PROPOSAL TEMPLATE

Forest Service use only.
Control Number: 7-C2-3-NA Browing U IL

COVER SHEET
2016 U.S. Forest Service
National Urban and Community Forestry Challenge Cost-Share Grant Program

INNOVATION GRANT CATEGORY:
(An estimated total amount of $900,000, may be available, approximately $300,000 per category) Check one category per application. More than one application may be submitted by an organization.

Category 1: Analysis and Solutions for Development and Redevelopment Impacts on Urban and Community Forests
✓ **Category 2: Building Human Health Through Urban and Community Forestry**
Category 3: Climate Change and Its Impact on Trees and Water

PROJECT CONTACT NAME, ORGANIZATION, ADDRESS, PHONE NUMBER, FAX NUMBER AND EMAIL ADDRESS:

Matthew Browning
University of Illinois at Urbana-Champaign
Department of Recreation, Sport and Tourism
104 George Huff Hall, Champaign, IL 61820
Tel: 217-300-3496. Fax: (217) 244-1935. Email: brownin@illinois.edu

PROJECT TITLE:
Urban forestry's return on investment: Tying residential nature to health care expenditures

FUNDING REQUEST AND MATCH (Note: Matching amount must at a minimum equal requested amount.)

REQUESTED: $278,383 + MATCHING: $369,169 = TOTAL PROJECT: $ 647,552

OUTREACH:
Note: if one check "Yes" in either of the boxes below, the applicant will be required to describe either how they plan to outreach to the identified population and/or provide a description of your underserved organization.

- Is this project being developed to reach a minority or underserved population? **_X_Yes** __No
- Is this pre-proposal being submitted by a minority or underserved population (owned/operated/directed) business, organization or college/university? ___Yes **_X_No**

Applicants should also address how the issue impacts underserved communities and how the proposal can address or minimize these impacts when applicable.

LIST PROJECT PARTNERS: Project Partner letters are to describe their role and contribution with the project. [Provide: NAME, ADDRESS Phone Number and Email:]

LETTER OF SUPPORT INCLUDED: **YES, FOR ALL PARTNERS**

1. **Dr. Matthew Browning** (Assistant Professor) Department of Recreation, Sport and Tourism, University of Illinois at Urbana-Champaign, 104 George Huff Hall, Champaign, IL 61820. Tel: 217-300-3496. Email: brownin@illinois.edu
2. **Dr. Frances (Ming) Kuo** (Associate Professor) Department of Natural Resources & Environmental Conservation, University of Illinois at Urbana-Champaign, 1101 W Peabody Drive, Urbana, IL 61801. Tel: 217-244-0393. Email: fekuo@illinois.edu
3. **Dr. Jonathan Greenburg** (Assistant Professor) Department of Geography & Geographic Information Systems, University of Illinois at Urbana-Champaign, 605 E Springfield Ave, Champaign, IL 61820. Tel: 217-333-1880. Email: jgrn@illinois.edu
4. **Kaiser Permanente Northern California Division of Research** (KPNC), (Dr. Stephen Van Den Eeden, Research Scientist III) 2000 Broadway, Oakland, CA 94612. Tel: 510-891-3718. Email: stephen.vandeneeden@kp.org
5. **Arbor Day Foundation** (Dana Karcher, Program Manager, Alliance for Community Trees) 211 N. 12th St., Lincoln, NE 68508. Tel: 402-473-9554. Email: dkarcher@arborday.org
6. **National Wildlife Federation** (Patrick Fitzgerald, Senior Director of Community Wildlife) 11100 Wildlife Center Drive, Reston, VA 20190. Tel: 202-797-6821. Email: fitzgeraldP@nwf.org
7. **The Trust for Public Land** (Breece Robertson, National GIS Director) 607 Cerrillos Road, Suite F-1, Sante Fe, New Mexico 87505. Tel: 505-988-5922. Email: breecerobertson@tpl.org
8. **California Department of Health Care Services** (Dr. Desiree Backman, Chief Prevention Officer and Program Director, Institute for Population Health Improvement at UC Davis) 1501 Capital Ave, Suite 71.6129, Sacramento, CA 95814. Tel: 916-440-7628. Email: desiree.backman@dhcs.ca.gov
9. **California ReLeaf** (Cindy Blain, Executive Director) 2115 J Street, Suite 213, Sacramento, CA 95816. Tel: 916-497-0034. Email: cblain@californiareleaf.org
10. **California Urban Forests Council** (Nancy Hughes, Executive Director) P. O. Box 823, Novato, CA 94948. Tel: 415-479-8733. Email: njhughes@caufc.org
11. **Friends of the Urban Forest** (Doug Wildman, Executive Director) 1007 General Kennedy Ave #1, San Francisco, CA 94129. Tel: 415-268-0781. Email: doug@fuf.net
12. **State of California Department of Forestry and Fire Protection (CAL FIRE)** (John Melvin, State Urban Forester) P.O. Box 944246, Sacramento, CA 94244. Tel: 916-657-2289. Email: john.mevlin@fire.ca.gov
13. **Highstead Foundation** (Spencer Meyer, Senior Conservationist) P.O. Box 1097, Redding, CT 06875. Tel: 207-852-3171. Email: smeyer@highstead.net
14. **Natural Capital Project** (Dr. Bonnie Keeler, Lead Scientist, Natural Capital Project, University of Minnesota) 325 LES Building, 1954 Buford Avenue, St. Paul, MN 55108. Tel: 612-626-9553. Email: keeler@umn.edu
15. **The Paul Scherrer Institute** (Dr. Christopher Mutel, Scientist) 5232 Villigen PSI, Switzerland. Tel: 41 (0)56-310-5787. Email: christopher.mutel@psi.ch

LIST STAKEHOLDER SUPPORT: Support letters from stakeholders are to describe why the proposal end results are needed and how it will benefit them and their community.
[Provide: NAME, ADDRESS Phone Number and Email:]

LETTERS OF SUPPORT INCLUDED: **YES, FOR ALL STAKEHOLDERS**

1. **Kathleen Wolf** (Research Social Scientist, University of Washington College of the Environment) Box 352100, Seattle, WA 98195. Phone: 206-732-7820. Email: kwolf@u.washington.edu
2. **Pennsylvania Department of Conservation and Natural Resources** (Mark Hockley, Tree Canopy Coordinator) 400 Market St., Harrisburg, PA 17105. Phone: 717.214.7511, Email: c-mhockley@pa.gov
3. **Washington State Department of Natural Resources** (Aaron Everett, State Forester and Policy Director) 1111 Washington St SE, MS 47001, Olympia, WA 98504. Tel: 360-902-1000. Email: aaron.everett@dnr.wa.gov
4. **Wisconsin Department of Natural Resources** (Paul DeLong, Chief State Forester) 101 S. Webster Street, Box 7921, Madison, WI 53707. Phone: 608-266-2621. Email: Paul.DeLong@wisconsin.gov

ABSTRACT: Summarize the proposed project in 200 words or less.

We propose a project which has the potential to generate the single most powerful argument for urban and community forestry yet. Dozens of studies involving millions of people document the connection between urban forests and human health: in greener places, people are healthier. It is time to document the effects of these forests on actual health care savings. In this project, we work with one of the largest health insurers to examine the impacts of urban forestry on actual health care costs in nearly 4,000,000 people. LiDAR, state-of-the-art technology, allows us to characterize forests in 3D detail. The specific context of this study (Northern California) allows us to examine, in microcosm, the impacts of all major forms of U.S. urban forests on all major population groups, giving the findings direct national relevance. We focus extensively on technology transfer of results to policymakers and the public. We will: (1) document the impact of urban forestry on health care savings, particularly as it relates to underserved communities; (2) quantify how this impact differs by urban forest structure, subsequently providing management/maintenance best practices; and (3) produce a free, online urban forestry return-on-investment model (through Natural Capital's InVEST) usable by communities across the nation.

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Dept. of Recreation, Sport and Tourism
1206 South Fourth St., Champaign, IL 61820
Tel: 217-300-3496, Email: brownin@illinois.edu

April 18, 2016

Dear National Urban and Community Forestry Advisory Council,

Thank you for the opportunity to clarify and revise our proposal entitled *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures* which we submitted to the 2016 U.S. Forest Service National Urban and Community Forestry Challenge Cost-Share Grant Program. We have substantially expanded the scope of the proposed work. We have added a free, online GIS-based return-on-investment tool that allows urban foresters *anywhere in the country* to model how much their communities could save on health care expenditures with different levels and types of future urban forestry investments. We have also added a nationwide policy campaign that delivers our studies findings directly into the hands of advisors to Members of Congress who make policy decisions regarding urban forestry, health, and environment *with language and graphics that are professionally tailored to this audience*.

To conduct this expanded project, we have brought on board additional partners and expertise. Spencer Meyer (Highstead Foundation) will ensure our study's products (e.g., one-page fliers and infographics) use language and communication strategies that attract and speak to the values and interests of urban forestry funders and policymakers. The National Wildlife Federation will conduct a nation-wide policy campaign on Capital Hill as well as deliver our findings to the general public and non-traditional urban forestry partners (e.g., schools and homeowner associations). The Natural Capital Project and Paul Scherrer Institute in Switzerland will facilitate the development of the return-on-investment tool through the InVEST platform, which is currently being used to dictate funding and management of natural resources in over 80 countries. The Trust for Public Land National GIS Office will assist with verifying that our geospatial analyses of urban forests match the actual on-ground conditions.

This project's dataset (actual health care expenditure data from millions of people over 20 years) would cost millions of dollars to go out and collect. Our study thus presents an extremely low-cost opportunity to analyze such data and generate nationally-scalable results that draw cause-and-effect relationships between urban forestry and health care spending. We have tried to make our project even more cost-effective by decreasing our budget request in our revised proposal and by increasing our match. The total ask has decreased from $294,397 to $278,383, and the total match has increased from $294,387 to $369,169. The Kaiser Permanente contribution has increased from $26,718 to $40,089. Further, the Highstead Foundation is contributing $15,000, and National Wildlife Federation is contributing $11,600.

Should you have any further questions about our proposal, please do not hesitate to contact us again. You can reach me at brownin@illinois.edu or 217-300-3496. We look forward to hearing back from you soon about the status of our proposal.

Most sincerely,

Matthew Browning, University of Illinois at Urbana-Champaign

CC'ed: Pre-existing Partners
Frances (Ming) Kuo, University of Illinois at Urbana-Champaign
Jonathan Greenburg, University of Illinois at Urbana-Champaign
Stephen Van Den Eeden, Kaiser Permanente Northern California, Division of Research
Charles Quesenberry, Kaiser Permanente Northern California, Division of Research
G. Tom Ray, Kaiser Permanente Northern California, Division of Research
Stacey Alexeff, Kaiser Permanente Northern California, Division of Research
Dana Karcher, Arbor Day Foundation
Desiree Backman, California Department of Health Care Services
Cindy Blain, California ReLeaf
Nancy Hughes, California Urban Forests Council
Doug Wildman, Friends of the Urban Forest
John Melvin, State of California Department of Forestry and Fire Protection

CC'ed: New Partners
Patrick Fitzgerald, National Wildlife Federation
Breece Robertson, The Trust for Public Land
Spencer Meyer, Highstead Foundation
Bonnie Keeler, Natural Capital Project
Christopher Mutel, Paul Scherrer Institute, Switzerland

Original reviewer's comments

7-C2-3-NA	Urban Forestry's Return On Investment Tying Residential Nature To Health Care Expenditures, University of IL Browning/Kuo **Federal $294,387 + Match $294,387 = $588,774**

1* Looks like an interesting project that has the potential to make a significant impact on perceived benefits of urban forests. Partnering with a health care company to deliver this project is unique and welcomed.

2* It was unclear to me exactly what health care costs will be collected, how confounding factors will be dealt with. A description or graphic of expected results would have been nice. Project timeline was brief and not descriptive. Would be much stronger application if Kaiser contractual was in the match portion of the budget. Clarify if this is Kiser Foundation or Corporation.

3* Ambitious, potentially high impact project. Large scale analysis. Specific metrics identified for evaluation. Outcomes/findings could be very useful to policy makers and those working to influence policy makers.

4* How complete are electronic medical records - many are still paper files inaccessible to this project?

5* should include state forestry networks (urban coordinators, etc.) especially in CA.

6* Activities to be done by Kaiser for consulting fees not detailed.

7* Ambitious, very promising collaboration suggested, and innovative.

8* Appears to focus primarily on California without any provision for application on national level. While it refers to literature on health benefits it unclear how the benefits will be quantified and collected. It would also seem like an important team member would be social scientist or experienced researcher in this area.

9* This is an impressive project idea in terms of its very focused look at health care costs and urban forest investments. It fits squarely with this category. Project directors will look at this relationship while holding other factors constant and also look at the relationship over time. This is very good and necessary if any claims of causality are made for the link between urban vegetation and amounts spent on health care. Also, the proposal is very well-written and easy to follow.

10* The exact nature of the statistical modeling is not specified. I'm glad that the researchers acknowledge the importance of confounding factors, but they don't specify any models stating which variables would be held constant. Also, no exact research hypothesis is stated.

11* I'm not sure how representative northern California is of the nation. Yes, there is a range of communities and ethnic/racial groups represented in the region, but there are also many other factors besides these (which might have a bearing on people's health) in this part of the country that could explain how much or little people pay for health care. These conditions may not exist in other parts of the country. For instance, climate may play a huge role. The northern California climate is not representative of the rest of the nation. Investments in trees may not bring anticipated results in a region with a formidable climate because people may be more reluctant place themselves into this environment. Suggest you broaden you geographical areas.

12* This proposal is supposed to target under-served populations, but I see no efforts to do so. No community-based groups representing under-served populations are mentioned in the outreach and communications discussion. The SMART acronym is not defined.

13* The funding requested for Kaiser is very large. There's no explanation other than "consulting" fee. More than 1/3 of federal funds requested is going to a for profit company.

14* Good evaluation and qualifications, collaboration.

15* Project clarity could be improved; what are the "confounding factors"? This is still a correlative study; not direct economic impact. Lit review had not mention of BenMap, iTree Landscape integration; healthcare expenditure by census block, unclear. Timeline is too lumped between compiling findings and transfer of technology; no mention of data extrapolation. Is KP a national or regional health care partner? High cost of data consultant and indirect.

16* Great new partners. Impressive grant match.

17*We are asking applicants to look at their over-all budget to see if there are any areas that they can reduce their costs, since we will not be receiving the full amount of estimated funds.

Reviewer's comments summarized by topic, and replied to by authors

Aims/Significance/Impact

Looks like an interesting project that has the potential to make a significant impact on perceived benefits of urban forests.
Ambitious, potentially high impact project. Large scale analysis. Outcomes/findings could be very useful to policy makers and those working to influence policy makers.
Ambitious, very promising collaboration suggested, and innovative.
This is an impressive project idea in terms of its very focused look at health care costs and urban forest investments. It fits squarely with this category. Also, the proposal is very well-written and easy to follow

Underserved

This proposal is supposed to target under-served populations, but I see no efforts to do so. No community-based groups representing under-served populations are mentioned in the outreach and communications discussion.	The primary aims of this project are to produce information of national relevance to all populations, in particular, those who are underserved – and to disseminate these findings at a national level to local, community-based organizations which can better argue for the need and value of greening their communities. The scale of this project (4 million people, 80K square miles) allows us to compare the effects of different types of urban forests and urban forestry practices in many different underserved populations (e.g., predominantly lower socio-economic, Hispanic, or African American neighborhoods). Our research analyses will focus explicitly on health disparities in underserved populations (see Aim 2 in project narrative). We anticipate showing – with more cause-and-effect evidence than past literature – how the lack of green cover in underserved areas is actually a tremendously poor fiscal choice, because the evidence so far suggests green cover may play a large role in creating the health disparities between different socio-economic and racial/ethnic groups.

Literature review

Lit review had not mention of BenMap, iTree Landscape integration	We have included a brief discussion of pre-existing mapping/modeling software available to the urban forester as well as how our modeling product supplements these existing tools (see Products in project narrative).

Method

Project clarity could be improved; what are the "confounding factors"?	We will account for variables in our analyses that may either confound the association between urban forestry and health care expenditures or help explain our results so that we avoid reporting spurious associations. Specifically, we will consider confounding factors related to socio-demographic characteristics (e.g., age, race/ethnicity, and sex), health status (e.g., presence of diabetes, cardiovascular disease, and other comorbidity), and neighborhood characteristics (e.g., urban/suburban/rural,

	traffic density, air pollution, and socioeconomic deprivation).
Also, no exact research hypothesis is stated.	We have elaborated on the things we hope to show in this study (see Aims in project narrative).
A description or graphic of expected results would have been nice.	We have added a table of expected products resulting from this project (see Products in project narrative). These include two figures describing the expected results of our analyses and an example of an infographic designed by one of our partners (they will create the infographics in our project).
Healthcare expenditure by census block, unclear	We will establish yearly health care costs for all Kaiser Permanente Northern California (KP/KPNC) members within each census block of the study region. These data will be linked to urban forest data using increasingly large buffers around the centroid of each census block (see Analytic Plans in project narrative).
While it refers to literature on health benefits it unclear how the benefits will be quantified and collected.	We propose looking at health care costs, not specific health outcomes. Thus, we are substantially expanding literature on the health benefits of urban forestry by calculating a return on investment (money into urban forestry, 10x or 100x the money out from urban forestry in regards to how much less people are spending on health care).
The exact nature of the statistical modeling is not specified. I'm glad that the researchers acknowledge the importance of confounding factors, but they don't specify any models stating which variables would be held constant.	We will hold - at minimum - the following variables constant: age, race/ethnicity, sex, socio-economic status, comorbidity (presence/absence of multiple diseases and illnesses), level of urbanity, traffic density, and air pollution. Please see Analytic Plans in project narrative for the exact nature of our statistical modeling.
It was unclear to me exactly what health care costs will be collected, how confounding factors will be dealt with.	We will calculate the direct health care costs for each KP member by year for the period of 1995-2014. These costs will be the sum total costs of all health care utilization in each study year across inpatient, outpatient, radiology, pharmacy and laboratory services (since each of these are captured in detail in the electronic administrative and clinical data of KP). Please see Analytic Plans in project narrative and responses above for discussion on how we will deal with confounding factors.
How complete are electronic medical records - many are still paper files inaccessible to this project?	All diagnoses, procedures, laboratory tests, radiology exams, surgery, prescriptions and other health care utilization have been documented in the KPNC electronic clinical and administrative databases since 1995 (some data precede this date). Thus, we have essentially complete capture of all the encounters between KPNC members and the system (members receive service solely at KPNC

	facilities with care solely provided by KPNC physicians and staff; the exception is in emergency care or KP referred care out-of-system, but both types are captured in a referral and claims database). Dr. Van Den Eeden and his team have been working with these data for over 25 years. Only the written physician progress notes are in hard copy from 1995 to 2009, but we do not need this information since we have access to the above diagnostic data.

