotes goal clarity, communication, and collaboration. Such efforts allow for health care and conservation groups to understand and utilize their respective strengths and roles. Developing a joint land conservation-public health lexicon will create a unified message for how and why green space should be protected. This will be beneficial not only to practitioners and policymakers, but also to the general public. To achieve a common language, workshops and educational materials should be used to increase capacity between disciplines and respective organizations.

Many organizations take steps to define meanings within their discipline. Work within the conservation biology field, for instance, has attempted to create consistency around the meaning of certain terms and particular types of efforts. A specific example of this was led by a group from the Conservation Science Program at the World Wildlife Fund. Here, efforts were undertaken to standardize meanings around the monitoring and evaluation of conservation projects. Within their Biological Conservation paper, these practitioners specifically discuss the risks of not having a common understanding across the field. They write: “Commonalities and complementarities among approaches to conservation monitoring and evaluation are not well articulated, creating the potential for confusion, misuse, and missed opportunities to inform conservation policy and practice” (Mascia et al., 2014). To head off such problems, efforts should be taken to define meaning and goals within efforts to promote land conservation for improved public health.

Connecting Networks to Networks

Across the United States, many networks of organizations and professionals already exist
within both the health care and land conservation communities. On a regional level, hospitals, community health centers, and municipal health departments all actively work together to coordinate health initiatives. Likewise, there are extensive networks of land conservation organizations that operate at local, regional, and national levels. In Connecticut, for example, there are national organizations like the Land Trust Alliance, but also midsized umbrella organizations like the Connecticut Land Conservation Council, as well as 137 small, local land trusts. As an ever-growing number of organizations are coalescing around the beneficial connections between open space and human health, efforts should be taken to formalize these connections as a way to increase idea sharing, capacity, and action.

The networks and structures that exist within and across local, state, and federal government agencies should also be better connected. Here, creative solutions should be sought to achieve greater action by bridging agencies and levels of government. Departments of health, agriculture, and environmental protection are just a few of the many government agencies whose missions align with our efforts to improve human health and land conservation objectives. Moreover, the physical and mental health needs of veterans have the potential to further incentivize government agencies to invest in the access and use of green space.

Furthermore, it is important to consider how other organizations that may not specifically be focused on health care or land conservation might also be included in this work. Organizations with shared goals, like groups working on green infrastructure, have the potential to further expand the constituency working towards healthy, sustainable communities (Hartig et al., 2014).

The role that private industry plays within the relationship of land conservation and health should also be explored. Here, outdoor gear and apparel companies have the potential to facilitate increased time spent outdoors and improve experiences within natural settings. Such companies could help advance this cause though marketing campaigns and formally sponsored initiatives.

In addition, large employers are looking for ways both to improve the health of their workers, as well as reduce costs – increasing time in nature may help both. In such instances, while direct missions may be different, the desired outcomes of using and appreciating natural environments overlap and provide opportunities to create a constituency and movement with an even larger voice.

Efforts to build such “networks of networks” might also work at the horizontal and vertical scales by building:

- Regional partnerships/collaborations to connect health and access to natural areas in a particular town, city, county, etc. – such as those described in Chapters 2 and 3 above;
- National or global information sharing networks across health and nature organizations, including those focusing on particular issues (exercise, food, mental health, etc.).
Elevating Awareness

The connection between the natural environment and peoples’ health and wellness is not a novel idea. For well over 100 years, people have been utilizing the healthful benefits of nature. However, in an age of technological medical fixes and human disconnection from nature, special efforts must be made to rekindle awareness about the benefits of time spent outdoors. Outreach, potentially in the form of media coverage and campaigns, should be undertaken specifically to communicate the healthful benefits of nature to the general public, health care professionals and conservation organizations. Advertisements and public service announcements on radio, television, and social media are all possible ways to share this information – as are efforts to bring these connections into the scripts used on popular TV shows hosted by doctors and other medical professionals.

Bolstering the general public’s awareness can have many beneficial implications. Awareness can help mobilize grassroots advocates and lead to interest group and coalition formation. Such changes can help create a broad horizontal constituency that is willing to actively support the healthful benefits of open space.