Generalizability

I'm not sure how representative northern California is of the nation. Yes, there is a range of communities and ethnic/racial groups represented in the region, but there are also many other factors besides these (which might have a bearing on people's health) in this part of the country that could explain how much or little people pay for health care. These conditions may not exist in other parts of the country. For instance, climate may play a huge role. The northern California climate is not representative of the rest of the nation. Investments in trees may not bring anticipated results in a region with a formidable climate because people may be more reluctant place themselves into this environment. Suggest you broaden you geographical areas.	One of the key aims of our study is to produce findings and models generalizable to communities across the nation. Please see Aim 4 in the project narrative for a full discussion of the generalizability of our study. This summarizes how northern CA is representative of more climates and populations than almost any other area that could be chosen for this study. Just as importantly, we have the data available to analyze this region. This is no small feat, due to the difficulty of securing actual health care expenditure data (not just self-reported survey data or spending estimates) geo-located to subscribers' addresses.

Appears to focus primarily on California without any provision for application on national level.	Due to the extreme diversity of populations and climates in our study region, we are able to generate results applicable across the country (see Aim 4 in project narrative for full discussion). The national generalizability is also demonstrated in the letters from our partners and supporters. The success of a large-impact project such as this requires detailed individual level data at fine spatial resolutions. Thus, we have chosen to partner with KPNC, a large, mature health delivery system that includes a diverse population that is *larger in size than 28 states and has a service area that is larger than 10 states*, and we have chosen to focus on a region of the country that allows us to answer our research questions in an extremely cost-efficient way. There is simply no other region of the country with the diversity of populations and environments of northern California. While we intend to pursue ongoing funding for this line of work and validate the findings we discover in this current study in other parts of the country, our health insurance partner estimates the costs of such efforts to be well over $2 million. Thus, for the relatively modest request of $278,383, we are able to generate models with national impact on urban forestry for a bargain. Ultimately, we will create a free return on investment tool using the results of this study with which urban forestry practitioners and allies anywhere in the United States can input their unique neighborhood characteristics and calculate the net health care savings from different urban forest interventions.

Internal Validity

This is still a correlative study; not direct economic impact.	We expect this study to rigorously and convincingly demonstrate the cause-and-effect relationship between urban forestry and *actual* (not estimated or self-reported) health care savings through converging, longitudinal studies (Kaiser data has been collecting health care expenditure data for over 20 years). Thus our study will measure the direct economic impact of urban forestry (see Aim 1 in project narrative for full discussion).
Project directors will look at this relationship while holding other factors constant and also look at the relationship over time. This is very good and necessary if any claims of causality are made for the link between urban vegetation and amounts spent on health care.	

Partners/Kaiser Permanente

Partnering with a health care company to deliver this project is unique and welcomed.	
Great new partners.	
Is KP a national or regional health care partner?	While KP has a national presence (with regions in 9 states), this study will focus on its oldest and most (data) mature region (northern CA). It should be noted that the data systems are at the regional level.
Clarify if this is Kiser Foundation or Corporation.	KP operates as a *non-profit health care provider* with research grants such as the one requested from this proposal which are administered via the non-profit Kaiser Foundation Research Institute (KFRI). The

	Division of Research (DOR) has been conducting research in the public interest since 1961. Funding for the research at DOR comes primarily via external grants from federal, state, foundation, or private sources. A small proportion of the funding for DOR is provided from the organization for infrastructure. For more information, please visit: https://www.dor.kaiser.org/external/dorexternal/about/index.aspx
Should include state forestry networks (urban coordinators, etc.) especially in CA.	We have secured letters of support from offices in Pennsylvania, Washington, and Wisconsin. Our project also has extensive connections to urban forestry state networks in California through our partners at the State of California Department of Forestry and Fire Protection and the California Urban Forest Council.

Team

(Good) qualifications, collaboration.	
It would also seem like an important team member would be social scientist or experienced researcher in this area.	Frances (Ming) Kuo is an internationally known social scientist in the area of health benefits of nature and urban forestry (see Collaboration / Experience / Personnel / Adequacy of Resources in project narrative).

Evaluation

Specific metrics identified for evaluation.
Good evaluation

Timeline

Timeline is too lumped between compiling findings and transfer of technology; no mention of data extrapolation.	Please see expanded Project Planning / Timeline in project narrative.
Project timeline was brief and not descriptive.	Again, please see expanded Project Planning / Timeline in project narrative.
The SMART acronym is not defined.	We have defined SMART objectives (see National Dissemination / Technology Transfer / Project Evaluation in project narrative)

Match/Budget/Budget justification

Impressive grant match.	
High cost of data consultant and indirect.	Kaiser Permanente is not a consultant but a collaborating partner in this research (their identification as a "consultant" in the pre-proposal was misrepresentative). While both the University of Illinois and KP are large institutions with many components to which indirect costs are allocated, such high-caliber institutions have proven to be highly successful at research with national and international reach. Such institutions will offer substantial internal support to our research team (e.g., administrative, public outreach, name-recognition, and capacity for securing on-going funding).
We are asking applicants to look at	We have increased the cost-share component of the grant ($369,169 now, up from $294,387) and decreased the requested amount from

their over-all budget to see if there are any areas that they can reduce their costs, since we will not be receiving the full amount of estimated funds.	the U.S. Forest Service and Council ($278,383 now, down from $294,387). **This amounts to the Council gaining more than $90,000 of additional value by investing in the revised project.**
The funding requested for Kaiser is very large. There's no explanation other than "consulting" fee. More than 1/3 of federal funds requested is going to a for profit company.	The primary endpoint (health care expenditures) is completely tied to the KP system. The KP team is a full collaborating partner on the study and has the necessary expertise in collection, use, and analysis of health data and costs required of this project. We have included a full budget justification for our KPNC team. As noted above, the KPNC Division of Research is a *non-profit entity*, as is KP.
Activities to be done by Kaiser for consulting fees not detailed	We have included justification for the work of our collaborators at KP in the project narrative. Because actual health care expenditures is a vital component of this project but is not already compiled or processed, we require a group of KP researchers' time to geocode the KPNC subscribers, ascertain all health care utilizations, and link to health care expenditure data (including hospital, in-home, and pharmacy expenses). Each KPNC Division of Research personnel member has unique skills required for these efforts. In addition, KPNC administrative functions such as obtaining IRB approval and preparing reports and manuscripts will be performed. Given the size of the KPNC population over time, the detail of the utilization and cost data, and that the analytic dataset will need to be created from numerous raw databases, KPNC collaborators will be required to make a tremendous effort toward this study.
Would be much stronger application if Kaiser contractual was in the match portion of the budget.	As the Division of Research is primarily funded through external sources (e.g., NIH, CDC, foundations, and private entities) rather than core (hard) funds, it is not possible to waive salaries. However, Kaiser fully supports this project and is now contributing approximately 40% of the direct costs of this project including maintenance and accessing data, salary support above the NIH cap for several researchers, and Dr. Alexeff's contributions.

7-C2-3-NA Browing U IL
Urban Forestry's Return on Investment
Tying Residential Nature to Health Care Expenditures

Project Description

We propose quantifying the impacts of the urban forest on health care expenditures, filling in the giant missing piece in urban forestry's economic return on investment. We will calculate how much people spend on health care in areas with well-developed urban and community forests, in areas without these forests – where the greatest health disparities lie – and everything in between. This project thus has the potential to document that urban greening is a potentially low-cost, proven effective, politically-popular way of substantially reducing health care expenditures. This is urgently needed in today's society for three reasons:

Reason 1. Health care costs are huge. People spend more money on health care each year. In 2013, national spending reached $2.9 trillion. This figure is projected to increase to $5.1 trillion by 2023, which equates to a 5.8% average annual growth [1]. Further, health expenditures are disproportionally high for underserved audiences and people at risk. Each year, Medicare and Medicaid programs cost $11,422 and $7,627 per person, respectively, compared to $5,365 for people with employer-sponsored insurance. These costs have caused Medicare to comprise as much of the federal budget as defense spending (17%) for the first time in history [2].

Reason 2. The effects of nature on health are huge. Nature – in the form of urban and community forests – provides an incredible opportunity to combat these rising health care costs, particularly in underserved communities with unequal access to both urban forestry and health care services. Even small, regular "doses" of stress-reducing activities in natural settings have dramatic effects at no cost. For example, as little as 20 minutes of regular walking reduces sick days due to upper respiratory tract infection during cold and flu season by 43% [3], effects which are seen most strongly in forest settings [4]. A recent literature review by Kuo has identified dozens of other health outcomes tied to nature access (Table 1) [5]. These include some of the most expensive and most common health concerns today, including cancer ($125-$150 billion in treatment costs annually) [6] and upper respiratory tract infections, specifically the common cold (approximately $40 billion in annual costs related to treatment and missing work or school) [7].

Reason 3. The amount of money we spend on health care compared with parks and urban forestry is dramatically off-balance. Several studies show that between 2-4% of annual health care costs are attributable to physical inactivity [8]. Considering the average health care spending (approximately $8,500/person annually) and the number of people living in the United States (more than 300 million), encouraging physical activity through urban greenspace would *conservatively* save 2.4% in health care spending or $60 billion dollars. In comparison, a survey of nearly 100 U. S. cities found that approximately 85% of them spent only $83/person on parks and recreation departments [8]. Ergo, we spend roughly 100 times more per capita on health care than we do on urban greenspace.[1]

[1] While these estimates do not include street trees, "health care spending" is only a part of the larger economic costs of poor health (e.g., decreases in productivity costs as a result of missed workdays in cold/flu season). Thus, the 1:100 ratio may actually be *under*-estimate of how much we spend on urban greenspace compared with the total costs of poor health.

We need to tie nature to reduced health care savings. It is time to document the effects of urban and community forests on actual health care savings. Given society's increased foci on human health and the economy, this is the key pathway forward to increase urban forestry support and funding. The proposed project will document these effects using two huge, *existing* datasets (geo-located health care expenditures and aerial LiDAR data) that allow us to control for a myriad of potential confounding factors. Drawing a cause-and-effect argument for urban forestry and human health is critical. A large number of studies have drawn *correlations* between urban greening/parks and health outcomes (see Literature Review). Similarly, many studies have *estimated* the economic benefits of urban greening (again, see Literature Review). We do not need more correlational studies – nor do we need more studies that estimate health or health care spending impacts. We need studies that draw strong cause-and-effect arguments from objective measures (not self-report survey data) with nationally-scalable results.

Table 1. *Selected examples of effects from living in nature-poor environments*

Health Outcome	**Effects**
Anxiety disorder	44% increase in incidence
Cancer	10% increase in incidence
Childhood obesity	15% increase in incidence
Coronary heart disease	27% increase in incidence
Depression	33% increase in incidence
Diabetes mellitus	25% increase in incidence
Immune system functioning	28% decrease in function
Mortality among older adults	13% increase in incidence
Upper respiratory tract infection (e.g., the common cold)	24% increase in incidence

Project Aims

The specific aims of our study include:

Aim 1: Providing the basis for a powerful new argument for urban forestry by documenting the impact of residential urban forestry on health care savings. We propose to rigorously and convincingly demonstrate the cause-and-effect relationship between urban forestry and health care savings through converging studies. It will be difficult to argue that the UF:health care savings link is merely a coincidence if we can show *simultaneously*:

i. that city blocks[2] with high green cover have health care savings even after taking into account socioeconomic deprivation, age, race/ethnicity, gender, and neighborhood characteristics likely to contribute to health (e.g. urban/suburban/rural, traffic density, air pollution, and land use); and, where appropriate, individuals' initial health status (e.g., presence of diabetes, cardiovascular disease, and other comorbidity).

ii. that city blocks with low green cover have high health care expenditures, after taking into account those same factors.

[2] Throughout this document, we refer to "city blocks" because it most concretely conveys the focus of our work; in fact, however, we will be comparing census blocks, and we will be comparing these blocks in the entire 80,000 square mile area of this study, including rural, suburban, and peri-urban areas, as well as urban areas. The census block is the smallest unit of U.S. census data. In urban areas, a census block roughly corresponds to a city block, but in rural areas census blocks can be much larger. There are roughly 40 census blocks in a "census block group" and 125 census block groups in a "census tract."

iii. that there is a dose-response relationship between green cover and health care savings, such that
    a. the greater the green cover for a city block, the greater the health care savings;
    b. and the effect of residential greenness on health care savings drops off as we consider urban forests at larger and larger concentric circles around a city block (in other words, the impact of urban forests continues to decrease the farther away we go from any specific city block).

iv. that there is a longitudinal relationship between green cover and health care savings, such that
    a. pre-post greening comparisons show health care expenses decrease after census blocks are substantially greened, and increase after census blocks lose substantial green cover - whether via blight, lack of maintenance, or active removal;
    b. and pre-post move comparisons show individuals spend less on health care after moving to greener areas and more after moving to less green areas.

Aim 2: Addressing one of the greatest challenges to greening in underserved areas by documenting the impact of residential urban forestry on health care savings specifically in underserved areas in relation to other areas. Because urban forestry is widely misperceived as no more than an aesthetic amenity, urban forestry in low-income, disadvantaged neighborhoods may be viewed as an unaffordable luxury and a poor use of funds compared with seemingly-more urgent needs (e.g., a spike in drug use or gang violence). By documenting the impact of urban forestry on health care expenditures in underserved areas**, we hope to position urban forestry as an investment that communities cannot afford *not* to make**. We seek to document the public burden related to paying for health care services for underinsured and uninsured individuals in nature-poor neighborhoods and the opportunity to enhance underserved communities' health, economy, and productivity through urban greening. We hope not only to quantify the impacts of urban greening on health care savings but also to replicate (in the U.S.) the United Kingdom findings in which fully half of the income-related disparities in health were attributable to differences in nearby greenness [9].

Aim 3: Shaping urban greening practices to maximize health impacts by quantifying the impact of different urban forest structures on health care savings. Existing research on the health benefits of urban greening suggests that greening is good, but is nearly silent on the question of how to green. In this work, we propose to compare the health care savings for different urban forest structures. Specifically, we hope to show the independent contributions of street trees and other forms of vegetation immediately surrounding the home versus those of parks; to show that more mature trees have larger impacts on health care savings than the same total cover provided via multiple smaller trees – a much-needed argument for tree maintenance – and to show that a stratified urban forest has greater impact on health care expenditures than a single-layer urban forest (e.g., canopy trees with only turf or groundcover). Further, our local non-profit partners (e.g., Friends of the Urban Forest and ReLeaf) have agreed to provide urban forestry cost data. We will be able to estimate the amount of cash required to provide certain urban forest features in residential surroundings and calculate the actual return on investment of those greening dollars in terms of health care dollars saved.

Aim 4: Producing findings and models generalizable to communities across the nation. This line of investigation spans a diverse population of roughly 4 million individuals (larger than the populations of 28 of the 50 states) and a geographic area of 80,000 square miles (larger than the areas of 10 states). Our study region is representative of more climates than almost any other

area that could be chosen for this study, and has the data available to utilize. There is nothing homogenous about this region of the country. Its climate ranges from Mediterranean, high desert, and great basin to montane, alpine, and northwest coastal. Temperatures cover the gamut, from a low of -45°F near Lake Tahoe to a high of 120°F in King City, and everything in between.[3] There are parallels to many other places in the U.S. and beyond, including several large cities from Seattle to Atlanta (Table 2). The state-wide average temperatures for California (daily min=46°F, daily max=71°F) are quite similar to 28 other states in the nation, which have daily min and max temperatures of approximately 45°F and 68°F respectively, including: Alabama, Arizona, Arkansas, Connecticut, Delaware, Florida, Georgia, Idaho, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, Nevada, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, and West Virginia. If one looks at Sunset climate zones or USDA hardiness zones, there is an exceptionally wide range in this region. Hardiness zones, for instance, range from 5b in Placer and El Dorado Counties near Lake Tahoe to 10a in San Francisco County.

The study region's populations are also one of the most diverse in the country. The region is home to over 7 million people, but only 51% of these people are non-Hispanic white [10]. Other racial/ethnic subpopulations are large enough to generalize to and make claims about. For example, Asians constitute 1.6 million (23%), Hispanics/Latinos constitute 1.7 million (24%), Blacks and African Americans constitute 0.5 million (7%), and people of mixed race/ethnicity constitute 0.4 million (5%). The region has not only single family suburban neighborhoods but also dense urban cores, peri-urban fringes, and the more rural landscapes typically of most of the country. More than 400,000 acres of urban and peri-urban greenspace are scattered throughout the San Francisco Bay Area alone, which is also home to over 100,000 street trees [11].

Table 2. *California cities and towns compared to major U.S. cities (sorted by average annual temperature on left; sorted by average annual precipitation levels on right)*[*]

City	Temp		City	Precipitation
Denver	50 ºF		Phoenix	8"
Truckee, CA	50 ºF		**Hanford, CA**	9"
Chicago	51ºF		**Truckee, CA**	12"
Seattle	53ºF		**Modesto, CA**	13"
New York	55ºF		**Hollister, CA**	14"
Philadelphia	56ºF		Denver	16"
San Francisco, CA	57ºF		**San Francisco, CA**	24"
Berkeley, CA	58ºF		**Berkeley, CA**	27"
Hollister, CA	59ºF		Chicago	39"
Redding, CA	60ºF		Seattle	40"
Atlanta	63ºF		Philadelphia	42"
Hanford, CA	63ºF		**Redding, CA**	48"
Modesto, CA	64ºF		New York	50"

[3] It should also be noted that many of the well-sited studies concerning the health outcomes of urban forestry are from regions that have cold/inhospitable climates, specifically the UK [9] and the Netherlands [12]. The daily highs in the Netherlands, for example, are between 30-50°F for half the year, and below 60°F for 10 months of the year. As such, the impacts of the urban forest on health outcomes are likely independent – or at most only partially mediated – by the extent to which a region's climate is favorable to people going outside and recreating.

Phoenix	75ºF		Atlanta	50”

*based on 1981-2010 data from Natl. Climate Data Center: www.ncdc.noaa.gov/cdo-web/ and Western Regional Climate Center: www.wrcc.dri.edu/

We will ensure our study results will be nationally applicable and representative by generating a free, online modeling tool using Natural Capital's InVEST platform. This complements pre-existing models (e.g., USFS's i-Tree Streets or EPA's BenMAP) and streamlines the calculation of the health/economic benefits of urban greening compared with pre-existing online calculators (e.g., Green Infrastructure Valuation Toolkit Calculator, www.greeninfrastructurenw.co.uk). InVEST is a well-established GIS-based modelling platform (www.naturalcapitalproject.org/invest) that has raised over $6 million in funding from Stanford University and University of Minnesota and is used officially in urban and natural resource planning by governments worldwide, averaging over 600 downloads per month with active users in over 80 countries. It has a range of pre-existing models, such as estimating the value of timber harvests over time under different management techniques and calculating the monetary value of scenic viewsheds based on sited or planned features that impact visual quality and aesthetics.

The particular InVEST model that will be developed in this study will calculate the rate of return in regards to health care savings based on urban forestry investments. This model will allow a City Arborist in a small town in South Dakota, for example, to locate their town in InVEST's free online geographic information system (GIS) platform, enter their neighborhood characteristics, and run simulations for different urban forestry investments (e.g., planting 100, 1,000 or 100,000 street trees for the cost of X dollars versus establishing 1, 2, or 5 new parks – each of which are Y acres in size – at the cost of Z dollars). This City Arborist will then be presented with the return on investment (ROI) for these different scenarios from a public health perspective (perhaps a 1:10 ROI for planting 100 street trees or a 1:100 ROI for developing a new park). We anticipate also being able to model time-bound questions, such as how would spending $5,000 on maintenance over the next 5 years pay off? Or what would the ROI be on street tree planting in 1, 5, and 50 years?

Analytic Plans

Analyses for Aim 1 will be modeled after Maas and colleagues' ground-breaking work on the effects of residential green cover on diagnostic categories in physician records for 345,000 persons in the Netherlands [12]. The authors used postal codes to localize residences within an area containing between 15 and 20 houses and obtained land use data from the National Land Cover Database of the Netherlands, which names the dominant use of land parcels with 25m resolution. The authors used multilevel logistic regression analysis to predict the prevalence of 15 disease clusters based on proximity to greenspace while controlling for socioeconomic and employment status, age, gender, level of education, and population density. Similar to this study, we will use multilevel logistic regression to examine the relationship between health metrics and extent/type of urban forestry around where people live. In contrast, we will examine actual health care expenditures, use U.S. census blocks rather than UK postal codes (they are on similar scales), use U.S. rather than the European diagnostic categories, and employ the (much more extensive) data on possible confounding variables available in the Kaiser Permanente database.

We will also conduct longitudinal analyses examining the impacts of moving to greener/less green surroundings, and the impacts of changes in the green cover of an area on its residents before/after urban forestry interventions. These analyses will be modeled after the work of Alcock and colleagues [13] and Annerstedt and colleagues [14] in regards to the use of fixed-

effect regression analysis to control for time-invariant individual level heterogeneity and other area/individual-level effects (e.g., socio-demographic and environmental toxins confounding factors) [15] while calculating how post-move or post-greening interventions have impacted health care spending. Our initial analyses will use generalized estimating equations under the gamma distribution with log link (e.g., log-linear) to account for the skewed distribution of the health care cost data (the vast majority of people spend very little on health care while a very small percentage of people spend a huge amount on health care). Because gamma distribution modeling would exclude any records with no costs, we will add $1 to each category of summarized costs in each year for each individual in the study. This will allow us to retain all eligible records in the study, even if there is no direct care provided in a study year.

Analyses for Aim 2 will follow the same structure as Aim 1, except that we will stratify the sample by race/ethnicity and socio-economic status and systematically compare these groups. Additional analyses, modeled after Mitchell & Popham's work on comparing mortality rates for different populations in the UK based on presence/absence of nearby greenspace [9], will examine the proportion of income disparities in health care expenditures. These will entail using an interaction term for income deprivation and greenspace exposure, and examining the association between greenspace and expenditures in populations with different income quartiles.

Analyses 3 will again follow the same structure as Aim 1, except for our use of more sophisticated geospatial measures of the urban forest. Categorizing different urban forest types and extents will first require classifying LiDAR points into broad categories (e.g., ground, vegetation, or buildings). This process will then require generating digital terrain models in GIS software by assigning each point an elevation above the ground. From these elevations, we can generate many different 3D grids at 1m resolutions that represent a range of surfaces related to the urban forest (e.g., one grid could represent the presence or absence of any vegetation; another could represent the presence or absence of low, medium, and high vegetation; and another could represent the maximum height of any vegetation). We will then conduct multilogistic models (similar to before) but for each layer in isolation (e.g., total vegetation cover; mean vegetation height; ratio of high to low cover; and diversity of canopy heights). We will also rerun analyses while controlling for different contexts of the study region (e.g., urban, peri-urban, suburban, and rural as well as different USDA hardiness and climactic zones) to generate nationally-representative results.

While the data needed for these analyses are already collected, they require extensive cleaning, coding, organization, and centralization to make them available for modeling. Kaiser Permanente researchers will undertake the tremendous task of accumulating and translating all health care expenditure data into usable forms, while Drs. Greenburg and Browning will lead the task of translating LiDAR data into usable 3D grids for analysis (see Project Planning / Time and Detailed Budget and Budget Justification for ***Non-Profit*** Kaiser Permanente Northern California Division of Research).

Originality/Innovation

Our project attempts to advance our understanding of the UF:health relationship in several ways that *past literature has failed to do*:

1. We will go a step beyond past studies that examined ties with health data. We look at real health care costs - *perhaps one of the most convincing metrics of the benefits of urban and community forestry* - because they suggest the direct economic impacts of this work.

2. We will provide as *near an air-tight argument on causality as possible* regarding the relationship between human health and urban forestry. We do this by:
    a. controlling for socio-demographic characteristics (e.g., age, race/ethnicity, and sex), health status (e.g., presence of diabetes, cardiovascular disease, and other comorbidity), and neighborhood characteristics (e.g., urban/suburban/rural, traffic density, air pollution, and socioeconomic deprivation) in regression analyses, such that we will be able to more confidently attribute differences in health care expenditures to differences in urban forestry than previously-utilized datasets with smaller sample sizes and fewer statistical controls;
    b. utilizing longitudinal data from Kaiser Permanente, which has tracked its members' residences for nearly 20 years. These will allow us to systematically examine whether health care expenditures go down after communities conduct greening efforts, increase after communities lose green cover, and change when people move to greener or less green communities.
3. We will explain *how to maximize return on investment* for different type of urban forestry programs. By mapping out our study region in 3D at 1m resolution – and by categorizing the urban forestry by type (e.g., yards with trees, street tree plantings, pocket parks, unmanaged overgrown wooded areas, and managed parklands) and trait (e.g., level of forest stratification, diameter of trees as a proxy for age/height, and tree canopy density and shape) – we will identify which urban forestry characteristics in which settings lead to greatest health care savings. Based on these results, we will be able to *advise urban forestry practitioners where to plant what and where*, as well as the relative importance of maintenance versus new plantings using our free online modeling tool (see Products).

Literature Review

There has been no shortage of large-scale studies tying the urban forest to objective health outcomes. On "all-cause mortality" and life expectancy alone, there have been at least 8 large-scale studies [16-23] — one examining all counties in the United States [16] and another examining mortality rates for 40 million UK residents as a function of the greenness of their "Least Statistical Output Area" [17]. There have been even more studies that tie specific diseases, mortality related to specific diseases, and disease symptoms to the urban forest. For example, there have been at least 12 large-scale studies tying the urban forest to cardiovascular diseases [24-35] – not including the plethora of smaller scale experimental studies; at least 9 on the allergies, asthma and eczema [36-44]; at least 7 on Attention Deficit/Hyperactivity Disorder [45-51]; and at least 5 apiece on birth outcomes [52-56] and diabetes [57-60], respectively.

By contrast, almost no work has tied the urban forest (UF) to health care expenditures. Kathleen Wolf and colleagues [61] used existing UF:health work to *estimate* the possible effects of the urban forest on health care expenditures for a number of health outcomes ranging from ADHD to premature births to cardiovascular disease. And Nutsford and colleagues [62] tied the urban forest to one very narrow subcategory of health care expenditures — prescriptions for anxiety medications. However, neither of these studies give us any reliable idea of how much the urban forest actually reduces health care expenditures as a whole — for medical visits, procedures, hospitalizations, and tests as well as medications, or for the full range of physical diagnoses and mental health diagnoses other than anxiety disorders. *What work we do have suggests the total impact of the urban forest on health care expenditures is staggering*. For example, Wolf and colleagues [61] estimate urban forestry-related health care

savings related to premature births at $5.3 million, the savings related to ADHD at $1.9 billion, and the savings related to cardiovascular disease at $1.2 billion.

One major weakness of the existing literature is addressing the cause-and-effect question. While it is obviously impossible to randomly assign groups of people to different levels of green cover and hold other factors constant until we can see what long-term health outcomes emerge, it is possible to strengthen correlational studies by (a) taking more confounding factors into account, and (b) supplementing cross-sectional work with longitudinal work. Currently, most UF:health studies are careful to control for income but have failed to take other environmental factors into account. This ignores an entire body of findings in the environmental justice literature, showing that poverty is associated with both unhealthy land uses, lower levels of green cover (and other environmental amenities, and poorer health outcomes) [63]. Similarly, longitudinal work looking at the health benefits of urban forestry is nearly nonexistent.

Almost no work has tied the urban forest to health or health care expenditures in a sufficiently fine-grained way to guide greening efforts — except to suggest that more green is better. Most of the large-scale work has used coarse-resolution measures of greenness, counting only large, open green spaces as "green" — and ignoring street trees and smaller spaces entirely. One of the very few studies available on street trees suggest that they might be very important factors in health [64], but is silent on questions such as, should the UF be multilevel (turf, shrubs, and trees) or do canopy trees alone deliver the same benefits? Does a single, mature tree provide more benefits than the same total green cover achieved via multiple smaller trees? These and other questions about what we should plant and how important maintenance is for improving human health and/or reducing health expenditures remain to be answered.

There's a clear trend for coarse-resolution studies (e.g., those attempting analyses over the entire nation, rather than a highly-diverse, regional area) to show weaker effects or no effect at all. In Maas et al (2009)'s novel work on greenness and disease [12], they found clear, strong effects when they restricted their focus to the area within a 1km radius of each person's residence, but fewer and weaker effects when they examined greenness within a 3km radius. Similarly, although the mortality research examining smaller units (e.g., census blocks, counties and Least Statistical Output Areas) has consistently found better outcomes for greener places than less green places, when we compare outcomes for whole cities at a time, we find no difference for greener cities over more barren cities [59]. The data in these coarser-grained (commonly nation-wide) studies are noisier than in finer-grained (region-specific) studies. As a result, *studies attempting to analyze the UF:health relationship across an entire nation – scales at which **only** low resolution geospatial resolution data analysis is possible without millions of research dollars - tend to result in less convincing, more caveated arguments for the benefits of urban forestry*. Additional coarse-grained work on the relationship between UF and health is likely to, once again, produce results which are difficult if not impossible for UF practitioners to use when planning and securing funds for urban forestry. We already know greener is better. What we don't know is what type and extent of the urban forest relates most closely with health (and health care spending).

Very little work has focused on the potential role of the urban forest in underserved communities. Since underserved communities tend to have substantially lower levels of green cover [65] and the highest levels of health care expenditures [66], the need to examine the impacts of the urban forest on health care expenditures in low-income, underserved communities is urgent. One finding suggests that the urban forest has the potential to substantially decrease

health care expenditures in low-income communities. Mitchell & Popham (2008) examined whether differences in residential greenness might partly account for income-related disparities in health, and found that when rich and poor household were matched in residential greenness, the disparities in their health were cut in half [9]. Importantly, this study fails to control for all the factors likely influencing this relationship (e.g., environmental toxins or pollutants) and was conducted with a cross-sectional design by which cause-and-effect arguments are suggested, not inferred.

Project Planning/Timeline

Our project will run August 16, 2016 to August 15, 2019 (three years) and be completed in three phases: phase one (Aug 2016 – May 2017) will focus on data compilation; phase two (May 2018 – Aug 2018) on data analysis; and phase three (Aug 2018 – Aug 2019) on technology transfer and dissemination of results.

Phase One: Drs. Greenburg and Browning and their two graduate students will translate raw geospatial data into usable forms for analysis (estimated timeframe Aug – Dec 2016). Simultaneously, Dr. Stephen Van Den Eeden will led the team of KP researchers to connect individuals' electronic medical records and cost management information system data (CMIS)[4] with residential histories (estimated timeframe Aug 2016 – May 2017). At this stage, we will also acquire urban forestry cost data from our local non-profit partners (e.g., Friends of the Urban Forest and ReLeaf) to estimate the amount of cash required to design, plant, and maintain these forest structures (estimated timeframe Aug 2016 – May 2017).

Phase Two: Drs. Browning and Kuo along with a graduate research assistant will use buffer analyses tools and models in GIS software to look at the relationship between different urban forests structures around peoples' homes and their health care spending, thereby seeking to achieve Aims 1-3. We will also develop the InVEST model during this timeframe with our partners (estimated timeframe May 2017 – Aug 2018).

Phase three: Drs. Browning and Kuo and their graduate research assistant will lead the effort to disseminate our findings with the help of our many state and national partners (see Products and National Dissemination/Technology Transfer/Project Evaluation). Simultaneously, they will evaluate the success of these efforts (estimated timeframe Aug 2018 – Aug 2019). Throughout this final year, we will identify and pursue future funding to test the extent to which the InVEST model generated from this study's results accurately predicts health care spending nationally and internationally.[5] Through this future research, we will refine our modeling tools to *create the most accurate model for estimating the impacts of urban forestry across the nation*.

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[4] CMIS is a decision-support system that integrates health care use data with General Accounting Ledger data to provide fully-allocated costs by medical center, patient, and service [67-69]. CMIS derives cost by allocating actual service department expenses to the weighted service volumes provided by the department, including overhead costs for administering the medical care program via a step-down method. Use is accumulated for each patient's encounter with the health system, and each encounter is costed out by applying service costs to the patient's actual use of services during that encounter. We will link to other KPNC clinical data as needed.

[5] Although not part of this proposal, Dr. Van Den Eeden and the research team have discussed future plans on approaches to expanding the work on a national level. Specifically, KPNC is part of the Health Care Systems Research Network (HCSRN, http://www.hcsrn.org/en/), a group of 19 research departments from health care delivery systems across the US (and one international partner). These delivery systems and research groups have created a harmonized set of administrative and clinical data called the Virtual Data Warehouse. Each center has created the identical databases for a wide range of clinical data from inpatient, outpatient, laboratory, pharmacy and

Products

This study will produce several products that summarize findings and serve as vehicles for dissemination and technology transfer (see Table 3).

Table 3. *Study products*

Item	Description
One-page fliers	Colorful, professionally designed 8 ½" x 11" handouts that summarize our key findings using language that effectively reaches potential urban forestry funders and policymakers (philanthropy/communications expert Spencer Meyer will assist with crafting this language). Fliers will be distributed primarily in hard-copy to policymakers, the general public, municipalities, and potential funders and will be available for free online.
Scientific articles	Peer-reviewed articles in high-quality scientific articles for distribution amongst other scientists and educators. We anticipate at least four articles coming from this study (based on Aims identified above): 1. "The return on investment of urban forestry over time and distance." Target journal: *Science.* Figure 1 depicts possible article graphic based on our hypotheses and past literature [70-72]. 2. "Investments in urban greenspace and street trees and health disparities in low-income and minority neighborhoods: Results from greenspace development in San Francisco over 20 years." Target journal: *American Journal of Public Health.* 3. "The independent impacts of nearby nature and neighborhood parks on health care expenditures in communities." Target journal: *Landscape and Urban Planning.* Figure 1 depicts possible article graphic based on our hypotheses and past literature [73]. 4. "Relationships between health care spending and urban forestry development or maintenance: Management implications for planners and investors." Target journal: *Forestry & Urban Greening.*
Infographics	Colorful graphical representations of our data and results for distribution primarily over social media platforms as well as on urban forestry organization and agency websites. These will be developed in conjunction with social media/graphic designers at the California Urban Forests Council (see Figure 2 for an example of their work). Our infographics will summarize (a) our studies' results regarding the health/economic argument for investing in urban forestry, and (b) management recommendations for urban and community forestry based on our studies' results.
InVEST model	We will create a free, online model that allows urban forestry practitioners and allies to calculate the return on investment for different urban forestry treatments (e.g., increasing street tree plantings or developing parks) by health care savings. This tool will complement pre-existing forestry applications, such as BenMAP

cancer sources, as well as administrative (e.g., membership, residence), social and census data. Assuming the results with this study are positive and additional resources can be obtained, it is feasible to leverage the work we propose herein to a geographically and socially diverse population spread across the US with greenspace and clinical data that are at a high spatial and temporal resolution.

which uses air quality data to estimate economic and health implications of the built and natural environment and the i-Tree software suite (e.g., i-Tree Streets which uses user-populated or pre-existing street tree inventories to analyze stormwater control, property value increases, and air quality improvements as a result of these specific trees; and i-Tree Eco which uses data from a sample of trees or a complete tree inventory to calculate a wide range of ecosystem services). None of the pre-existing models examine health care expenditures.