Arguably one of the most successful health advocacy organizations in the United States is the American Cancer Society. From local Relay for Life events to Daffodil Days, this group has developed an extremely powerful brand and a substantial horizontal network in support of cancer research and policy. Achieving such a strong presence within mainstream society should be a major goal of health-nature advocates.

Moreover, as with cases of well-advertised pharmaceuticals, if patients know of certain treatment options, they will be more likely to ask their health care provider about their use. In these instances, changes to the health care system may effectively be created by a public demand for a particular type of service. In this case, an increased awareness could create a greater demand for access to green space.

Health care providers and conservation organizations also need to be exposed to information about the benefits of open space. The relationship between open space and human health offers exciting opportunities of which many land trusts and health care providers are simply not yet aware. Efforts to disseminate information to these organizations should focus on how to build understanding of health benefits and promote collaboration within geographic regions.

Curating the Science and Promoting Further Research

While the scientific understanding behind access to and use of green space and its connections to human health is limited compared to other medical and public health concepts, there is an ever-growing body of literature on the subject.

This information should be reviewed and catalogued in order to comprehensively utilize known findings and understand the state of the science (Sarah Milligan-Toffler, conversa-
tion with the author, May 14, 2014). Such curation would allow for more effective usage and increase the dissemination of this information to land conservation and health professionals. Moreover, such an undertaking would bring attention to knowledge gaps and facilitate additional research.

**Case Study: Children and Nature Network**

The Children and Nature Network (C&NN) is widely considered the leader in the effort to reconnect children, families, and communities with the natural world. C&NN’s work offers many constructive parallels to our efforts to improve public health, control health care costs, and improve access to green space through land conservation. C&NN actively works to develop and expand partnerships, as well to steward academic and multimedia resources on child development and nature. Moreover, C&NN’s 2014 Agenda has particular relevance to efforts to advance the important connections between the environment and human health.

In 2014, the organization’s four areas of focus include: 1) Improving community health, 2) Engaging families, 3) Inspiring nature-smart leaders, and 4) Building the worldwide network.

Additional information available at: [http://www.childrenandnature.org/](http://www.childrenandnature.org/)

### 4.2 Influencing the Health Care Industry

Increasing numbers of health care professionals understand the connections between wellness and time spent outdoors. However, using green space as a preventative measure and management tool has not been widely accepted and employed.

In an effort to build and advance the case around the health benefits of access to green space, specific efforts to influence and alter the health care industry should be taken. The concepts discussed below begin with health care education and build to increasingly larger concepts within the field.

**Professional School Training**

Today, public health, nursing, and medical schools rarely teach the breadth of ways that the natural environment impacts human health. Despite increasing efforts to train providers about the biopsychosocial-ecological paradigm, a framework that takes a more holistic perspective on what it means to prevent and treat disease (Stineman and Streium, 2013), health care professionals typically receive little or no education on the importance of access to open space.

While all professional school curriculums face time constraints, efforts should be made to promote formal training and specialty tracks that will educate future health care providers and health care leaders about the physical and emotional benefits of time spent in natural environments.
Such training should cover a spectrum of topics about the relationship between time spent outdoors and health outcomes. As research on this topic enhances our understanding, it should include the physiological and biomedical benefits of nature at the cellular level, as well as how access to green space may positively contribute to various social determinants of health. With this knowledge, health professionals should also be trained in how to use natural environments as a prescriptive tool to manage and treat conditions.

While improving professional school training is a very bottom-up, long-term approach in expanding the role of green space, it has the potential to establish a new set of norms around the importance of land conservation for human health.

**Continuing Education**

Almost all health care professions, including nurse practitioners, physicians, and therapists, require relicensing at regular intervals. To successfully maintain certification, these professionals must pass board exams and complete continuing education (CE) requirements.

While state and professional requirements vary, CE’s offer a unique chance to engage a segment of the health care profession already in the midst of their careers. Similar to the introduction of a new pharmaceutical or medical technology, CE’s offer an opportunity to change the way clinicians see, manage, and potentially solve health care challenges.

The creation of a new CE program focused on health and nature, which would need to be formally approved by an accredited organization of health professionals, could help advance this initiative in many ways. A CE on the health benefits of the natural environment could focus on how access to nature can improve health outcomes through prevention and improved disease management.

CE’s could also offer an opportunity to mobilize medical professionals and their networks around land conservation and stewardship efforts. If green spaces are part of a larger solution to improve health, clinicians and public health leaders have a professional obligation to promote the protection and stewardship of green space. As such, CEs have the potential to train medical professionals about the role of green space and the ways they can help protect it.

**Influential Health Publications**

There are several publications within the health care field that carry significant prestige and clout. These documents, which are often authored by well-respected scientists and clinicians, are considered to be at the forefront of what is believed to be the most reputable science. Government-sponsored publications from the National Institutes of Health (NIH), or private publications, like *The Cochrane Review* and *The New England Journal of Medicine*, offer an academic and professional venue to promote the human health benefits of time spent in natural environments.

Commissioning formal reports and reviews for these types of publications has the potential to elevate awareness and understanding around the importance of green space for human health. Credible publications within these venues are also a powerful step in gaining the
support of professional societies and the larger medical community, as these groups rely heavily on these documents to guide their decision-making and actions.

Popular books also have a role to play in the promotion of green space for improved health outcomes. These materials have the ability to reach a larger audience who may not have formal medical or scientific training. The most well-known, and arguably most influential of these works is Richard Louv’s book *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. While academic publications can influence vertical networks within the health care field, such popular publications have the potential to mobilize broader horizontal networks for constructive action.

**Professional Societies**

In many ways, professional specialty organizations are the gatekeepers of health care change. These organizations, which are made up of practitioners from all fields, assert considerable influence in defining standards of care, best practices, and recommendations for change within the profession.

Formal efforts should be made to comprehensively outline the latest and best evidence for why green space is beneficial to the public’s health. Upon building this body of knowledge, supportive members of professional societies should be identified to help push their organizations to adopt and promote recommendations that incorporate the utility of open space within their standards and guidelines of medical practice.

The American Academy of Pediatrics (AAP) is one of the most prominent organizations that could become an advocate for this topic. The AAP is widely considered one of the most progressive medical academies in the country and has even taken on such public health challenges as gun control. It is probable, based on its mission and history, that this group would be receptive to advocating for the many ways that access to green space positively contributes to the growth and development of children. (See also: “Strategic Areas of Focus: Inequality and Children” below)

Professional societies offer a significant leverage point because they are also often the groups that most effectively influence political action. Elected officials frequently rely on the recommendations and expertise of professional societies as a way to guide and provide political cover for novel health care programs. As such, achieving professional society support can effectively pave the way for political action that supports formal policy initiatives focused on conservation and the use of nature areas for health.

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**Case Study: American Public Health Association Policy Statement**

On November 5, 2013, the American Public Health Association (APHA) issued a policy statement on “Improving Health and Wellness through Access to Nature.” Within this document, the APHA describes several nature-health connections, offers recommendations and provides a series of action steps to promote this important public health topic.
This policy statement (#20137) has substantial implications for efforts to improve health by increasing land conservation and the use of green space. Such a statement offers legitimacy to this work and a solid platform for moving this cause forward.


Accreditation and Certification

Similar to professional societies, health care accreditation and certification organizations offer a constructive opportunity to better medical principles. These groups work to sustain and improve standards across the health care field by maintaining uniform requirements for public health, nursing, and medical schools and within various clinical settings.

Efforts should be taken to expand these organizations’ understanding of how and why natural areas are important to human health. From here, improved principles should be developed and incorporated into standards of accreditation and certification.

As with efforts to leverage professional societies and influential publications, work should be focused on targeting the accreditation and certification bodies that have the greatest ability to influence change in the health care system.

Two organizations that offer promise in advancing land conservation for the public’s health are the Facilities Guidance Institute Guidelines and The Joint Commission. (See also: “Facilities Guidance Institute Guidelines” below) These organizations set standards for health care in order to ensure consistent quality, safety, and accountability. The reach of these guidelines can be significant. For example, the Guidelines for the Design and Construction of Health Care Facilities, from the Facility Guidelines Institute, have been adopted entirely or partially by 42 states (Sachs et al., 2014). As such, expanding accreditation and certification standards has the potential to achieve substantial positive change with both vertical and horizontal networks.