Figure 1. Probable figures resulting from this study. On left, a possible bar chart from our anticipated article entitled: *The return on investment of urban forestry over time and distance*. On right, a possible line graph from our anticipated article entitled: *The independent impacts of nearby nature and neighborhood parks on health care expenditures in communities.*

Collaboration/Experience/Personnel/Adequacy of Resources

Dr. Matthew Browning has successfully formed cross-disciplinary teams of researchers and practitioners to design, fund, implement, and evaluate over $300K in projects related to humans and nature, including several using GIS. He has long-standing relationships with key personnel in agencies and organizations doing work related to health and nature (e.g., Children & Nature Network, Arbor Day Foundation, National Audubon Society, National Wildlife Federation, National Park Service, U.S. Fish & Wildlife Service) and has 15 years of experience communicating scientific findings regarding people's connection to nature. He holds a Ph.D. in Forestry from Virginia Tech and a Masters in Environmental Science from the Yale School of Forestry & Environmental Studies, where he was trained in GIS analysis with Dr. Dana Tomlin who helped develop this software as a student at Harvard in the mid-1970s.

Dr. Frances "Ming" Kuo (Associate Professor, University of Illinois at Urbana-Champaign, Department of Natural Resources and Environmental Sciences) **is an internationally known social scientist with a track record of conducting ground-breaking, high-impact research and outreach.** In her roughly $4M of externally funded research, she has been responsible for first documenting the effects of the urban forest on Chicago public housing residents, aggression, levels of violent crime and property crime, and ADHD symptoms. Her extension work in "Conveying the Power of Trees" has been described as "one of the best investments NUCFAC ever made" (Rodbell), and her work prompted the largest ($10M) tree planting in Chicago's history, and is now shaping the SITES sustainable landscapes credit rating

system adopted as Best Practices by the federal government. In recognition of her consistent ground-breaking work, NUCFAC has asked her to testify on multiple occasions; in the most recent of these, she was invited to guide the Council on how to identify and disseminate high-impact research. Of the top 50 most cited articles in *Environment & Behavior* (one of the two top journals in the field), Kuo is sole, first, or supervising author on 5.

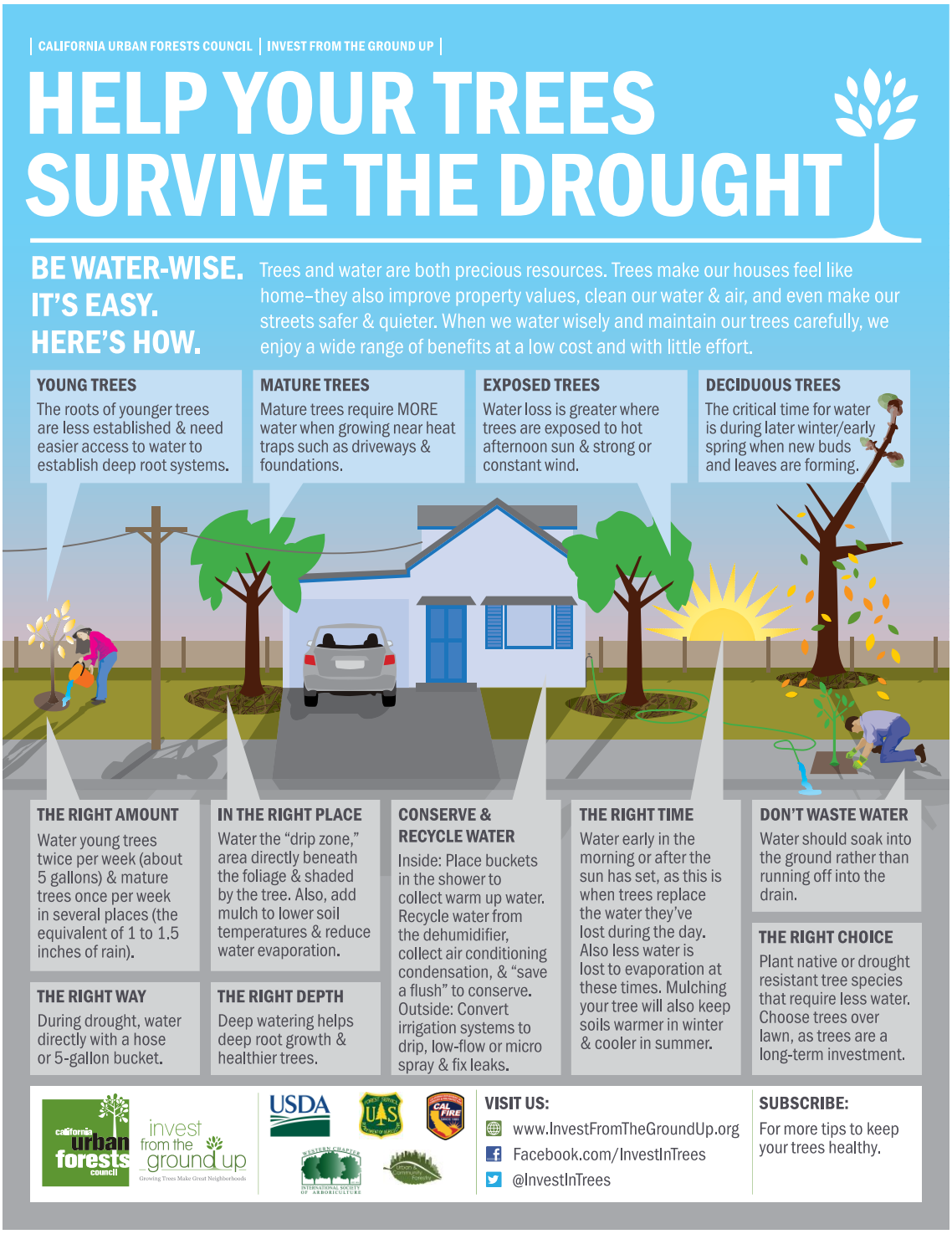

Figure 2. Demonstration infographic. This particular example summarizes the urban forestry tips for droughts. Our infographics will summarize (a) the health/economic arguments for urban forestry investments, and (b) management recommendations for urban foresters based on our study results.

Dr. Jonathan Greenburg (Assistant Professor, University of Illinois at Urbana-Champaign Department of Geography and GIS) runs the Global Environmental Analysis and

Remote Sensing (GEARS) Laboratory at University of Illinois. This lab centers on addressing questions of the impacts of land use/land cover change on vegetated ecosystems using remote sensing data. Research ranges across scales from individual plants to the entire globe, across many terrestrial and aquatic ecosystems, and utilizes state-of-the-art remote sensing imagery including hyperspectral, hyperspatial, multitemporal, thermal, and LiDAR data.

The Kaiser Permanente Northern California Division of Research team: Our team includes a team of researchers from the Division of Research for Kaiser Permanente (KP) Northern California. KP is one of America's leading health care providers and not-for-profit health plans. They currently serve over 10 million members in eight states and the District of Columbia, generating $3.1 billion in revenue annually. This company, and others like it, are potentially powerful drivers of urban and community forestry advocacy and funding. KP currently provides over $2.2 billion in community investments, including $200+ million in grants and donations and $40+ million in community health initiatives. By partnering with KP and demonstrating the potential economic gain for them by investing in urban and community forestry, we have the potential to not only gain a partner in future research studies but also sizeable funding for urban forestry projects.

Dr. Stephen Van Den Eeden (Research Scientist III; Leader of the Environmental Exposures Cores for the Research Program in Genes, Environment, and Health) provides expertise in large-scale health insurance claims datasets. He has been an epidemiologist at the non-profit Division of Research since 1990. He has conducted a wide variety of studies, including those focused on environment and health. He has extensive experience in the use of KP data and data sources, including cost data.

Dr. Charles P. Quesenberry, Jr., PhD, (Biostatistician, Kaiser Permanente Northern California, Division of Research) has been a biostatistician at the Division of Research for over 30 years and leads the Biostatistics Group at the Division of Research. He has provided biostatistical support and guidance on a wide variety of epidemiologic studies and other projects involving large databases, including longitudinal observation studies related to treatment. He has analytic expertise and has numerous publications in the analysis of health cost and cost-effectiveness analyses. He has collaborated with Mr. Ray and Dr. Van Den Eeden in a variety of cost related studies.

Stacey Alexeff, PhD, (Environmental Biostatistician, Kaiser Permanente Northern California, Division of Research) trained at Harvard with a focus on statistics and measurement error in environmental health studies. (Her time will contribute entirely to the cost-share match).

G. Tom Ray, MBA, (Health Economic Biostatistician, Kaiser Permanente Northern California, Division of Research) has been at KPNC for 20 years. He manages cost data at the Division of Research and has published extensively on the cost of illness and cost-effectiveness of health interventions/treatments. He is the Division of Research expert in the use of the Cost Information Management System (CMIS), which is the expenditure database that apportions expenditures for each item of utilization (e.g., a specific outpatient or inpatient visit, a radiological exam, cost of prescription medications, and a surgical procedure).

Consultants: The National Wildlife Federation (NWF) will lead dissemination efforts to policymakers, the general public, and other audiences.

Patrick Fitzgerald, (Senior Director of Community Wildlife, NWF), leads the National Wildlife Federation (NWF) Community Wildlife Habitat program (www.nwf.org/community)

and is a member of the NWF leadership team. He leads outreach efforts to our nearly 300 municipal partners and works closely with our K-12, higher education and other education program teams. Through the Community Wildlife Habitat team, more than 155 cities, towns, counties and neighborhoods partner with NWF to provide pollinator and wildlife habitat throughout their community, raise awareness and educate citizens about pollinators and wildlife, and activate citizens through community service projects and advocacy. Patrick also oversees the Mayor's Monarch Challenge, an effort to engage local municipalities in monarch butterfly conservation. Patrick was previously the Senior Director of Education Advocacy at NWF where he led federal policy efforts to get kids outdoors and advance environmental education and outdoor recreation. Before joining NWF, Patrick was the Director of Governmental Relations for The Corps Network and Jumpstart for Young Children and worked on education policy and federal funding issues for Teach For America.

National Dissemination/Technology Transfer/Project Evaluation

We realize that no matter how strongly our study's results *could* make an argument for the economic and health benefits of urban forestry, its ultimate impact is also strongly tied to messaging and outreach efforts. To this end, we've partnered with a conservation communication professional (Spencer Meyer at Highstead Foundation) to ensure the language and overall design of products used to disseminate our study findings attract potential funders and policymakers. We've also partnered with the National Wildlife Federation to ensure our message directly reaches Capital Hill and less-traditional partners in urban forestry (e.g., homeowner associations and school administrators).

Similar to past projects, we will use a variety of vehicles to reach the primary constituencies relevant to our project – policymakers, the general public, urban forestry practitioners/allies, and scientists/educators. We will measure our success at reaching these audiences using Specific, Measurable, Attainable, Relevant, and Time-Bound (SMART) objectives that will measure the extent to which our study shapes the political climate regarding urban and community forestry. All metrics are at no cost and/or are contributed in-kind. We anticipate this studies' website and resulting products (infographics, one-page fliers, and scientific articles) to be found online through keyword searches for 'public health,' 'reducing health care costs,' 'health care expenditures,' 'disparities in health care,' 'health benefits of nature,' 'urban forestry,' 'green cities,' 'urban nature,' 'access to nature,' 'park prescriptions,' and 'environmental justice.'

Constituency 1: *Policymakers*. It is essential that policymakers across the nation recognize the vital role trees play in urban communities. Here, our targets are state legislators, members of Congress, the United States Department of Education, and the State Departments of Natural Resources, Conservation, and Environmental Protection. One page fliers, appearing as new findings emerge, will keep Congress members and other policymakers up-to-date on the most recent findings. We will funnel these fliers to policymakers via established channels (e.g., U.S. Conference of Mayors, City Parks Alliance, Nextcity, National League of Cities, International City and County Management Association, and CityLab), write press releases for prominent environmental policy news sites (e.g., Greenwire by E&E publishing), and contract the National Wildlife Federal to distribute them directly to congressional offices. Our goal is to send at least 3 emails directly to environmental and health legislative staff on Capital Hill (these include approximate 1,000 individuals who advise and support Members of Congress in making policy decisions in these areas) as well as contact policymakers 3 additional times through the

other channels and press releases listed above. When we send emails, we will provide a link to PDFs of our one-page fliers and infographics, and analyze how many congressional staff download these materials. *Evaluation:* We seek to obtain at least 100 unique downloads from the clickable URLs in the emails sent to Capital Hill by the end of this project. This will demonstrate that policymakers and their staff are actually accessing these products. (We anticipate these groups will also be accessing these products from other sources and channels as described above, so the actual rate of downloads would be much higher).

Constituency 2: *General Public*. Just as policymakers need information demonstrating the importance of urban forests, the public needs to know the economic and health benefits of living in contact with trees. The University of Illinois News and Information Service will continue to assist in putting together press releases and news stories for such vehicles as the New York Times Science section, Chicago Tribune, the Economist, and the Atlantic. In addition, we have amassed a large network of reporters interested in our research; press releases will be emailed to this network as new findings, greening guidelines, and policy recommendations are developed. Our partners will also disseminate one-page fliers at conferences and events and distribute infographics via social media channels to over 500K subscribers. We will also design a professional, mobile-friendly, regularly-updated project website (e.g., www.natureandhealth.org is currently available) that will provide free downloads of our one-page fliers, infographics, and information about our project and its partners more generally (including links that highlight the U.S. Forest Service's urban forestry efforts and NUCFAC). *Evaluation:* We aim for two published articles in national newspapers and one article in a national magazine before the completion of the award timeframe (August 2019). We will calculate the number of total social media shares, tweets, and "likes" at these URLs using a tracker website (e.g., www.sharetally.co) and aim for 100K hits for each online one-page flier within 12 months of online publication. We believe this number is attainable based on our recent general public media releases, for example, Browning's research on nature play in Slate.com received 110K hits from May 2014-2015 [74].

Constituency 3: *Urban and community forestry practitioners and allies*. This project will provide urban forestry practitioners and allies with new ammunition for local issues and funding on how the urban forest enhances human capacities across the lifespan. Our primary targets are State Urban Forestry Coordinators, the State Urban Forest Councils, and public and private urban forestry organizations across the country. Our vehicles of dissemination are our one-page fliers, infographics with design recommendations, and the InVEST modeling tool which will allow forestry and planning professionals who are *working anywhere in the nation* to calculate a return on investment from urban forest investments in their communities. We will distribute fliers nationally and hold workshops/develop tutorials on how to use the InVEST model at conference presentations and roundtables (e.g., SAF, ISA, ACTrees Day, and Partners in Community Forestry), via trade/professional journals articles (e.g., Arbor Day Foundation, Journal of Arboriculture), on LISTSERVs (e.g., UEC, EDRA), via Webinars (e.g., ACTrees, Urban Forest Connections, and City Parks Alliance) and via a YouTube video. *Evaluation:* We will follow-up with participants six months after each event at which we present our study findings (e.g., conference workshops and webinars) or InVEST trainings and invite them to online surveys to measure the extent to which they believed our findings, products, and InVEST model aided in demonstrating the value of urban forestry, securing program funding, and deciding how to maximize their return on investment with urban forestry. We will aim for 75% of respondents indicating findings are helpful and 5 illustrative narratives that describe specific stories of success.

Constituency 4: ***Educators and the scientific community*****.** Scientists and educators concerned with health, urban forests, or both, will need to know new theories, findings, and research methods for documenting the health benefits of the urban forest. Again, conference presentations and articles in academic journals will be the vehicles. *Evaluation:* We will track the number of downloads and cites for peer-reviewed journal articles coming out of this study through scholarly tracking services (e.g., www.researchgate.net and www.webofscience.com). We will aim for 5 cites within 12 months of online access.

Budget Justification

Personnel:

The majority of personnel are working on this project with cost-shared time (Tables 4 and 5).

Table 4. *Time requested/provided by research personnel* [a]

Person	Affiliation	Requested	Matched
Dr. Browning	UIUC		1.8 month in years 1, 2, and 3 (5.4 months total)
Dr. Kuo	UIUC		1.0 months in year 3
Dr. Greenburg	UIUC		.47 months in year 2 and 3 (.94 months total)
Graduate Research Assistant (supervised by Browning)	UIUC		9 months (25%) in year 1
Graduate Research Assistant (supervised by Greenburg)	UIUC	4.5 months (25%) in year 1	
Graduate Research Assistant (supervised by Browning/Kuo)	UIUC	9 months (50%) in years 2 and 3	Tuition remission in years 2-3
Dr. Van Eeden	KPNC Div of Research	1.2 months in year 1	Salary over NIH cap in year 1[b]
Dr. Quesenberry	KPNC Div of Research	.60 months	Salary over NIH cap in year 1[b]
Dr. Alexeff	KPNC Div of Research		.60 months in year 1
Dr. Ray	KPNC Div of Research	2.40 months in year 1	
Ms. Leimpeter	KPNC Div of Research	.24 months in year 1	
Dr. Shan	KPNC Div of Research	.96 months in year 1	

[a]fringe benefits are 29% for KP physician personnel; 41% for non-physician personnel; 44.77% for UIUC faculty, and 6.19% for grad students, [b]the NIH cap of $185,100 per year has been imposed on all applicable salaries at KP.

Table 5. *Budgets requested/provided by partners*

Group	Contact	Contributions	Requested	Matched
Arbor Day Foundation and Alliance for Community Trees	Dana Karcher	• Share results nationally to 3K contacts through printed newsletters and e-newsletters • Facilitate presentations to 200 attendees of the Partners in Community Forestry conference		$15,000
California Department of	Dr. Desiree Backman	• Advise on research design, implementation, analysis, and reporting		$10,000

Health Care Services				
California ReLeaf	Cindy Blain	• Advise on research design and dissemination • Share results to 90+ community organizations • Share results to wide array of partnering organizations • Provide data on urban forestry costs in the study's geographic area		$20,000
California Urban Forests Council	Nancy Hughes	• Assist with creating infographics • Share results to 7 regional urban forestry councils • Share results with other urban forestry partners		$10,000
Friends of the Urban Forest	Doug Wildman	• Provide data on urban forestry costs in the study's geographic area • Assist with analyzing urban forestry data • Present results in community meetings • Share results nationally to 17K contacts through e-newsletters and social media		$40,000
Highstead Foundation	Spencer Meyer	• Advise on communication strategies to use with potential urban forestry funders and policymakers • Advise on research design and implementation • Share results nationally through social networks and at conferences • Document evidence of dissemination efforts being successful at raising funds for urban forestry and land conservation		$15,000
National Wildlife Federation	Patrick Fitzgerald	• Share results nationally through nearly 10K schools, 300 municipalities and homeowner associations (HOAs), 700K individuals, and 20K higher education administrators/student leaders • Share results nationally through webinar • Share results nationally to policy makers on Capital Hill through 3-5 emails to congressional staff members	$11,600	$11,600
Natural Capital Project (Stanford University and University of Minnesota)	Dr. Bonnie Keeler	• Support in creating free model that allows users to quantify and map the impacts of alternative urban forestry designs on health care spending • Allow us to test and model study results in states and cities across the United States and entire world using InVEST platform • Host and maintain InVEST platform which averages over 600 downloads per month with active users in over 80 countries		
State of California Dept. of Forestry and Fire Protection	John Melvin	• Share results to urban forest field specialists • Share results nationally on Urban Forest Ecosystems Institute website at Cal Poly		$10,000
The Trust for Public Land	Breece Robertson	• Advise on GIS and economic analyses • Assist with identification of GIS datasets to verify our findings from LiDAR imagery • Share study results to 10K Twitter and 10K Facebook followers		(up to $5,000)[a]
Paul Scherrer Institute	Dr. Christopher Mutel	• Assist with developing InVEST model		

[a]The Trust for Public Land cost-share is *not* included in the budget below, because the match was secured after our final proposal budget was under review with UIUC Office of Sponsored Programs.

Cost share partners = $131,600
Cost share Kaiser Permanente = $40,089

Other:

- Travel in years two and three, to cover one trip in each year, covering lodging, airfare, per diem, and registration fees for conference travel. Total requested $3,600
- Flyer publication and design in year two, total requested $10,000 for one page briefs
- Publication costs in year three, total requested $3,000
- Website maintenance and design services to serve as a central repository for information about this project and its products (e.g., one-page fliers, infographics, articles, and press releases) in years two and three, total requested $2,000.

Direct budget request UIUC $219,745

Cost share budget UIUC $134,341

- Federal negotiated F&A rate 58.6% at University of Illinois at Urbana-Champaign

Indirect budget request $58,638

Cost share budget UIUC $63,139

Total budget requested from sponsor $278,383
Total *cost share budget match* $369,169

Detailed Budget and Budget Justification for
Non-Profit **Kaiser Permanente Northern California Division of Research**

Category	Request
Personnel Salary	*$64,543*
Personnel Fringe	*$24,489*
Total Personnel	$89,032
Supplies	$1,206
Indirect (Kaiser)	$51,639
Total cost of project	$181,965
Cost-share match (Kaiser)	*$40,089*
Total budget request	**$141,876**

Personnel Overview

- *Salaries.* Salaries of non-physician, physician and staff personnel are based on the Kaiser Division of Research title and pay plan scales, effective April 1, 2015. Range adjustments and cost of living increases have been applied to salary figures, where appropriate.

- *Fringe Benefits.* Physician Personnel 29%; Non Physician personnel 41%

- *NIH Capped Salaries*. The NIH cap of $185,100 per year has been imposed on all applicable salaries.

Pursuant to the Kaiser Division of Research policy, salaries in the initial budget period are based on current published Kaiser Salary rates and include Kaiser mandated range adjustments and merit increases scheduled to occur before the proposed project start date.

Senior / Key Person(s)

Stephen K. Van Den Eeden, PhD, KP Site Principal Investigator, will work directly with Dr. Browning and the other researchers at the University of Illinois and with the KP research team. All study decisions will be joint ones between the Co-PIs in consultation with the co-Investigators. Dr. Van Den Eeden will be involved in all scientific aspects of this study, including all manuscripts that use these data. Dr. Van Den Eeden will be directly responsible for all study activity at Kaiser Permanente Northern California (KPNC). In this capacity, he will supervise the work related to the study at Kaiser Permanente, including ascertainment of included KP members, building the residential history files, geocoding, and linkage of electronic clinical and cost information. He will participate in the regular investigator calls as well as attend at least one in-person meeting. He and his staff will prepare the study operations manual that will provide detailed descriptions and instructions for the collection of all data to fully document the process. Dr. Van Den Eeden will supervise the analysis of the cost data at KP in full

collaboration with Drs. Quesenberry and Browning and the other research team members. Dr. Van Den Eeden and his staff will also prepare material for reports on study progress for the investigators and for progress reports. He will work with Kaiser Permanente's Institutional Review Board and Privacy Office to insure that procedures for the protection for human subjects and the safeguarding of patient confidentiality are strictly followed. He will be responsible for hiring and training of personnel at KPNC. We request 1.2 calendar months (10% FTE) support for the project. Salary support over the NIH cap will be included in the cost sharing portion of the budget.

Charles P. Quesenberry, Jr., PhD, will collaborate with the investigators in the study design. He will formally oversee the cost statistical analysis of this project. We request 0.60 calendar months (5% FTE) support for the project. Salary support over the NIH cap will be included in the cost sharing portion of the budget.

Stacey Alexeff, PhD, will be part of the analytic team at the Division of Research that oversees the final analyses of the cost data. She will contribute to sensitivity analyses related to measurement error of both the exposure (e.g., urban forest/greenspace) and endpoint (costs). Dr. Alexeff's effort on the study (0.60 calendar months or 5% FTE) will be donated and included in the cost sharing portion of the budget.

G. Tom Ray, MBA, will prepare the relevant cost data and work under the supervision of Drs. Van Den Eeden, Quesenberry, Browning and the other research team in the analyses of these data. We request 2.40 calendar months (20% FTE) support for the project.

Other Personnel

Project Manager: Amethyst Leimpeter, MS, will be the Project Manager and will supervise the daily conduct and logistics of the study under the supervision of Dr. Van Den Eeden. Ms. Leimpeter has been a senior project manager for a wide variety of epidemiologic studies for over 15 years, including large cohort studies. As such, she is very familiar with all aspects of KPNC data systems, case identification, and data collection. She will facilitate communication between Drs. Van Den Eeden and Browning, as well as the other investigators and staff, and provide progress reports. Ms. Leimpeter will participate in the regular Investigator study meetings. She will also have primary responsibility of maintaining IRB and HIPAA compliance at Kaiser Permanente. She will work with Dr. Shan on the tracking system. We request 0.24 calendar months (2% FTE) support for the project.

Programmer/Data Analyst: Jun Shan, PhD, will be the primary programmer/analyst for the project. He will be responsible for all programming required for the study including programming systems to identify potential eligible KP subscribers. He will be responsible for managing, cleaning and documenting the KPNC data which will be accumulated as part of this study, including, but not limited to, residential histories, geocoding and abstraction of clinical data. Dr. Shan will also be responsible for linking the environmental (greenspace/urban forest) data prepared by Dr. Browning's team for the final analytic datasets. Dr. Shan will directly maintain the relational databases to be used in this study. He will directly execute the

programming for statistical analyses to be done at KPNC and assist with programming or analysis needed for reports. We request 0.96 calendar months (8% FTE) support for the project.

Other Direct Costs

Materials and Supplies: Based on prior experience with projects of a similar size, we have budgeted general office supplies at 2.0% of personnel costs. This includes digital storage media, computer costs, telephone charges and miscellaneous office items.

Indirect Costs: Per our negotiated indirect cost rate agreement (effective 12/28/2015) indirect costs are calculated at 58% on a base of salary and wages.

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Budget Narrative
Applicant: University of Illinois
Project: *Urban Forestry's Return on Investment - Tying Residential Nature to Health Care Expenditures*

	Federal Funds (requested)	**Non-federal Match Cash / In-Kind**	**Total**	**Source of Matching Funds**
Personnel at University of Illinois	47,669[*]	134,341	182,010	University of IL
Personnel, indirect, and materials/supplies at KPNC	141,876[**]	40,089	181,965	Kaiser Permanente
National Wildlife Federation Policy Campaign	11,600	11,600	23,200	National Wildlife Federation
Personnel, infrastructure, volunteer time from partners		120,000[***]	120,000	Partners
Travel	3,600[^]		3,600	
One-page briefs	10,000[^^]		10,000	
Design services	2,000[^^^]		2,000	
Publication costs	3,000[#]		3,000	
Indirect Applicable Costs [##]	58,638	63,139	121,777	University of IL
Total Cost	**278,383**	**369,169**	**647,552**	

[*]**Personnel Requests and Matches:**

1. Graduate Student #1: 360hrs * $22/hr + fringe and tuition remission ***MATCH***
2. Graduate Student #2: 180hrs * $22/hr + fringe requested; tuition remission ***MATCH***
3. Graduate Student #3: 720hrs * $22/hr + fringe + cost of living increases in years two and three requested; tuition remission in years two and three ***MATCH***
4. Browning: 864hrs * $46/hr + cost of living increases in years two and three ***MATCH***
5. Kuo: 160hrs * $53/hr ***MATCH***
6. Greenberg: 75hrs * $55/hr ***MATCH***

[**]**KPNC Personnel Requests and Matches (in Year One Only):**

1. Van Den Eeden: 208hrs * $103.60/hr + fringe; Salary over NIH cap ($185,100/yr) ***MATCH***
2. Quesenberry: 104hrs * $110.83/hr + fringe; Salary over NIH cap ($185,100) ***MATCH***
3. Alexeff: 104hrs * $62.02/hr + fringe ***MATCH***
4. Ray: 416hrs * $60.10/hr + fringe
5. Leimpeter: 42hrs * $54.62/hr + fringe
6. Shan: 166hrs * $58.75/hr + fringe
7. Materials and supplies: $1,206
8. Indirect costs: 58%

[***]**Partner Matches:**

1. Arbor Day Foundation: $15,000
2. California Dept. of Health Care Services: $10,000
3. California ReLeaf: $20,000
4. California Urban Forests Council: $10,000
5. Friends of the Urban Forest: $40,000
6. Highstead Foundation: $15,000
7. State Dept. of Forestry & Fire Protection: $10,000

[^] **Travel**: Two trips in years two and three at $1,800/trip.

[^^] **One-page Briefs:** Anticipated costs of designing, printing, and distributing 10,000 graphic fliers with summaries of our results.

[^^^] **Design Services:** Anticipated costs of professionally designing and maintaining website.

[#] **Publication Costs:** Anticipated costs of publishing articles in top tier scientific journals.

[##] **University Indirect:** 58.60%

Grant Application Package

Opportunity Title:	2016 National Urban and Community Forestry Challenge Co
Offering Agency:	Forest Service
CFDA Number:	10.675
CFDA Description:	Urban and Community Forestry Program
Opportunity Number:	USDA-FS-UCF-01-2016
Competition ID:	USDA-FS-UCF-01-2016
Opportunity Open Date:	08/25/2015
Opportunity Close Date:	11/23/2015
Agency Contact:	Nancy Stremple Urban Forestry Program Splst E-mail: nstremple@fs.fed.us Phone: 202-205-7829

This opportunity is only open to organizations, applicants who are submitting grant applications on behalf of a company, state, local or tribal government, academia, or other type of organization.

Application Filing Name: Browning_Matthew_v1_USDA_November_23_2015

Select Forms to Complete

Mandatory

Application for Federal Assistance (SF-424)	**Complete**
Assurances for Non-Construction Programs (SF-424B)	**Complete**
Budget Information for Non-Construction Programs (SF-424A)	**Complete**

Optional

Instructions

Show Instructions >>

This electronic grants application is intended to be used to apply for the specific Federal funding opportunity referenced here.

If the Federal funding opportunity listed is not the opportunity for which you want to apply, close this application package by clicking on the "Cancel" button at the top of this screen. You will then need to locate the correct Federal funding opportunity, download its application and then apply.

OMB Number: 4040-0004
Expiration Date: 8/31/2016

Application for Federal Assistance SF-424

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☒ New	
☒ Application	☐ Continuation	* Other (Specify):
☐ Changed/Corrected Application	☐ Revision	

* 3. Date Received:	4. Applicant Identifier:
Completed by Grants.gov upon submission.	

5a. Federal Entity Identifier:	5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:	7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name:	Board of Trustees of the University of Illinois
* b. Employer/Taxpayer Identification Number (EIN/TIN):	37-6000511
* c. Organizational DUNS:	0415440810000

d. Address:

* Street1:	Office of Sponsored Programs
Street2:	1901 S. First Street, Suite A
* City:	Champaign
County/Parish:	
* State:	IL: Illinois
Province:	
* Country:	USA: UNITED STATES
* Zip / Postal Code:	61820-7473

e. Organizational Unit:

Department Name:	Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:		* First Name:	David
Middle Name:			
* Last Name:	Richardson		
Suffix:			

Title:	AVCR/Director
Organizational Affiliation:	Board of Trustees of the University of Illinois
* Telephone Number:	(217)333-2187
Fax Number:	(217)239-6830
* Email:	osp@illinois.edu

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

H: Public/State Controlled Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Forest Service

11. Catalog of Federal Domestic Assistance Number:

10.675

CFDA Title:

Urban and Community Forestry Program

*** 12. Funding Opportunity Number:**

USDA-FS-UCF-01-2016

* Title:

2016 National Urban and Community Forestry Challenge Cost Share Grant Program

13. Competition Identification Number:

USDA-FS-UCF-01-2016

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: IL-013 * b. Program/Project: CA-014

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 08/16/2016 * b. End Date: 08/15/2019

18. Estimated Funding ($):

* a. Federal	278,383.00
* b. Applicant	197,480.00
* c. State	0.00
* d. Local	0.00
* e. Other	171,689.00
* f. Program Income	0.00
* g. TOTAL	647,552.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: * First Name: Walter

Middle Name: K

* Last Name: Knorr

Suffix:

* Title: Comptroller

* Telephone Number: (217)333-2187 Fax Number: (217)239-6830

* Email: osp@illinois.edu

* Signature of Authorized Representative: Completed by Grants.gov upon submission. * Date Signed: Completed by Grants.gov upon submission.

Walter K. Knorr 4/18/16

OMB Number: 4040-0007
Expiration Date: 06/30/2014

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C.§§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U. S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Walter K. Knaus Completed on submission to Grants.gov	Comptroller
APPLICANT ORGANIZATION	**DATE SUBMITTED**
Board of Trustees of the University of Illinois	4/18/16 Completed on submission to Grants.gov

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 06/30/2014

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. 2016 National Urban and Community Forestry Challenge Cost-Share Grant Program	10.675	$	$	$ 278,383.00	$ 369,169.00	$ 647,552.00
2.						
3.						
4.						
5. Totals		$	$	$ 278,383.00	$ 369,169.00	$ 647,552.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
	2016 National Urban and Community Forestry Challenge Cost-Share Grant Program				
a. Personnel	$ 37,920.00	$	$	$	$ 37,920.00
b. Fringe Benefits	2,347.00				2,347.00
c. Travel	3,599.00				3,599.00
d. Equipment					
e. Supplies					
f. Contractual	153,476.00				153,476.00
g. Construction					
h. Other	22,403.00				22,403.00
i. Total Direct Charges (sum of 6a-6h)	219,745.00				$ 219,745.00
j. Indirect Charges	58,638.00				$ 58,638.00
k. TOTALS (sum of 6i and 6j)	$ 278,383.00	$	$	$	$ 278,383.00
7. Program Income	$ 0.00	$	$	$	$

SECTION C - NON-FEDERAL RESOURCES

	(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8.	2016 National Urban and Community Forestry Challenge Cost-Share Grant Program	$ 197,480.00	$ 0.00	$ 171,689.00	$ 369,169.00
9.					
10.					
11.					
12.	TOTAL (sum of lines 8-11)	$ 197,480.00	$	$ 171,689.00	$ 369,169.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 166,711.00	$ 43,748.00	$ 43,747.00	$ 43,747.00	$ 35,469.00
14. Non-Federal	$ 62,724.00	20,908.00	20,908.00	20,908.00	
15. TOTAL (sum of lines 13 and 14)	$ 229,435.00	$ 64,656.00	$ 64,655.00	$ 64,655.00	$ 35,469.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

	(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16.	2016 National Urban and Community Forestry Challenge Cost-Share Grant Program	$ 48,126.00	$ 63,548.00	$ 0.00	$ 0.00
17.					
18.					
19.					
20.	TOTAL (sum of lines 16 - 19)	$ 48,126.00	$ 63,548.00	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: 219745

22. Indirect Charges: 58638

23. Remarks: N/A

Instructions for Certification

1. By signing and submitting this form, the prospective primary participant is providing the certification set out on the reverse side in accordance with these instructions.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out on this form. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

6. The prospective primary participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this form that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

U.S. DEPARTMENT OF AGRICULTURE

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989 Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) have not within a three-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Board of Trustees of the University of Illinois

Organization Name | PR/Award Number or Project Name

Walter K. Knorr

Name(s) and Title(s) of Authorized Representative(s)

Walt K. Knorr | 4/18/16

Signature(s) | Date

Form AD-1047 (1/92)

U.S. DEPARTMENT OF AGRICULTURE

CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS (GRANTS) ALTERNATIVE I - FOR GRANTEES OTHER THAN INDIVIDUALS

This certification is required by the regulations implementing Sections 5151-5160, of the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D; 41 U.S.C. 701 et seq.), 7 CFR Part 3017, Subpart F, Section 3017.600, Purpose. The January 31, 1989, regulations were amended and published as Part II of the MAY 25, 1990, Federal Register (pages 21681-21691). Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the grant.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

Alternative I

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about --

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a):

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notify the agency in writing, within 10 calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position, title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, State, zip code)

506 S. Wright St.

Urbana, IL 61801

Check ☐ if there are workplaces on file that are not identified here.