Making the Business Case

The business aspect of improved access to green space for human health offers an additional opportunity to leverage action. Health care providers need proof that a proposed initiative is cost effective and that there will be a financial return on investments.

Fortunately, an ever-growing body of research is showing that access to green space is improving outcomes and reducing medical costs. As mentioned in Section 2, Robert Ulrich’s seminal 1984 Science paper “View Through a Window May Influence Recovery from Surgery” is widely considered the first paper to demonstrate the health and potential economic benefits of the natural environment. Ulrich found that postoperative patients with a view of nature had shorter hospital recovery stays, less negative evaluative comments and needed fewer negative evaluative comments, and high-strength painkillers (Ulrich, 1984). Additionally,
more recent studies have found that approximately $93 million can be saved annually in health care costs by simply providing patients a view of nature (Terrapin Bright Green LLC, 2012). Such benefits from the natural environment have the potential to significantly reduce health care expenses while improving patients’ recovery experience and overall condition.

The business dynamics of the health care industry should also be considered and promoted in relation to the role and benefits of nature. If health care providers can reduce costs, improve patients’ comfort, and lessen recovery time, they are likely to gain a significant competitive advantage. In such scenarios, improved access to nature can help to improve providers’ treatment services and brand, while also incentivizing the protection and stewardship of open space. Partnerships should be coordinated and pursued between academic institutions and health care providers to conduct additional research on the business benefits of improved access and use of natural areas.

It should be acknowledged, however, that the business model on which the U.S. health care industry is built – treatment of illness, rather than prevention – does not easily accommodate investments in increasing access to nature. Research on the health benefits of a new drug might yield a patent and years of sales revenue. Research on the health benefits of time in nature might yield a reduction in the number of patients that need to be treated – but not sales revenue. As such, it will be a less attractive investment to many businesses in the health sector.

New business models need to be developed and promoted that allow health funders/investors to capture the financial benefits of improving health at lower cost by increasing access to nature.

**Case Study: Facilities Guidance Institute Guidelines**

The case of the Facilities Guidance Institute’s Guidelines for the Design and Construction of Health Care Facilities offers a useful example of how policy changes can be achieved. In 2014, after persistent efforts over many years to incorporate language on access to nature directly into the formal standards, the Environmental Standards Council (ESC) succeeded in doing so.

The ESC’s accomplishment is largely attributable to three primary factors (Sachs et al., 2014):

- Synthesizing a rich body of research
- Demonstrating clear health benefits
- Making a convincing businesses case

Future efforts should utilize these approaches when seeking to advance the use of green space for improved health outcomes.
4.3 Taking Political and Policy Action

In addition to improving how the health care industry understands and utilizes the benefits of green space, significant efforts should be taken to educate elected officials about known public health problems and how green space can be part of larger solutions for the public’s health and wellness. Land conservation at the local level, still widely considered a bipartisan issue, offers an opportunity to achieve a multitude of social and health benefits for any particular community.

Hearings

Formal hearings offer a unique opportunity to promote policy action around the beneficial connections between human health and green space. State and federal hearings offer an elevated platform to explain the best-known science and the rationale behind the connections between natural environments and public health. In such a setting, the positive connections between open space and human health can be directly conveyed to policymakers within vertical networks and formally entered into the public record. Such settings also offer a constructive opportunity to garner positive media coverage that can bring awareness and attention to this issue, and expand the horizontal scope of this work.

Ordinances and Laws

Formalized public health and governmental land use policies in the form of ordinances and laws have the ability to mandate land protection for the health and welfare of communities. This form of regulation would be an acknowledgement of a new set of norms on nature’s role within society. In addition to achieving new regulation around this cause, efforts should also be made to use elements and opportunities within existing ordinances and laws to promote green space for improved public health.

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Strategic Areas of Focus: Inequality and Children

Identifying constructive leverage points to promote the benefits of green space for improved health outcomes requires targeted initiatives. Improving health equality and the benefits that natural areas provide children are two specific focus areas that should be pursued.