Board of Trustees of the University of Illinoi

Organization Name | Award Number or Project Name

Walter K. Knorr

Name and Title of Authorized Representative

Walter K. Knorr

Signature

04/18/2016

Date

Instructions for Certification

1. By signing and submitting this form, the grantee is providing the certification set out on pages 1 and 2.

2. The certification set out on pages 1 and 2 is a material representation of fact upon which reliance is placed when the agency awards the grant. If it is later determined that the grantee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

3. Workplaces under grants, for grantees other than individuals, need not be identified on the certification. If know, they may be identified in the grant application. If the grantee does not identify the workplaces at the time of application, or upon award, if there is no application, the grantee must keep the identity of the workplace(s) on file in its office and make the information available for Federal inspection. Failure to identify all known workplaces constitutes a violation of the grantee's drug-free workplace requirements.

4. Workplace identifications must include the actual address of buildings (or parts of buildings) or other sites where work under the grant takes place. Categorical descriptions may be used (e.g., all vehicles of a mass transit authority or State highway department while in operation, State employees in each local unemployment office, performers in concert halls or radio studios).

5. If the workplace identified to the agency changes during the performance of the grant, the grantee shall inform the agency of the change(s), if it previously identified the workplaces in question (see paragraph three).

6. Definitions of terms in the Nonprocurement Suspension and Debarment common rule and Drug-Free Workplace common rule apply to this certification. Grantees' attention is called, in particular, to the following definitions from these rules:

``Controlled substance'' means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

``Conviction'' means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

``Criminal drug statute'' means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, use, or possession of any controlled substance;

``Employee'' means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all ``direct charge'' employees; (ii) all ``indirect charge'' employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if sued to meet a matching requirement; consultants or independent contractors not on the grantee's payroll; or employees of subrecipients or subcontractors in covered workplaces).

CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

* APPLICANT'S ORGANIZATION	Board of Trustees of the University of Illinoi
* PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
Prefix:	
* First Name:	Walter
Middle Name:	K
* Last Name:	Knorr
Suffix:	
* Title:	Comptroller
* SIGNATURE:	
* DATE:	4/18/16

This form is available electronically.

Form Approved – OMB No. 0505-0025
Expiration Date: 12/31/2012

AD-3030 U.S. DEPARTMENT OF AGRICULTURE

REPRESENTATIONS REGARDING FELONY CONVICTION AND TAX DELINQUENT STATUS FOR CORPORATE APPLICANTS

Note: You only need to complete this form if you are a corporation. A corporation is any entity that has filed articles of incorporation in one of the 50 States, the District of Columbia, or the various territories of the United States including American Samoa, Federated States of Micronesia, Guam, Midway Islands, Northern Mariana Islands, Puerto Rico, Republic of Palau, Republic of the Marshall Islands, or the U.S. Virgin Islands. Corporations include both for profit and non-profit entities.

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. 552(a), as amended). The authority for requesting the following information for USDA Agencies and staff offices is in §738 and 739 of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2012, P.L. 112-55 and subsequent similar provisions. The information will be used to confirm applicant status concerning entity conviction of a felony criminal violation, and/or unpaid Federal tax liability status.

According to the Paperwork Reduction Act of 1985 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0025. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

1. APPLICANT'S NAME	2. APPLICANT'S ADDRESS *(Including Zip Code)*	3. TAX ID NO. *(Last 4 digits)*
Board of Trustees of the University of Illinoi	506 S. Wright St. Urbana, IL 61801	0511

4A. Has the Applicant been convicted of a felony criminal violation under Federal or State law in the 24 months preceding the date of application? ☐ YES ☑ NO

4B. Has any officer or agent of Applicant been convicted of a felony criminal violation for actions taken on behalf of Applicant under Federal or State law in the 24 months preceding the date of application? ☐ YES ☑ NO

4C. Does the Applicant have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability? ☐ YES ☑ NO

Providing the requested information is voluntary. However, failure to furnish the requested information will make the applicant ineligible to enter into a contract, memorandum of understanding, grant, loan, loan guarantee, or cooperative agreement with USDA.

PART B – SIGNATURE

5A. APPLICANT'S SIGNATURE (BY)	5B. TITLE/RELATIONSHIP OF THE INDIVIDUAL IF SIGNING IN A REPRESENTATIVE CAPACITY	5C. DATE SIGNED *(MM-DD-YYYY)*
Walter K. Knorr	Walter K. Knorr / Comptroller	4/18/16

The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Assistant Secretary for Civil Rights, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, S.W., Stop 9410, Washington, DC 20250-9410, or call toll-free at (866) 632-9992 (English) or (800) 877-8339 (TDD) or (866) 377-8642 (English Federal-relay) or (800) 845-6136 (Spanish Federal-relay). USDA is an equal opportunity provider and employer.

Landscape and Human Health Laboratory

Frances E. "Ming" Kuo, Director
1101 W. Peabody Drive
Urbana, IL 61801
217 244-0393
fekuo@illinois.edu

December 2, 2015

Matt Browning, Ph.D.
College of Agricultural, Consumer, and Environmental Sciences
227 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801

Re: letter of support for NUCFAC proposal 2016

Dear Matt:

I am writing to confirm my interest in, and commitment to, documenting the impacts of the urban forest on health care expenditures with you and our colleagues here at UIUC and at Kaiser Permanente Northern California. I sincerely believe that this project has the potential to provide the single most powerful argument for investments in urban forestry. Of all the ecosystem services tied to the urban forest, the impacts on health have been by far the most compelling to policy makers and the general public, and translated into dollar terms, these health impacts promise to yield financial returns which simply dwarf the economic value of other ecosystem services, and because of the staggering costs of health care in this nation, perhaps all other ecosystem services combined.

The Landscape and Human Health Lab has been responsible for some of the widely cited and shared findings in the nature benefits literature. Our NUCFAC-funded findings on social ties, aggression, violence, crime, and Attention Deficit/Hyperactivity Disorder have been shared via newspaper, magazine, television, radio to audiences in the hundreds of millions – for example, a single recent article in *AARP The Magazine* reached the American Association of Retired People's 47 million readers. My Lab's findings were credited by the *Chicago Tribune* as prompting the City of Chicago's single largest tree planting – a $10 million dollar investment in urban forestry. And my Lab's outreach efforts have successfully reached the US Conference of Mayors, and Capitol Hill, as well as local, regional, and federal agencies. Although my work was sidelined by major medical issues for a handful of years, I, my Lab and my work are now thriving, and we stand ready and eager to help conduct compelling, high-impact research to drive urban forest policy, funding, and practice. As always, my commitment to this work is such that I am donating my time to it. I think this has the potential to be a simply spectacular project, and am eager to join you in bringing it to fruition. .

Sincerely,

Frances E. "Ming" Kuo, Ph.D.
Director, Landscape and Human Health Laboratory
Associate Professor,
Department of Natural Resources & Environmental Sciences
Department of Psychology

1 December 2015

Department of Geography and Geographic Information Science
University of Illinois at Urbana-Champaign
259 Computing Applications Building, MC-150
605 East Springfield Avenue
Champaign, IL 61820-6371

Re: Commitment letter to 2016 USFS NUCFAC pre-proposal

Dear Dr. Browning,

I am pleased to send this letter demonstrating my deep interest in partnering with you and our UIUC colleagues and other partners on the proposed project: Urban Forestry's Return on Investment. I see this as a valuable and exciting opportunity to join a broad spectrum of researchers and partners to collaboratively tie health care cost expenditures to urban forestry components.

As a partner on this effort, I will provide a variety of functions throughout the grant period including LiDAR data analysis, and I am aware of and agree to all of these commitments. I agree, as well, to the match of my time [.47 months in year one) and effort (e.g., overseeing a graduate student assistant for 4.5 months in year one in my department) toward this project.

I look forward to working with you to realize these goals.

Sincerely,

Jonathan Greenberg

KAISER PERMANENTE®

Stephen K. Van Den Eeden, Ph.D.
Division of Research

11 April 2016

David W. Richardson, AVCR/Director
Office of Sponsored Programs
1901 S. First Street, Suite A
Champaign, IL 61820-7406

Dear Mr. Richardson,

I am writing in enthusiastic support of our full (revised) proposal to be submitted by the University of Illinois (UofI) entitled "**The Next Step: Building a better understanding of the relationship between urban and community forestry and human health**". I will be part of the Investigator team leading the research with Dr. Matthew Browning and others at the (UofI). I believe the collaboration between the expertise of Dr. Browning and the team there with our expertise and data in health-related endpoints, including costs will be a unique contribution to the science of greenspace and health. My training and career as an epidemiologist will make a nice complement for the research team. In addition, my 25 years here at KPNC allows me to fully understand our population and our data. Our team here includes expertise in costs analysis and large health datasets.

We have developed the revised proposal it in response to the critiques we obtained. The work was done collaboratively and I fully believe the study has great merit to elucidate how greenspace may affect health care costs. My team will link the greenspace data with the costs data to create an analytic dataset. We will work collaboratively in the analysis of the data to examine if there is an association and, if so, what factors may help explain it.

The Kaiser Permanente Northern California (KPNC) membership includes over 3.8 million individuals. Our membership is 25-30% of the geographic population and thus is representative of the underlying population (as well as reflecting the diversity of the United States) on a wide range of socioeconomic characteristics. The integrated nature of the KPNC delivery system and comprehensive care we provide translates into unparalleled opportunities for studies such as the one we are proposing.

We estimate that the cost for the research at KPNC will cost $181,965, of which $40,089 will be in the form of contributions in-kind or cost-sharing from KPNC. The requested amount is therefore $141,876 ($90,237 in direct costs and $51,639 in indirect costs). Our cost-sharing reflects organizational contributions in salary support, database access and database infrastructure support.

The work here will comprise the following effort and constitutes the Statement of Work:

1) Obtain appropriate subcontracts with prime institution.
2) Obtain IRB approval for stated work.
3) Identify specific geographic boundaries for the areas that will be used in the study.
4) Identify the cohort of KPNC members living in the study geographic area.
5) Ascertain all health care utilization for the included cohort.
6) Determine the specific health costs to be included in the study.
7) Retrieve all relevant health costs for each individual in the study.

8) Merge the environmental data with the individual level health utilization data and health costs.
9) Conduct analyses estimating the association between green space and health costs.
10) Participate in regular study meeting calls.
11) Prepare reports as necessary.
12) Prepare presentations for funding agency and scientific meetings.
13) Prepare manuscripts related to the study.
14) Prepare material for Final Report.
15) Execute study closure procedures at KPNC.

I very much look forward to working together on this important project.

Sincerely,

Stephen K. Van Den Eeden, PhD
Research Scientist III, DOR, KPNC
Adjunct Professor, UCSF

December 2, 2015

Dr. Matthew Browning
Assistant Professor
Department of Recreation, Sport and Tourism
University of Illinois
104 Huff Hall (MC-584)
1206 South Fourth Street
Champaign, IL 61820

Dear Dr. Browning,

On behalf of the non-profit Arbor Day Foundation, we are pleased to offer our support for your application for a NUCFAC grant. We believe this potential project is ground breaking and appreciate your willingness to work with the Friends of the Urban Forest in San Francisco, and engage members of the Alliance for Community Trees, a program of the Arbor Day Foundation.

Arbor Day, and our program Alliance for Community Trees, can support you with $15,000 of in kind services. This includes contributed salary time as well as other potential avenues for imparting the information, not only to Alliance members, but to the general urban forestry community throughout the United States. At this time, we can commit to a nationwide reach to non-profit groups and stakeholders through "Treebune" news, our bi-weekly eblast newsletter with the latest in urban forestry information. It has a distribution of almost 3000 email addresses to groups, individuals, and urban and community forestry stakeholders throughout the United States. Additionally, we will strongly consider hosting a webinar through our Alliance for Community Trees webinar program. Attendance at those events numbers greater than 200 interested persons. Lastly, we will consider your proposal to speak at our annual conference, Partners in Community Forestry, held in 2016 in Indianapolis. This nationwide outreach will support the integral and important grant component of reaching audiences across the US.

Thank you for the opportunity to support you and your colleagues in this important urban forestry research. Arbor Day Foundation is both excited and honored to share your results with our thousands of stakeholders across the country.

Sincerely,

Dana Karcher

Dana Karcher
Program Manager
Alliance for Community Trees

NATIONAL WILDLIFE FEDERATION

11100 Wildlife Center Drive • Reston, VA 20190 • 703.438.6000 • www.nwf.org

April 8, 2016

Matthew H E M Browning, Assistant Professor
Department of Recreation, Sport and Tourism
University of Illinois
104 Huff Hall (MC-584), 1206 South Fourth Street
Champaign, IL 61820

On behalf of the National Wildlife Federation (NWF) and our six million members and supporters nationwide, we are writing to express our support for your research proposal, titled "Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures."

We believe that this research and the projects' findings will be valuable to many NWF programs and our partners, including municipalities, K-12 schools, universities, urban wildlife gardeners and legislators. The municipal and community leaders and teachers that work with NWF to increase urban tree canopy and create community and school gardens will be eager to learn more about this project and its findings. We are seeking $11,600 over three years ($3,867/ year) in grant funding for NWF to support this research by facilitating outreach to our networks. NWF is pledging an additional $11,600 of cash match. Both the grant support and match will support the salary of our Senior Director of Community Wildlife who will conduct the outreach.

Specifically, NWF will help disseminate information about the research and findings through emails, newsletters, our Wildlife Promise blog, social media and possibly *National Wildlife* magazine (readership of 500,000). Our reach includes a network of 50 independent, non-profit state affiliates, nearly 10,000 K-12 schools implementing our Schoolyard Habitats or Eco-Schools USA programs, more than 300 municipalities and homeowners associations participating in our urban gardening and forestry programs, nearly 200,000 individuals that have certified their yard with the National Wildlife Federation's Certified Wildlife Habitat program, more than 500,000 wildlife gardeners that we reach through Facebook and email, at least 20,000 individuals that plant seedlings through NWF's Trees for Wildlife program and more than 20,000 individuals that are part of NWF's Campus Ecology email list which reaches college and university administrators, student leaders and others.

NWF will also facilitate an online presentation or webinar about the research to be presented to the NWF Community Wildlife Habitat program network which includes municipal arborists, sustainability directors, mayors and homeowners' associations landscaping committees. NWF will also help to inform policy makers on Capitol Hill about the project by distributing information through email to relevant Congressional staff members. We are excited to support this project and share the results of this study with hundreds of thousands of decision makers and individuals across the nation.

Sincerely,

Patrick Fitzgerald

Patrick Fitzgerald
Senior Director of Community Wildlife
National Wildlife Federation

Inspiring Americans to protect wildlife for our children's future.

THE TRUST FOR PUBLIC LAND

National GIS Office
607 Cerrillos Road
Suite F-1
Santa Fe, New Mexico 87505

(505) 988-5922

www.tpl.org

April 15, 2016

Matt Browning, Ph.D.
University of Illinois at Urbana-Champaign
Department of Recreation, Sport and Tourism
104 George Huff Hall, 1206 S 4th St
Champaign, IL 61820

Dear Dr. Browning

I am writing to express my interest in and support for the proposed project, *Urban forestry's return on investment: Tying residential nature to health care expenditures* to be submitted to the U.S. Forest Service and National Urban and Community Forestry Advisory Council. This sounds like a very unique and important project with national applicability for our work at The Trust for Public Land.

As this time, our GIS and Conservation Economics staff at TPL can contribute up to $5,000 of in-kind staff resources to contribute to this project. The scope of our work will entail:

- Participate in advisory board conference calls throughout project (estimated at one to two hours, twice per year, for years one, two, and three), in particular regarding GIS and economic analyses and interpretation of results, modeling for the Natural Capital InVEST model, and review of conservation economic metrics with our staff specialist, Jessica Sargent;
- Assist with the identification and use of GIS datasets (e.g., Bay Area Protected Area Database) that would verify and augment the analytical dataset your team creates;
- Share through social media the project's infographics and findings associated with TPL's nation-wide 10-minute walk to a park and public health initiative;
- Share evidence provided through your project that show that the findings actually led to greater investments in conservation/urban forestry for TPL or partners;
- Contribute to and review scientific manuscripts for publication.

The Trust for Public Land is a leader in "land for people" conservation nationwide. We work from the main streets to the mountain tops. Our nationally award-winning GIS team brings over 15 years of experience in developing and delivering conservation planning methodologies to cities, counties and landscapes across the United States. Our Conservation Economics team prepares economic benefit and ROI reports on conservation values to communities and is considered a thought leader in this area. We are confident that our skills and experience will provide insight and support to this project and we are excited to use the findings in our own work to further the cause for park, open space and "green" development nationwide.