Inequality

Many health disparities, such as diabetes and obesity, disproportionately affect minority and lower socio-economic populations. Likewise, these populations typically have less access to green space and natural areas (Wen et al., 2013). The protection of undeveloped land and the use of green space within underserved communities have the potential to mitigate the disproportional health burden that these populations face by improving the conditions necessary for more healthy lifestyles.
Children

Kids offer a constructive and powerful leverage point to advance the benefits of access to green space for improved health outcomes. Policymakers and the general public care deeply about the welfare of children and child development is an undertaking that innately has long-term implications (Mark Schleshinger, conversation with the author, May 16, 2014). It takes decades and a tremendous investment to raise a child. Likewise, improving health through increased access and use of natural areas requires a long-term view that involves comprehensive planning within urban, suburban, and rural communities. The health benefits of land conservation are cumulative and will likely only be truly realized over time.

This concept can be further illustrated by comparing an adult with a chronic condition and the health and development of a child. While the creation of park may help a 70-year-old man with diabetes better manage his condition, increased access to green space will not cure his disease. A child, however, who grows up with access to a safe park and community gardens is arguably less likely to develop diabetes in the first place. The power of children and the temporal relationship between raising a child and the protection of natural areas offers an effective platform to advance this cause.

4.4 Pursuing Strategic Opportunities

The 2010 passage of the Patient Protection and Affordable Care Act (PPACA) offers several novel opportunities for action. What follows is a review of two provisions that have the potential to advance policies and opportunities that connect access to open space with improved health outcomes and lower medical costs.

Leveraging Community Health Needs Assessments

Periodically, health care organizations, such as nonprofit hospitals, are required by the Internal Revenue Service (IRS) to prepare a document called a community health needs assessment (CHNA). These documents offer a constructive opportunity for a variety of health care professionals and community stakeholders to develop a plan that identifies health care challenges and constructive opportunities for concerted action.

Considerable opportunity exists to expand the scope of CHNAs to include efforts to use green space for health care and to protect and steward green space for improved health outcomes. As discussed earlier, efforts should be taken to connect land conservation networks to health care organizations and to develop a common language. By building understanding and capacity around these documents, land conservation organizations can effectively influence the direction of these assessments to include provisions for open space protection. Such language has the potential to feed into implementation strategies, and then formalized plans of action (CDC, 2014). Moreover, limited guidance exists around what should be included within a CHNA. This flexibility offers an additional opportunity to shape the goals and objectives for what this type of document can achieve.
Building Capacity: Community Health Needs Assessment Process

Sara Rosenbaum of The George Washington University School of Public Health and Health Services recently published “Principles to Consider for the Implementation of a Community Health Needs Assessment Process.” This document is an insightful reference for understanding and developing effective community health needs assessments. In addition to exploring the ways the PPACA hopes to improve community health, the paper outlines a variety of principles and concepts ranging from multi-sector collaborations to community engagement and the use of evidence-based interventions.


Expanding Nonprofit Hospital Community Benefits

There are approximately 2,700 nonprofit hospitals in the United States(114,605),(884,617) that currently receive an estimated $13 billion in federal tax exemptions per year (Young et al., 2013). As part of the PPACA, hospitals are now more formally required to prove their community benefit through IRS reporting mechanisms.

A comprehensive national review of community benefit funding allocations found that 85% of expenditures were devoted to charity care, 5% was spent on community health improvements and that the remaining 10% was spent on professional education, research, and grants to community groups (Young et al., 2013).

With the known health benefits of access to green space, efforts should be made to steer community benefit financial resources to work specifically focused on human health and land conservation initiatives. Hospitals typically serve a roughly defined geographic region with a particular population. This structure innately allows hospitals and other providers to invest in the populations they are charged with keeping healthy.

4.5 Conclusion

It is time to deepen this work. While there are unknowns, and there will always be unknowns in this field, we have enough information to act in more communities. After laying a strong foundation and building capacity, there are numerous opportunities to leverage both vertical and horizontal networks to achieve positive action in promoting green space for human health. As described above, this work ranges from simply promoting awareness to leveraging certain elements of the PPACA. As these efforts progress, they will build on and reinforce one another.