We eagerly anticipate collaborating on this project. Should you have any questions about my interest/partnership in this project, please feel free to contact me at breece.robertson@tpl.org or 505-988-5922.

Sincerely,

Breece Robertson

National GIS Director

DHCS
JENNIFER KENT
DIRECTOR

State of California—Health and Human Services Agency
Department of Health Care Services

EDMUND G. BROWN JR.
GOVERNOR

December 1, 2015

Desiree Backman, DrPH, MS, RD, Chief Prevention Officer,
California Department of Health Care Services
Program Director, Institute for Population Health Improvement, University of California, Davis
1501 Capitol Avenue, Suite 71.6129
Sacramento CA, 95814

Dear Dr. Browning:

It is with great enthusiasm that I express support for your research proposal, titled *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures*. As the Chief Prevention Officer of the California Department of Health Care Services, Program Director with the University of California, Davis Institute for Population Health Improvement, and former Deputy Director of the Sacramento Tree Foundation, I understand the many contributions that our urban forest has on population health. In fact, while at the Sacramento Tree Foundation, I secured a CalFIRE grant to investigate the relationship between tree canopy cover and physical, social, and mental health behaviors and outcomes among adults, adolescents, and children in the six-county Sacramento region.

I plan to support your research project by serving on your advisory committee and offering advice on your research design, implementation, analysis, and reporting at an in-kind value of $10,000. I hope your proposal receives full funding, and I'm looking forward to being involved in this important investigation.

Sincerely,

Desiree Backman, DrPH, MS, RD
Chief Prevention Officer
Program Director

Office of the Medical Director
PO Box 997413, MS 0000, Sacramento CA, 99899-7413
Desiree.Backman@dhcs.ca.gov // 916-440-7628
Internet Address: http://www.DHCS.ca.gov

December 1, 2015

Matthew H E M Browning
Department of Recreation, Sport, and Tourism
University of Illinois
1206 S 4th Street
Champaign, IL 61820

Dear Dr. Browning,

California ReLeaf is dedicated to expanding, enhancing, and preserving California's urban and community forests through the empowerment of grassroots efforts. We do this through a variety of programs, including:

- Coordinating the ReLeaf Network, an alliance of over 90 community-based organizations
- Building strategic partnerships with government, the research community, the green industry, and environmental justice coalitions
- Educational outreach to the public
- Administration of urban forestry grant programs in cooperation with of the Department of Forestry and Fire Protection
- Advocacy regarding important urban forestry issues and policies

An outstanding strategic partner is the University of Illinois: not only does our Network rely on the University's ground-breaking research and their user-friendly presentations of the science at conferences in California, one of the University professors, Dr. William Sullivan, also supported a local research project on health and urban greening in Sacramento. California ReLeaf is very pleased to have the opportunity to partner again with the University of Illinois and Dr. Sullivan's colleagues, including yourself, Drs. Frances Kuo and Jonathan Greenberg, as part of your NUCFAC grant application for their research project on human health and urban greening.

Other project partners are equally impressive: we are proud to count the Friends of the Urban Forest as a strong Network member dedicated to leading edge innovation while Dr. Desirée Backman of the UC Davis Institute for Population Health brings a wealth of urban forest and public health expertise to this research effort. Dr. Backman is the former Deputy Director of the Sacramento Tree Foundation and a California ReLeaf Board Member. The involvement of this superlative team ensures that this project is an excellent choice for funding with your grant program while aligning completely with the second NUCFAC Action Plan Goal of "Promoting the Role of Urban and Community Forestry in Human Health and Wellness."

To support the implementation of this important project, California ReLeaf will provide in kind services with a value of $20,000 to help match the funding for this project. Our services will be an integral and necessary part of this proposal. We will provide access to numerous stakeholders and data distribution strategies not otherwise obtainable by the University of Illinois.

We believe this project will have national impact and know many other organizations (current and future partners) who will work toward transferring the results across the nation. Our in kind services will include educational

outreach to our statewide Network of 90+ community organizations as well as to our wide array of partners in California, representing public health, environmental and social justice, urban planning, green industry and governmental agencies - many of whom have affiliations nationwide. The in kind services will also include advisory consultation with respect to the implementation of the project based on experience with the Sacramento Tree Foundation's Green Prescription project which was jointly funded by the USDA Forest Service Region 5 and the California Department of Forestry and Fire Protection.

I urge the funding agency to help advance the population health connection to the urban forest by supporting this research project. The human health connection is one of the most promising avenues for gaining greater recognition of the value of trees in our communities.

If you have any questions, please don't hesitate to contact me at (916) 497-0034 or cblain@californiareleaf.org.

Sincerely,

Cindy Blain
Executive Director

December 1, 2015

Matthew H E M Browning
Assistant Professor
Dept of Recreation, Sport & Tourism
University of Illinois
104 Huff Hall (MC-584)
1206 South Fourth St.
Champaign, IL 61820

RE: Urban forestry's return on investment: Tying residential nature to health care expenditures - grant submittal

Dear Matthew,

The California Urban Forests Council (CAUFC) envisions thriving and prosperous California communities transformed by healthy trees and green spaces. We advance smart investment in urban and community trees, parks, and green spaces through education and outreach, community-based activities, and collaborative action.

Thank you for reaching out to us to support the implementation and outcomes of the "Urban forestry's return on investment: Tying residential nature to health care expenditures" grant submittal through in-kind participation. We are happy to be part of this important work and con contribute in the following ways to meet the goals of the project:

- CaUFC has a network of seven regional councils across California; Bay Area, Central Coast, Inland Empire, Los Angeles/Orange County, San Diego, Sacramento Valley, and San Joaquin Valley. The Regional Councils bring professional expertise and experience to communities throughout the state through local events which help communities develop and expand urban forests and local advocacy efforts. We can work through and with these councils to both gather and disseminate information as is needed.

- Through our outreach and public policy efforts we work with local, state, and national leaders to improve public policy and support for urban and community forestry, as well as to continue existing and create new public funding sources for the enhancement and maintenance of our trees and green spaces. This can be an avenue for information sharing if appropriate.

- We focus on building a strong coalition; we work with other statewide organizations such as the Western Chapter of the International Society of Arboriculture and California ReLeaf. We work together, through our Invest From

the Ground Up campaign projects, on education and support for local urban and community forest efforts, and community-base education and outreach efforts to build unified local collaborations to address issues, and opportunities for positive change.

We are in a position at this time to commit $10,000 in matching/in-kind funds to this project utilizing the opportunities captured above over the course of the project but as needed in a more focused manner as well. Also, our Communication's Manager is in a position to craft remarkable infographics to support the efforts if desired.

Please let me know if you would like more information and we look forward to working on this worthy project.

Sincerely,

Nancy J. Hughes
Executive Director

FRIENDS OF THE URBAN FOREST
GREENING SAN FRANCISCO
1007 General Kennedy Ave Ste 1, San Francisco, CA 94129-1405

November 30, 2015

Dr. Matthew Browning
University of Illinois at Urbana-Champaign
Department of Recreation, Sport and Tourism
104 George Huff Hall, 1206 S 4th St
Champaign, IL 61820

Dear Dr. Browning,

On behalf of the Friends of the Urban Forest, please accept this letter of support of the University of Illinois at Urbana-Champaign 2015 USFS NUCFAC pre-proposal. It is our understanding that this grant would enable research that identifies how specific urban forestry components correlate with objective measures of human health in San Francisco with implications for across the United States.

As a small urban forestry non-profit, the Friends of the Urban Forest (FUF) helps individuals and neighborhood groups plant and care for street trees and sidewalk gardens in San Francisco. FUF helps the City of San Francisco with critical urban forestry services and maintains close relationships with all city departments. Having data and results on how we can get our biggest bang for the buck in regards to improving the health of the Bay area would be tremendously helpful. Also, having objective measures to back up our claims would help us secure additional funding and promote urban forestry awareness and legitimacy in the communities in which we work. There has been some great work done in this field, including studies by Dr. Francis Kuo whom we understand will be working with you on the grant. However, there is much more work to be done. What we need is innovative methodologies to examine urban forestry on a much finer detail than has previously been conducted. We appreciate Dr. Browning and his team attempting to conduct such crucial research that would have direct benefit to our organization, and we believe, community and urban forestry organizations more broadly.

Friends of the Urban Forest will provide data, data analysis and in-kind services with a value of $40,000 to help match the funding of this project. These in-kind services include presentation of the findings in community meetings, monthly e-newsletters reaching over 17,000 addresses, Facebook postings which have nearly 6,000 'liking our organization' and over 2,000 Twitter followers. This data and services are necessary and crucial to the success of this project and in its dissemination of the findings.

Please feel free to contact me if you need additional information regarding our support of this USFS NUCFAC pre-proposal.

Sincerely,

Doug Wildman, Program Director
doug@fuf.net
Office: 415-268-0781

DEPARTMENT OF FORESTRY AND FIRE PROTECTION
Urban & Community Forestry Program
P.O. Box 944246
Sacramento, CA 94244-2460
(916) 657-2289
(916) 653-8957 fax
Website: www.fire.ca.gov

April 11, 2016

Matt Browning, Ph.D.
University of Illinois at Urbana-Champaign
Department of Recreation, Sport and Tourism
104 George Huff Hall, 1206 S 4th St
Champaign, IL 61820

REF: 2016 NUCFAC Proposal

To whom it may concern:

I am pleased to send this letter regarding the importance of further research looking at the relationship between urban forestry and public health. We, as urban foresters, need more of this type of work. Particularly work using datasets with objective (not self-report) health-related measures and outcomes, such as the *actual* health care expenditure dataset from Kaiser Permanente which I understand will be a central and unique part of this proposal. I cannot endorse any given NUCFAC proposal, because we are not privy to the full range of projects proposed in this round of funding. However, I feel confident in saying that urban foresters of all backgrounds *nationally* would warmly receive any health benefits of nature study very positively, and they have discussed your study in a recent national call and were particularly interested in it.

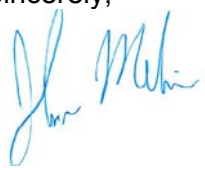
The mission of the CAL FIRE Urban & Community Forestry Program is to lead the effort to advance the development of sustainable urban and community forests in California, thereby providing energy conservation, reduction of storm-water runoff, extensions of the life of surface streets, improving local air, soil and water quality, reducing atmospheric carbon dioxide, providing wildlife habitat, increasing property values, and improving public health. In short, we strive to improve the quality of life in our urban environments which, increasingly, are where people live, work, and play.

We are in a position at this time to commit $10,000 in matching/in-kind funds to this project focused on helping spread the study findings utilizing our network of Urban Forest Field Specialists across the state, our network of Urban Forestry Advisory Committee members, and other means. We are particularly well-suited to distribute the online one-page flier and social media infographics of the study results through our own website as well as potentially our partner's sites (e.g., Urban Forest Ecosystems Institute at Cal Poly). These partners include those traditionally associated with urban forestry programs and others, such as other state agencies, non-profit organizations, private urban forestry and arboricultural companies, power and utility companies, cities, counties, special districts, and professional organizations. While we are primarily a California-focused agency, our efforts are often recognized nationally. As such, our partnership will help this project have impact across the United States.

I also wanted to mention that I believe it smart and efficient to conduct a large-scale study in California. We have one of the, if not the, most diverse states in the nation both environmentally and demographically. The findings you (or other researchers) find in our state are likely generalizable in many cities and towns across the country.

I hope NUCFAC is able to fund significant public health and urban forestry research projects this year, such as yours.

Sincerely,



JOHN MELVIN
Forester II, State Urban Forester

Highstead

April 8, 2016

Dr. Matthew Browning
University of Illinois at Urbana-Champaign
Department of Recreation, Sport and Tourism
104 George Huff Hall, 1206 S 4th St
Champaign, IL 61820

Dear Dr. Browning:

On behalf of Highstead Foundation, I am pleased to write in support of your research proposal, *Urban Forestry's Return on Investment*, submitted to the U.S. Forest Service and National Urban and Community Forestry Advisory Counci. Highstead's mission is to conserve the forested landscape of New England through science, sound stewardship, and collaboration with partners. As Senior Conservationist for conservation finance at Highstead, my specific role is work with academic and NGO partners to advance strong economic cases for advancing land and forest conservation. One way in which we are doing this is through exploring the public health-forest conservation nexus.

Recent research in Connecticut has shown huge economic benefits associated with reduced chronic diseases for people living within close proximity to parks and open space. We are keenly interested in expanding this work regionally. To do so, we need the additional clarity, both in terms of the specific healthcare expenses, and longitudinal socio-economic factors that your proposed study will provide. I feel your study will lay the groundwork for showcasing the science-based economic valuation of forests as a major contributor to public health, and will help attract public and private funders to make new investments in conservation for the health benefits.

I am eager to engage in the project in the following ways:

1. Serve as a member of the project advisory board;
2. Help refine and research questions and analytical approaches;
3. Contribute to development and review of scientific papers;
4. Help develop the business case for funders interested in the public health-conservation nexus;
5. Assist develop of communications and help disseminate outputs summarizing key findings;
6. Document how outputs from this project lead to new investments in conservation and urban forestry.

Highstead is happy to provide an in-kind contribution of $15,000 in salary for my involvement in the project over the three-year project duration. I am excited that you have sought to conduct this ambitious and important study and am delighted to be a part of it. Thank you for the opportunity to contribute.

Sincerely,

Spencer R. Meyer

Spencer R. Meyer, PhD
Senior Conservationist
Highstead Foundation

UNIVERSITY OF MINNESOTA

Institute on the Environment

325 LES Bldg
1954 Buford Avenue
St. Paul, MN 55108
612-626-9553

April 6, 2016

Dear National Urban and Community Forestry Challenge Cost-Share Grant Program Review Panel and Program Officers,

I am writing to express the support of the Natural Capital Project for the proposal that University of Illinois at Urbana-Champaign University is submitting to the U.S. Forest Service entitled *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures* led by Drs. Browning, Kuo, Greenburg, and Van Den Eeden.

The Natural Capital Project (NatCap) is a partnership combining research innovation at the University of Minnesota and Stanford University with the global reach of conservation science and policy at the Nature Conservancy and the World Wildlife Fund. NatCap has 10 years of experience developing tools and approaches that assess where and when nature-based solutions will deliver the greatest benefits to people and biodiversity. A core outcome of the project is the free and open-source Integrated Valuation of Environmental Services and Tradeoffs (InVEST) platform. InVEST is used officially in planning by governments and other leaders worldwide, averaging over 600 downloads per month with active users in over 80 countries. The project and associated software is supported by a dedicated software development team, an active user forum, online user guides, an online and in-person training and capacity building program, and hundreds of peer-reviewed publications using or citing our work.

The proposed work by the University of Illinois at Urbana-Champaign is of particular interest to the Natural Capital Project because it aligns with a new initiative supported by NatCap called "Urban-InVEST". The goal of Urban-InVEST is to promote more livable and sustainable cities through strategic and cost-effective investments in green infrastructure. To support this initiative we are building on our existing InVEST data and modeling platform to provide information and analytics of particular interest to developers, lenders, municipal governments, consultants and advocacy groups working on urban design and planning. Urban-InVEST features spatially explicit biophysical and economic models that enable users to quantify and map the impacts of alternative urban designs on multiple urban ecosystem services, showing the benefits and costs to households and communities by socioeconomic status and vulnerability. We see the proposed research as having potential to contribute to this open source software platform by developing new models and tools to understand the value of green space for community health and wellbeing. The project builds upon existing Natural Capital Project resources of over $1 million USD committed to the project by the University

of Minnesota with over $5 million committed by Stanford University and NatCap partners. The research and tool development proposed in the work plan leverages software and science resources committed by NatCap and partners including work on data hosting, core geoprocessing libraries, capacity building and training, and economic valuation.

Sincerely,

Dr. Bonnie Keeler
Lead Scientist, Natural Capital Project
University of Minnesota
Institute on the Environment

PAUL SCHERRER INSTITUT

11. April, 2016
5232 Villigen PSI
Switzerland

Telephone +41 (0)56 310 5787
E-mail christopher.mutel@psi.ch

Matthew H E M Browning, Assistant Professor
Dept. of Recreation, Sport and Tourism
Univ. of Illinois
104 Huff Hall (MC-584)
1206 South Fourth St.
Champaign, IL 61820

Dear Dr. Browning:

Thank you for offering the opportunity to contribute to your project proposal entitled Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures submitted to the U.S. Forest Service. This sounds like an exciting project with a high probability for international applicability for ecosystem modeling and urban planning.

We are willing to consult on an as-need basis as you develop and integrate your health care expenditure model for NatCap InVEST.

At the Paul Scherrer Instititut, we have been doing spatial environmental modelling and assessment for over 20 years, and I have focused my PhD and subsequent research on working with and integrating GIS techniques into larger models for environmental and life cycle assessment. I have authored a number of different open-source spatial assessment software libraries, including Brightway (https://brightwaylca.org/, https://brightway2-regional.readthedocs.org/en/latest/), Pandarus (https://bitbucket.org/cmutel/pandarus), and Constructive Geometries (https://bitbucket.org/cmutel/constructive-geometries). In our work, we have used SQL, Python Javascript, Fortran, and shell scripting, and have chaired working groups on best practices for spatial datasets, data models, and data interoperability.

Please feel free to contact me if you have any questions. We believe in this project, and in particular in its ability to do cost-effective environmental interventions such as urban forestry for improving quality of life and public health.

Yours sincerely,

Chris Mutel, PhD

PAUL SCHERRER INSTITUT

School of Environmental and Forest Sciences

UNIVERSITY of WASHINGTON

College of the Environment

April 14, 2016

Dear National Urban and Community Forestry Advisory Council,

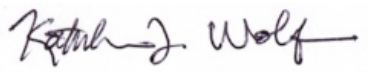
I am pleased to send this letter of support regarding Dr. Browning and colleagues' proposed project, *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures* to the U.S. Forest Service and the National Urban and Community Forestry Advisory Council.