As noted earlier, while the benefits of green space collectively contribute to improved health, it will take time to achieve noticeable public health benefits. As such, it is important to realize that promoting the health benefits of natural areas is a truly long-term investment. The
goal of incorporating access to green space into communities will require a sustained and dedicated focus.

Promoting access to green space for peoples’ wellbeing is not just about land conservation and public health. It is about envisioning and working towards creating the most positive human experience in harmony with the natural world. With thoughtful and logical action, this can be achieved.

**Possible Questions for Discussion**

- What actions can be taken to develop and foster better relationships between land conservation and health care organizations?
- Most municipal and state governments already have separate environment and health programs. How can networks that already exist among and within local, state, and federal government agencies be better connected?
- What are some inexpensive or free ways to boost awareness about the benefits of open space for improved health?
- Who should spearhead efforts to increase the awareness within professional health care societies about the healthful benefits of access to green space?
- Through what venues can the business case around the healthful benefits of access to natural environments be further promoted?
- How should work on this subject continue past the 2014 Berkley Workshop? How can actions across multiple organizations best be coordinated or at least communicated/shared?

**Useful Information & Other Organizations Doing Interesting Work on this Topic**

**Maximizing the Impact of Public Hearings:** The Institute for Local Government has published a document titled “Getting the Most Out of Public Hearings: Ideas To Improve Public Involvement.” This publication offers a considerable amount of helpful information about public hearings for both public health and land conservation organizations. Complete document available at: [http://www.cnrep.org/documents/handbooks/Getting_the_Most_Public_Hearings.pdf](http://www.cnrep.org/documents/handbooks/Getting_the_Most_Public_Hearings.pdf)

**Kaiser Permanente:** This well-known and well-respected managed plan organization has actively been pursuing work on the connections between open space and human health. Specific efforts have involved grants for land conservation and walking programs. Additional information available at: [http://share.kaiserpermanente.org/article/environmental-stewardship-overview/](http://share.kaiserpermanente.org/article/environmental-stewardship-overview/)
Useful Readings/Works Cited


**Phone Interviews Were Conducted with the Following People in Preparation for This Chapter**

- Berejka, Marc, conversation with the author, April 16, 2014.
- Cochran, John, conversation with the author, April 7, 2014.
- Frumkin, Howard, conversation with the author, February 13, 2014.
- Grigsby, Gene, conversation with the author, April 11, 2014.
- Mays, David, conversation with the author, April 11, 2014.
- Robinson, Perry, conversation with the author, March 24, 2014.
- Sachs, Naomi, conversation with the author, April 18, 2014.
- Schleshinger, Mark, conversation with the author, May 16, 2014.
Biosketches of Authors

Bradford S. Gentry is the Associate Dean for Professional Practice at the Yale School of Forestry & Environmental Studies and a Professor in the Practice at the Yale School of Management. He is also the Director of the Program on Strategies for the Future of Land Conservation, as well as of the Center for Business and the Environment. Trained as a biologist and a lawyer, his work focuses on strengthening the links between private investment and improved environmental performance. He has worked on land, water, energy, industrial, and other projects in over 40 countries for private (GE, Suez Environnement), public (UNDP, World Bank, Secretariat for the Climate Change Convention), and not-for-profit (Land Trust Alliance, The Trust for Public Land) organizations. His teaching includes multi-disciplinary courses on the management of complex resource systems, including the emerging markets for ecosystem services. He holds a B.A. from Swarthmore College and a J.D. from Harvard Law School.

Julia E. Anderson is a Master of Public Health and Master of Environmental Management candidate at Yale University. She holds degrees in Environmental Economics and Policy and Geography from the University of California, Berkeley. Prior to beginning her graduate studies at Yale, Julia spent her time tramping around in temperate and tropical forests to understand the impact of disturbances on regeneration for ecological research studies. The experience made her realize the health benefits from exposure to nature and physical activity in open space. Since then, she has focused on research to reduce health disparities that cause chronic diseases and mental health problems. She hopes to develop and contribute to innovative strategies that improve community health.

W. Colby Tucker is a Master’s of Environmental Science candidate at Yale School of Forestry and Environmental Studies. In 2009, he graduated Trinity College (Hartford, CT) with a B.S. in Environmental Science. Prior to attending Yale, Colby taught high school chemistry and environmental science at Pomfret School in Connecticut. His interests are varied, including natural science research, education, and improving the human relationship with the environment. He is grateful for the opportunity to work on this project and looks to continue researching the intersection of public health and public lands.

David R. Krause recently completed a Master of Environmental Management and Master of Public Health from Yale University. David’s academic and professional interests center around how natural systems contribute to human health and how conservation can both improve health outcomes and access to health care. Prior to beginning his graduate studies,
David worked at the Connecticut Agricultural Experiment Station's Center for Vector Biology and Zoonotic Disease and for the Subsistence Branch of the United States Fish and Wildlife Service on remote Yukon River tributaries. During graduate school David worked for the Wild Salmon Center on policy to protect drinking water sources and wild salmon habitat in Western Oregon, and on a public health and community development initiative in southwest Alaska. He received his B.S. (*cum laude*) from Cornell University in 2008. David serves as the Vice-Chairman of his hometown's conservation commission and is an avid angler.

Karen A. Tuddenham recently graduated with a Master's in Environmental Management from the Yale School of Forestry and Environmental Studies, where she focused on environmental justice, social ecology, and environmental communication. She is particularly interested in the ways in which natural environments can contribute to the resilience of the human communities who rely on them, and in how to foster equitable access to the outdoors. Prior to coming to Yale, she graduated with a B.A. in Biology from Harvard in 2005, worked in international development in China and Nepal, and taught outdoor education in the American Southwest. As a biologist and an environmental advocate she worked on uranium mining issues in Colorado, where her volunteer experience as an EMT and an advocate on a domestic violence hotline inspired her interest in supporting the health and sustainability of rural communities. While at F&ES Karen interned with the Trust for Public Land at their Parks for People Initiative in Bridgeport, CT, directed the Environmental Film Festival at Yale, and conducted research on salmon resources and mining in Bristol Bay, Alaska. Over her two years of work with the Yale Program on Strategies for the Future of Land Conservation, she has felt incredibly lucky to explore the connections between child development, human health, and nature. She hopes to continue to work in this field in the future.
The purpose of the Yale Program on Strategies for the Future of Conservation is:

• To support the efforts of the Maine Coast Heritage Trust, the Land Trust Alliance and similar private organizations to develop and apply new, innovative strategies for land conservation by linking the convening, research, and teaching activities at the Yale School of Forestry & Environmental Studies ever more closely to the needs of the land conservation community.

Established by a gift from Forrest Berkley ’76 and Marcie Tyre, the Program has two parts:

• Sponsoring student internships and research projects (through the Berkley Conservation Scholars program), to bring the passion, experience and creativity of Yale graduate students to bear on these issues; and

• Convening workshops and other conversations across sectors and perspectives in the search for new approaches to expanding the resources applied to land conservation in the United States.

Berkley Conservation Scholars are students of high potential who receive funding for their research and professional experiences at the cutting edge of land conservation. Support is available during both the school year and the summer, creating a virtual “R&D Department” for the U.S. land conservation community. The Berkley Conservation Scholars play a critical role in helping to bring together practitioners and academics in the search for new conservation tools.

The Yale Program on Strategies for the Future of Conservation is a major extension of the Yale School of Forestry & Environmental Studies’ continuing efforts to enhance the effectiveness of organizations to develop and apply new, innovative strategies for land conservation by linking the convening, research, and teaching activities at the Yale School of Forestry & Environmental Studies ever more closely to the needs of the land conservation community. The Berkley Conservation Scholars play a critical role in helping to bring together practitioners and academics in the search for new conservation tools.

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Improving Human Health by Increasing Access to Natural Areas: Linking Research to Action at Scale

Report of the 2014 Berkley Workshop

Held at the Wingspread Conference Center, Johnson Foundation, Racine, Wisconsin June 2014