My recent article published in *Urban Forestry & Urban Greening* (Wolf et al., 2015) demonstrates how urban greening likely provides billions of dollars in return on investment in urban forestry and urban greening. However, no study to date has been able to tie actual health care costs with urban natural and built environments. I sincerely hope the Council strongly considers funding this project, as it has great potential to move the field forward in terms of presenting cause-and-effect arguments for the relationship between nature and health, and increasing awareness of and funding for urban and community forestry across the country.

As a researcher of the health and economic benefits of urban greening, I am particularly supportive of this project as it addresses a number of the limitations that my colleagues and I revealed in our UFUG article about the state of urban greening and health economics knowledge. First, the project's selection of Northern California as a study site will generalize modeling to communities across the United States due to the great socio-demographic and biological/ecological diversity of this study region. Second, the project uses and LiDAR high-resolution imagery rather than small sampling frames and coarse, less-telling geospatial techniques used in past research. Third, the project is using actual data on health care costs rather than estimates and these original data are being provided by a highly respected health insurance partner. Fourth, the project partners have longitudinal data which has been rarely used in past studies (meaning most have been cross-sectional or have small sample sizes that are of limited generalizability to other populations/sites).

Again, I strongly endorse this project for funding. If Council members have any questions regarding my support of this project, please feel free to contact me.

Sincerely,



Kathleen L. Wolf, Ph.D.
Research Social Scientist
kwolf@u.washington.edu

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

April 11, 2016

Matthew H E M Browning
Department of Recreation, Sport and Tourism
University of Illinois
104 Huff Hall (MC-584), 1206 South Fourth Street
Champaign, IL 61820

Thank you for reaching out to us and explaining the proposed research project entitled "Urban forestry's return on investment: Tying residential nature to health care expenditures" which you are submitting to the U. S. Forest Service. We are very happy to express our support of this project to the proposal reviewers.

The mission of the PA Department of Conservation and Natural Resources Bureau of Forestry and Rural & Community Forestry Section is to promote Community Forests and Tree Planting through partnerships and programs, providing leadership and coordination in planting and maintaining trees in cities and towns across the Commonwealth.

My current position as Urban Forest Program Coordinator is to provide Pennsylvania communities' with methods to set and achieve canopy cover goals, developing tools and partnerships to promote trees as effective tools for community greening, human health improvement, storm water management, and many other benefits by providing the science, research, and best practices to communities'.

Me and my colleagues throughout Pennsylvania and the larger northeastern U.S. region are always looking for more ways to demonstrate the importance of urban forestry, land conservation, and greening neighborhoods. We understand that your project will be developing a powerful modeling tool through the Natural Capital Project at Stanford University that will enable State Forestry Coordinators across the United States to model the extent to which investments in urban greening will save on health care expenditures. While it sounds like your project will be collecting data from a select region of the country (Northern California), this region of the country seems to be quite diverse in regards to its ecosystems and populations. We are thankful that your project will thus have national impact in Pennsylvania and other states in the Eastern United States.

We encourage the reviewers to strongly consider funding this project. Please let me know if you would like more information about our interests in this project.

Sincerely,

Mark Hockley
Urban Forest Program Coordinator
PA Department of Conservation and Natural Resources
Bureau of Forestry, Rural and Community Forestry Section
400 Market Street, Harrisburg, PA 17105
Phone: 717-214-7511 Email: c-mhockley@pa.gov

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Caring for
your natural resources
... now and forever

April 13, 2016

Dr. Matthew H E M Browning
University of Illinois
104 Huff Hall (MC-584)
1206 South Fourth St.
Champaign, IL 61820

Subject: Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures

Dear Dr. Browning:

This letter is written in support of your proposal to the U.S. Forest Service National Urban and Community Forestry Challenge Cost Share Grant Program titled *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures.*

Reducing health care expenses is a strong economic incentive to invest in urban forests, but the positive link between healthy urban forests and healthy residents is an even greater incentive.

University of Washington's Dr. Kathleen Wolf's research has linked urban trees with economic benefits which has enabled urban forestry practitioners, nationally and internationally, to show a positive return on investments to the urban forest. Because there is reason to expect nature is directly tied to health care costs, and human health, this project has the potential to produce an even stronger argument for investments in urban forestry management.

The information and deliverables associated with the grant will provide additional tools to Urban and Community Forestry practitioners that will reach an even broader audience of local and national policymakers, as well as the public.

Sincerely,

Aaron Everett
Washington State Forester
Policy Director
Office of the Commissioner of Public Lands
Washington State Department of Natural Resource

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

April 18, 2016

Matthew Browning - Assistant Professor
University of Illinois
104 Huff Hall (MC-584)
1206 South Fourth St.
Champaign IL 61820

Subject: Letter of Support - NUCFAC Proposal

Dear Mr. Browning:

Thank you for providing an application of *Urban Forestry's Return on Investment: Tying Residential Nature to Health Care Expenditures* which you submitted to the U.S. Forest Service National Urban and Community Forestry Challenge Cost Share Grant Program.

We understand part of the intent of the National Urban and Community Forestry Challenge Cost Share Grant Program funding is to "…increase knowledge within communities of how local investments in their urban forest ecosystems have potential to maximize their return through quantifiable public health benefits." Your project attempts to tie together health care expenditures and access to nature, and ultimately, focus urban forestry efforts on those which are most likely to increase human health, decrease health care spending, and bolster support and funding for urban forestry.

Wisconsin DNR is in full support of this project. We believe this research is important and will help us support and move forward the work we've been doing here in our state. The outcome of this project will provide additional information and tools to help us meet an identified priority in our Wisconsin Statewide Forest Strategy, specifically *Strategy 21 – Expand and manage a diverse urban tree canopy cover to provide multiple public benefits.* Additionally, the outcome meets two out of five of WI DNR's Urban Forestry Program goals in the Division's Strategic Direction: *UF-2 Focus on developing broad scale partnerships and funding methods…* and *UF-5 Focus on partnerships that can provide services & tools to local governments…*

Wisconsin is excited to increase our ability to provide research specifically about the relationship between health benefits and urban forestry. We absolutely think this research is important, and we would be willing to disseminate information via fliers/infographics/articles about your research results in FY2019.

Thank you for your work linking health care spending and urban greenspace. We are eager to see this project succeed.

Sincerely,

Paul DeLong
Chief State Forester
Division of Forestry

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
875 NORTH RANDOLPH STREET
SUITE 1425
ARLINGTON, VA 22203-1995

Agreement Date: July 27, 2015

NEGOTIATION AGREEMENT

INSTITUTION: **UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN**
CHAMPAIGN, ILLINOIS 61820-6242

The Facilities and Administrative (F&A) cost rates contained herein are for use on grants, contracts and/or other agreements issued or awarded to the University of Illinois at Urbana-Champaign by all Federal Agencies of the United States of America, in accordance with the cost principles mandated by 2 CFR 200. These rates shall be used for forward pricing and billing purposes for the University of Illinois at Urbana-Champaign Fiscal Year 2016. This rate agreement supersedes all previous rate agreements/determinations for Fiscal Year 2016.

Section I: RATES - TYPE: PROVISIONAL (PROV)

Type	From	To	On-Campus Rates	Off-Campus Rates	Base	Applicable Function
Prov	7/1/15	Until Amended	45.4%	24.0%	(a)	Sponsored Instruction
Prov	7/1/15	Until Amended	58.6%	24.0%	(a)	Organized Research
Prov	7/1/15	Until Amended	25.4%	18.7%	(a)	Other Sponsored Activities

DISTRIBUTION BASE

(a) Modified Total Direct Cost (MTDC), as defined in 2 CFR 200, consisting of all salaries and wages, fringe benefits, materials and supplies, services, travel, and up to the first $25,000 each subaward (regardless of the period of performance covered by the subawards under the award); and excluding equipment (defined in Section II, paragraph D.1.), capital expenditures, charges for patient care, tuition remission, rental costs, scholarships and fellowships, participant support costs and the portion of each subaward in excess of $25,000.

SECTION II: GENERAL TERMS AND CONDITIONS

A. **LIMITATIONS:** Use of the rates set forth under Section I is subject to any statutory or administrative limitations and is applicable to a given grant, contract or other agreement only to the extent that funds are available and consistent with any and all limitations of cost clauses or provisions, if any, contained therein. Acceptance of any or all of the rates agreed to herein is

predicated upon all the following conditions: (1) that no costs other than those incurred by the grantee/contractor were included in its indirect cost pool as finally accepted and that all such costs are legal obligations of the grantee/contractor and allowable under governing cost principles; (2) that the same costs that have been treated as indirect costs are not claimed as direct costs; (3) that similar types of costs, in like circumstances, have been accorded consistent accounting treatment; (4) that the information provided by the contractor/grantee, which was used as the basis for the acceptance of the rates agreed to herein and expressly relied upon by the Government in negotiating the said rates, is not subsequently found to be materially incomplete or inaccurate.

B. **ACCOUNTING CHANGES**: The rates contained in Section I of this agreement are based on the accounting system in effect at the time this agreement was negotiated. Changes to the method(s) of accounting for costs, which affects the amount of reimbursement resulting from the use of these rates, require the written approval of the authorized representative of the cognizant negotiating agency for the Government prior to implementation of any such changes. Such changes include but are not limited to changes in the charging of a particular type of cost from indirect to direct. Failure to obtain such approval may result in subsequent cost disallowances.

C. **PROVISIONAL RATES**: The provisional rates contained in this agreement are subject to unilateral amendment by the Government or bilateral amendment by the contracting parties at any time.

D. **SPECIAL REMARKS**:

1. Equipment is defined as follows: The costs of items of purchased equipment with an estimated life of more than one year and an acquisition cost of $5,000 or more per unit, including lease-purchase agreements. This definition includes the cost of component parts, materials and/or supplies used to fabricate an item or piece of equipment when (1) the aggregate cost of the component parts, materials and/or supplies is $5,000 or more in value and (2) the cost of fabrication is documented and accounted for by the department.

2. The Government's agreement with the rates set forth in Section I is not an acceptance of the University of Illinois at Urbana-Champaign's accounting practices or methodologies. Any reliance by the Government on cost data or methodologies submitted by the University of Illinois at Urbana-Champaign is on a non-precedence-setting basis and does not imply Government acceptance.

E. **APPLICATION OF RATES**:

1. The rates included in Section I are not applicable to Intergovernmental Personnel Act (IPA) costs. If the University elects to seek reimbursement of F&A costs associated with IPA agreements, then the University and the Office of Naval Research shall establish a special F&A rate for IPA agreements in accordance with the provisions of 2 CFR 200.

2. Application of the appropriate On-Campus or Off-Campus indirect rate(s) is to be determined at the beginning of each sponsored agreement and is to be equitably adjusted if the

circumstances which determined the application change materially during the period of performance.

a. The On-Campus rate is to be assessed except when a portion of the sponsored agreement is performed at an off-campus site. The criteria for utilization of the off-campus rate consists of all of the following: (a) performance at the off-campus site must be on a continuous basis; intermittent performance is not sufficient; (b) the University personnel working or engaged on the project must be physically located at an off-campus site; and (c) the off-campus performance must be of sufficient duration; normally a full semester, summer term or the period of performance of the sponsored agreement. The off-campus rate will be used for the off-campus portion of the work on a sponsored agreement.

b. Off-campus costs may include costs incurred at the off-campus site for salaries, related benefits, supplies, utility costs, rent, local travel and other similar costs, which are treated as direct. Travel to and from an off-campus site is considered an off-campus cost.

F. **DFARS WAIVER**: Signature of this agreement by the authorized representative of the University of Illinois at Urbana- Champaign and the Government acknowledges and affirms the University's request to waive the prohibition contained in DFARS 231.303(1) and the Government's exercise of its discretion contained in DFARS 231.303(2) to waive the prohibition in DFARS 231.303(1). The waiver request by the University of Illinois at Urbana- Champaign is made to simplify the University's overall management of DOD cost reimbursements under DOD contracts.

G. **USE BY OTHER FEDERAL AGENCIES**: The rates set forth in Section I hereof were negotiated in accordance with and under the authority set forth in 2 CFR 200. Accordingly, such rates shall be applied to the extent provided in such regulations to grants, contracts and other transactions to which 2 CFR 200 is applicable, subject to any limitations in part A of this section. Copies of this document may be provided by either party to other Federal agencies which have or intend to issue or award grants and contracts using these rates or to otherwise provide such agencies with documentary notice of this agreement and its terms and conditions.

Accepted:

FOR THE UNIVERSITY:

Walter K. Knorr

WALTER K. KNORR
Vice President, Chief Financial Officer and Comptroller

7/27/15
Date

FOR THE U.S. GOVERNMENT:

Beth A. Snyder

BETH A. SNYDER
Contracting Officer

7/28/2015
Date

For information concerning this agreement contact:
Beth Snyder
Office of Naval Research
Phone: (703) 696-5755
E-mail: beth.snyder@navy.mil

Statement of Key Personnel Qualifications

Dr. Matthew Browning has successfully formed cross-disciplinary teams of researchers and practitioners to design, fund, implement, and evaluate over $300K in projects related to humans and nature, including several using GIS. He has long-standing relationships with key personnel in agencies and organizations doing work related to health and nature (e.g., Children & Nature Network, Arbor Day Foundation, National Audubon Society, National Wildlife Federation, National Park Service, U.S. Fish & Wildlife Service) and has 15 years of experience communicating scientific findings regarding people's connection to nature. He holds a Ph.D. in Forestry from Virginia Tech and a Masters in Environmental Science from the Yale School of Forestry & Environmental Studies, where he was trained in GIS analysis with Dr. Dana Tomlin who helped develop this software as a student at Harvard in the mid-1970s.

Dr. Frances "Ming" Kuo (Associate Professor, University of Illinois at Urbana-Champaign, Department of Natural Resources and Environmental Sciences) **is an internationally known social scientist with a track record of conducting ground-breaking, high-impact research and outreach.** In her roughly $4M of externally funded research, she has been responsible for first documenting the effects of the urban forest on Chicago public housing residents, aggression, levels of violent crime and property crime, and ADHD symptoms. Her extension work in "Conveying the Power of Trees" has been described as "one of the best investments NUCFAC ever made" (Rodbell), and her work prompted the largest ($10M) tree planting in Chicago's history, and is now shaping the SITES sustainable landscapes credit rating system adopted as Best Practices by the federal government. In recognition of her consistent ground-breaking work, NUCFAC has asked her to testify on multiple occasions; in the most recent of these, she was invited to guide the Council on how to identify and disseminate high-impact research. Of the top 50 most cited articles in *Environment & Behavior* (one of the two top journals in the field), Kuo is sole, first, or supervising author on 5.

Dr. Jonathan Greenburg (Assistant Professor, University of Illinois at Urbana-Champaign Department of Geography and GIS) runs the Global Environmental Analysis and Remote Sensing (GEARS) Laboratory at University of Illinois. This lab centers on addressing questions of the impacts of land use/land cover change on vegetated ecosystems using remote sensing data. Research ranges across scales from individual plants to the entire globe, across many terrestrial and aquatic ecosystems, and utilizes state-of-the-art remote sensing imagery including hyperspectral, hyperspatial, multitemporal, thermal, and LiDAR data.

Dr. Stephen Van Den Eeden (Research Scientist III; Leader of the Environmental Exposures Cores for the Research Program in Genes, Environment, and Health) provides expertise in large-scale health insurance claims datasets. He has been an epidemiologist at the non-profit Division of Research since 1990. He has conducted a wide variety of studies, including those focused on environment and health. He has extensive experience in the use of KP data and data sources, including cost data.

Dr. Charles P. Quesenberry, Jr., PhD, (Biostatistician, Kaiser Permanente Northern California, Division of Research) has been a biostatistician at the Division of Research for over 30 years and leads the Biostatistics Group at the Division of Research. He has provided biostatistical support and guidance on a wide variety of epidemiologic studies and other projects involving large databases, including longitudinal observation studies related to treatment. He has analytic expertise and has numerous publications in the analysis of health cost and cost-effectiveness analyses. He has collaborated with Mr. Ray and Dr. Van Den Eeden in a variety of cost related studies.

Stacey Alexeff, PhD, (Environmental Biostatistician, Kaiser Permanente Northern California, Division of Research) trained at Harvard with a focus on statistics and measurement error in environmental health studies. (Her time will contribute entirely to the cost-share match).

G. Tom Ray, MBA, (Health Economic Biostatistician, Kaiser Permanente Northern California, Division of Research) has been at KPNC for 20 years. He manages cost data at the Division of Research and has published extensively on the cost of illness and cost-effectiveness of health interventions/treatments. He is the Division of Research expert in the use of the Cost Information Management System (CMIS), which is the expenditure database that apportions expenditures for each item of utilization (e.g., a specific outpatient or inpatient visit, a radiological exam, cost of prescription medications, and a surgical procedure).

Patrick Fitzgerald, (Senior Director of Community Wildlife, NWF), leads the National Wildlife Federation (NWF) Community Wildlife Habitat program (www.nwf.org/community) and is a member of the NWF leadership team. He leads outreach efforts to our nearly 300 municipal partners and works closely with our K-12, higher education and other education program teams. Through the Community Wildlife Habitat team, more than 155 cities, towns, counties and neighborhoods partner with NWF to provide pollinator and wildlife habitat throughout their community, raise awareness and educate citizens about pollinators and wildlife, and activate citizens through community service projects and advocacy. Patrick also oversees the Mayor's Monarch Challenge, an effort to engage local municipalities in monarch butterfly conservation. Patrick was previously the Senior Director of Education Advocacy at NWF where he led federal policy efforts to get kids outdoors and advance environmental education and outdoor recreation. Before joining NWF, Patrick was the Director of Governmental Relations for The Corps Network and Jumpstart for Young Children and worked on education policy and federal funding issues for Teach For America.